McMaster University | **SCHOOL OF GRADUATE STUDIES**

Gilmour Hall, Room 212
1280 Main Street West
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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 16th at 9:00 am in** ==MUSC 311/313==

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 5th, 2023**

        Approval

   III. **Business arising**

   IV. **Housing and Conference Services – Discussion**

        Led by Kevin Beatty, Director HCS

   V.   **Report from the Associate Deans, Graduate Studies**

   VI. **Report from the Associate Registrar and Graduate Secretary**

   VII. **Faculty of Engineering Graduate Curriculum and Policy Committee Report**

        Approval

   VIII. **New Awards and Award Term Changes**

        Approval (new awards only)

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Tuesday December 5th at 9:00 am in Council Chambers (GH 111)

Present: S. Hranilovic (Chair), S. Hanna, M. Verma, B. Newbold, M. Horn, A. Prasad, A. Ammar, D. Trigatti, N. Carter, L. Dondi, C. di Mama, W. Liao, X. Li, K. McCallum, B. Milliken, M. Gough, T. McDonald, J. Kish, N. Wagner, M. Kadem, E. Grodek, C. Bryce (Assistant Graduate Secretary), S. Baschiera (Associate Registrar and Graduate Secretary)

Regrets: M. Young, V. Lewis, C. Biruk, L. Kayassi, T. Chamberlain, C. Ching, D. Emslie

I.   Opening Remarks

Dr. Hranilovic reported on the following items:

- Recent Convocation ceremonies;
- The School of Graduate Studies presentation to Budget Committee and University Planning Committee;
- The Blue-Ribbon Panel on Postsecondary Education;
- Financial cut to a number of federal agencies;
- The substance of the taskforce report is done;
- Updates on the graduate student residence.

Members discussed the situation for students in the graduate residence as well as the process and options for dealing with stress from the construction process and potential impacts on their academic work, students moving in in the winter term, the role of Housing and Conference Services and the need to communicate with students in residence.

II.   Minutes of the meeting of November 14th, 2023

It was duly moved and seconded, **'that Graduate Council approve the minutes of the meeting of November 14th, 2023 as circulated.'**

The motion was **carried**.

III.   Business arising

There was no business arising.

IV.   Report from the Associate Deans, Graduate Studies

Dr Verma (Faculty of Business) reported on the following items:
- Application acceptances across programs;
- The Ph.D. student awards night.

Dr. Horn (Faculty of Humanities) reported on the following items:
- The SSHRC national meeting, noting a 3% cut across the board to grants.

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Members discussed the formula the councils use to allocate nominations and other options for generating funding.

Dr. Thompson (Faculty of Engineering) reported on the following items:
- Thanks to the Student Success Centre for their presentation to students on presenting like professionals.

Dr. Newbold (Faculty of Science) reported on the following items:
- A great panel discussion at the recent science communication event;
- The upcoming Graduate Symposium.

Dr. Hanna (Faculty of Health Sciences) reported on the following items:
- Noted that he would connect with the program leadership to see if there are any academic issues with students living in residence.

V.   Report from the Associate Registrar and Graduate Secretary

Ms. Baschiera reported on the following items:

- The launch of the iThenticate system, noting active supervisors received their login and that a guide is on the website.

Members discussed the location of the iThenticate servers, the use of hard delete in the system, the intersection between the tool to be used and the Senate-approved policy and the collection of input before the license is next renewed.

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

Dr. Hanna presented the following items for approval:
- A change to calendar copy for the Master of Health Management, offered jointly between Health Sciences and Business, noting that it's a part-time program and tuition is charged per-course and they would like to offer and option for the part-time students do to an accelerated option and take additional courses with approval;
- A clarification to confusing language in the Medical Science Ph.D. program calendar copy around course requirements.

It was duly moved and seconded, **'that 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.   Faculty of Business Graduate Curriculum and Policy Committee Report

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Dr. Verma presented a new course from the Blended Learning Part-Time MBA program for information.

VIII. **Generative AI Taskforce**

Dr. Erin Aspenlieder (Associate Director, Central Programming with MacPherson) delivered a presentation on generative AI and the intersection with graduate students work, highlighting the report from the taskforce, the community dialogue with students and the opportunities and challenges of preparing graduate students to work with AI.

Members discussed dealing with resistance to the use of AI, ethical concerns with the use of AI and academic integrity concerns.

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To : Graduate Council

From : Christina Bryce
Assistant Graduate Secretary
_____

At its meeting on October 16th and November 14th, 2023 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:

   i. **eHealth***
      1. **Change to Program Requirements**

   ii. **School of Engineering Practice and Technology**
      1. **Change to Course Requirements**
         a. **Engineering Design**
         b. **Engineering and Public Policy**
         c. **Manufacturing**
         d. **Systems and Technology**

For Information of Graduate Council:

   i. **eHealth***
      2. **New Course**
         a. 706 eHealth Capstone

   iii. **Chemical Engineering**
      1. **New Course**
         a. 6EC3 Electrochemistry and Electrochemical Engineering

      2. **New Cross-listed Course**
         a. 718 Biomass conversion to high value products and bioenergy technology
   iv. **Civil Engineering**
      1. **New Course**
         a. 6TA4 Traffic Analysis: Theory and Simulation
   v. **Electrical and Computer Engineering**
      1. **New Courses**
         a. 722 Advanced Computer Architecture

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b. 725 Predictable Computer Architecture For Real-Time Embedded Systems

vi. **Materials Science and Engineering**
1. **New Course**
   a. 6B03 Biomaterials & Tissue Engineering
2. **Course Cancellation**
   a. 703 Biomaterials & Tissue Engineering

vii. **Mechanical**
1. **New Cross-listed Course**
   a. 740 Deep Learning

viii. **School of Engineering Practice and Technology**
1. **New Courses**
   a. 6EP3 Entrepreneurial Thinking & Innovation
   b. 6MK3 Fundamentals of Marketing
   c. 712 The Application of Computation Modelling for Biomanufacturing
   d. 736 Railway Electrification Infrastructure and Technology
   e. 756 Future electric networks, simulation challenges, and automation
   f. 762 Introduction to Railway Engineering
   g. 797 System Assurance
   h. 713 Cloud Computing
   i. 785 Machine Learning

2. **Course Cancellations**
   a. 771 W Booth School of Engineering Practice and Technology Practitioner's Forum
   b. 720 Cloud Computing
   c. 721 Data Analytics, Machine Learning and AI on Cloud Platforms
   d. 786 Artificial Intelligence and Machine Learning Fundamentals
   e. 787 Machine Learning : Classification Models

3. **Change in Course Titles**
   a. 6BS3 Biotechnology Regulations
   b. 745 Recombinant Microorganisms
   c. 764 Current Good Manufacturing Practice Upstream Operations

ix. **UNENE**

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1. **Change to Course Delivery**

*also approved by the Faculties of Business and 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	DeGroote School of Business				
NAME OF PROGRAM and PLAN	eHealth				
DEGREE	MSc eHealth				
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:	x	Explain: additional course requirement, removal of the scholarly paper (tracked as a milestone), and changes to grad calendar and the program website			

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Describe the existing requirement/procedure:

Currently course-based students (full and part-time) complete a scholarly paper as a *milestone* near the end of their program. This is done independently and offers students an opportunity to explore a topic of interest in more depth under the supervision of first and second readers (at least one McMaster faculty member).

Full-time students are required to take 4 core courses, 4 electives, and complete an 8-month internship, and the scholarly paper. They progress through the program with 8 months of course work (fall/winter; 4 core and 2 electives), the 8-month internship (summer/fall), and then complete final 2 electives and their scholarly paper in their second winter term (20-month program). They are guided through optional scholarly paper preparation steps during the internship phase by the 3 faculty co-leads. Students frequently complete their scholarly paper into the spring semester.

Part-time students work in the field of eHealth/digital health and complete 4 core and 4 elective courses and a scholarly paper over 9 terms. They do not complete an internship.

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

Recommended change: Replace the scholarly paper milestone with a capstone course designed around projects with a problem statement—identified by students or industry partners. Students would conduct background research, analysis, consider/potentially prototype solutions, and present their findings. The capstone course would be mostly virtual to facilitate the participation of part-time students, course consultants and partners. *The course would include individual preparation work in the fall (during internship for full-time students) and the majority of the work in the winter (course syllabus provided).*

- Fall: Asynchronous modules on foundational topics (e.g., project management, communication). Identify groups and prepare problem statements.
- Winter: Conduct research on the problem, consider options and solutions, develop report and present to partners/instructors.

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 2020 IQAP review of the MSc eHealth program at McMaster recommended considering a design-focused capstone project as an alternative, complement, or replacement for the scholarly paper as a culminating milestone. Associate Deans from the 3 faculties have also expressed the need for a course that integrates the 3 disciplines. A capstone course allows students to integrate the knowledge gained across the core courses, their electives, and internship/work experience and apply that knowledge to a real-world project outside the traditional classroom environment. In doing so, this course supports an experiential learning process and enforces program learning objectives:

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1. Students will have foundational knowledge in the eHealth disciplines of business, health sciences, and engineering.
2. Students will integrate knowledge across the eHealth disciplines of business, health sciences, and engineering.
3. Students will be critical thinkers.
4. Students will have professional skills.
5. Students will work collaboratively in interdisciplinary teams.
6. Students will have research expertise.

With funding from the MacPherson Institute Garden Grant program, we assessed the desirability, feasibility, and potential sustainability of an interdisciplinary capstone project course for course-based students (thesis students would be unaffected). The project steering committee led by Cynthia Lokker included: eHealth Director (Wagner-DSB), 3 Faculty coordinators (Maccio-Engineering; Barr-DSB; Lokker-FHS), the eHealth employer relations manager (Leyland), and 3 eHealth students (part- and full-time; current and alumni). Two current eHealth students and an instructional designer (also an alumni) were hired to support the work.

Methods: We conducted 1) a student survey (n=86 students), 2) three focus groups (n=17 students), 3) an environmental scan of capstone courses, and 4) key informant interviews with capstone course instructors. We informally shared the findings with our department leadership to identify any concerns across the faculties and have considered these in our proposal. Key concerns were resourcing and impact on eHealth faculty workloads. With an instructional designer, we developed a capstone course as an alternative to the scholarly paper (syllabus provided).

What we learned:

- 45 (52%) survey respondents indicated a preference for a capstone project and its associated benefits.
- Students also appreciate the independent research of a scholarly paper, though they want more structure to the process.
- Capstone courses range in duration (≥1 semester), number of projects (grand challenge vs many challenges), and source (student-identified, industry-sourced). They can be resource intensive.

Students would like to have choice to work on a project alone or in groups, on self-identified or industry-sources challenges.

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

Change to grad calendar for 2024; course will be offered 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:

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Key considerations:

- *Faculty coordinator time commitment*: Currently the coordinators are academic advisors for 1/3 of the students each. This includes **undocumented** student support commitments as students develop their scholarly paper proposals (normally during internship), and often acting as first or second reader of the paper. In the proposed capstone course, the 3 faculty coordinators will act as consultants during the winter terms with a reduction in their undocumented time commitment.
- *On-time completion of the program*: Having a required capstone course within semester structures will increase on-time completion since students sometimes stumble with the self-directed nature of the scholarly paper and therefore graduate late.
- *Resourcing*: The program would pay for a sessional instructor to manage the course and industry sourced projects/relationships (one sessional across two terms, half per term). The eHealth program budget is healthy and can absorb this cost.
- *Curriculum change*: The program would be adding a required course and removing a milestone.
- *Two-semester 3-credit course*: There are examples of 700-level courses similar to our proposal that are group project-based with non-traditional timing (i.e., work is done across semesters).
- *Impact on student progression through the program*: The flow of part- and full-time students through the program (Current State vs. Future State) is shown below. The greatest impact is on part-time students adding capstone prep in fall term 7 (*though part-time enrollment has been dropping due to the in-person nature of the program and new online options at other institutions*). Students currently do scholarly paper preparations while on internship.
- There is 1 part time student who will complete their paper after all other concurrent students are required to take the capstone course. The student and their advisor will continue to support the scholarly paper process. Once that student has completed the scholarly paper, we will remove the milestone.

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):

Disciplines

The eHealth program is offered in collaboration of the Faculties of Health Sciences, Engineering, and Business. All eHealth students are required to complete four core courses across the disciplines. A variety of elective courses in each discipline are available to cater to individual interests. Students are assigned an academic advisor upon entry to the program to assist them with course selection and navigation through the program. All students must participate in and contribute to a weekly seminar series during their on-campus semesters. These seminars are designed to acquaint students with recent advances in the eHealth field, build skills sets, supplement course content, and to introduce them to experts in industry, government and research.

Admission

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Students entering the eHealth program may be admitted from a variety of suitable undergraduate degrees. They will belong to a community with a variety of backgrounds in related fields, with common interests in information technology to support health services delivery and research. The main requirements are a passion for the study of eHealth, a background in computing and a strong interest in the use of computing support in health care applications. Students must present evidence that they have taken a minimum of two computer science-related courses at the undergraduate or community college level. One of these courses must be in any programming language. The second course must be in either data base design or data structures and algorithms. A background in health sciences, life sciences, business, or computer science is an asset, but not a requirement. The Admissions Committee will judge each candidate's suitability for the program. A minimum B+ average in the final year of a four-year undergraduate degree program is required for admission. Applicants for the full-time options must also attend a face-to-face interview that evaluates their suitability for an eight-month internship, a required component of the program. English language competency testing is also required for those without post-secondary study conducted in English.

Degree Options and Internship

A candidate for the M.Sc. eHealth degree may choose to take the program either full-time or part-time. The full-time program has two options: thesis or course-based. In the thesis option, students must complete the required courses plus one elective course (a total of five courses). In addition, students must complete and defend a thesis successfully. The thesis option is not open to part-time students. Completion of the M.Sc. thesis option is the preferred route to a Ph.D. program in a similar field (e.g., Health Research Methodology, Computer Science, Business). In the course-based option (which may be taken full or part-time), students take the five required courses and four electives selected (for a total of ~~eight~~ nine courses). All courses must be completed with at least a B- standing.

Students taking the thesis option are expected to complete their programs and submit their theses within 24 months of registration. Full-time students taking the course-based option are expected to complete their programs within 20 months, including a culminating capstone project course integrating knowledge gained during the eHealth program core courses and applying that knowledge to a real-world project outside the traditional classroom environment.~~or academic review which will result in a scholarly paper a relevant study in eHealth~~. Full time students are limited to a maximum of three years from initial registration. Part-time students are expected to complete their programs within four years of registration, and are limited to a maximum of five years. Part-time students are also required to complete a scholarly paper relevant to eHealth.

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In addition to coursework, all full-time students must satisfactorily complete an eight-month internship with a company, healthcare institution, or government agency. In most, but not all cases, the internship will be a paid position.

eHealth Courses

All required and elective courses are half courses. Required courses must be taken in the first and second semester of study by full-time students, and early in the program for part-time students.

Required Courses for all students:

EHEALTH 705 / Statistics for eHealth

EHEALTH 724 / Fundamentals of eHealth and the Canadian Health Care System

EHEALTH 736 / Management Issues in eHealth

EHEALTH 757 / Modern Software Technology for eHealth

Course-based students:

EHEALTH 706 / eHEALTH CAPSTONE

Contact information for the recommended change:

Name: Cynthia Lokker   Email: lokkerc@mcmaster.ca   Date submitted: Nov 1, 2023

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

<div align="center">

MSc eHealth

GPCC -curriculum changes -Program

</div>

==Describe existing requirements/procedure==

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The flow of students is depicted in the table below.

==Provide a detailed description of the recommended change==

Recommended change: Replace the scholarly paper milestone with a capstone course designed around projects with a problem statement—identified by students or industry partners. Students would conduct background research, analysis, consider/potentially prototype solutions, and present their findings. The capstone course would be mostly virtual to facilitate the participation of part-time students, course consultants and partners. *The course would include individual preparation work in the fall (during internship for full-time students) and the majority of the work in the winter (course syllabus provided).*

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- *On-time completion of the program*: Having a required capstone course within semester structures will increase on-time completion since students sometimes stumble with the self-directed nature of the scholarly paper and therefore graduate late.
- *Resourcing*: The program would pay for a sessional instructor to manage the course and industry sourced projects/relationships (one sessional across two terms, half per term). The eHealth program budget is healthy and can absorb this cost.

SGS curriculum changes-program
eHealth scholarly paper milestone to Capstone project course, fall 2023

- *Curriculum change*: The program would be adding a required course and removing a milestone.
- *Two-semester 3-credit course*: There are examples of 700-level courses similar to our proposal that are group project-based with non-traditional timing (i.e., work is done across semesters).
- *Impact on student progression through the program*: The flow of part- and full-time students through the program (Current State vs. Future State) is shown below. The greatest impact is on part-time students adding capstone prep in fall term 7 (*though part-time enrollment has been dropping due to the in-person nature of the program and new online options at other institutions*). Students currently do scholarly paper preparations while on internship.

Group	States	Term 1 Fall	Term 2 Winter	Term 3 Spring	Term 4 Fall	Term 5 Winter	Term 6 Spring	Term 7 Fall	Term 8 Winter	Term 9 Spring
Full-time course (5 semesters)	Current state	3 req	1 req 2 elect	Intern/ SP prep	Intern/ SP prep	2 elect/ SP	Some continue SP			
	Future state	3 req	1 req 2 elect	Intern	Intern/ Capstone prep	2 elect/ Capstone				
Part-time course (9 semesters)	Current state	1 req	1 elect (or stats)	1 elect	1 req	1 elect (or stats)	1 elect	1 req	SP	Final elect
	Future state	1 req	1 elect (or stats)	1 elect	1 req	1 elect (or stats)	1 elect	1 req/ Capstone prep	Capstone	Final elect

Provide implementation date (implementation date should be at the beginning of the academic year):
Our goal would be to include the new course and requirement in the 2024-2025 calendar. The new course requirement would apply to students entering the program in Fall 2024 who would enrol in the course in Fall 2025/Winter 2026.

FT students who entered the program in fall 2023 would complete their scholarly paper in Winter 2025.

Timeline for on-time scholarly paper completion during capstone implementation:

	On-time paper completion semester				
Enrolment period	Fall 2024	Winter 2025	Fall 2025 Capstone self-directed	Winter 2026 Capstone project work	Fall 2026
Part-time start 2021	8				
Part-time start 2022			9		
Part-time start 2023					1
Full time start 2023		~30			

<mark>Are there any other details of the recommended change that the curriculum and policy committee should be aware of? If yes, explain.</mark>
There is 1 part time student who will complete their paper after all other concurrent students are required to take the capstone course. The student and their advisor will continue to support the scholarly paper process. Once that student has completed the scholarly paper, we will remove the milestone.

Provide a description of the recommended change to be included in the calendar (please include tracked changes of the calendar section affected if applicable)
Changes to the Graduate Calendar are tracked below:

Disciplines

The eHealth program is offered in collaboration of the Faculties of Health Sciences, Engineering, and Business. All eHealth students are required to complete four core courses across the disciplines. A variety of elective courses in each discipline are available to cater to individual interests. Students are assigned an academic advisor upon entry to the program to assist them with course selection and navigation through the program. All students must participate in and contribute to a weekly seminar series during their on-campus semesters. These seminars are designed to acquaint students with recent advances in the eHealth field, build skills sets, supplement course content, and to introduce them to experts in industry, government and research.

Admission

Students entering the eHealth program may be admitted from a variety of suitable undergraduate degrees. They will belong to a community with a variety of backgrounds in related fields, with common interests in information technology to support health services delivery and research. The main requirements are a passion for the study of eHealth, a background in computing and a strong interest in the use of computing support in health care applications. Students must present evidence that they have taken a minimum of two computer science-related courses at the undergraduate or community college level. One of these courses must be in any programming language. The second course must be in either data base design or data structures and algorithms. A background in health sciences, life sciences, business, or computer science is an asset, but not a requirement. The Admissions Committee will judge each candidate's suitability for the program. A minimum B+ average in the final year of a four-year undergraduate degree program is required for admission. Applicants for the full-time options must also attend a face-to-face interview that evaluates their suitability for an eight-month internship, a required component of the program. English language competency testing is also required for those without post-secondary study conducted in English.

Degree Options and Internship

A candidate for the M.Sc. eHealth degree may choose to take the program either full-time or part-time. The full-time program has two options: thesis or course-based. In the thesis option, students must complete the required courses plus one elective course (a total of five courses). In addition, students must complete and defend a thesis successfully. The thesis option is not open to part-time students. Completion of the M.Sc. thesis option is the preferred route to a

Ph.D. program in a similar field (e.g., Health Research Methodology, Computer Science, Business). In the course-based option (which may be taken full or part-time), students take the five required courses and four electives selected (for a total of ~~eight~~ nine courses). All courses must be completed with at least a B- standing.

Students taking the thesis option are expected to complete their programs and submit their theses within 24 months of registration. Full-time students taking the course-based option are expected to complete their programs within 20 months, including a culminating capstone project course integrating knowledge gained during the eHealth program core courses and applying that knowledge to a real-world project outside the traditional classroom environment.~~or academic review which will result in a scholarly paper a relevant study in eHealth~~. Full time students are limited to a maximum of three years from initial registration. Part-time students are expected to complete their programs within four years of registration, and are limited to a maximum of five years. Part-time students are also required to complete a scholarly paper relevant to eHealth.

In addition to coursework, all full-time students must satisfactorily complete an eight-month internship with a company, healthcare institution, or government agency. In most, but not all cases, the internship will be a paid position.

eHealth Courses

All required and elective courses are half courses. Required courses must be taken in the first and second semester of study by full-time students, and early in the program for part-time students.

Required Courses

All students:

EHEALTH 705 / Statistics for eHealth

EHEALTH 724 / Fundamentals of eHealth and the Canadian Health Care System

EHEALTH 736 / Management Issues in eHealth

EHEALTH 757 / Modern Software Technology for eHealth

Course-based students:

EHEALTH 706 / eHEALTH CAPSTONE

Appendix

Website changes:

Tracked changes to text
Full-Time or Part-Time (Course Based) - MSc eHealth Program (mcmaster.ca) Full-Time or Part-Time (Course Based) **Full-Time Program**

There are three components of the full-time, course-based option:

- 8 one-term **courses**
- **A 2-term capstone course**
- Development and presentation of a **scholarly paper**
- Eight-month **internship**

Courses

You must successfully complete 8, one-term graduate courses (four compulsory core courses and four electives) and the capstone course.

The **required courses** are:

- Statistics for eHealth
- Fundamentals of eHealth and the Canadian Healthcare System
- Management Issues in eHealth
- Modern Software Technology for eHealth
- eHealth Capstone

You can choose your other four courses from a list of approved electives. At least two of your electives must be level 700.

Scholarly Paper (Capstone Course Project)

The scholarly paper should reflect your understanding of the innovation, methodological, and management issues in the field of study you've chosen. It should show that you can independently discuss these issues concisely, critically, and coherently.

Your paper should not involve an extensively focused examination of a particular research issue, since it's a scholarly essay, not a thesis.

The paper is evaluated by a first and second reader who are determined between the student and their advisor.

The eHealth capstone course is designed with a comprehensive goal of providing a culminating exercise for course-based students. This will be achieved by having you apply the integrated knowledge accumulated through the core courses, electives, and internship experiences to a tangible healthcare challenge and propose possible solutions. The course will by necessity include a broad range of projects for students. Regardless of the type of project, students are expected to a) develop a proposal which will include a project plan, b) research and ideate possible solutions, and c) present their final projects to stakeholders. Projects can be completed individually or as a group.

Timing

All students start the program in the fall term (September). There are three terms throughout the year.

- Fall: September to December
- Winter: January to April
- Spring: May to August

Students complete three courses during each of the first two terms. Then they complete their internship in the third and fourth terms (May – December).
Students complete outstanding course-work ~~and their scholarly paper~~ when they return from internship in the Winter term (January – April).

The capstone course includes self-directed learning to be completed in the fall during internship (Sep-Dec) and project focused work in the winter term (Jan-Apr)

The program must be completed within 36 months.

Part-Time Program

Requirements for the part-time program are the same as for the full-time, course-based option except:

- **No internship** is required.
- You have up to **5 years** to complete the program part-time.

Although night classes and online options are available, flexibility to study during the day will be required.

Program Requirements - MSc eHealth Program (mcmaster.ca)

Program Requirements

You must meet these requirements to graduate from the program. If you have any questions about the requirements, please contact our Program Administrator.

Full-Time (Thesis) Students

- Complete at least 5 graduate-level, one-term courses. You must earn at least a B- in each of them. This includes:
    - 4 compulsory (required) courses.
    - At least one approved elective from your area of focus.
- Complete an 8-month internship.
- Prepare and orally defend a written thesis.

Your supervisor will work with you to plan your study program.

Full-Time (Course-Based) Students

- Complete at least 8 graduate-level, one-term courses. You must earn at least a B- in each of them. This includes:
  - 4 compulsory (required) courses.
  - At least 4 approved electives.
- Complete an 8-month internship.
- ~~Write a scholarly research paper (which earns at least a passing grade).~~ Complete the eHealth capstone course. You must earn at least a B-.

Your advisor will work with you to plan your study program.

Part-Time (Course-Based) Students

- Complete at least 8 graduate-level, one-term courses. You must earn at least a B- in each of them. This includes:
  - 4 compulsory (required) courses.
  - At least 4 approved electives.
- Complete the eHealth capstone course. You must earn at least a B-. ~~Write a scholarly research paper (which earns at least a passing grade)~~.

Your advisor will work with you to plan your study program.

Part-time students are not required to do an internship.

SCHOOL OF GRADUATE STUDIES

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

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 (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 Design	
DEGREE		**M.Eng.**

NATURE OF RECOMMENDATION *(PLEASE CHECK APPROPRIATE BOX)*				
Is this change a result of an IQAP review? ☐ Yes ☐ No				
CREATION OF NEW MILESTONE ☐				
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 <u>EXISTING</u> REQUIREMENT/PROCEDURE:

1. SEP 771 is a 0-unit seminar series that is required for all full-time students in all W Booth Grad programs.
2. Strongly recommended technical electives include SEP 757 <u>OR</u> SEP 758
3. Currently there are 7 cross-disciplinary elective options
4. Currently there are two streams in MED – Product Design and Digital Reality

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

1. Removal of SEP 771 as a requirement from MED program
2. Remove the "OR" from the strongly recommended electives. Both SEP 757 and SEP 758 can be taken as electives.
3. Add two cross-disciplinary electives – SEP 6xx3 Entrepreneurial Thinking & Innovation & SEP 6xx3 Fundamentals of Marketing (courses approved in October 2023 GCPC Meeting)
4. Removal of Digital Reality Stream

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?):

1. Removal of SEP 771:
   The Practitioner's Forum is a zero-unit mandatory course, and it comes with a set of unique challenges. The initial challenge arises from the fact that students pay no tuition for this course due to the newly adopted credit-based tuition system. The second challenge revolves around the instructor's compensation, as they cannot receive regular payment based on teaching load or overload, primarily because this course carries no credit units. The third one lies in the course's Pass and Fail grading mechanism, which can be challenging to assess comprehensively. Thus, we suggest to remove this requirement.

2. SEP 757 AND SEP 758 as recommended electives:
   Both of these courses are now recommended as some projects involve both hardware and software and the breadth of skills provided by the two courses helps students explore a wider range of solutions for project clients.

3. Adding two new Cross-disciplinary courses:
   The two new entrepreneurial and marketing courses, "SEP 6xx3 Entrepreneurial Thinking & Innovation" and "SEP 6xx3 Fundamentals of Marketing," offer students an excellent opportunity to delve into the mindsets of entrepreneurial thinking and market analysis. These aspects are currently missing from our cross-disciplinary courses.

4. Removal of Digital Reality Stream:
   The Digital Reality stream has never been officially offered to applicants. Unfortunately, the MED program was unable to implement this stream and there is no intention to offer it in the future.

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

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

Engineering Design, M. Eng

Innovative new designs and the ability to improve performance of existing systems have become a basis for a competitive advantage in the marketplace. Innovativeness, performance, environmental sustainability, safety, usability, desirability, viability and efficiency are integral parts of the requirements in the design of industrial products, healthcare products, large-scale systems, or software solutions. Within this complex set of constraints, successful engineers and engineering managers must be able to lead transformation of an idea to a complete design by working in interdisciplinary teams and with stakeholders. The Master of Engineering Design program provides its participants with technical expertise and leadership capabilities required to innovate and to lead technically-oriented organizations. The M.Eng. Design program emphasizes development of competencies in Design Thinking and innovations methodologies, as well as leadership, collaboration, and management skills to lead diverse teams. These competencies are combined with advanced technologies to enable design and implementation of solutions which integrate digital reality with the physical world to deliver solutions for daily living or for complex IT or industrial systems.

The following streams are currently offered in the Program:

Product Design: Design Thinking approach to development of products and services.
Digital Reality: Design of augmented-, virtual-, and mixed-reality immersive experiences.

Admission

In addition to the general requirements for entry into a graduate program in Engineering, students must hold a four-year engineering undergraduate degree or

equivalent, with 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. Students with a degree in Science, Technology or Mathematics will also be considered.

Strong letters of recommendation are also required. Applicants will be required to complete an online interview.

Professional work experience will be desirable, but not essential.

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. Part-time students will normally be expected to complete the program in three years and one term (40 months).

Prospective applicants who did not attain the required standing in their undergraduate degree, but who have at least four (4) years of relevant work experience, should discuss their situation with the Program Lead. If the experience is deemed sufficient, the Program Lead may then recommend a live interview. Evidence of ability to do graduate work will still be required. (See Sections 2.1.1 Admission Requirements for Master's Degree and 2.1.5 Admission of Students with Related Work Experience or Course Work beyond the Bachelor's Degree in the Graduate Calendar.)

McMaster Students may receive advanced standing for up to two courses (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

The curriculum has three main components:

1. Professional Development courses that will enable M.Eng. Design graduates to deal with complex situations in the work environment, to lead teams, and to manage projects.
2. Courses Relevant to the selected stream: some courses are mandatory for a given stream while others are elective.
3. An M.Eng. project that requires synthesis of knowledge from various disciplines.

Product Design Stream

Innovative and creative systems, solutions, and product designs are emphasized through design in a collaborative design studio environment. The interdisciplinary nature of the

program enables its participants to work on a variety of design work, such as industrial machinery, consumer products, automotive, etc.

The following course requirements need to be fulfilled by the candidates:

- 10 courses (30 units)

- 5 mandatory courses
- 4 technical elective courses
- 1 cross-disciplinary elective course

Mandatory Courses

Candidates are required to take the following five half courses (15 units):

- SEP 700 / M.Eng. Project in Engineering Design Part I
- SEP 700 / M.Eng. Project in Engineering Design Part II
- SEP 760 / Design Thinking
- SEP 761 / Design Thinking II
- SEP 773 / Leadership for Innovation

OR

- SEP 6EL3 / Leading Innovation

All full-time students must also register for the seminar series courses (attendance is mandatory), which are:
- SEP 771 / W Booth School of Engineering Practice and Technology Practitioner's Forum Part I
  (full time students only)
- SEP 771 / W Booth School of Engineering Practice and Technology Practitioner's Forum Part II
  (full-time students only)

SEP 771 is a seminar series presented by guest speakers, invited by the School, of relevance to all M. Eng. programs at the School. All full-time students are required to take these courses. Course grades are either 'pass' or 'fail'. In order to pass the course, the student must attend a minimum of 80% of the seminars.

Technical Electives

Candidates are required to take four half courses (12 units) which should be selected from graduate courses offered by departments within the Faculty of Engineering.

Candidates are required to have their elective course selection approved by the Associate Director of Graduate Studies in SEPT.

Strongly recommended:

- SEP 757 / Rapid Prototyping

OR

- SEP 758 / Software Design Tools and Methods

Other recommended electives include:

- SEP 6CG3 / Fundamentals of computer graphics and animation development
- SEP 6VE3 / Visual effects and animation production technology
- SEP 714 / Workflow Management for Animated Prototypes
- SEP 715 / Rendering techniques
- SEP 791 / Augmented Reality, Virtual Reality and Mixed Reality
- SEP 792 / GPU Intensive applications for real-time projects

Cross-Disciplinary Electives

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

- SEP 6xx3 / Entrepreneurial Thinking & Innovation
- SEP 6xx3 / Fundamentals of Marketing
- SEP 6X03 / LIVABLE CITIES, THE BUILT AND NATURAL ENVIRONMENT
- SEP 709 / Emerging Issues, Technology and Public Policy
- SEP 710 / International Governance and Environmental Sustainability
- SEP 729 / Manufacturing Systems
- SEP 731 / Lean Six Sigma for Engineering
- SEP 770 / Total Sustainability Management
- SEP 777 / Cyber-Physical Systems and Industry 4.0
- SEP 790 / Emerging Technologies for Engineering Enterprise Innovation
- SEP 793 / Entrepreneurial Opportunity Identification

Digital Reality Stream

Graduates from Digital Reality stream develop competencies required to work on MR/AR/VR applications in e.g. autonomous vehicles, games design, entertainment,

architecture, medicine, etc.,. All candidates will complete a project and an optional co-op with an organization which develops products in the digital reality space.

Mandatory Courses

Candidates are required to take the following three half courses (9 units):
- SEP 700 / M.Eng. Project in Engineering Design Part I
- SEP 700 / M.Eng. Project in Engineering Design Part II
- SEP 760 / Design Thinking

All full-time students must register for the seminar series courses (attendance is mandatory), which are:
- SEP 771 / W Booth School of Engineering Practice and Technology Practitioner's Forum Part I
  (full time students only)
- SEP 771 / W Booth School of Engineering Practice and Technology Practitioner's Forum Part II
  (full-time students only)

SEP 771 is a seminar series presented by guest speakers, invited by the School, of relevance to all M. Eng. programs at the School. All full-time students are required to take these courses. Course grades are either 'pass' or 'fail'. In order to pass the course, the student must attend a minimum of 80% of the seminars.

Technical Electives

Six courses (18 units) from the following list must be completed by the candidates:
- SEP 6CG3 / Fundamentals of computer graphics and animation development
- SEP 6VE3 / Visual effects and animation production technology
- SEP 714 / Workflow Management for Animated Prototypes
- SEP 715 / Rendering techniques
- SEP 791 / Augmented Reality, Virtual Reality and Mixed Reality
- SEP 792 / GPU Intensive applications for real-time projects

Cross-Disciplinary Electives

- SEP 6X03 / LIVABLE CITIES, THE BUILT AND NATURAL ENVIRONMENT
- SEP 709 / Emerging Issues, Technology and Public Policy
- SEP 710 / International Governance and Environmental Sustainability

- ~~SEP 729 / Manufacturing Systems~~
- ~~SEP 730 / Reliability and Risk Management~~
- ~~SEP 770 / Total Sustainability Management~~
- ~~SEP 777 / Cyber Physical Systems and Industry 4.0~~

CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:

Name: Zhen Gao   Email: gaozhen@mcmaster.ca   Extension: Date submitted: Nov 23

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

SGS/2013

McMaster University

SCHOOL OF GRADUATE STUDIES

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

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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	Manufacturing – All streams		
DEGREE	**M.Eng.**		
NATURE OF RECOMMENDATION *(PLEASE CHECK APPROPRIATE BOX)* **Is this change a result of an IQAP review?** ☐ Yes ☐ No			
CREATION OF NEW MILESTONE ☐			
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 <u>EXISTING</u> REQUIREMENT/PROCEDURE:

1. In Biomanufacturing, currently there are two required core courses (SEP 744 & SEP 767) along with four other core courses students can choose from (SEP 764, 745, 743 & 765)
2. Currently MEME Discrete Manufacturing has 5 recommended technical electives
3. SEP 771 is a 0-unit seminar series that is required for all full-time students in all W Booth Grad programs.
4. The MEME program has both a professional development requirement (two courses needed) and cross-disciplinary requirement (one course needed).

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

1. Addition of the new course *SEP 7xx - The Application of Computation Modelling for Biomanufacturing* (approved in Oct 2023 GCPC) to the "other core course" section for Biomanufacturing
2. Addition of new recommended electives in the Discrete Manufacturing stream
3. Removal of SEP 771 as a requirement of <u>all streams</u>
4. Combining Professional Development (PD) and Cross-disciplinary (CD) Requirements. The CD courses will be added into the PD list
5. Addition of two new courses to the new combined PD requirement list

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?):

1. **Addition of the new course SEP 7xx - The Application of Computation Modelling for Biomanufacturing (approved in Oct 2023 GCPC) to the "other core course" section for Biomanufacturing:**

The addition of SEP 7xx - The Application of Computational Modeling for Biomanufacturing as a core course option is driven by its direct alignment with the Biomanufacturing program's learning outcomes:

a. Comprehensive Understanding of Biomanufacturing Processes: This course is essential to provide students with a deep understanding of how computational modeling can be applied to optimize and analyze biomanufacturing processes. It allows students to grasp the intricacies of bioprocessing and how computational tools can be leveraged to improve efficiency and quality.

b. Interdisciplinary Knowledge: The course integrates principles from biology, engineering, mathematics, and computer science, thereby enhancing the students' interdisciplinary knowledge. Biomanufacturing is inherently interdisciplinary, and this course equips students to bridge the gap between various fields, making them well-rounded professionals.

c. Problem-Solving and Critical Thinking Skills: Computational modeling encourages critical thinking and problem-solving. By offering this course, students can develop these skills, which are crucial in the biomanufacturing industry, where complex challenges often require innovative solutions.

d. Industry Relevance: The inclusion of computational modeling reflects the industry's growing demand for data-driven decision-making and optimization. This directly addresses the learning outcome of ensuring that graduates are industry-ready and equipped with the skills and knowledge currently in demand.

e. Career Preparedness: Graduates need to be prepared for the demands of the job market. Offering this course as a core option ensures that all students have access to the skills and knowledge necessary for a successful career in biomanufacturing. It prepares them for a wide range of roles within the industry, from research and development to manufacturing and quality control.

2. **Addition of new recommended electives in the Discrete Manufacturing stream:**

- SEP 736 - Railway Electrification Infrastructure and Technology

This course covers principles of railway electrification, overhead catenary and third rail systems, power supply and distribution for electric trains, and control and protection systems. It delves deep into the advanced technology behind electrification systems, their design, operation, and safety measures. The students gain insights into high-voltage electrification and sustainable solutions for modern railways. This course is essential for engineers and professionals in the railway industry seeking expertise in electrification systems.

The addition of a course on "Railway Electrification Infrastructure and Technology" to the MEME program is justified by its alignment with industry demands, its interdisciplinary nature, its contribution to existing Program Learning Outcomes (PLO), and its relevance to sustainable transportation solutions. This change enhances the educational experience of MEME students and equips them with valuable knowledge and skills for careers in the railway electrification field.

It can contribute to the development of PLOs related to problem-solving, technical knowledge, and application of engineering principles. Students who complete this course will gain a deeper understanding of railway electrification systems, contributing to their overall engineering knowledge and skills.

PLO 1 Systematic understanding of knowledge including relevant inside or outside the field of discipline and a critical awareness of current problems.

PLO 2 Enable a conceptual understanding and methodological competence that enable a working comprehension and critical evaluation of current and advanced manufacturing engineering field

PLO 3 Competence in the applied research process by applying an existing engineering knowledge in the critical analysis of a specific problem or in a unique setting.

- SEP 756 - Future electric networks, simulation challenges, and automation

This course will introduce the most recent challenges in power system operations with high penetration of renewable energy resources such as Wind, Solar, and Energy Storage. The course will present the basic concept of power system studies in Electro Magnetic Transient (EMT) environment.
This course not only enriches the educational experience of MEME students but also equips them with skills and knowledge relevant to the evolving field of electrical engineering in the context of renewable energy and power system automation.

PLO 1 Systematic understanding of knowledge including relevant inside or outside the field of discipline and a critical awareness of current problems.

PLO 3 Competence in the applied research process by applying an existing engineering knowledge in the critical analysis of a specific problem or in a unique setting.

PLO 5 The ability to communicate ideas, issues and conclusions clearly, orally and in writing, to a range of audiences.

PLO 6 Cognizance of the complexity of knowledge and of the potential contributions of other interpretations, methods, and disciplines.

- SEP 762 - Introduction to Railway Engineering

This course blends theory and practical expertise to provide a strong foundation in railway engineering. We begin with a historical exploration of railway systems, then delve into diverse topics each week: from

track engineering to rolling stock, signaling, systems, subway elements, tunneling, operations, project management, predictive maintenance, and future innovations like high-speed trains and autonomous systems. The course offers vital insights into the dynamic railway industry, preparing the students to excel in this field by addressing its challenges and seizing its opportunities.

This course provide valuable insights into the broader context in which manufacturing operates. It connects manufacturing engineering to the transportation industry, materials science, quality control, and interdisciplinary problem-solving. This exposure can enhance the skillset of manufacturing engineers and make them more versatile and adaptable in their careers.

PLO 1 Systematic understanding of knowledge including relevant inside or outside the field of discipline and a critical awareness of current problems.

PLO 3 Competence in the applied research process by applying an existing engineering knowledge in the critical analysis of a specific problem or in a unique setting.

PLO 4 The ethical behavior consistent with academic integrity and the use of appropriate guidelines and procedures for responsible conduct of research.

PLO 5 The ability to communicate ideas, issues and conclusions clearly, orally and in writing, to a range of audiences.

- SEP 797 - System Assurance

This course offers an in-depth exploration of system assurance principles, focusing on their application in railways and critical infrastructure. Topics covered include assurance concepts, systems engineering, standards and regulations, physical and cyber security, software safety, fire/life safety, and reliability. Students will learn safety and security planning, hazard and threat analysis, and safety case development. The course concludes with certification processes and a practical case study. Graduates will be well-prepared to apply system assurance in the railway industry and other critical sectors, ensuring the integrity and safety of complex systems.

This course is closely related to manufacturing as it addresses core principles of quality, safety, reliability, and interdisciplinary systems thinking. It equips MEME students with the knowledge and tools to ensure the smooth operation of manufacturing processes and the production of high-quality, safe products in a safety critical application such as railway industry. IT directly enhances the following PLOs in MEME:

PLO 2 Enable a conceptual understanding and methodological competence that enable a working comprehension and critical evaluation of current and advanced manufacturing engineering field.

PLO 3 Competence in the applied research process by applying an existing engineering knowledge in the critical analysis of a specific problem or in a unique setting.

PLO 4 The ethical behavior consistent with academic integrity and the use of appropriate guidelines and procedures for responsible conduct of research.

PLO 5 The ability to communicate ideas, issues and conclusions clearly, orally and in writing, to a range of audience.

PLO 6 Cognizance of the complexity of knowledge and of the potential contributions of other interpretations, methods, and disciplines.

3. **Removal of SEP 771 as a requirement of <u>all streams</u>:**
   The Practitioner's Forum is a zero-unit mandatory course, and it comes with a set of unique challenges. The initial challenge arises from the fact that students pay no tuition for this course due to the newly adopted credit-based tuition system. The second challenge revolves around the instructor's compensation, as they cannot receive regular payment based on teaching load or overload, primarily because this course carries no credit units. The third one lies in the course's Pass and Fail grading mechanism, which can be challenging to assess comprehensively. Thus, we suggest to remove this

requirement.

4. **Combining Professional development and cross-disciplinary requirements:**
The cross-disciplinary requirements will be combined into the professional development requirement. Specifically, the PD collection will be the aggregate of the pre-existing Professional Development Series, and a revised collection of Cross-disciplinary elective courses. This revision was required to adjust for the recent pausing of the Master of Engineering/Technology Entrepreneurship programs. After this combination, students will be allowed to take 2 or 3 courses in this new category.

The cross-disciplinary elective requirement is the replacement of an older course SEP 772 Innovation Studio. That older course attempted bring instructors from all programs into a single course framework to be offered to all Booth grad students. In 2022, GCPC approved the deletion of that course due to basic challenges in efficacy and delivery logistics. The then new cross-disciplinary elective requirement replaced the blended course with choices from a selection of high-quality generalist courses recommended by each of the programs

5. **Adding two new courses to the combined PD list options – SEP 6xx3 Entrepreneurial Thinking & Innovation & SEP 6xx3 Fundamentals of Marketing (courses approved in October 2023 GCPC Meeting**)

The two new entrepreneurial and marketing courses, "SEP 6xx3 Entrepreneurial Thinking & Innovation" and "SEP 6xx3 Fundamentals of Marketing," offer students an excellent opportunity to delve into the mindsets of entrepreneurial thinking and market analysis. These aspects are currently missing from our cross-disciplinary courses.

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

Fall 2024

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

Engineering in Manufacturin Engineering, M.E.M.E.

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.

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 students may receive advanced standing for up to two courses (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

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~~2~~ professional development courses
- 3 to 4 core courses
- 1 to 2 technical elective courses
- ~~1 cross-disciplinary elective~~
- 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)

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

~~All full-time students must register for the seminar series courses (attendance is mandatory), which are:~~

- ~~SEP 771 / W Booth School of Engineering Practice and Technology Practitioner's Forum Part I~~
- ~~SEP 771 / W Booth School of Engineering Practice and Technology Practitioner's Forum Part II~~

~~(seminar series, full-time students only)~~

~~SEP 771 is a seminar series presented by guest speakers, invited by the School, of relevance to all M.Eng. programs at the School. All full-time students are required to take these courses. Course grades are either 'pass' or 'fail'. In order to pass the course the student must attend a minimum of 80% of the seminars.~~

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 741 / Project Management for High Tech Projects~~
- SEP 6TC3 / Technical Communications
- SEP 6X03 / LIVABLE CITIES, THE BUILT AND NATURAL ENVIRONMENT

- SEP 6xx3 / Entrepreneurial Thinking & Innovation
- SEP 6xx3 / 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

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

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 7xx / Electrification
- SEP 7xx / Future Electric Networks, Simulation Challenges and Automation
- SEP 7xx / Introduction to Railway Engineering
- SEP 7xx / System Assurance
- Other elective courses available.

Cross-Disciplinary Elective Courses

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

- SEP 709 / Emerging Issues, Technology and Public Policy
- SEP 710 / International Governance and Environmental Sustainability
- SEP 6X03 / LIVABLE CITIES, THE BUILT AND NATURAL ENVIRONMENT
- SEP 793 / Entrepreneurial Opportunity Identification
- SEP 770 / Total Sustainability Management

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 32 professional development courses
- 2 to 3 core courses
- 0 to 1 technical elective courses
- 1 cross-disciplinary elective course

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 32 professional development courses
- 3 to 5 core courses
- 0 to 2 technical elective courses
- 1 cross-disciplinary elective course

All full-time students must register for the seminar series courses (attendance is mandatory), which are:

- SEP 771 / W Booth School of Engineering Practice and Technology Practitioner's Forum Part I
- SEP 771 / W Booth School of Engineering Practice and Technology Practitioner's Forum Part II

(seminar series, full-time students only)

SEP 771 is a seminar series presented by guest speakers, invited by the School, of relevance to all M.Eng. programs at the School. All full-time students are required to take these courses. Course grades are either 'pass' or 'fail'. In order to pass the course the student must attend a minimum of 80% of the seminars.

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 741 / Project Management for High Tech Projects
- SEP 6TC3 / Technical Communications
- SEP 6X03 / LIVABLE CITIES, THE BUILT AND NATURAL ENVIRONMENT
- SEP 6xx3 / Entrepreneurial Thinking & Innovation
- SEP 6xx3 / 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

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 / Current Good Manufacturing Practice Upstream Operations
- SEP 745 / Fermentation of Recombinant Microorganisms
- SEP 743 / Animal Cell Culture Engineering
- SEP 765 / Current Good Manufacturing Practice Downstream Operations
- SEP 7xx / The Application of Computation Modelling for Biomanufacturing

Technical Elective Courses

Recommended technical elective courses are:

- SEP 749 / Biomedical Engineering
- SEP 766 / Membrane-Based Bioseparation
- BIOMED 799 / Independent Study in Biomedical Engineering
- SEP 6BI3 / Bioinformatics
- SEP 6BS3 / Biotechnology Regulations
- SEP 729 / Manufacturing Systems

Cross-Disciplinary Elective Courses

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

- SEP 709 / Emerging Issues, Technology and Public Policy
- SEP 710 / International Governance and Environmental Sustainability
- SEP 6X03 / LIVABLE CITIES, THE BUILT AND NATURAL ENVIRONMENT
- SEP 793 / Entrepreneurial Opportunity Identification
- SEP 770 / Total Sustainability Management

CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:

Name: Zhen Gao   Email: gaozhen@mcmaster.ca   Extension: Date submitted: Nov 23

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

SGS/2013

SCHOOL OF GRADUATE STUDIES

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

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 (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	Public Policy

DEGREE	M.Eng.

NATURE OF RECOMMENDATION *(PLEASE CHECK APPROPRIATE BOX)*
Is this change a result of an IQAP review? ☐ Yes ☐ No

CREATION OF NEW MILESTONE ☐

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:			

1

DESCRIBE THE <u>EXISTING</u> REQUIREMENT/PROCEDURE:

1. SEP 771 is a 0-unit seminar series that is required for all full time students in all W Booth Grad programs.
2. Currently there are 7 cross-disciplinary elective options

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

1. Removal of SEP 771 as a requirement from MED program
2. Add two cross-disciplinary electives – SEP 6xx3 Entrepreneurial Thinking & Innovation & SEP 6xx3 Fundamentals of Marketing (courses approved in October 2023 GCPC Meeting)
3. Some minor grammar and formatting edits

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?):

1. Removal of SEP 771:
   The Practitioner's Forum is a zero-unit mandatory course, and it comes with a set of unique challenges. The initial challenge arises from the fact that students pay no tuition for this course due to the newly adopted credit-based tuition system. The second challenge revolves around the instructor's compensation, as they cannot receive regular payment based on teaching load or overload, primarily because this course carries no credit units. The third one lies in the course's Pass and Fail grading mechanism, which can be challenging to assess comprehensively. Thus, we suggest to remove this requirement.

2. Adding two new Cross-disciplinary courses:
   The two new entrepreneurial and marketing courses, "SEP 6xx3 Entrepreneurial Thinking & Innovation" and "SEP 6xx3 Fundamentals of Marketing," offer students an excellent opportunity to delve into the mindsets of entrepreneurial thinking and market analysis. These aspects are currently missing from our cross-disciplinary courses.

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

Fall 2024

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

Engineering and Public Poli
M.E.P.P.

In today's complex world engineers and scientists are called upon to 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, 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 and Public Policy (MEPP) is offered within the W Booth School of Engineering Practice and Technology. Engineers and applied scientists from a wide cross-section of organizations 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 aundergraduate degree in STEM or a 4-year non-STEM degree in a public policy-related field including, for example, 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 in the areas 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 students may receive advanced standing for up to two courses (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

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; completes a formal research paper and prepares to publish their results for broad 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 701 / Theory and Practice of Policy Analysis: Frameworks and Models
- SEP 709 / Emerging Issues, Technology and Public Policy

- SEP 6EL3 / Leading Innovation ~~OR~~
  OR
- SEP 773 / Leadership for Innovation
- SEP 778 / Circular Economy - Engineering Perspectives and Application
- SEP 704 / Public Policy Research Project, Part 1
- SEP 704 / Public Policy Research Project, Part 2

~~In addition students are required to take:~~
- ~~SEP 771 / W Booth School of Engineering Practice and Technology Practitioner's Forum Part I (zero units)~~
  ~~(full-time students only)~~
- ~~SEP 771 / W Booth School of Engineering Practice and Technology Practitioner's Forum Part II (zero units)~~
  ~~(full-time students only)~~

Focus Elective Courses

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

- SEP 6I03 / Sustainable Manufacturing Processes
- 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

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 6xx3 / Entrepreneurial Thinking & Innovation
- SEP 6xx3 / 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 Associate Director of the Graduate Studies in SEPT.

CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:

Name: Zhen Gao   Email: gaozhen@mcmaster.ca   Extension: Date submitted: Nov 23

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

SGS/2013

McMaster University

SCHOOL OF GRADUATE STUDIES

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

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 (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	Systems and Technology	
DEGREE	**M.Eng**	

NATURE OF RECOMMENDATION *(PLEASE CHECK APPROPRIATE BOX)*
Is this change a result of an IQAP review? ☐ Yes ☐ No

CREATION OF NEW MILESTONE ☐					
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 <u>EXISTING</u> REQUIREMENT/PROCEDURE:

1. SEP 752 (Systems Modeling and Optimization) is not part of the curriculum for streams of Digital Manufacturing, and Automation & Smart Systems in MEST program.
2. SEP 720 (cloud Computing) / 721 (Data Analytics, Machine Learning and AI on Cloud Platforms) and SEP 786/787 (Artificial Intelligence and Machine Learning Fundamentals, Machine Learning: Classification Models) are 1.5 unit pairs offered in the MEST program.
3. SEP 771 (W Booth School of Engineering Practice and Technology Practitioner's Forum,) is a 0-unit seminar course that is a requirement for all W Booth programs.
4. The MEME program has both a professional development requirement (two courses needed) and cross-disciplinary requirement (one course needed).

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

1. Add SEP 752 as <u>core course</u> to both the Digital Manufacturing Stream and Automation & Smart Systems stream in MEST.
2. Replace SEP 720/721 and SEP 786/787 with SEP 7xx Cloud Computing (3 units) and SEP 7xx Machine Learning (3 units), respectively.
3. Remove SEP 771 as a requirement for all MEST streams.
4. Combining Professional Development and Cross-disciplinary Requirements
5. Addition of two new courses to the new combined requirement list

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?):

1. **Add SEP 752 as <u>core course</u> to both the Digital Manufacturing Stream and Automation & Smart Systems stream in MEST.**

SEP 752 Systems Modeling and Optimization is a course focused on simulation software architecture and solution methods. It is featured with plant data analysis and model building which essential for Cyber-Physical-System and Industry 4.0. The topic of evolutionary optimization including differential evolution, genetic algorithms, and particle swarm, is an important part of AI that students should comprehend.

With the addition of this course into our curriculum, it will definitely enhance the following two PLOs:

PLO #2. Apply system engineering tools and methods to monitor, analyze, and improve performance of the cyber-physical systems based on data and models.
PLO #3. Integrate electro-mechanical components, IT hardware and software infrastructure and software applications into a functioning cyber-physical system and control its operation.

2. **Replace SEP 720/721 and SEP 786/787 with SEP 7xx Cloud Computing (3 units) and SEP 7xx Machine Learning (3 units), respectively.**
   2.1 Replace SEP 720/721 with SEP 7xx Cloud Computing (3 units)

Cloud computing is one of the highly demanded courses in MEST programs. Due to the legacy, this course was offered as two quarter (1.5 units) courses, i.e., SEP 720 and 721 (the second part is a continuation of the first part), which brought some issues such as 1) assigning more challenging projects, 2) incompleteness in terms of overall learning outcomes if students will finish one quarter course, 3) admin and logistics issue. By organically integrating SEP 720 and 721 as a single 3-unit course, both the course quality and the popularity will be increased.

This new Cloud Computing course will contribute to the following Program Learning Outcomes of the Systems and Technology Program:

PLO #1. Communicate effectively engineering content, work in teams, manage projects, assess risks, and assure quality.
PLO #2. Apply system engineering tools and methods to monitor, analyze, and improve performance of cyber-physical systems based on data and models.
PLO #5. Approach holistically domain specific problems and apply system engineering methods (software/hardware, data analysis, control and optimization and others) to solve them.

After completing this course, the students are capable of:
- comprehending the mechanism of cloud computing.
- gaining experience of the major cloud platforms including GCP, AWS and Azure.
- knowing how to use the big data tools in cloud.
- analyzing and comparing the performances of AWS, GCP and Azure.

2.2 Replace SEP 786/787 with SEP 7xx Machine Learning (3 units)

Machine learning is the core of AI. This topic has high-demand in MEST and MEME programs, and a good portion of students in other departments. This course was offered as two quarter (1.5 units) courses, which brought some issues such as 1) assigning more challenging projects, 2) incompleteness in terms of overall learning outcomes if students will finish one quarter course. By organically integrating SEP-786 and 787 as a single 3-unit course, both the course quality and the popularity will be increased.

This course will help students acquire the knowledge and skills to:
1. [PLO #5] Approach holistically domain specific problems and apply system engineering methods (machine learning and data mining) to solve them.
2. [PLO #2] Apply system engineering tools and methods to monitor, analyze, and improve performance of the cyber-physical systems based on data and models.
3. [PLO #1] Communicate effectively engineering content, work in teams, manage projects, assess risks, and assure quality.

After completing this course, the students are capable of:
- knowing how to handle machine learning data properly and efficiently.
- gaining experience to design, evaluate and improve machine learning algorithms for real-world problem solving such as object classification/recognition and system prediction.
- coding and debugging independently of machine learning and data mining methods.
- analyzing and comparing the behaviors and performances of various well-known algorithms and models.
- designing multiple solutions to machine learning and data mining problems using different approaches.

3. Remove SEP 771 as a requirement for all MEST streams

The Practitioner's Forum is a zero-unit mandatory course, and it comes with a set of unique challenges. The initial challenge arises from the fact that students pay no tuition for this course due to the newly adopted credit-based tuition system. The second challenge revolves around the instructor's compensation, as they cannot receive regular payment based on teaching load or overload, primarily because this course carries no credit units. The third one lies in the course's Pass and Fail grading mechanism, which can be challenging to assess comprehensively. Thus, we suggest to remove this requirement.

4. Combining Professional development and cross-disciplinary requirements:

The cross-disciplinary requirements will be combined into the professional development requirement. Specifically, the PD collection will be the aggregate of the pre-existing Professional Development Series, and a revised collection of Cross-disciplinary elective courses. This revision was required to adjust for the recent pausing of the Master of Engineering/Technology Entrepreneurship programs. After this combination, students will be allowed to take 2 or 3 courses in this new category.

The cross-disciplinary elective requirement is the replacement of an older course SEP 772 Innovation Studio. That older course attempted bring instructors from all programs into a single course framework to be offered to all Booth grad students. In 2022, GCPC approved the deletion of that course due to basic challenges in efficacy and delivery logistics. The then new cross-disciplinary elective requirement replaced the blended course with choices from a selection of high-quality generalist courses recommended by each of the programs

5. **Adding two new courses to the combined list options – SEP 6xx3 Entrepreneurial Thinking & Innovation & SEP 6xx3 Fundamentals of Marketing (courses approved in October 2023 GCPC Meeting**)

   The two new entrepreneurial and marketing courses, "SEP 6xx3 Entrepreneurial Thinking & Innovation" and "SEP 6xx3 Fundamentals of Marketing," offer students an excellent opportunity to delve into the mindsets of entrepreneurial thinking and market analysis. These aspects are currently missing from our cross-disciplinary courses

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

September 1, 2024

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 (please include a tracked changes version of the calendar section affected if applicable):

Systems and Technology, M.Eng.

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 t highly motivated students seeking advanced training in area of cyber-physical systems. Students design their own program of studies by selecting (with approval of their academic advisor) courses of interest to them in one of the following streams: (i) Automation and Smart Systems, (ii) Automotive, and (iii) Digital Manufacturing.   Application for admission to the program are 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 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 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 courses (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 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
- Digital Manufacturing
- Process Systems

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.

Students wishing to take an elective course outside of the recommended electives need to obtain a written permission from their graduate advisor.

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~~2~~ professional development courses
    - 3 to 4 core courses
    - 0 to 1 technical elective courses
    - ~~1 cross-disciplinary elective~~

    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~~2~~ professional development courses
    - 4 to 6 core courses
    - 0 to 2 technical elective courses
    - ~~1 cross-disciplinary elective~~

~~All full-time students must register for the seminar series courses (attendance is mandatory), which are:~~

- ~~SEP 771 / W Booth School of Engineering Practice and Technology Practitioner's Forum Part I (seminar series, full-time students only)~~
- ~~SEP 771 / W Booth School of Engineering Practice and Technology Practitioner's Forum Part II (seminar series, full-time students only)~~

~~SEP 771 is a seminar series presented by guest speakers, invited by the School, of relevance to all M. Eng. programs at the School. All full-time students are required to take these courses. Course grades are either 'pass' or 'fail'. In order to pass the course, the student must attend a minimum of 80% of the seminars.~~

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 6TC3 / Technical Communications~~
- ~~SEP 725 / Practical Project Management for Today's Business Environment~~
- ~~SEP 773 / Leadership for Innovation~~
- ~~SEP 760 / Design Thinking~~
- ~~SEP 741 / Project Management for High Tech Projects~~
- SEP 6TC3 / Technical Communications
- SEP 6X03 / LIVABLE CITIES, THE BUILT AND NATURAL ENVIRONMENT
- SEP 6xx3 / Entrepreneurial Thinking & Innovation
- SEP 6xx3 / Fundamentals of Marketing
- 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 740 / Deep Learning
- SEP 742 / Visual Perception for Autonomous Vehicles
- SEP 775 / Introduction to Computational Natural Language Processing

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

Cross-Disciplinary Elective Course

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

- SEP 709 / Emerging Issues, Technology and Public Policy
- SEP 710 / International Governance and Environmental Sustainability
- SEP 6X03 / LIVABLE CITIES, THE BUILT AND NATURAL ENVIRONMENT
- SEP 793 / Entrepreneurial Opportunity Identification
- SEP 770 / Total Sustainability Management
- SEP 705 / Green Engineering, Sustainability and Public Policy

Courses- Automation and Smart Systems

Core Courses

- SEP 720 / Cloud Computing
- SEP 721 / Data Analytics, Machine Learning and AI on Cloud Platforms
- SEP 7xx / 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 786 / Artificial Intelligence and Machine Learning Fundamentals / CHEM ENG 786 / Artificial Intelligence and Machine Learning Fundamentals
- SEP 787 / Machine Learning : Classification Models / CHEM ENG 787 / Machine Learning : Classification Models
- SEP 7xx / 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

Cross-Disciplinary Elective Courses

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

- SEP 709 / Emerging Issues, Technology and Public Policy
- SEP 710 / International Governance and Environmental Sustainability
- SEP 6X03 / LIVABLE CITIES, THE BUILT AND NATURAL ENVIRONMENT
- SEP 793 / Entrepreneurial Opportunity Identification
- SEP 770 / Total Sustainability Management
- SEP 705 / Green Engineering, Sustainability and Public Policy

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
- 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 786 / Artificial Intelligence and Machine Learning Fundamentals / CHEM ENG 786 / Artificial Intelligence and Machine Learning Fundamentals
- SEP 787 / Machine Learning : Classification Models / CHEM ENG 787 / Machine Learning : Classification Models
- SEP 7xx / Machine Learning

Cross-Disciplinary Elective Courses

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

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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 754 / Process Design and Integration for Minimal Environmental Impact
- SEP 740 / Deep Learning

Recommended Technical Electives

- SEP 730 / Reliability and Risk Management
- CHEM ENG 773 / Advanced Concepts of Polymer Extrusion
- CHEM ENG 740 / Advanced PSE Tools and Methods
- SEP 6IT3 / Internet Technologies and Databases

Cross-Disciplinary Elective Courses

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

- SEP 709 / Emerging Issues, Technology and Public Policy
- SEP 710 / International Governance and Environmental Sustainability
- SEP 6X03 / LIVABLE CITIES, THE BUILT AND NATURAL ENVIRONMENT
- SEP 793 / Entrepreneurial Opportunity Identification

- ~~SEP 770 / Total Sustainability Management~~
- ~~SEP 705 / Green Engineering, Sustainability and Public Policy~~
- Students can take other elective courses with permission of their program lead.

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

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

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 767 / Information Privacy and Security
- CAS 771 / Introduction to Big Data Systems and Applications

CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:

Name: Zhen Gao   Email: gaozhen@mcmaster.ca   Extension: Date submitted: Oct 2ⁿᵈ, 2023

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

SGS/2013

January 2024 Graduate Council

New Award Terms for Approval

Name of Fund: The Thomas and Lianne Dean MBA Bursary

Terms of Reference for Fund:
Established in 2023 by Thomas (MBA '92) and Lianne Dean. To be awarded by the School of Graduate Studies, to a student in the MBA program who demonstrates financial need.

Name of Fund: The Alan Hitchen Memorial Chemistry Graduate Scholarship

Terms of Reference for Fund:
Established in 2023 in memory of Alan Hitchen, B.Sc. Hons. (Class of '51). To be awarded by the School of Graduate Studies, on the recommendation of the Faculty of Science, to graduate students enrolled in the Faculty of Science who demonstrate academic and research excellence in chemistry and/or chemical biology.

Name of Fund: The Don Morrison Scholarship (resubmission)

Terms as presented to Graduate Council March 21st, 2023:
Established in 2022 by Heather Sheardown, B. Eng. (Class of '89) in memory of her father, Don Morrison, a man who valued both work and recreation, connected through his music, and loved deeply. To be awarded by the School of Graduate Studies on the recommendation of the Faculty of Engineering, to a female graduate student in an Engineering program who demonstrates academic and research excellence.

Graduate Council requested endorsement from the Equity and Inclusion Office. Dr. Walker, Vice Provost, Equity & Inclusion, has endorsed the updated terms as follows:

Established in 2022 by Heather Sheardown, B. Eng. (Class of '89) in memory of her father, Don Morrison, a man who valued both work and recreation, connected through his music, and loved deeply. To be awarded by the School of Graduate Studies on the recommendation of the Faculty of Engineering, to graduate student who self-identifies as female, in an Engineering program who demonstrates academic and research excellence.

Terms Change (for information purposes only)

Original Terms:
Established in 1990 by family and friends to honour the valuable contribution of Dr. Rawls made to cancer research; as Professor in the Faculty of Health Sciences, founder and coordinator of the McMaster Research Group, Director of the Molecular Virology and Immunology Programme and Past President of the National Cancer Institute. Eligible nominees are students, regardless of departmental affiliation, currently supervised by a graduate faculty member of the Molecular Virology and

Immunology Research program (MVIP). The award will be made by the School of Graduate Studies on the recommendation of the Chair of the Medical Sciences Graduate Program. The selection committee will include the Chair of the Molecular Immunology, Virology and Inflamation Program Education Committee.

Revised Terms:
Established in 1990 by family and friends to honour the valuable contribution of Dr. Rawls made to cancer research; as Professor in the Faculty of Health Sciences, founder and coordinator of the McMaster Cancer Research Group, Director of the Molecular Virology and Immunology Programme and Past President of the National Cancer Institute. Eligible students are from the Medical Sciences Graduate Program currently supervised by a faculty member who is associated with the McMaster Immunology Research Centre (MIRC). The award will be made by the School of Graduate Studies on the recommendation of the Assistant Dean of the Medical Sciences Graduate Program.

Reason for change:
The Molecular Virology and Immunology Programme no longer exists. It is now the McMaster Immunology Research Centre (MIRC).