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To : Members of Graduate Council

From : Christina Bryce
Assistant Graduate Secretary

The next meeting of Graduate Council will be held on **Tuesday January 14th at 9:00 am in GH-111**

Listed below are the agenda items for discussion.

Please email *cbryce@mcmaster.ca* if you are unable to attend the meeting.

A G E N D A

I. Opening Remarks
II. Minutes of the meeting of December 3rd, 2024
Approval
III. Business arising
IV. Report from the Associate Deans, Graduate Studies
V. Report from the Associate Registrar and Graduate Secretary
VI. Faculty of Engineering Graduate Curriculum and Policy Committee Report
Approval

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Tuesday December 3rd at 9:00 am in GH-111

Present: S. Hranilovic (Chair), D. Trigatti, B. Newbold, K. McCallum, S. Hanna, F. Ma, M. Cino, K. Mattison, S. Heathorn, N. Carter, M. Heath, E. Grodek, T. Davidson, L. Parker, B. Milliken, Y. K. Shin, A. Prasad, A. Shakib, M. Verma, N. Wagner, E. Zhou, Y. Kim, C. Brendan, M. Rego, L. Side, Stephanie Baschiera (Senior Associate Registrar and Graduate Secretary), Christina Bryce (Assistant Graduate Secretary)

Regrets: K. Graham, F. Homid, A. Gadsden, P. Miu, K. Grandfield, M. Gough, T. Ruebottom

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I. Opening Remarks

Dr. Hranilovic reported on the following items:

- Provincial Attestation Letters (PAL), noting no word on allocations but some clarity on how they'll be administered internally;
- November Convocation Ceremonies, noting the President's Award for Excellence in Graduate Supervision had been handed out at the ceremonies for the first time;
- A recent visit to the MBA programs at the Ron Joyce Center, highlighting feedback on how professional and course-based Masters are different from more traditional research-based programs;
- Colleges can now deliver professional or applied Masters degree, noting that a number of proposals have been received by OCGS and highlighting overlap with programs at McMaster and related feedback.

II. Minutes of the meeting of November 12th, 2024

it was duly moved and seconded, **that the Graduate Council approve the minutes of the November 12th, 2024 meeting, as circulated.**

The motion was **carried**.

III. Business arising

There was no business arising.

IV. Report from the Associate Deans, Graduate Studies

Dr. Newbold (Faculty of Science) reported on the following items:

- The upcoming Graduate Research Symposium for the Faculty;
- Hiring for the career position within the Faculty;
- The Redistribution Policy was passed through the Faculty Council.

Drs. Heathorn, Verma, Heath, Hanna had no report

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V. Report from the Associate Registrar and Graduate Secretary

Ms. Baschiera reported on the following items:

- Work on the PAL process;
- Visa processing times, noting they're anywhere from 10-12 weeks and that they'd been advising programs to move up offers where possible;
- Strategies with the enrollment management group to keep applicants engaged ahead of registration;

Members discussed visa processing times, whether international Masters students needed a PAL to do their Ph.D., communication on students asking about the process, who can pay the deposit for an international graduate student, and work to manage/communicate with the applicant population before enrollment.

VI. Faculty of Health Sciences Graduate Policy and Curriculum Committee Report

Dr. Hanna presented the change, noting that Medical Sciences had informally required students to do one seminar presentation and now they're making it a formal requirement with lots of opportunities for students to complete it.

It was duly moved and seconded, '**that the Graduate Council approve, for recommendation to Senate as appropriate, the change proposed by the Faculty of Health Sciences, as described in the documents.'**

The motion was **carried.**

VII. New Award and Changes to Award terms

It was duly moved and seconded, 'that the Graduate Council approve the new award as described in the document.'

The motion was carried.

VIII. Report from the Ombuds Office

Carolyn Brendan presented the report, highlighting the role of the office and the advocacy it provides. The report includes statistics year over year and highlights the most prevalent issues students came to the office with.

Members discussed professionalism policies reference in the report, the intersection between funding pressures and tasks graduate students are asked to conduct, and the importance of communicating lab expectations from the outset.

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To : Graduate Council

From : Christina Bryce
Assistant Graduate Secretary

At its meeting on October 23rd and November 13th the Faculty of Engineering Graduate Curriculum and Policy Committee approved the following graduate curriculum recommendations.

Please note that these recommendations were approved by the Faculty of Engineering.

For Approval of Graduate Council:

a. Computing and Software
    i. Change to Program Requirements

b. Materials Science and Engineering
    i. Change to Comprehensive Exam Requirements
    ii. Change to Calendar Copy

c. School of Engineering Practice and Technology
    i. MEEI/MTEI, MEPP, MEST, MEME
        1. Change to Course Requirements and Calendar Copy

d. Career Planning and Professional Skills Development

For Information of Graduate Council:

e. Biomedical Engineering*
    i. New Course (and cross-listings)
        1. 734 Science and technology of protective materials and their applications
    ii. New Cross-listed Course
        1. 714 Collaborative Design in Controlled Release

f. Chemical Engineering
    i. New Cross-listed Course
        1. 792 Machine Learning

g. Electrical and Computer Engineering
    i. New Course
        1. 743 Coding Theory

h. Mechanical Engineering
    i. Course Cancellations

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1. 702 Advanced Dynamics of Machines 1
2. 722 Theory Of Elasticity
3. 738 Manufacturing Processes II
4. 742 Fundamentals of Acoustics
5. 748 Experimental Mechanics
6. 750 Computer Integrated Manufacturing

ii. New Courses
1. 6AI3 Applied Artificial Intelligence
2. 6ES3 Energy Storage

iii. New Cross-listed Courses
1. 776 Manufacturing Systems 2 – System Engineering, Process Integration and Simulation

i. School of Engineering Practice and Technology

i. MEEI/MTEI

1. Change to Course Title and Description
   a. 753 Enterprise Opportunity Development
   b. 755 Business Launch and Development
2. Change in Course Title
   a. 790 Emerging Technologies for Engineering Enterprise Innovation
3. Change in Course Title, Description and Requisite
   a. 794 Engineering Innovation Project
4. New Courses
   a. 715 Organizational Behaviour and Human Resources
   b. 719 Organizational Change Management

ii. MEPP

1. Course Cancellation
   a. 6X03 Livable Cities, the Built and Natural Environment
2. Change to Course Descriptions
   a. 701 Theory and Practice of Policy Analysis: Frameworks and Models
   b. 704 Public Policy Research Project (Part 1 and 2)
   c. 705 Green Engineering, Sustainability and Public Policy
   d. 706 Energy and Public Policy
   e. 709 Emerging Issues, Technology and Public Policy
   f. 710 International Governance and Environmental Sustainability
   g. 778 Circular Economy - Engineering Perspectives and Application
3. New Courses
   a. 6EM3 Legal and Regulatory Issues

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b. 714 Governance and Regulation of Information and Telecommunications Technologies

iii. MEST
   1. Course Cancellation
      a. 716 Automotive Safety Design
   2. New Courses
      a. 6SC3 Smart Cities and Communities
      b. 703 Railroad Track

iv. New Courses
   1. 6BE3 Battery Energy Storage System

v. Course Cancellations
   1. 788 Neural Networks and Development Tools
   2. 789 Deep Learning and Its Applications

vi. Change to Requisite
   1. 742 Visual Perception for Autonomous Vehicles

vii. Change to Course Description and Requisite
   1. 6CG3 Fundamentals of computer graphics and animation development

viii. Change to Course Description and Title
   1. 773 Leadership for Innovation

*Also approved by the Faculty of Health Sciences

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Recommendation for Change in Graduate Curriculum – For Change(s) Involving Degree Program Requirements / Procedures / Milestones

Please read the following notes before completing this form:

1. This form must be completed for all changes involving degree program requirements/procedures. All sections of this form must be completed.

2. An electronic version of this form (must be in MS WORD not PDF) should be emailed to the Assistant Secretary, School of Graduate Studies (cbryce@mcmaster.ca).

3. A representative from the department is **required to attend** the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.

DEPARTMENT	Computing and Software
NAME OF PROGRAM and PLAN	Computer Science
DEGREE	**Ph.D.**

NATURE OF RECOMMENDATION *(PLEASE CHECK APPROPRIATE BOX)*

Is this change a result of an IQAP review? ☐ Yes ☒ No

Creation of a New Milestone ☐

Change in Admission Requirements	X	**Change in Comprehensive Examination Procedure**		**Change in Course/Program Requirements**	
Change in the Description of a section of the Graduate Calendar		**EXPLAIN:**			
Other Changes:		**Explain:**			

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Describe the existing requirement/procedure:

Section 2.3 reads as follows:

Transfer from the Department's Master's programs

Advanced students in the Software Engineering M.Eng. or M.A.Sc. programs or in the Computer Science M.Sc. program may be admitted to the CS Ph.D. program without completing the Master's program if the candidate has:

1. completed the course requirements of the program with an average of at least A-,
2. shown significant progress and maturity in research,
3. the full support of the supervisor,
4. the approval of the admission authority of the Ph.D. program,
5. the approval of the School of Graduate Studies.

Requesting a Transfer:

1. A student wishing to transfer from a Masters program to the PhD program must prepare a transfer request that contains four sections:
   a. a status report including transcript of courses taken and grades earned,
   b. a description of the research or project carried out in the present program,
   c. an application for the new program,
   d. a statement by the supervisor indicating why he/she supports the transfer.
2. The transfer request is considered by the same committee that processes other requests for admission to the Ph.D. program. If the committee approves the transfer, it sends the application to the School of Graduate Studies in the usual way.
3. A transferring student must complete four courses beyond the Master's requirements, see Section~\ref{courses}.

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Provide a detailed description of the Recommended Change *(Attach additional pages if space is not sufficient.)*

We want to add the following section 4.2 to our document (Section 4 is Course Requirements):

4.2 Transfers from the Department's Master's

1. A transferring student must complete a total of six (6) courses as a requirement for their PhD degree.
2. A maximum of four (4) courses may be transferred from the Master's program towards the PhD program.
3. The six (6) courses chosen must follow one of the following patterns
    a. At least two (2) Theory courses, at least one (1) Systems course, at least one (1) Software course
    b. At least two (2) Systems courses, at least one (1) Theory course, at least one (1) Software course
4. At most two (2) 600-level courses
5. Two free course choices deemed relevant to the degree program and research, which can be from other departments subject to the approval of the supervisor and the graduate chair.

We further wish to change "must complete four courses" to "must complete two courses" in Section 2.3 as highlighted in yellow above.

Rationale for the Recommended Change (How does the requirement fit into the department's program and/or tie to existing Program Learning Outcomes from the program's IQAP cyclical review?):

This makes the transfer regulations be the same as the Direct Entry regulations

Provide implementation date: *(Implementation date should be at the beginning of the academic year)*

September 2023. (Yes, we want to back-date this, as it was supposed to have gone through the committees in time for this, but fell through the cracks. This is a net positive for students.)

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Are there any other details of the recommended change that the curriculum and policy committee should be aware of? If yes, please explain:
Provide a description of the recommended change to be included in the calendar (please include a tracked changes version of the calendar section affected if applicable):
Contact information for the recommended change: Name: Jacques Carette Email: carette@mcmaster.ca Date submitted: Oct. 11, 2024

If you have any questions regarding this form, please contact the Assistant Secretary, School of Graduate Studies, cbryce@mcmaster.ca

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DEPARTMENT	Computing and Software
NAME OF PROGRAM and PLAN	Software Engineering
DEGREE	**Ph.D.**

NATURE OF RECOMMENDATION *(PLEASE CHECK APPROPRIATE BOX)*

Is this change a result of an IQAP review? ☐ Yes ☒ No

Creation of a New Milestone ☐

Change in Admission Requirements	X	**Change in Comprehensive Examination Procedure**		**Change in Course/Program Requirements**	
Change in the Description of a section of the Graduate Calendar		**EXPLAIN:**			
Other Changes:		**Explain:**			

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2. shown significant progress and maturity in research,
3. the full support of the supervisor,
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4.2 Transfers from the Department's Master's

1. A transferring student must complete a total of six (6) courses as a requirement for their PhD degree.
2. A maximum of four (4) courses may be transferred from the Master's program towards the PhD program.
3. The six (6) courses chosen must additionally contain: At least two (2) Software courses, at least one (1) Systems course, at least one (1) Theory course
4. At most two (2) 600-level courses
5. Two free course choices deemed relevant to the degree program and research, which can be from other departments subject to the approval of the supervisor and the graduate chair.

We further wish to change "must complete four courses" to "must complete two courses" in Section 2.3 as highlighted in yellow above.

Rationale for the Recommended Change (How does the requirement fit into the department's program and/or tie to existing Program Learning Outcomes from the program's IQAP cyclical review?):

This makes the transfer regulations be the same as the Direct Entry regulations

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September 2023. (Yes, we want to back-date this, as it was supposed to have gone through the committees in time for this, but fell through the cracks. This is a net positive for students.)

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DEPARTMENT	Materials Science and Engineering
NAME OF PROGRAM and PLAN	GENPH / MATSENPHD
DEGREE	Doctor of Philosophy

NATURE OF RECOMMENDATION *(PLEASE CHECK APPROPRIATE BOX)*

Is this change a result of an IQAP review? ☐ Yes ☒ No

Creation of a New Milestone ☐

Change in Admission Requirements		**Change in Comprehensive Examination Procedure**	☒	**Change in Course/Program Requirements**	
Change in the Description of a section of the Graduate Calendar		**EXPLAIN:**			
Other Changes:		**Explain:**			

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Describe the existing requirement/procedure:

Ph.D. students in Materials Science and Engineering must submit a written Research Proposal and pass the associated oral exam within three-five terms (12-20 months) in the program, but no more than six terms (24 months). For students transferring into the Ph.D. program from the M.A.Sc. program, this requirement is replaced by the Transfer Report.

Ph.D. students in Materials Science and Engineering are required to successfully complete the oral Comprehensive Examination which tests the student's knowledge of three topics related to the research at an advanced level. The comprehensive exam must be completed within the first 6 terms (24 months) of entry into the Ph.D. program.

For reporting purposes, only the comprehensive is recorded as the comprehensive exam and the proposal is considered a program milestone.

Provide a detailed description of the Recommended Change *(Attach additional pages if space is not sufficient.)*

In the proposed system, the separate Proposal Exam will be eliminated, and the Comprehensive Exam will be split into two parts to take place at the same time, Part A: composed of Proposal Report, and Part B: an Oral Exam including questions on the Proposal and 3 topics.

Rationale for the Recommended Change (How does the requirement fit into the department's program and/or tie to existing Program Learning Outcomes from the program's IQAP cyclical review?):

- Little information is given on expectations for the written or oral exam. There is a large variability in quality of exams
- Time to completion is a challenge - students are going overtime or taking months to complete their written documents
- Providing a written document with a timeline, guidelines for report length/sections, and a place for student/supervisor to sign will help unify expectations and increase quality.
- We used to do the comprehensive at 36 months – we cannot and must make a shift in our expectations for breadth/depth of knowledge expected at 24 months vs 36 months.

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Provide implementation date: ***(Implementation date should be at the beginning of the academic year)***

September 1, 2025

Are there any other details of the recommended change that the curriculum and policy committee should be aware of? If yes, please explain:

N/A

Provide a description of the recommended change to be included in the calendar (please include a tracked changes version of the calendar section affected if applicable):

~~Research Proposal Examination~~

~~Students entering the Ph.D. program in Materials Science and Engineering must submit a written Research Proposal for their research program and complete (pass) the associated oral exam within three-five terms (12-20 months) in the program, but no more than six terms (24 months). Their Supervisory Committee, augmented by one other member, assigned by the Associate Chair, Graduate, will give a critical review and examine the student on the content contained in or related to the Research Proposal during the oral exam. For students transferring into the Ph.D. program from the M.A.Sc. program, this requirement is replaced by the Transfer Report.~~

Comprehensive Examination

Students enrolled in the Ph.D. program in Materials Science and Engineering are required to successfully complete (pass) the Comprehensive Examination. The Comprehensive Examination includes two parts: Part A: Written Proposal Report and Part B: Oral Examination. The oral exam, tests the student's knowledge of three topics related to the research at an advanced level. Students are expected to show the greatest depth of knowledge in their field of research, but also be expected to demonstrate knowledge of fields related to their areas of specialization. The exam committee will consist of the Supervisory Committee, augmented by one other member, assigned by the Associate Chair, Graduate. The comprehensive exam must be completed within three-five terms (12-20 months) in the program, but no more than six terms (24 months). ~~within the first 6 terms (24 months) of entry into the Ph.D. program.~~ For students transferring into the Ph.D. program from the

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M.A.Sc. program, the Transfer Exam would be in lieu of Part A of the Comprehensive Examination.

Contact information for the recommended change:

Name: Alisha Digba Email: digbaa1@mcmaster.ca Date submitted: ———2024-10-07

If you have any questions regarding this form, please contact the Assistant Secretary, School of Graduate Studies, cbryce@mcmaster.ca

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DEPARTMENT	Materials Science and Engineering
NAME OF PROGRAM and PLAN	GENPH / MATSENPHD
DEGREE	Doctor of Philosophy

NATURE OF RECOMMENDATION *(PLEASE CHECK APPROPRIATE BOX)*

Is this change a result of an IQAP review? ☐ Yes ☒ No

Creation of a New Milestone ☐

Change in Admission Requirements		**Change in Comprehensive Examination Procedure**		**Change in Course/Program Requirements**	
Change in the Description of a section of the Graduate Calendar	x	**EXPLAIN:** Remove a part in the description of graduate courses			
Other Changes:		**Explain:**			

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Describe the existing requirement/procedure:

The current graduate calendar advises that our 600 level courses, which are available to senior undergraduate students, are also offered for graduate credit at the M.Sc. and M.Eng. level only.

Provide a detailed description of the Recommended Change *(Attach additional pages if space is not sufficient.)*

The highlighted part needs to be removed for two reasons:

1. It conflicts with the Ph.D. student guidelines, which allow one 600-level course.
2. The department does not offer an M.Eng. program

Rationale for the Recommended Change (How does the requirement fit into the department's program and/or tie to existing Program Learning Outcomes from the program's IQAP cyclical review?):

The highlighted section, i.e. "at the M.Sc. and M.Eng. level only" conflicts with the Ph.D. student guidelines, which allow one 600-level course. In addition, the department does not offer an M.Eng. degree.

Provide implementation date: *(Implementation date should be at the beginning of the academic year)*

September 1, 2025

Are there any other details of the recommended change that the curriculum and policy committee should be aware of? If yes, please explain:

N/A

Provide a description of the recommended change to be included in the calendar (please include a tracked changes version of the calendar section affected if applicable):

The following courses, which are available to senior undergraduate students, are also offered for graduate credit~~. at the M.Sc. and M.Eng. level only.~~ Graduate students taking these courses are required to do extra course work beyond that required of undergraduates in the 400-level course.

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Contact information for the recommended change: Name: Alisha Digba Email: digbaa1@mcmaster.ca Date submitted:

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3. A representative from the department is **required to attend** the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.

DEPARTMENT	W Booth School of Engineering Practice and Technology
NAME OF PROGRAM and PLAN	Engineering Entrepreneurship and Innovation, M.E.E.I.
DEGREE	Master's in engineering (M Eng)

NATURE OF RECOMMENDATION *(PLEASE CHECK APPROPRIATE BOX)*

Is this change a result of an IQAP review? ☐ Yes ☒ No

Creation of a New Milestone ☐

Change in Admission Requirements		**Change in Comprehensive Examination Procedure**		**Change in Course/Program Requirements**	Y

Change in the Description of a section of the Graduate Calendar	X	**EXPLAIN:** See below
Other Changes:		**Explain:**

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Describe the existing requirement/procedure:

The current set of course courses does not have a course on (1) project management, (2) Organizational Change Management and (3) Organizational Behaviour and Human Resources

Provide a detailed description of the Recommended Change *(Attach additional pages if space is not sufficient.)*

We propose to introduce three new courses.

New Core Course: SEP 725 Practical Project Management for Today's Business Environment

New Elective Course: Organizational Change Management

New Elective Course: Organizational Behaviour and Human Resources

Changes:

- Move Sep 770 Total Sustainability Management to elective
- Rename Sep 790 Emerging Technologies for Engineering Enterprise Innovation to Engineering Innovation Project -1
- Change Full-time and part time require to match other Sep programs
- Remove Sept 795 as we added 2 project courses to this program

Rationale for the Recommended Change (How does the requirement fit into the department's program and/or tie to existing Program Learning Outcomes from the program's IQAP cyclical review?):

The new core course SEP 725 will help be immensely helpful for students to plan and execute corporate innovation successfully.

The two new electives will help students engage in corporate innovation and corporate strategy with mastery over organizational change management, and human resource management.

Moving Sep 770 from core to elective, and instead introducing SEP 725 as a core course aligns with the program's revised focus on intrapreneurship.

Remove Sept 795 as we added 2 project courses to this program

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Change Full-time and part time require to match other Sep programs

Provide implementation date: ***(Implementation date should be at the beginning of the academic year)***

The changes will be implemented in Fall 2025

Are there any other details of the recommended change that the curriculum and policy committee should be aware of? If yes, please explain:

No

Provide a description of the recommended change to be included in the calendar (please include a tracked changes version of the calendar section affected if applicable):

The Master of Engineering Entrepreneurship and Innovation program is a fast-paced program that will provide new and seasoned engineering professionals with the modern skills and insights needed to confidently engage in corporate innovation and bring technology innovation to market. Successful graduates receive the MEng degree.

Admission

Applications for admission will be made directly through the W Booth School of Engineering Practice and Technology. In addition to the general requirements for entry into a graduate program in Engineering, candidates applying to the Master of Engineering Entrepreneurship and Innovation program must hold an Honours Bachelor's degree in engineering or closely related discipline (i.e. science, technology, math), with at least a B- average (equivalent to a McMaster 7.0 GPA out of 12) in the final year in all courses.

~~The program is intended for full time students and the nominal program duration is 16 months. Part-time students will normally be expected to complete the program in three years and one term (40 months).~~

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Candidates may be enrolled on a full- or part-time basis. Full-time students will complete the degree in 24 months with an accelerated path to complete in twelve consecutive months. Students are admitted for September or January~~.~~. Part-time students will normally be expected to complete the program in three years and one term (40 months).

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Courses

Students in the MEEI program must complete 10 courses (30 units).

7 core courses (21 units)

2 technical electives (6 units)

1 cross-disciplinary elective (3 units)

Core Courses

The core program consists of seven mandatory 3-unit courses:

SEP 793 / Entrepreneurial Opportunity Identification

SEP 773 / Leadership for Innovation

SEP 753 / ~~Enterprise Opportunity Development~~Financial Decision Making

SEP 755 / ~~Business Launch and Development~~Marketing Analytics

SEP 790 / Engineering Innovation Project -1

~~SEP 770 / Total Sustainability Management~~

SEP 794 / Engineering Innovation Project -2

~~SEP 790 / Emerging Technologies for Engineering Enterprise Innovation~~

-SEP 725 Practical Project Management for Today's Business Environment

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~~Those students who have exceptional technical backgrounds may consult the Program Lead to request an exemption for SEP 790. If approved, the student will choose an additional technical or approved cross-disciplinary elective to replace SEP 790.~~

Technical Electives

All students in the Master of Engineering Entrepreneurship and Innovation program must complete 6 units of elective courses. Students may choose any course in the Faculty of Engineering as an elective.

~~Students with an exceptional entrepreneurship project may obtain permission from the Program Lead to complete the following course towards 3 units of their elective requirements.~~

~~SEP 795 / Entrepreneurship Project~~

Cross-Disciplinary Elective Course

All students in the Master of Engineering Entrepreneurship and Innovation program are required to complete one half course (3 units) which should be selected from the following approved cross-disciplinary elective list.

SEP 701 / Theory and Practice of Policy Analysis: Frameworks and Models

SEP 709 / Emerging Issues, Technology and Public Policy

SEP 777 / Cyber-Physical Systems and Industry 4.0

SEP 729 / Manufacturing Systems

SEP 731 / Lean Six Sigma for Engineering

SEP 760 / Design Thinking

Sept 770 Total Sustainability Management

SEP 7XXX Organizational Change Management

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SEP 7XXX Organizational Behaviour and Human Resources

Innovation and Entrepreneurship Projects

An essential element in the MEEI/MTEI program is an Innovation project (SEP 794). Building on key concepts and outcomes of the core course progression, students will work in groups to develop market-aligned and technologically innovative new venture concepts. The project can be derived from several important sources:

Inventions and intellectual property developed by McMaster researchers

Innovation initiatives from sponsoring organizations from the community

Original concepts or inventions from students.

Corporate innovation challenges currently prevalent in an industry

The project will allow students to experience the full cycle modern engineering and technology innovation including:

Assessing and characterizing markets and technology spaces

Developing high and unique value propositions for promising technologies

Thorough market research, competitive research, and IP management

Proof of Concept and Minimum viable product definitions

Framing a promising new business with either entrepreneurial or intrapreneurial intent

Essential financial and operational models for new ventures

~~Through the program, student groups who exhibit exceptional potential, through either the SEP 794 / Engineering Innovation Project course or other course activities, may be approved to take the elective SEP 795 / Entrepreneurship Project course elective. This intensive course provides an immersive opportunity for the project team to convert their project concepts into viable ventures that will be ready for either incubation via McMaster's Forge organization or to enter global pitch competitions. Key activities of this process include:~~

~~Rigorous proof of concept in business concept and critical technical elements.~~

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~~Detailed, credible operational, financial, and marketing plans suitable for a new venture launch.~~ ~~Intensive pitch preparations for competitions and even investment discussions with external parties.~~
Contact information for the recommended change: Name: Zhen Gao Email: gaozhen@mcmaster.ca Date submitted: October 2024

If you have any questions regarding this form, please contact the Assistant Secretary, School of Graduate Studies, cbryce@mcmaster.ca

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Recommendation for Change in Graduate Curriculum – For Change(s) Involving Degree Program Requirements / Procedures / Milestones

Please read the following notes before completing this form:

1. This form must be completed for all changes involving degree program requirements/procedures. All sections of this form must be completed.
2. An electronic version of this form (must be in MS WORD not PDF) should be emailed to the Assistant Secretary, School of Graduate Studies (cbryce@mcmaster.ca).
3. A representative from the department is **required to attend** the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.

DEPARTMENT	W Booth School of Engineering Practice and Technology
NAME OF PROGRAM and PLAN	Technology Entrepreneurship and Innovation, M.T.E.I.
DEGREE	Master's of Technology (M Tech)

NATURE OF RECOMMENDATION *(PLEASE CHECK APPROPRIATE BOX)*

Is this change a result of an IQAP review? ☐ Yes ☒ No

Creation of a New Milestone ☐

Change in Admission Requirements		**Change in Comprehensive Examination Procedure**		**Change in Course/Program Requirements**	Y
Change in the Description of a section of the Graduate Calendar	X	**EXPLAIN:** See below			
Other Changes:		**Explain:**			

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Describe the existing requirement/procedure:

The current set of course courses does not have a course on (1) project management, (2) Organizational Change Management and (3) Organizational Behaviour and Human Resources

Provide a detailed description of the Recommended Change *(Attach additional pages if space is not sufficient.)*

We propose to introduce three new courses.

New Core Course: SEP 725 Practical Project Management for Today's Business Environment

New Elective Course: Organizational Change Management

New Elective Course: Organizational Behaviour and Human Resources

Changes:

- Move Sep 770 Total Sustainability Management to elective
- Rename Sep 790 Emerging Technologies for Engineering Enterprise Innovation to Engineering Innovation Project -1
- Change Full-time and part time require to match other Sep program
- Remove Sept 795 as we added 2 project courses to this program

Rationale for the Recommended Change (How does the requirement fit into the department's program and/or tie to existing Program Learning Outcomes from the program's IQAP cyclical review?):

The new core course SEP 725 will help be immensely helpful for students to plan and execute corporate innovation successfully.

The two new electives will help students engage in corporate innovation and corporate strategy with mastery over organizational change management, and human resource management.

Moving Sep 770 from core to elective, and instead introducing SEP 725 as a core course aligns with the program's revised focus on intrapreneurship.

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Remove Sept 795 as we added 2 project courses to this program

Change Full-time and part time require to match other Sep programs

Provide implementation date: *(Implementation date should be at the beginning of the academic year)*

The changes will be implemented in Fall 2025

Are there any other details of the recommended change that the curriculum and policy committee should be aware of? If yes, please explain:

No

Provide a description of the recommended change to be included in the calendar (please include a tracked changes version of the calendar section affected if applicable):

The Master of Technology Entrepreneurship and Innovation is a fast-paced program that will provide new and seasoned engineering professionals with the modern skills and insights needed to confidently bring technology innovation to market. Successful graduates receive the MTech degree.

Admission

While students in the Technology Entrepreneurship and Innovation program are not expected to have any engineering or scientific background, they are expected to embrace creativity and innovation. Some basic familiarity with technology is expected, but the required technological depth will depend on the project itself and will be evaluated on a case-by-case basis. Considerable emphasis will be placed on team-based experiential learning in which all members of the team will learn from each other as they complete the project.

Applications for admission will be made directly through the W Booth School of Engineering Practice and Technology. In addition to the general requirements for entry into a graduate program in Engineering, candidates applying to the Master of Technology Entrepreneurship and Innovation program must hold an Honours Bachelor's degree from any discipline, with at least a B- average (equivalent to a McMaster 7.0 GPA out of 12) students in the final year in

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all courses in the discipline, or relating to the discipline, in which the applicant proposes to do graduate work.

~~The program is intended for full time students and the nominal program duration is 16 months.~~

Candidates may be enrolled on a full- or part-time basis. Full-time students will complete the degree in 24 months with an accelerated path to complete in twelve consecutive months. Students are admitted for September or January~~r~~. Part-time students will normally be expected to complete the program in three years and one term (40 months).

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Courses

Students in the MTEI program must complete 10 courses (30 units).

- 7 core courses (21 units)
- 2 technical electives (6 units)
- 1 cross-disciplinary elective (3 units)

The core program consists of seven mandatory 3-unit courses:

SEP 793 / Entrepreneurial Opportunity Identification

SEP 773 / Leadership for Innovation

SEP 753 / ~~Enterprise Opportunity Development~~Financial Decision Making

SEP 755 / ~~Business Launch and Development~~Marketing Analytics

SEP 790 / Engineering Innovation Project -1

~~SEP 770 / Total Sustainability Management~~

SEP 794 / Engineering Innovation Project -2

~~SEP 790 / Emerging Technologies for Engineering Enterprise Innovation~~

-SEP 725 Practical Project Management for Today's Business Environment

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~~Those students who have exceptional technical backgrounds may consult the Program Lead to request an exemption for SEP 790. If approved, the student will choose an additional technical or approved cross-disciplinary elective to replace SEP 790.~~

Technical Electives

All students in the Master of Technology Entrepreneurship and Innovation must complete 6 units of elective courses. Students may choose any course in the Faculty of Engineering as an elective.

~~Students with an exceptional entrepreneurship project may obtain permission from the Program Lead to complete the following course towards 3 units of their elective requirements.~~

~~SEP 795 / Entrepreneurship Project~~

Cross-Disciplinary Elective Course

All students in the Master of Technology Entrepreneurship and Innovation program are required to complete one half course (3 units) which should be selected from the following approved cross-disciplinary elective list.

SEP 701 / Theory and Practice of Policy Analysis: Frameworks and Models

SEP 709 / Emerging Issues, Technology and Public Policy

SEP 777 / Cyber-Physical Systems and Industry 4.0

SEP 729 / Manufacturing Systems

SEP 731 / Lean Six Sigma for Engineering

SEP 760 / Design Thinking

Sept 770 Total Sustainability Management

SEP 7XXX Organizational Change Management

SEP 7XXX Organizational Behaviour and Human Resources

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Innovation and Entrepreneurship Projects

An essential element in the MEEI/MTEI program is an Innovation project (SEP 794). Building on key concepts and outcomes of the core course progression, students will work in groups to develop market-aligned and technologically innovative new venture concepts. The project can be derived from several important sources:

Inventions and intellectual property developed by McMaster researchers

Innovation initiatives from sponsoring organizations from the community

Original concepts or inventions from students.

Corporate innovation challenges currently prevalent in an industry

The project will allow students to experience the full cycle modern engineering and technology innovation including:

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Developing high and unique value propositions for promising technologies

Thorough market research, competitive research, and IP management

Proof of Concept and Minimum viable product definitions

Framing a promising new business with either entrepreneurial or intrapreneurial intent

Essential financial and operational models for new ventures

~~Through the program, student groups who exhibit exceptional potential, through either the SEP 794 / Engineering Innovation Project course or other course activities, may be approved to take the elective SEP 795 / Entrepreneurship Project course elective. This intensive course provides an immersive opportunity for the project team to convert their project concepts into viable ventures that will be ready for either incubation via McMaster's Forge organization or to enter global pitch competitions. Key activities of this process include:~~

~~Rigorous proof of concept in business concept and critical technical elements.~~

~~Detailed, credible operational, financial, and marketing plans suitable for a new venture launch.~~

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~~Intensive pitch preparations for competitions and even investment discussions with external parties.~~
Contact information for the recommended change: Name: Zhen Gao Email: gaozhen@mcmaster.ca Date submitted: October 2024

If you have any questions regarding this form, please contact the Assistant Secretary, School of Graduate Studies, cbryce@mcmaster.ca

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Recommendation for Change in Graduate Curriculum – For Change(s) Involving Degree Program Requirements / Procedures / Milestones

Please read the following notes before completing this form:

1. This form must be completed for all changes involving degree program requirements/procedures. All sections of this form must be completed.
2. An electronic version of this form (must be in MS WORD not PDF) should be emailed to the Assistant Secretary, School of Graduate Studies (cbryce@mcmaster.ca).
3. A representative from the department is **required to attend** the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.

DEPARTMENT	W Booth SEPT
NAME OF PROGRAM and PLAN	Engineering and Public Policy (MEPP)
DEGREE	Master of Engineering and Public Policy

NATURE OF RECOMMENDATION *(PLEASE CHECK APPROPRIATE BOX)*

Is this change a result of an IQAP review? ☐ Yes ☒ No

Creation of a New Milestone ☐

Change in Admission Requirements		**Change in Comprehensive Examination Procedure**		**Change in Course/Program Requirements**	X
Change in the Description of a section of the Graduate Calendar	X	**EXPLAIN:** See below			
Other Changes:		**Explain:**			

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Describe the existing requirement/procedure:

MEPP students take 10 courses (30 units) electives consisting of:

4 <u>required</u> 3-unit courses (= 12 units) …

These provide the content and methodological skills that allow you to understand and analyze societal issues to contribute to public policy solutions

2 <u>required</u> 3-unit courses (= 6 units) (Together, they constitute your "research project')

Here, you prepare a substantive research paper exploring an issue at the interface of engineering, science and public policy

1 <u>cross-disciplinary</u> elective graduate engineering course (3 units)

Selected from an approved cross-disciplinary elective list

3 <u>elective</u> 3-unit courses (= 9 units) …

Giving students a chance to deepen knowledge in a range of engineering, science, and social science areas

Provide a detailed description of the Recommended Change *(Attach additional pages if space is not sufficient.)*

We propose to:

A. Develop within SEP two new focus elective courses.
   - SEP 7xx, Governance and Regulation of Information and Telecommunications Technologies
   - SEP 6XX, Legal and Regulatory Issues (an expansion of an existing 400 series course)

B. Remove an existing focus elective SEP course. (A consequence of it not being offered for two years and the instructor is retiring)
   - SEP 6X03, Livable Cities, the Built and Natural Environment

C. Add a focus elective option from another Faculty. (We have reviewed and discussed the option with the Wilson College of Leadership and Civic Engagement)
   - Wilson 700, Studies in Leadership in Civic Engagement - Selected Topics

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D. Amend items in the calendar that do not reflect current expectations or requirements (e.g. inclusion of "Additional Courses" which includes reference to courses beyond MEPP's 30 unit requirements).

Rationale for the Recommended Change (How does the requirement fit into the department's program and/or tie to existing Program Learning Outcomes from the program's IQAP cyclical review?):

A. We are proposing to add two new focus elective offerings. These courses will provide timely and relevant support:

1. SEP 7xx Governance and Regulation of Information and Telecommunications Technologies

A course on the Governance and Regulation of Information and Communication Technologies (ICT) aligns closely with the Master of Engineering and Public Policy (MEPP) program's broader objectives of integrating engineering principles with public policy frameworks. It directly supports MEPP's commitment to equipping students with the skills to critically analyze and influence the regulatory landscape of emerging technologies. By focusing on current issues such as artificial intelligence, data privacy, and social media governance, the course will prepare students to navigate the complex interplay between technological innovation and public policy.

By completing this course, students will enhance their ability to craft informed, balanced policies that address the multifaceted challenges of ICT governance, contributing to their overall capability as public policy leaders in the engineering and technology sectors.

2. SEP 6XX Legal and Regulatory Issues

This course is supportive of the MEPP program's intent to prepare professionals to effectively navigate Ontario's complex legal, ethical, and regulatory environments. Targeted at those engaged in regulated professions (e.g. engineers, health care providers etc.) it emphasizes the integration of public policy considerations into everyday practice. Through a combination of applied assignments, a midterm, and a final exam, students will develop the skills to critically assess and apply these frameworks in diverse professional contexts.

The graduate version of this course aligns with McMaster's Master of Engineering Practice program's learning objectives by enhancing students' understanding of the complex legal, ethical, and regulatory environments that impact regulated professions' practice. Students enrolled in the graduate version of this course (SEP

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6xx) can also expect to complete a research project on a relevant legal or ethical issue within regulated professional practice and participate in a seminar where they will present their findings and engage in advanced discussions with peers and faculty.

B. We will add a focus elective option from another Faculty (we have reviewed and discussed the option with the Wilson College of Leadership and Civic Engagement). That course is Wilson 700, Studies in Leadership in Civic Engagement - Selected Topics

C. Remove a course that is no longer taught. (The course has not been taught for more than two years. The instructor is retiring.) Sept 6X03

D. We have identified items contained in the calendar that do not reflect current expectations of requirements (e.g. see "Additional Courses" in the section below called "Provide a description of the recommended change to be included in the calendar (please include a tracked changes version of the calendar section affected if applicable)" That passage should be removed.

Provide implementation date: ***(Implementation date should be at the beginning of the academic year)***

The changes will be implemented in Fall 2025

Are there any other details of the recommended change that the curriculum and policy committee should be aware of? If yes, please explain:

No

Provide a description of the recommended change to be included in the calendar (please include a tracked changes version of the calendar section affected if applicable):

Engineering and Public Policy, M.E.P.P.

In today's complex world public policy practitioners, including engineers and scientists are called upon to manage and design technical systems that provide goods and services to society in a safe, efficient and environmentally sound manner. In this context, engineers and scientists can serve as key advisors to and take the lead as decision makers in both the public and private sectors. Therefore, such persons ~~engineers and scientists~~ need more than extensive technical skills; they also need an enhanced understanding of public policy and the role of engineering and science in ~~sustainable~~ technological, social, ecological and economic systems.

A professional ~~Master's degree in Engineering~~Master's degree in Engineering and Public Policy (MEPP) is offered within the W Booth School of Engineering Practice and Technology.

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Engineers, ~~and~~ applied scientists and others from a wide cross-section of organizations and disciplines (including for example, economics, political science, public policy, public administration or global studies) who want professional graduate training will find our program goes well beyond a conventional technical Master's to develop candidates as leaders in the public policy area.

Admission

Students must hold an undergraduate degree in STEM or a 4-year non-STEM degree in a public policy-related field including, for ~~example,~~example, economics, political science, public policy, public administration or global studies. Applicants must have at least a B-average (equivalent to a McMaster 7.0 GPA out of 12) in the final year in all courses in the discipline, or relating to the discipline, in which the applicant proposes to do graduate work. Applicants will be required to complete an online interview. Professional work experience is desirable but not essential.

The W Booth School of Engineering Practice and Technology has the following program objectives for the Master's degree in Engineering and Public Policy (MEPP):

- to provide a high quality educational experience to graduate engineers, ~~and~~ scientists and others from a public policy-related field including, for example, economics, political science, public policy, public administration or global studies ~~in the areas~~on topics at the intersection of engineering, science and public policy;
- to foster applied research in the areas of engineering, science and public policy through the successful completion and dissemination of a research paper;
- to develop viable, working linkages between engineering, science and fields of study within social sciences and the humanities (public policy, economics, society, and others);
- to produce graduates who will provide inspired leadership in the engineering, science and public policy areas within the public, private and NGO sectors.

Candidates may be enrolled on a full- or part-time basis. Full-time students will complete the degree in 24 months with an accelerated path to complete the program in 12 months of study, beginning in September or January. Part-time students will normally be expected to complete the program in 3 years, one term (40 months).

McMaster undergraduate students may receive advanced standing for up to two 400-level courses taken at the 600-level (note that a maximum of two 600-level courses can count towards a SEPT graduate program) with the approval of the Associate Dean of Graduate Studies.

Curriculum

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The curriculum has the following components:

1. Core courses that provide the content and methodological skills necessary for understanding and analyzing societal issues for which engineering and science can contribute to public policy solutions;
2. Focus elective courses that allow students to deepen their knowledge of a range of engineering, science and social science applications;
3. The completion of a substantive research paper on a problem at the interface of engineering, science and public policy

Research Project - Thesis in Engineering and Public Policy

Students select a research topic at the interface of engineering, science and public policy which is of interest to them and carries out inquiry-driven research. The~~;~~ complete~~s~~ a formal research paper which may be subsequently ~~and prepares to~~ published ~~their results~~ for broader dissemination.

Candidates for the MEPP degree will follow a program consisting of the following and will need to complete 30 units to meet the degree requirements:

Required Courses

Candidates are required to take the following six half courses (18 units):

- SEP 6PM3 / Project Management
- SEP 701 / Theory and Practice of Policy Analysis: Frameworks and Models
- SEP 709 / Emerging Issues, Technology and Public Policy
- SEP 778 / Circular Economy - Engineering Perspectives and Application
- SEP 704 / Public Policy Research Project, Part 1
- SEP 704 / Public Policy Research Project, Part 2

Focus Elective Courses

Three half-courses (9 units) are required for electives. Recommended electives include but are not limited to:

- SEP 7xxx / The Governance and Regulation of Information and Telecommunications Technologies
- SEP 6XXX / Legal and Regulatory Issues
- SEP 6I03 / Sustainable Manufacturing Processes

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- ~~SEP 6X03 / Livable Cities, the Built and Natural Environment~~
- SEP 702 / Systems Engineering and Public Policy
- SEP 705 / Green Engineering, Sustainability and Public Policy
- SEP 706 / Energy and Public Policy
- SEP 708 / Special Topics in Engineering and Public Policy
- SEP 710 / International Governance and Environmental Sustainability
- POL SCI 784 / Quantitative Political and Policy Analysis
- POL SCI 785 / Public Sector Management
- POL SCI 790 / The Politics of Economic Policy in Market Economies
- WILSON 700 / Studies in Leadership in Civic Engagement - Selected Topics
- Other courses in other departments and Faculties with approval of the Public Policy Program Lead.

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Cross-Disciplinary Elective Courses

Candidates are required to take one half course (3 units) which should be selected from the following approved cross-disciplinary elective list.

- SEP 6EP3 / Entrepreneurial Thinking & Innovation
- SEP 6MK3 / Fundamentals of Marketing
- SEP 770 / Total Sustainability Management
- SEP 790 / Emerging Technologies for Engineering Enterprise Innovation
- SEP 760 / Design Thinking
- SEP 777 / Cyber-Physical Systems and Industry 4.0

~~**Additional Courses**~~

- ~~Up to two graduate engineering half courses from departments within the Faculty of Engineering~~
- ~~Other courses in other departments and Faculties with approval of the Public Policy Program Lead.~~

Contact information for the recommended change:

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Name: Greig Mordue Email: Mordueg@mcmaster.ca Date submitted: October 2, 2024

If you have any questions regarding this form, please contact the Assistant Secretary, School of Graduate Studies, cbryce@mcmaster.ca

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Recommendation for Change in Graduate Curriculum – For Change(s) Involving Degree Program Requirements / Procedures / Milestones

Please read the following notes before completing this form:

1. This form must be completed for all changes involving degree program requirements/procedures. All sections of this form must be completed.
2. An electronic version of this form (must be in MS WORD not PDF) should be emailed to the Assistant Secretary, School of Graduate Studies (cbryce@mcmaster.ca).
3. A representative from the department is **required to attend** the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.

DEPARTMENT	SEPT
NAME OF PROGRAM and PLAN	System & Technology
DEGREE	**Master of Engineering**

NATURE OF RECOMMENDATION *(PLEASE CHECK APPROPRIATE BOX)*

Is this change a result of an IQAP review? ☐ Yes ☒ No

Creation of a New Milestone ☐

Change in Admission Requirements		**Change in Comprehensive Examination Procedure**		**Change in Course/Program Requirements**	X
Change in the Description of a section of the Graduate Calendar		**EXPLAIN:**			
Other Changes:		**Explain:**			

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Describe the existing requirement/procedure:

The Master of Engineering Systems and Technology (MEST) Program at W Booth School of Engineering Practice and Technology currently offers four streams:

1. **Automation & Smart Systems**
2. **Automotive**
3. **Digital Manufacturing**
4. **Process Systems**

- The **Automation** stream has low enrollment, leading to difficulty in offering core courses every semester.
- We have new courses relevant to **Railway Systems which** have seen increasing interest, and there is a significant demand in the railway industry for graduates with expertise in this field.

Provide a detailed description of the Recommended Change *(Attach additional pages if space is not sufficient.)*

To address the low enrollment in the Automation stream and leverage the high demand for railway system expertise, we propose integrating railway system courses into the existing Automotive stream. This change aims to offer students a broader range of core course options and to align the stream with emerging industry needs.

Recommended Changes:

1. **Integrate Railway System Courses into the Automotive Stream:**
    - **Current Core Courses:** Focus primarily on automotive engineering.
        1. **SEP 6AE3 / Internal Combustion Engines**
        2. **SEP 6DV3 / Vehicle Dynamics**
        3. **SEP 711 / Electric Powertrain Components Design**
        4. **SEP 722 / Electric Drive Vehicles / MECH ENG 760 / Electric Drive Vehicles**
        5. **SEP 724 / Intelligent Transportation Systems**
        6. **SEP 734 / Issues in Vehicle Productions**
        7. **SEP 740 / Deep Learning**
        8. **SEP 742 / Visual Perception for Autonomous Vehicles**
        9. **SEP 775 / Introduction to Computational Natural Language Processing**
        10. **SEP 798 / Management and Control of Electric Vehicle Batteries**
    - **Proposed additional Core Courses:**
        1. **SEP 736 / Railway Electrification Infrastructure and Technology**
        2. **SEP 756 / Future Electric Networks, Simulation Challenges, and Automation**

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3. **SEP 762 / Introduction to Railway Engineering**
4. **SEP 797 / System Assurance**
5. **SEP 6XX3 / Smart Cities and Communities (pending GCPC approval)**
6. **SEP 792 / Signaling**
7. **SEP 7XX / Railroad Track (pending GCPC approval)**

2. **Remove core courses:**
   - **SEP 716**

Rationale for the Recommended Change (How does the requirement fit into the department's program and/or tie to existing Program Learning Outcomes from the program's IQAP cyclical review?):

Benefits of the Proposed Changes:

1. **Increased Enrollment and Course Offering Flexibility:**
   - By integrating railway system courses, the Automotive and Railway stream will attract students with diverse interests and improve overall enrollment.
   - Offering a range of core courses will provide students with more options and flexibility, addressing the current limitations in course availability.
2. **Alignment with Industry Demand:**
   - The inclusion of railway system courses meets the growing industry demand for expertise in railway technology and Automotive and Railway systems.
   - This will enhance the employability of graduates by equipping them with relevant skills for emerging job markets.
3. **Enhanced Program Appeal:**
   - The renaming and restructuring of the stream will position the MEST program as a leader in Automotive and Railway education, potentially increasing its appeal to prospective students.
   - The new focus on Automotive and Railway encompasses automotive, railway, and autonomous vehicles, making the program more comprehensive and forward-looking.
4. **Optimized Resource Utilization:**
   - By merging interests in automotive and railway systems, the program can better utilize faculty expertise and resources, potentially leading to more efficient course delivery and research opportunities.
5. **Removal of 716:**

   Course has not been offered in several years. With addition of new courses, we do not have the capacity to offer this in the future.

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Provide implementation date: ***(Implementation date should be at the beginning of the academic year)***

Sep 2025

Are there any other details of the recommended change that the curriculum and policy committee should be aware of? If yes, please explain:

No

Provide a detailed description of the Recommended Change ***(Attach additional pages if space is not sufficient.)***

Systems and Technology, M.Eng.

Return to: Faculty of Engineering

The Master of Engineering in Systems and Technology is a 24-month program for full time students with an accelerated path to complete the program in 12 months of study. Part time students will normally be expected to complete the program in 3 years, one term (40 months). The program attracts highly motivated students seeking advanced training in the area of cyber-physical systems. Students design their own program of studies by selecting (with the approval of their academic advisor) courses of interest to them in one of the following streams: (i) Automation and Smart Systems, (ii) Automotive and Railway, and (iii) Digital Manufacturing. Application for admission to the program is made through the W Booth School of Engineering Practice and Technology. The program accepts full-time and part-time students.

In addition to the general requirements for entry into a graduate program in Engineering, students must hold a Bachelors degree in Engineering, Technology, Sciences, or Software with at least a B average (equivalent to a McMaster 8.0/12 GPA) in the penultimate and final years.

Delivery of the program includes a strong emphasis on project-based experience within the Manufacturing Industry, which is obtained through an industry-based project during

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the coursework portion of the program. Requirements for these are outlined below. Due to the strong practical orientation of the project components of the program, successful completion requires that students have strong interpersonal and communication skills. Applicants will be required to complete an online interview.

Students completing the Program on a course-only basis will be required to complete 10 courses from the approved list of courses. Course selection must be done in consultation with the program lead.

Students completing the Program through course and project work will be required to complete eight courses from the approved list of courses, plus successful completion of the project. Course and project selection must be done in consultation with the program lead.

McMaster students may receive advanced standing for up to two 400-level courses taken at the 600-level (note that a maximum of two 600-level courses can count towards a SEPT graduate program) with the approval of the Associate Dean of Graduate Studies.

Project

Students wishing to pursue the project-based option must submit a project proposal for approval by both the faculty lead as well as the Associate Director of Graduate Studies in SEPT. If the project is not approved by either individual, students will be reverted to the course-based stream. Students are encouraged to develop their own ideas and find industrial sponsors. Projects are ideally undertaken at local companies but may be conducted at locations inside Canada or abroad with the Program Lead's approval and provided that none of the work on the project was done prior to admission into the program. Project groups or individuals will have an industry-based supervisor (stakeholder) with whom the student team can discuss progress, arrange trials etc. Students will also have an academic supervisor who will normally have some expertise in the subject area. It is expected that the teams will meet with their supervisors on a regular basis to discuss their progress.

The project team will orally defend their final project report to an examination committee comprised of their academic supervisor and the second reader (faculty member).

Curriculum

Students enrolling in the program choose their courses in one of the following streams:

- Automation and Smart Systems,
- Automotive, and

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- Digital Manufacturing
- Process Systems

Each stream has a set of core courses and a set of recommended elective courses. Students can take a maximum of 2 half courses (one term courses) at the 600 level.

Students wishing to take an elective course outside of the recommended electives need to obtain -written permission from their graduate advisor and by the Associate Dean of Graduate Studies if outside of the program list.

Students have to complete the minimum required number of core courses in order to complete the program. There are 2 pathways towards the degree:

- 8 courses (24 units) + project (6 units)
  - 1 required course
  - 2 or 3 professional development courses
  - 3 to 4 core courses
  - 0 to 1 technical elective courses

  Students pursuing this option, in addition to taking 8 courses specified above, must register for the project courses:

  - SEP 799 / M.Eng. Project in Systems and Technology Part 1
  - SEP 799 / M.Eng. Project in Systems and Technology Part 2

- 10 courses (30 units)
  - 1 required course
  - 2 or 3 professional development courses
  - 4 to 6 core courses
  - 0 to 2 technical elective courses

Students should note that not all courses are offered every year.

Required core courses for all streams:

- SEP 769 / Cyber Physical Systems

Professional Development Courses

Professional Development courses, common to all streams in MEng S&T, are listed below:

- SEP 6EP3 / Entrepreneurial Thinking & Innovation
- SEP 6MK3 / Fundamentals of Marketing
- SEP 6TC3 / Technical Communications

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- SEP 6X03 / Livable Cities, the Built and Natural Environment
- SEP 705 / Green Engineering, Sustainability and Public Policy
- SEP 709 / Emerging Issues, Technology and Public Policy
- SEP 710 / International Governance and Environmental Sustainability
- SEP 725 / Practical Project Management for Today's Business Environment
- SEP 760 / Design Thinking
- SEP 770 / Total Sustainability Management
- SEP 773 / Leadership for Innovation

Courses- Automotive Stream

Core Courses

- SEP 6AE3 / Internal Combustion Engines
- SEP 6DV3 / Vehicle Dynamics
- SEP 711 / Electric Powertrain Components Design
- ~~SEP 716 / Automotive Safety Design~~
- SEP 722 / Electric Drive Vehicles / MECH ENG 760 / Electric Drive Vehicles
- SEP 724 / Intelligent Transportation Systems
- SEP 734 / Issues in Vehicle Productions
- SEP 736 / Railway Electrification Infrastructure and Technology
- SEP 740 / Deep Learning
- SEP 742 / Visual Perception for Autonomous Vehicles
- SEP 775 / Introduction to Computational Natural Language Processing
- SEP 798 / Management and Control of Electric Vehicle Batteries
- SEP 756 / Future Electric Networks, Simulation Challenges, and Automation
- SEP 762 / Introduction to Railway Engineering
- SEP 797 / System Assurance
- SEP 6XX3 / Smart Cities and Communities (pending GCPC approval)
- SEP 792 / Signaling
- SEP 7XX / Railroad Track (pending GCPC approval)

Recommended Technical Electives

- MECH ENG 6Z03 / CAD/CAM/CAE
- SEP 780 / Advanced Robotics and Automation
- SEP 783 / Sensors and Actuators
- SEP 791 / Augmented Reality, Virtual Reality and Mixed Reality

Courses- Automation and Smart Systems

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- SEP 713 / Cloud Computing
- SEP 728 / Internet of Things (ioT) and industrial Internet of Things (ioT) Systems
- SEP 752 / Systems Modeling and Optimization
- SEP 767 / Multivariate Statistical Methods for Big Data Analysis and Process Improvement / CHEM ENG 765 / Multivariate Statistical Methods for Big Data Analysis and Process Improvement
- SEP 780 / Advanced Robotics and Automation
- SEP 785 / Machine Learning
- SEP 791 / Augmented Reality, Virtual Reality and Mixed Reality
- CAS 771 / Introduction to Big Data Systems and Applications
- SEP 740 / Deep Learning
- SEP 775 / Introduction to Computational Natural Language Processing
- SEP 742 / Visual Perception for Autonomous Vehicles
- SEP 758 / Software Design Tools and Methods
- SEP 759 / Prototyping Web and Mobile Applications

Recommended Technical Electives

- SEP 718 / Industrial Automation
- SEP 723 / Industrial Components, Networks, and Interoperability / MECH ENG 761 / Industrial Components, Networks, and Interoperability
- SEP 783 / Sensors and Actuators
- SEP 6CS3 / Computer Security
- SEP 6DA3 / Data Analytics and Big Data
- SEP 6DM3 / Data Mining

Courses- Digital Manufacturing

Core Courses

- SEP 718 / Industrial Automation
- SEP 723 / Industrial Components, Networks, and Interoperability / MECH ENG 761 / Industrial Components, Networks, and Interoperability
- SEP 728 / Internet of Things (ioT) and industrial Internet of Things (ioT) Systems
- SEP 735 / ADDITIVE MANUFACTURING / MECH ENG 735 / Additive Manufacturing
- SEP 740 / Deep Learning
- SEP 752 / Systems Modeling and Optimization
- SEP 758 / Software Design Tools and Methods
- SEP 759 / Prototyping Web and Mobile Applications
- SEP 780 / Advanced Robotics and Automation
- SEP 783 / Sensors and Actuators

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- SEP 791 / Augmented Reality, Virtual Reality and Mixed Reality

Recommended Technical Electives

- SEP 6FM3 / Computer Integrated Manufacturing (CIM) and Flexible Manufacturing
- SEP 742 / Visual Perception for Autonomous Vehicles
- SEP 767 / Multivariate Statistical Methods for Big Data Analysis and Process Improvement / CHEM ENG 765 / Multivariate Statistical Methods for Big Data Analysis and Process Improvement
- SEP 775 / Introduction to Computational Natural Language Processing
- SEP 785 / Machine Learning

Courses - Process Systems Stream

Core Courses

- SEP 750 / Model Predictive Control Design and Implementation
- SEP 751 / Process Design and Control for Operability CHEM ENG 764 / Process Control and Design for Operability
- SEP 752 / Systems Modeling and Optimization
- SEP 767 / Multivariate Statistical Methods for Big Data Analysis and Process Improvement
- SEP 718 / Industrial Automation
- SEP 783 / Sensors and Actuators
- SEP 739 / Distributed Computing for Process Control
- SEP 740 / Deep Learning

Recommended Technical Electives

- CHEM ENG 773 / Advanced Concepts of Polymer Extrusion
- CHEM ENG 740 / Advanced PSE Tools and Methods
- SEP 6IT3 / Internet Technologies and Databases

Moreover, a maximum of two courses can be selected from the following list as technical electives

Electrical Engineering

- ECE 710 / Engineering Optimization
- ECE 732 / Non-linear Control Systems
- ECE 736 / 3D Image Processing and Computer Vision
- ECE 744 / System-on-a-Chip (SOC) Design and Test: Part I - Methods
- ECE 778 / Introduction to Nanotechnology

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Software Engineering

- SFWR ENG 6HC3 / The Human Computer Interface

Computer Science

- COMP SCI 6F03 / Distributed Computer Systems
- COMP SCI 6TE3 / Continuous Optimization

Computing and Software

- CAS 771 / Introduction to Big Data Systems and Applications

Contact information for the recommended change:

Name: Marjan Alavi Email: alavis2@mcmaster.ca Date submitted: Sep 2024

If you have any questions regarding this form, please contact the Assistant Secretary, School of Graduate Studies, cbryce@mcmaster.ca

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Recommendation for Change in Graduate Curriculum – For Change(s) Involving Degree Program Requirements / Procedures / Milestones

NOTE: All new changes since the previous GCPC meetings are noted in **GREEN**

Please read the following notes before completing this form:

1. This form must be completed for all changes involving degree program requirements/procedures. All sections of this form must be completed.
2. An electronic version of this form (must be in MS WORD not PDF) should be emailed to the Assistant Secretary, School of Graduate Studies (cbryce@mcmaster.ca).
3. A representative from the department is **required to attend** the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.

DEPARTMENT	SEPT
NAME OF PROGRAM and PLAN	System & Technology
DEGREE	**Master of Engineering**

NATURE OF RECOMMENDATION *(PLEASE CHECK APPROPRIATE BOX)*

Is this change a result of an IQAP review? ☐ Yes ☒ No

Creation of a New Milestone ☐

Change in Admission Requirements		**Change in Comprehensive Examination Procedure**		**Change in Course/Program Requirements**	X
Change in the Description of a section of the Graduate Calendar	X	**EXPLAIN:**			
Other Changes:		**Explain:**			

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Describe the existing requirement/procedure:

The Master of Engineering Systems and Technology (MEST) Program at W Booth School of Engineering Practice and Technology currently offers four streams:

- **Automation & Smart Systems**
- **Automotive**
- **Digital Manufacturing**
- **Process Systems**
- The **Automation** stream has low enrollment, leading to difficulty in offering core courses every semester.
- We have new courses relevant to **Railway Systems which** have seen increasing interest, and there is a significant demand in the railway industry for graduates with expertise in this field.
- Adding SEP 6XX3– Battery Energy Storage Systems as 600 level courses to AUTOTECH 4BE3

Provide a detailed description of the Recommended Change *(Attach additional pages if space is not sufficient.)*

To address the low enrollment in the Automation stream and leverage the high demand for railway system expertise, we propose integrating railway system courses into the existing Automotive stream. This change aims to offer students a broader range of core course options and to align the stream with emerging industry needs.

Recommended Changes:

1. **Integrate Railway System Courses into the Automotive Stream:**
   - **Current Core Courses:** Focus primarily on automotive engineering.
     1. **SEP 6AE3 / Internal Combustion Engines**
     2. **SEP 6DV3 / Vehicle Dynamics**
     3. **SEP 711 / Electric Powertrain Components Design**
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     10. **SEP 798 / Management and Control of Electric Vehicle Batteries**
   - **Proposed additional Core Courses:**
     1. **SEP 736 / Railway Electrification Infrastructure and Technology**
     2. **SEP 756 / Future Electric Networks, Simulation Challenges, and Automation**

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3. **SEP 762 / Introduction to Railway Engineering**
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5. **SEP 6XX3 / Smart Cities and Communities (pending GCPC approval)**
6. **SEP 792 / Signaling**
7. **SEP 7XX / Railroad Track (pending GCPC approval)**

2. **Remove core courses:**
   - **SEP 716**
3. Adding SEP 6XX3– Battery Energy Storage Systems. This course supports the department's focus on advanced energy systems, aligning with key Program Learning Outcomes (PLOs).

Rationale for the Recommended Change (How does the requirement fit into the department's program and/or tie to existing Program Learning Outcomes from the program's IQAP cyclical review?):

Benefits of the Proposed Changes:

1. **Increased Enrollment and Course Offering Flexibility:**
   - By integrating railway system courses, the Automotive and Railway stream will attract students with diverse interests and improve overall enrollment.
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Provide implementation date: ***(Implementation date should be at the beginning of the academic year)***

Sep 2025

Are there any other details of the recommended change that the curriculum and policy committee should be aware of? If yes, please explain:

No

Provide a detailed description of the Recommended Change ***(Attach additional pages if space is not sufficient.)***

Systems and Technology, M.Eng.

Return to: Faculty of Engineering

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Curriculum

Students enrolling in the program choose their courses in one of the following streams:

- Automation and Smart Systems,
- Automotive, and

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- Digital Manufacturing
- Process Systems

Each stream has a set of core courses and a set of recommended elective courses. Students can take a maximum of 2 half courses (one term courses) at the 600 level.

Students wishing to take an elective course outside of the recommended electives need to obtain -written permission from their graduate advisor and by the Associate Dean of Graduate Studies if outside of the program list.

Students have to complete the minimum required number of core courses in order to complete the program. There are 2 pathways towards the degree:

- 8 courses (24 units) + project (6 units)
  - 1 required course
  - 2 or 3 professional development courses
  - 3 to 4 core courses
  - 0 to 1 technical elective courses

  Students pursuing this option, in addition to taking 8 courses specified above, must register for the project courses:

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- SEP 799 / M.Eng. Project in Systems and Technology Part 2

- 10 courses (30 units)
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  - 4 to 6 core courses
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Students should note that not all courses are offered every year.

Required core courses for all streams:

- SEP 769 / Cyber Physical Systems

Professional Development Courses

Professional Development courses, common to all streams in MEng S&T, are listed below:

- SEP 6EP3 / Entrepreneurial Thinking & Innovation
- SEP 6MK3 / Fundamentals of Marketing
- SEP 6TC3 / Technical Communications

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- SEP 6X03 / Livable Cities, the Built and Natural Environment
- SEP 705 / Green Engineering, Sustainability and Public Policy
- SEP 709 / Emerging Issues, Technology and Public Policy
- SEP 710 / International Governance and Environmental Sustainability
- SEP 725 / Practical Project Management for Today's Business Environment
- SEP 760 / Design Thinking
- SEP 770 / Total Sustainability Management
- SEP 773 / Leadership for Innovation

Courses- Automotive Stream

Core Courses

- SEP 6AE3 / Internal Combustion Engines
- SEP 6DV3 / Vehicle Dynamics
- SEP 6XX3-**Battery Energy Storage Systems**
- SEP 711 / Electric Powertrain Components Design
- ~~SEP 716 / Automotive Safety Design~~
- SEP 722 / Electric Drive Vehicles / MECH ENG 760 / Electric Drive Vehicles
- SEP 724 / Intelligent Transportation Systems
- SEP 734 / Issues in Vehicle Productions
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- SEP 792 / Signaling
- SEP 7XX / Railroad Track (pending GCPC approval)

Recommended Technical Electives

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Courses- Automation and Smart Systems

Core Courses

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- SEP 742 / Visual Perception for Autonomous Vehicles
- SEP 758 / Software Design Tools and Methods
- SEP 759 / Prototyping Web and Mobile Applications

Recommended Technical Electives

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- SEP 783 / Sensors and Actuators
- SEP 6CS3 / Computer Security
- SEP 6DA3 / Data Analytics and Big Data
- SEP 6DM3 / Data Mining

Courses- Digital Manufacturing

Core Courses

- SEP 718 / Industrial Automation
- SEP 723 / Industrial Components, Networks, and Interoperability / MECH ENG 761 / Industrial Components, Networks, and Interoperability
- SEP 728 / Internet of Things (ioT) and industrial Internet of Things (ioT) Systems
- SEP 735 / ADDITIVE MANUFACTURING / MECH ENG 735 / Additive Manufacturing
- SEP 740 / Deep Learning
- SEP 752 / Systems Modeling and Optimization
- SEP 758 / Software Design Tools and Methods
- SEP 759 / Prototyping Web and Mobile Applications
- SEP 780 / Advanced Robotics and Automation

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- SEP 783 / Sensors and Actuators
- SEP 791 / Augmented Reality, Virtual Reality and Mixed Reality

Recommended Technical Electives

- SEP 6FM3 / Computer Integrated Manufacturing (CIM) and Flexible Manufacturing
- SEP 742 / Visual Perception for Autonomous Vehicles
- SEP 767 / Multivariate Statistical Methods for Big Data Analysis and Process Improvement / CHEM ENG 765 / Multivariate Statistical Methods for Big Data Analysis and Process Improvement
- SEP 775 / Introduction to Computational Natural Language Processing
- SEP 785 / Machine Learning

Courses - Process Systems Stream

Core Courses

- SEP 750 / Model Predictive Control Design and Implementation
- SEP 751 / Process Design and Control for Operability CHEM ENG 764 / Process Control and Design for Operability
- SEP 752 / Systems Modeling and Optimization
- SEP 767 / Multivariate Statistical Methods for Big Data Analysis and Process Improvement
- SEP 718 / Industrial Automation
- SEP 783 / Sensors and Actuators
- SEP 739 / Distributed Computing for Process Control
- SEP 740 / Deep Learning

Recommended Technical Electives

- CHEM ENG 773 / Advanced Concepts of Polymer Extrusion
- CHEM ENG 740 / Advanced PSE Tools and Methods
- SEP 6IT3 / Internet Technologies and Databases

Moreover, a maximum of two courses can be selected from the following list as technical electives

Electrical Engineering

- ECE 710 / Engineering Optimization
- ECE 732 / Non-linear Control Systems
- ECE 736 / 3D Image Processing and Computer Vision
- ECE 744 / System-on-a-Chip (SOC) Design and Test: Part I - Methods
- ECE 778 / Introduction to Nanotechnology

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Software Engineering

- SFWR ENG 6HC3 / The Human Computer Interface

Computer Science

- COMP SCI 6F03 / Distributed Computer Systems
- COMP SCI 6TE3 / Continuous Optimization

Computing and Software

- CAS 771 / Introduction to Big Data Systems and Applications

Contact information for the recommended change:

Name: Marjan Alavi Email: alavis2@mcmaster.ca Date submitted: Sep 2024

If you have any questions regarding this form, please contact the Assistant Secretary, School of Graduate Studies, cbryce@mcmaster.ca

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Recommendation for Change in Graduate Curriculum – For Change(s) Involving Degree Program Requirements / Procedures / Milestones

Please read the following notes before completing this form:

1. This form must be completed for all changes involving degree program requirements/procedures. All sections of this form must be completed.

2. An electronic version of this form (must be in MS WORD not PDF) should be emailed to the Assistant Secretary, School of Graduate Studies (cbryce@mcmaster.ca).

3. A representative from the department is **required to attend** the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.

DEPARTMENT	W Booth Sep
NAME OF PROGRAM and PLAN	Engineering in Manufacturing Engineering, M.E.M.E.-Discrete Manufacturing Courses
DEGREE	**M.Eng**

NATURE OF RECOMMENDATION *(PLEASE CHECK APPROPRIATE BOX)*

Is this change a result of an IQAP review? ☐ Yes ☐ No

Creation of a New Milestone ☐

Change in Admission Requirements		**Change in Comprehensive Examination Procedure**		**Change in Course/Program Requirements**	X
Change in the Description of a section of the Graduate Calendar	X	**EXPLAIN:**			
Other Changes:		**Explain:**			

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Describe the existing requirement/procedure:

This is the current recommended list of Technical Elective Courses in Discrete Manufacturing

Recommended technical elective courses are:

- MATLS 6T03 / Properties and Processing of Composites SEP 6T03
- SEP 767 / Multivariate Statistical Methods for Big Data Analysis and Process Improvement
- SEP 718 / Industrial Automation
- SEP 776 / Manufacturing Systems 2 - System Engineering, Process Integration and Simulation
- SEP 777 / Cyber-Physical Systems and Industry 4.0
- SEP 736 / Railway Electrification Infrastructure and Technology
- SEP 756 / Future electric networks, simulation challenges, and automation
- SEP 762 / Introduction to Railway Engineering
- SEP 797 / System Assurance
- SEP 792 / Railway Signaling and Train Control
- Other elective courses available.

Provide a detailed description of the Recommended Change *(Attach additional pages if space is not sufficient.)*

We are removing the below courses from the recommended elective list:

- SEP 736 / Railway Electrification Infrastructure and Technology
- SEP 756 / Future electric networks, simulation challenges, and automation

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- SEP 762 / Introduction to Railway Engineering
- SEP 797 / System Assurance
- SEP 792 / Railway Signaling and Train Control

Rationale for the Recommended Change (How does the requirement fit into the department's program and/or tie to existing Program Learning Outcomes from the program's IQAP cyclical review?):

These courses has been moved to MEST Automation stream as they were deemed more appropriate there

Provide implementation date: ***(Implementation date should be at the beginning of the academic year)***

Fall 2025

Are there any other details of the recommended change that the curriculum and policy committee should be aware of? If yes, please explain:

No

Provide a description of the recommended change to be included in the calendar (please include a tracked changes version of the calendar section affected if applicable):

Program Description

The Master of Engineering in Manufacturing Engineering is a 24 month program for full time students with an accelerated path to complete the program in 12 months of study. Part time students will normally be expected to complete the program in 3 years, one term, (40 months). The program attracts highly motivated students seeking advanced training in the discrete manufacturing. Students design their own program of studies by selecting (with approval of their academic advisor) courses of interest to them. Applications for admission to the program are made through the W Booth School of Engineering Practice and Technology. Applicants will be required to complete an online interview.

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The program accepts full-time and part-time students.

In addition to the general requirements for entry into a graduate program in Engineering, students must hold a degree in Engineering or Technology with at least a B average (equivalent to a McMaster 8.0/12 GPA) in the penultimate and final years.

Delivery of the program includes a strong emphasis on project-based experience within the Manufacturing Industry, which is obtained through an industry-based project and through projects defined within courses. Requirements for these are outlined below. Due to the strong practical orientation of the project components of the program, successful completion requires that students have strong interpersonal and communication skills. Students completing the Program on a course-only basis will be required to complete 10 courses from the approved list of courses. Course selection must be done in consultation with the program lead.

Students completing the Program via course and project work will be required to complete eight courses from the approved list of courses and also successfully complete the M.Eng. project. Course and project selection must be done in consultation with the program lead.

McMaster undergraduate students may receive advanced standing for up to two 400-level courses taken at the 600-level (note that a maximum of two 600-level courses can count towards a SEPT graduate program) with the approval of the Associate Dean of Graduate Studies.

Project

Students wishing to pursue the course plus project-based option must submit a project proposal for approval by both the faculty lead as well as the Associate Director of Graduate Studies in SEPT. If the project is not approved by either individual, students will be reverted to the course based option. Students are encouraged to develop their own ideas and find industrial sponsors. Projects are ideally undertaken at local companies but may be conducted at locations inside Canada or abroad with the Program Lead's approval and provided that none of the work on the project was done prior to admission into the program. Project groups or individuals will have an industry-based supervisor (stakeholder) with whom the student team can discuss progress, arrange trials, etc. Students will also have an academic supervisor who will normally have expertise in the subject area. It is expected that the teams will meet with their supervisors on a regular basis to discuss their progress.

The project team will orally defend their final project report to an examination committee comprised of their academic supervisor and the second reader (faculty member).

Streams

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Students enrolling in the MEME program can tailor their program of studies according to their career interests. Students can choose from the following streams:

- Discrete Manufacturing
- Biomanufacturing and Industrial Biotechnology

Each stream has a set of core courses and a set of recommended elective courses. Students can take maximum of 2 half courses (one term courses) at 600 level. Courses can be selected from WBooth SEPT, Chemical, Materials or Mechanical Engineering departments. Students wishing to take an elective course outside of the recommended electives need to obtain a permission from their graduate advisor.

Students should note that not all courses are offered every year.

Discrete Manufacturing Courses

Students enrolling in the program can tailor their program of studies according to their career interests. Students can take maximum of 2 half courses (one term courses) at 600 level. Courses can be selected from WBooth SEPT, Chemical, Materials or Mechanical Engineering departments. Students wishing to take an elective course outside of the recommended electives need to obtain a permission from their program lead.

Students should note that not all courses are offered every year.

There are 2 pathways towards the degree:

8 courses (24 units) + project (6 units)

- 2 or 3 professional development courses
- 3 to 4 core courses
- 1 to 2 technical elective courses
- 2 project courses

Students pursuing this option, in addition to taking 8 courses specified above, must register for the project-courses:

- MANUF 701 / Project, Part I
- MANUF 701 / Project, Part II

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10 courses (30 units)

- 2 or 3 professional development courses
- 4 to 6 core courses
- 1 to 3 technical elective courses

Professional Development Courses

Professional Development courses in MEng of Manufacturing Engineering, are listed below:

- SEP 6TC3 / Technical Communications
- SEP 725 / Practical Project Management for Today's Business Environment
- SEP 760 / Design Thinking
- SEP 773 / Leadership for Innovation
- SEP 6X03 / Livable Cities, the Built and Natural Environment
- SEP 6EP3 / Entrepreneurial Thinking & Innovation
- SEP 6MK3 / Fundamentals of Marketing
- SEP 709 / Emerging Issues, Technology and Public Policy
- SEP 710 / International Governance and Environmental Sustainability
- SEP 770 / Total Sustainability Management

Core Courses

The following are core courses:

- SEP 6I03 / Sustainable Manufacturing Processes /MATLS 6I03
- SEP 726 / Discrete Manufacturing Processes I
- SEP 727 / Discrete Manufacturing Processes II
- SEP 738 / Artificial Intelligence Methods in Advanced Manufacturing
- MECH ENG 729 / Manufacturing Systems /SEP 729
- CHEM ENG 720 / Lean Six Sigma for Engineers /SEP 731
- SEP 757 / Rapid Prototyping /MECH ENG 759

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- SEP 780 / Advanced Robotics and Automation

Technical Elective Courses

Recommended technical elective courses are:

- MATLS 6T03 / Properties and Processing of Composites SEP 6T03
- SEP 767 / Multivariate Statistical Methods for Big Data Analysis and Process Improvement
- SEP 718 / Industrial Automation
- SEP 776 / Manufacturing Systems 2 - System Engineering, Process Integration and Simulation
- SEP 777 / Cyber-Physical Systems and Industry 4.0
- ~~SEP 736 / Railway Electrification Infrastructure and Technology~~
- ~~SEP 756 / Future electric networks, simulation challenges, and automation~~
- ~~SEP 762 / Introduction to Railway Engineering~~
- ~~SEP 797 / System Assurance~~
- ~~SEP 792 / Railway Signaling and Train Control~~
- Other elective courses available.

Contact information for the recommended change:

Name: **Zhen Gao** Email: gaozhen@mcmater.ca Date submitted: October 2024

If you have any questions regarding this form, please contact the Assistant Secretary, School of Graduate Studies, cbryce@mcmaster.ca

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Recommendation for Change in Graduate Curriculum – For Change(s) Involving Degree Program Requirements / Procedures / Milestones

NOTE: All new changes since the previous GCPC meetings are noted in **GREEN**

Please read the following notes before completing this form:

1. This form must be completed for all changes involving degree program requirements/procedures. All sections of this form must be completed.
2. An electronic version of this form (must be in MS WORD not PDF) should be emailed to the Assistant Secretary, School of Graduate Studies (cbryce@mcmaster.ca).
3. A representative from the department is **required to attend** the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.

DEPARTMENT	W Booth Sep
NAME OF PROGRAM and PLAN	Engineering in Manufacturing Engineering, M.E.M.E.-Biomanufacturing Courses
DEGREE	**M.Eng**

NATURE OF RECOMMENDATION *(PLEASE CHECK APPROPRIATE BOX)*

Is this change a result of an IQAP review? ☐ Yes ☐ No

Creation of a New Milestone ☐

Change in Admission Requirements		**Change in Comprehensive Examination Procedure**		**Change in Course/Program Requirements**	X
Change in the Description of a section of the Graduate Calendar	X	**EXPLAIN:**			
Other Changes:		**Explain:**			

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Describe the existing requirement/procedure:

This is the current recommended list of Technical Elective Courses in Biomanufacturing stream of MEME.

Recommended technical elective courses are:

- SEP 6BI3 – Bioinformatics (3 units)
- SEP 6BS3 – Biotechnology Regulations (3 units)
- SEP 729 – Manufacturing Systems (3 units)
- SEP 749 – Biomedical Engineering (3 units)
- SEP 766 – Membrane-Based Bioseparation (3 units)
- BIOMED 799 – Independent Study in Biomedical Engineering (3 units)
- Other elective courses available.
- Adding 776 and 731 to MEME-Biomanufacturing, which are existing Discrete Manufacturing courses

Provide a detailed description of the Recommended Change *(Attach additional pages if space is not sufficient.)*

- Adding courses 776 and 731 to MEME-Biomanufacturing recommended technical elective list. These are existing Discrete Manufacturing courses, and we would like them to be available to MEME-Bio students.

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Rationale for the Recommended Change (How does the requirement fit into the department's program and/or tie to existing Program Learning Outcomes from the program's IQAP cyclical review?):

These courses has been moved to MEST Automation stream as they were deemed more appropriate there

Adding courses 776 and 731 to MEME-Bio. These are existing Discrete Manufacturing courses, and we would like them to be available to MEME-Bio students.

Provide implementation date: ***(Implementation date should be at the beginning of the academic year)***

Fall 2025

Are there any other details of the recommended change that the curriculum and policy committee should be aware of? If yes, please explain:

No

Provide a description of the recommended change to be included in the calendar (please include a tracked changes version of the calendar section affected if applicable):

Program Description

The Master of Engineering in Manufacturing Engineering is a 24 month program for full time students with an accelerated path to complete the program in 12 months of study. Part time students will normally be expected to complete the program in 3 years, one term, (40 months). The program attracts highly motivated students seeking advanced training in the discrete manufacturing. Students design their own program of studies by selecting (with approval of their academic advisor) courses of interest to them. Applications for admission to the program are made through the W Booth School of Engineering Practice and Technology. Applicants will be required to complete an online interview.

The program accepts full-time and part-time students.

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In addition to the general requirements for entry into a graduate program in Engineering, students must hold a degree in Engineering or Technology with at least a B average (equivalent to a McMaster 8.0/12 GPA) in the penultimate and final years.

Delivery of the program includes a strong emphasis on project-based experience within the Manufacturing Industry, which is obtained through an industry-based project and through projects defined within courses. Requirements for these are outlined below. Due to the strong practical orientation of the project components of the program, successful completion requires that students have strong interpersonal and communication skills. Students completing the Program on a course-only basis will be required to complete 10 courses from the approved list of courses. Course selection must be done in consultation with the program lead.

Students completing the Program via course and project work will be required to complete eight courses from the approved list of courses and also successfully complete the M.Eng. project. Course and project selection must be done in consultation with the program lead.

McMaster undergraduate students may receive advanced standing for up to two 400-level courses taken at the 600-level (note that a maximum of two 600-level courses can count towards a SEPT graduate program) with the approval of the Associate Dean of Graduate Studies.

Project

Students wishing to pursue the course plus project-based option must submit a project proposal for approval by both the faculty lead as well as the Associate Director of Graduate Studies in SEPT. If the project is not approved by either individual, students will be reverted to the course based option. Students are encouraged to develop their own ideas and find industrial sponsors. Projects are ideally undertaken at local companies but may be conducted at locations inside Canada or abroad with the Program Lead's approval and provided that none of the work on the project was done prior to admission into the program. Project groups or individuals will have an industry-based supervisor (stakeholder) with whom the student team can discuss progress, arrange trials, etc. Students will also have an academic supervisor who will normally have expertise in the subject area. It is expected that the teams will meet with their supervisors on a regular basis to discuss their progress.

The project team will orally defend their final project report to an examination committee comprised of their academic supervisor and the second reader (faculty member).

Streams

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Students enrolling in the MEME program can tailor their program of studies according to their career interests. Students can choose from the following streams:

- Discrete Manufacturing
- Biomanufacturing and Industrial Biotechnology

Each stream has a set of core courses and a set of recommended elective courses. Students can take maximum of 2 half courses (one term courses) at 600 level. Courses can be selected from WBooth SEPT, Chemical, Materials or Mechanical Engineering departments. Students wishing to take an elective course outside of the recommended electives need to obtain a permission from their graduate advisor.

Students should note that not all courses are offered every year.

Discrete Manufacturing Courses

Students enrolling in the program can tailor their program of studies according to their career interests. Students can take maximum of 2 half courses (one term courses) at 600 level. Courses can be selected from WBooth SEPT, Chemical, Materials or Mechanical Engineering departments. Students wishing to take an elective course outside of the recommended electives need to obtain a permission from their program lead.

Students should note that not all courses are offered every year.

There are 2 pathways towards the degree:

8 courses (24 units) + project (6 units)

- 2 or 3 professional development courses
- 3 to 4 core courses
- 1 to 2 technical elective courses
- 2 project courses

Students pursuing this option, in addition to taking 8 courses specified above, must register for the project-courses:

- MANUF 701 / Project, Part I
- MANUF 701 / Project, Part II

10 courses (30 units)

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- 2 or 3 professional development courses
- 4 to 6 core courses
- 1 to 3 technical elective courses

Professional Development Courses

Professional Development courses in MEng of Manufacturing Engineering, are listed below:

- SEP 6TC3 / Technical Communications
- SEP 725 / Practical Project Management for Today's Business Environment
- SEP 760 / Design Thinking
- SEP 773 / Leadership for Innovation
- SEP 6X03 / Livable Cities, the Built and Natural Environment
- SEP 6EP3 / Entrepreneurial Thinking & Innovation
- SEP 6MK3 / Fundamentals of Marketing
- SEP 709 / Emerging Issues, Technology and Public Policy
- SEP 710 / International Governance and Environmental Sustainability
- SEP 770 / Total Sustainability Management

Core Courses

The following are core courses:

- SEP 6I03 / Sustainable Manufacturing Processes /MATLS 6I03
- SEP 726 / Discrete Manufacturing Processes I
- SEP 727 / Discrete Manufacturing Processes II
- SEP 738 / Artificial Intelligence Methods in Advanced Manufacturing
- MECH ENG 729 / Manufacturing Systems /SEP 729
- CHEM ENG 720 / Lean Six Sigma for Engineers /SEP 731
- SEP 757 / Rapid Prototyping /MECH ENG 759
- SEP 780 / Advanced Robotics and Automation

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Technical Elective Courses

Recommended technical elective courses are:

- MATLS 6T03 / Properties and Processing of Composites SEP 6T03
- SEP 767 / Multivariate Statistical Methods for Big Data Analysis and Process Improvement
- SEP 718 / Industrial Automation
- SEP 776 / Manufacturing Systems 2 - System Engineering, Process Integration and Simulation
- SEP 777 / Cyber-Physical Systems and Industry 4.0
- ~~SEP 736 / Railway Electrification Infrastructure and Technology~~
- ~~SEP 756 / Future electric networks, simulation challenges, and automation~~
- ~~SEP 762 / Introduction to Railway Engineering~~
- ~~SEP 797 / System Assurance~~
- ~~SEP 792 / Railway Signaling and Train Control~~
- Other elective courses available.

Biomanufacturing and Industrial Biotechnology Courses

Students enrolling in the program can tailor their program of studies according to their career interests. Students can take maximum of 2 half courses (one term courses) at 600 level. Courses can be selected from WBooth SEPT, Chemical, Materials or Mechanical Engineering departments. Students wishing to take an elective course outside of the recommended electives need to obtain a permission from their program lead.

Students should note that not all courses are offered every year.

There are 2 pathways towards the degree:

- 8 courses (24 units) + project (6 units)
    - 2 mandatory courses
    - 2 or 3 professional development courses

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- 2 to 3 core courses
- 0 to 1 technical elective courses
-

Students pursuing this option, in addition to taking 8 courses specified above, must register for the project-courses:

- MANUF 701 / Project, Part I
- MANUF 701 / Project, Part II

- 10 courses (30 units)
  - 2 mandatory courses
  - 2 or 3 professional development courses
  - 3 to 5 core courses
  - 0 to 2 technical elective courses

Professional Development Courses

Professional Development courses in MEng of Manufacturing Engineering, are listed below:

- SEP 6TC3 / Technical Communications
- SEP 6X03 / Livable Cities, the Built and Natural Environment
- SEP 6EP3 / Entrepreneurial Thinking & Innovation
- SEP 6MK3 / Fundamentals of Marketing
- SEP 709 / Emerging Issues, Technology and Public Policy
- SEP 710 / International Governance and Environmental Sustainability
- SEP 725 / Practical Project Management for Today's Business Environment
- SEP 760 / Design Thinking
- SEP 770 / Total Sustainability Management
- SEP 773 / Leadership for Innovation

Core Courses

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The following are core courses:
2 required core courses:

- SEP 744 / Biomanufacturing
- SEP 767 / Multivariate Statistical Methods for Big Data Analysis and Process Improvement
-

Other core courses:

- SEP 764 / Novel therapeutics and drug delivery systems
- SEP 745 / Bioassays and Biosensors in Biomanufacturing
- SEP 743 / Animal Cell Culture Engineering
- SEP 765 / Current Good Manufacturing Practice Downstream Operations
- SEP 712 / The Application of Computation Modelling for Biomanufacturing

Technical Elective Courses

Recommended technical elective courses are:

- CHEM ENG 720 / Lean Six Sigma for Engineers /SEP 731
- SEP 749 / Biomedical Engineering
- SEP 766 / Membrane-Based Bioseparation
- SEP 776 / Manufacturing Systems 2 - System Engineering, Process Integration and Simulation
- BIOMED 799 / Independent Study in Biomedical Engineering
- SEP 6BI3 / Bioinformatics
- SEP 6BS3 / Ethics and Biotechnology Regulations
- SEP 729 / Manufacturing Systems

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Contact information for the recommended change:

Name: **Zhen Gao** Email: gaozhen@mcmater.ca Date submitted: October 2024

If you have any questions regarding this form, please contact the Assistant Secretary, School of Graduate Studies, cbryce@mcmaster.ca

McMaster University **SCHOOL OF GRADUATE STUDIES**

RECOMMENDATION FOR CHANGE IN GRADUATE CURRICULUM - FOR CHANGE(S) INVOLVING DEGREE PROGRAM REQUIREMENTS / PROCEDURES

IMPORTANT: PLEASE READ THE FOLLOWING NOTES BEFORE COMPLETING THIS FORM:

1. This form must be completed for **ALL** changes involving degree program requirements/procedures. **All** sections of this form **must** be completed.

2. An electronic version of this form (must be in MS WORD **not** PDF) should be emailed to the Assistant Secretary, School of Graduate Studies.

3. A representative from the department is **required to attend** the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.

DEPARTMENT	All departments/programs in the Faculty of Engineering
NAME OF PROGRAM	M.A.Sc., M.Eng., M.Sc. (Computer Sci) and Ph.D. programs

PROGRAM DEGREE	**Ph.D. (x)**	**M.A. ( )**	**M.A.Sc. (x)**	**M.B.A. ( )**	**M. Eng. (x)**	**M.Sc. (x)**	**Diploma Program ( )**	**Other *(Specify)***

NATURE OF RECOMMENDATION *(PLEASE CHECK APPROPRIATE BOX)*

CHANGE IN ADMISSION REQUIREMENTS		**CHANGE IN COMPREHENSIVE EXAMINATION PROCEDURE**		**CHANGE IN COURSE REQUIREMENTS**	X
CHANGE IN THE DESCRIPTION OF A SECTION IN THE GRADUATE CALENDAR		**EXPLAIN:**			
OTHER CHANGES		**EXPLAIN:**			

DESCRIBE THE EXISTING REQUIREMENT/PROCEDURE:

To improve the awareness of our students toward career planning and professional skills development, the Faculty has approved measures that will require all incoming graduate students (with exemptions listed below) to complete a career plan within their first year in program. The student will be provided with career resources through our professional development team in the faculty, as well as directed to central career planning resources within the university. A report must be submitted to the department of the student for review but without grade.

PROVIDE A DETAILED DESCRIPTION OF THE RECOMMENDED CHANGE *(Attach additional pages if space is not sufficient.)*

To improve the awareness of our students toward career planning and professional skills development, the Faculty has approved measures that will require incoming graduate students to complete a career plan within their first ~~year~~ year in program. The student will be provided with career resources through our professional development team in the faculty, as well as directed to central career planning resources within the university. A report must be submitted to the department of the student for review but without grade.

Exemptions to this requirement: ~~Details of the policy are included in the attached document.~~Students enrolled in the following programs shall be exempt since career planning/development activities are already an integral part of their program requirements:

1. M.Eng. programs in the W Booth School of Engineering Practice and Technology
2. UNENE programs in the Engineering Physics Departments
3. All Industrial PhD programs

In addition, this activity will be changed from a milestone into a zero-unit course so that it can be better managed by Engineering's Coop and Career Services (ECCS) unit.

RATIONALE FOR THE RECOMMENDED CHANGE:

~~We are increasingly finding our students are not looking at their career options until nearing the end of their program. The faculty wants to broaden the value of our degrees by not only providing globally recognized excellence in research skills but to include, well integrated professional development skills. The mentioned career planning requirement will be just one component of many being developed in faculty to enhance the value of our programs.~~The career planning exercise is currently delivered as a milestone for all students in the Faculty. To be effective, the milestone is expected to be completed as quickly as possible so the student becomes aware early of potential career paths that lay ahead and have time to avail themselves of the services and resources of the university that can help prepare for the chosen path. We are seeing students taking up until the end of their degree before submitting the report which indicates completion of the milestone – being our only indication that the student is thinking about their careers, this timing is too late. Moving the activity to a course framework will allow us to use the tools of MOSAIC and AVENUE to now track enrolments and grading better. The now exclusion of SEPT students is due to the fact that career planning is a part of their curricula.

PROVIDE IMPLEMENTATION DATE: *(Implementation date should be at the beginning of the academic year)*

September 2025. Possible implementation for January 2025 under Dean's permission.

ARE THERE ANY OTHER DETAILS OF THE RECOMMENDED CHANGE THAT THE CURRICULUM AND POLICY COMMITTEE SHOULD BE AWARE OF? IF YES, EXPLAIN.

No.

PROVIDE A DESCRIPTION OF THE RECOMMENDED CHANGE TO BE INCLUDED IN THE CALENDAR:

N/A

CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:

Lubna Saleh, Graduate Studies Administrator, Engineering

Email: salehl5@mcmaster.ca

Date submitted: July 23, 2024

If you have any questions regarding this form, please contact the Assistant Secretary, School of Graduate Studies, cbryce@mcmaster.ca

SGS/2013