



MEMORANDUM

To: Executive Committee of Faculty Council (April 7, 2020)
Faculty Council (April 29, 2020)

From: Prof. Evan Bentz
Chair, Undergraduate Curriculum Committee

Date: March 24, 2020

Re: Major Curriculum Changes for the 2020-2021 Academic Year

REPORT CLASSIFICATION

This is a major policy matter that will be considered by the Executive Committee for endorsing and forwarding to Faculty Council for vote as a regular motion (requiring a simple majority of members present and voting to carry).

BACKGROUND

The Undergraduate Curriculum Committee is tasked with managing the curriculum change process for the Faculty. This report summarizes course changes proposed for the 2020-2021 academic year.

PROGRAMS AFFECTED

The proposed curriculum changes affect cross-disciplinary minors and certificates, and undergraduate programs in the Cross Disciplinary Programs Office, Engineering Science, First Year Core 8, the Institute for Studies in Transdisciplinary Engineering Education & Practice, Institute of Biomaterials & Biomedical Engineering, and Mechanical & Industrial Engineering.

CONSULTATION

These changes have been reviewed and approved by the Undergraduate Curriculum Committee, which is comprised of representatives from each undergraduate program; the Vice-Dean, Undergraduate Studies; the Vice-Dean, First Year; the Associate Dean, Cross-Disciplinary Programs; the Director, First Year Curriculum; the Registrar's Office; undergraduate students; the Faculty's Teaching and Learning Specialist; the Faculty's Scheduling Officer; and representatives from IBBME, UTIAS, the Institute for Studies in

Transdisciplinary Engineering & Practice, and the Engineering and Computer Science Library. The Committee meets regularly, and reviews changes to the curriculum. The impact of these changes on students in the relevant programs has been considered.

RECOMMENDATION FOR FACULTY COUNCIL

THAT the proposed curriculum changes for the 2020-2021 academic year, as described in Report 3659, be approved.

PROPOSED CURRICULUM CHANGES

1. CROSS DISCIPLINARY PROGRAMS OFFICE

1.1. APS360H1F/S Artificial Intelligence Fundamentals

- **Change course name to: Applied Fundamentals of Machine Learning**
- **Change course description to:** A basic introduction to the history, technology, programming and applications of the fast evolving field of machine learning. Topics to be covered may include neural networks, autoencoders/decoders, recurrent neural networks, natural language processing, and generative adversarial networks. Special attention will be paid to fairness and ethics issues surrounding machine learning. An applied approach will be taken, where students get hands-on exposure to the covered techniques through the use of state-of-the-art machine learning software frameworks.
- **Rationale:** This is a key course in the new Artificial Intelligence and Machine Learning minor. These changes to the name and description reflect the content of the course and the emphasis on machine learning.

1.2. Add HPS345H1 Quantifying the World: the debates on the ethical and epistemic implications of AI and automation (Arts & Science course) to *Requirement 5 of AI Engineering Minor*

- **Rationale:** An ethics component is important for this minor, and HPS (Arts & Science) have introduced two courses that are an excellent fit. The department has only guaranteed engineering students 10 slots in each offering, but they are electives.

1.3. Add HPS346H1 Modifying and Optimizing Life: on the peculiar alliance between AI, biology, and engineering (Arts & Science course) to *Requirement 5 of AI Engineering Minor*

- **Rationale:** An ethics component is important for this minor, and HPS (Arts & Science) have introduced two courses that are an excellent fit. The department has only guaranteed engineering students 10 slots in each offering, but they are electives.

- 1.4. **Add HPS346H1** Modifying and Optimizing Life: on the peculiar alliance between AI, biology, and engineering (Arts & Science course) as *Introductory Elective of Bioengineering Minor*
- 1.5. **Add MIE369H1** Introduction to Artificial Intelligence to *Requirement 3 of AI Engineering Certificate*
 - **Rationale:** This course is new and should be added to the certificate.
- 1.6. Add MIE440H1 Design of Innovative Products as *Advanced Elective – Advanced Manufacturing Minor*
- 1.7. **Add MIE540H** Product Design as *Advanced Elective – Advanced Manufacturing Minor*
- 1.8. **Add University of Toronto Sustainability Scholar transcript notation** to *Sustainable Energy Minor*
 - **Rationale:** This effort comes from the Presidential Advisory Committee on Sustainability. It will make earned credentials more recognizable between institutions, similar to the Global Engineering Certificate.
- 1.9. **Allow IB and AP Economics as Extra Credit** for *Engineering Business Minor*
 - **Rationale:** The Arts & Science Economics department allows these courses to count as credits.

2. ENGINEERING SCIENCE

- 2.1. **Remove CIV352H1** Structural Design I
- 2.2. **Remove CIV355H1** Urban Operations Research
- 2.3. **Remove CIV357H1** Structural Design 2
- 2.4. **Remove CIV360H1** Road Transportation Performance
- 2.5. **Remove CIV455H1** Collaborative Design Project I
- 2.6. **Remove CIV456H1** Collaborative Design Project II
 - **Rationale for items 2.1 through 2.6:** These courses are part of the Infrastructure option. The last cohort of this option is finishing this academic year, and it won't exist in future academic sessions. Since the courses won't be offered they should be stricken from the calendar.

3. FIRST YEAR CORE 8 AND TRACK ONE CURRICULUM

3.1. **Change APS100 Course Schedule from Bi-weekly to Weekly lectures**

- **Rationale:** Historically, this course has been offered with biweekly lectures and weekly tutorials. In an ongoing course survey, many students have suggested moving to a weekly lecture format. A broader piece of feedback from that survey is that students want to hear real life stories from other engineering students and professionals. This proposal is coming forward to address the second issue. Lecture will move to a weekly schedule, but no new work or assessment will be introduced. It will be an opportunity for speakers to relate course content to experience. Moving to a weekly schedule will also allow the course content to expand on topics only touched on in cursory way given the current schedule, like mental health, the purpose of grades, and intercultural fluency. It was proposed to move to 10 or 11 lectures rather than 13, and leave some select weeks free of formal lecture.

4. INSTITUTE FOR STUDIES IN TRANSDISCIPLINARY ENGINEERING EDUCATION & PRACTICE (ISTEP)

4.1. **Remove APS446H1 Leadership in Project Management**

- **Rationale:** This course was not offered in the most recent academic year, and there are no plans to offer it next year. As the course code for the course will need to change if the course is to be offered again, the most appropriate action was determine to be removing the course from the calendar at this time, and reintroducing the course with a new code if the opportunity occurs.

4.2. **APS234H1F Entrepreneurship and Small Business**

- **Change course code to:** TEP234H1

4.3. **APS281H1S Language and Meaning**

- **Change course code to:** TEP281H1

4.4. **APS320H1F Representing Science on Stage**

- **Change course code to:** TEP320H1

4.5. **APS321H1F Representing Science and Technology in Popular Media**

- **Change course code to:** TEP321H1

4.6. **APS322H1S Language and Power**

- **Change course code to:** TEP322H1

4.7. **APS323H1F Writing Lab**

- **Change course code to:** TEP323H1
- **Change course name to:** The Self and Negotiated Meaning in Work Life

- **Change course description to:** This workshop-based course focuses on the way that people develop understanding of one another in a workplace environment, apart from scientific and engineering discourse. In science and engineering, credibility and meaning are established through participation in a shared value system based on empirical method. Claims are supported through evidence that can be verified mathematically and/or scientifically and results are disseminated through appropriate professional media. Credibility and meaning in the workspace is clearly differentiated from that of the space of social interactions. In the non-Engineering workspace, such boundaries are not necessarily so clear. Credibility and meaning are negotiated through more personal narratives in which participants identify and build upon one another's experiences. This course focuses on the skills needed for responses to behavioural questions in job interviews, presentation of data or results in a company setting, and other situations that combine the personal and scientific in order to negotiate shared understandings.

4.8. **APS324H1S** Engineering and Social Justice

- **Change course code to:** TEP324H1

4.9. **APS325H1F** Engineering and Science in the Arts

- **Change course code to:** TEP325H1

4.10. **APS326H1F** Special Topics in Creative Writing

- **Change course code to:** TEP326H1

4.11. **APS327H1S** Engineering and Law

- **Change course code to:** TEP327H1

4.12. **APS343H1F/S** Engineering Leadership

- **Change course code to:** TEP343H1
- **Change course description to:** This course is a practical approach to being a more productive engineer based on the premise that for technology to become a reality it must be translated through people. A key is to understand that engineers lead in ways that reflect their skills and mind set. The course examines: 1) the meaning of leading (Why do something?); 2) the processes of leading (How do you do you create a vision and motivate others?); and 3) the tools of leading (What steps do you take to lead?). Learning frameworks and personal working styles inventories provide practical tools to assist the student to understand human nature and the logic of learning to become a competent leader of self, teams and organizations. The student prepares to become a competent leader by undertaking to learn (understand and integrate) key skills, character attributes and purposeful behaviours. The course presents strategies for development of high

performance teams. The course material is delivered through lectures, practical activities, readings, in-class discussion and a team project. The project is based on the team interviewing the CEO of an engineering-intensive company or senior leader in the community. Students will be required to submit written reflections on how the course content informs and might influence their personal experience.

- 4.13. **APS432H1S** Entrepreneurship and Business Management
 - **Change course code to:** TEP432H1
- 4.14. **APS442H1S** Cognitive and Psychological Foundations of Effective Leadership
 - **Change course code to:** TEP442H1
- 4.15. **APS444H1F** Positive Psychology for Engineers
 - **Change course code to:** TEP444H1
- 4.16. **APS445H1F/F** The Power of Story: Discovering Your Leadership Narrative
 - **Change course code to:** TEP445H1
- 4.17. **APS447H1S** The Art of Ethical & Equitable Decision Making in Engineering
 - **Change course code to:** TEP447H1
- 4.18. **STE448H1** Using System Mapping to Tackle Complex Problems
 - **Change course code to:** TEP448H1

5. **INSTITUTE OF BIOMATERIALS & BIOMEDICAL ENGINEERING**

- 5.1. **BME395H1F** Biomedical Systems Engineering II: Cells and Tissues
 - **Change course description to:** An introduction to the study of animal development, both at the cellular and molecular levels, with an emphasis on the integration of cells into tissues. Topics include developmental patterning and cell fate specification; the central dogma of molecular biology; genomic equivalence and mechanisms of differential gene expression (transcriptional, translational and post-translational); tools of molecular genetics; cell communication, signal transduction pathways and morphogenesis; and stem cells, pluripotency and stem cell niches. Considerable emphasis will be placed on reading the primary research literature. Laboratory sessions will introduce basic cell biology techniques including cell culture, immunofluorescence staining, and brightfield and fluorescence microscopies.
 - **Rationale:** The change to the course description was proposed to more accurately reflect course content

5.2. **BME410H1S** Regenerative Engineering

- **Change course description to:** This course focuses on regenerative medicine – tissue engineering, stem cells, endogenous repair, gene therapy, - and related topics, as seen through the patent literature. A different patent or patent application is discussed each period to illustrate an aspect of regenerative medicine. Most of the course content will be student presentations.
- **Rationale:** The change to the course description was proposed to more accurately reflect course content

6. **MECHANICAL & INDUSTRIAL ENGINEERING**

6.1. **MIE459H1S** Organization Design 4/0/0

- **Change credit weight unit to 3/0/0**
- **Rationale:** This course is currently 2x2 hours of lecture per week. The material outlined in this course description warrants a traditional 3 hours of lecture per week, 1x2 and 1x1.

6.2. **MIE504H1** Applied Computational Fluid Dynamics 3/0/0

- Change credit weight unit to 5/0/0