



MEMORANDUM

To: Executive Committee of Faculty Council (February 7, 2018)
Faculty Council (February 27, 2018)

From: Associate Professor Evan Bentz
Chair, Undergraduate Curriculum Committee

Date: January 16, 2018

Re: **Major Curriculum Changes for the 2018-2019 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).

SUMMARY

The Undergraduate Curriculum Committee is tasked with managing the curriculum change process for the Faculty. This report summarizes course changes proposed for the 2018-2019 academic year.

PROCESS AND 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 Engineering Communication Program, and the Engineering and Computer Science Library.

PROPOSAL/MOTION

THAT the proposed curriculum changes for the 2018-2019 academic year be approved as described in Report 3578.

PROPOSED CURRICULUM CHANGES

1. ENGINEERING SCIENCE

1.1 Foundation Curriculum Changes

- Change lab format for PHY180H1 - Classical Mechanics:
3 / 1.5 / 1 to 3 / 2 / 0

This combines the lab and tutorial experience into weekly sessions. This will better integrate the lab and lecture content, which is something we've received feedback on from our students. Reflects best practice in the research and best practice in A&S.

1.2 Option-Specific Changes

Aerospace

- Change AER521H1: Mobile Robotics and Perception to ROB521H1 and update 4W

UTIAS owns both AER and ROB postcodes; this course is more reflective of the ROB themes.

- Change ECE557H1: Systems Control to 'Linear Control Theory'

Updated course title more accurately reflects content of the course.

- Addition of the following footnote about the Year 4 technical elective:

"The Technical Elective may be chosen from any 400 or 500 level technical course offered in Engineering provided students have taken the pre-requisite course(s). Other non-Engineering courses may be taken with the approval of the Division of Engineering Science."

Provides clarity to students with respect to technical elective substitution requests.

Biomedical Systems

- Add MAT389H1: Complex Analysis as Technical Elective

Addresses a pre-requisite issue for another technical elective in the biomedical systems major.

- Move BME595H1: Medical Imaging from Winter to Fall term

This course is to act as a prerequisite for BME5XXH1S.

- Add BME5XXH1: Imaging Case Studies in Clinical Engineering as Technical Elective

New course offered by IBBME that fits well within the Biomedical Systems curriculum.

- Remove MSE442H1: Surgical and Dental Implant Design from Technical Electives

Course is no longer being offered by MSE.

- Remove ECE557H1: Systems Control from Technical Electives

Addresses a prerequisite issue for Biomedical Systems students.

- Add Technical Elective descriptions to calendar:

Systems and Synthetic Biology

'Omic technologies for the measurement of biological systems (genomics, proteomics, metabolomics, networks), and tools and methods to analyze 'omic data (databases, computational biology, pattern recognition, machine learning); multiscale modelling and related mathematical tools: ordinary and partial differential equations, advanced statistical methods.

Regenerative Medicine & Biomaterials

Stem cells and stem cell biology; tools and techniques to regulate stem cell behaviour; design, characterization, and application of materials for manipulation, repair, or replacement of biological systems.

Neuro Sensory and Rehab Engineering

Neural pathways and sensory communications, including brain and nervous system biology, sensing and interpreting neural signals, and human-computer interfaces; technologies and rehabilitation solutions for the elderly, disabled, and those affected by chronic disease, with an emphasis on bioelectric signal manipulation and robotic applications.

Sensors, Nano/Microsystems and Instrumentation

Tools and methods to detect molecular dynamics, cellular behaviours, and tissue-scale changes in biological systems under normal physiological conditions and disease; optics and optical systems; microscopy; molecular imaging; medical imaging; signal processing; image processing and analysis.

Helps students in selecting their technical electives by providing a description of each grouping, so that the students can select courses that represent their research and subject matter interests.

Electrical and Computer

- Add CSC369H1: Operating Systems exclusion to ECE353H1: Systems Software

Student identified overlap between the courses and upon examination, this was verified (catching up to current practice).

- Increase total tutorial hours for ECE354H1:Electronic Circuits:
From 3 / 1.50 / 0.5 to 3 / 1.50 / 1

Instructor request; makes the course consistent with the Core 8 equivalent (and most undergraduate courses).

- Remove 'AER521H1: Mobile Robotics and Perception' from Technical Electives

Addresses lack of prerequisite(s) for ECE students.

- Move ECE358 from the winter to the fall semester

Running this course in the fall semester will provide ECE Major students with an opportunity to develop skills relevant to potential PEY interviews. This also makes the course available to students in the Machine Intelligence Major.

- Update Year 3 Footnote from "CHE374H1: It is strongly recommended that students take this course in 3F, but students may choose to take it in 4F." to "Students may take CHE374H1 in 4F, particularly to accommodate ECE358H1"

Reflects change in Year 3 curriculum delivery with ECE358H1 moving to the Fall term.

- Course title change to ECE356 (Change to "Introduction to Control Theory" and ECE557 (Change to "Linear Control Theory")

Updates course to more accurately reflect content.

- Change BME595H1: Medical imaging from Winter to Fall term

Reflects a change in the course delivery to accommodate as a prerequisite for BME5XXH1.

- Add BME5XXH1: Imaging Case Studies in Clinical Engineering

Course added as a result of student interest.

- Update Technical Elective "ECE521H1: Inference Algorithms and Machine Learning" to "ECE421H1: Introduction to Machine Learning"

Reflects course change by ECE.

Engineering Mathematics, Statistics, and Finance

- Add STA457H1S: Time Series Analysis as Technical Elective

Has been requested as a technical elective substitution a number of times by students in the Major; course already reserves spots for our students.

- Update Technical Elective “ECE521H1: Inference Algorithms and Machine Learning” to “ECE421H1: Introduction to Machine Learning”

Reflects course change by ECE.

- Change ECE358H1: Foundations of Computing from Winter to Fall Term

Reflects change in course offering as a result of a core course change for EngSci’s ECE Major.

Energy Systems

- Change AU Distribution for MIE303H1: Mechanical and Thermal Energy Conversion Processes:
From 100% ES to 75% ES and 25% ED

Reflects work on our “year 3 design spine”, which was identified as a deficiency from our curriculum mapping process. This course is adding new design instruction and a new significant project in design.

- Replace “Technical Elective” in Year 3 Winter Term with “CS/HSS or Technical Elective”

Many Energy Systems students request to take their CS/HSS in the Year 3 Winter term. This change will increase this flexibility for students and reduce substitution requests.

Machine Intelligence

- Addition of Machine Intelligence as a new Major
- Create and add ECE3XXH1: Matrix Algebra & Optimization

Course created for the new MI option to be part of its core curriculum.

- Create and add ECE3XYH1: Probabilistic Reasoning

Course created for the new MI option to be part of its core curriculum.

- Create and add ECE4XXH1: Machine Intelligence Capstone Design

Created to be capstone course for the new MI major.

- Create and add MIE3XXH1: Introduction to Machine Intelligence

Course created to be introductory course for the new MI major.

- Create and add ROB3XXH1: Artificial Intelligence to 3W Core Curriculum

Course created for the new MI option to be part of its core curriculum.

- Replace ECE345H1F: Algorithms and Data Structures with ECE358H1F: Foundations of Computing in 3F

Given that ECE358 has been moved to the fall semester, and is an Engineering Science dedicated course, this is a better choice for the new MI Major.

- Update 3W Core “ECE521H1: Inference Algorithms and Machine Learning” to “ECE421H1: Introduction to Machine Learning”

Updates course code and title to reflect changes by ECE.

Physics

- Remove PHY495H1: Research Topic in Geophysics from Technical Elective list

Course cancelled by the department.

- Remove PHY494H1: Geophysical Imaging: EM and Potential Fields from Technical Elective list

Course cancelled by the department, replaced by ESS452H1.

- Add ESS452H1: Geophysical Imaging with Non-seismic Methods to Technical Elective list

ESS452 replaces PHY494 by A&S.

- Add BME595H1: Medical Imaging to Technical Elective list

Course added as a result of student interest as well as acting as a prerequisite to BME5XXH1.

- Add BME5XXH1: Imaging Case Studies in Clinical Engineering to Technical Elective list

Course added to accommodate student interest and provide more TE options.

Robotics

- Remove 'BME350H1: Biomedical Systems Engineering I: Organ Systems' from Application Courses Technical Elective list

Addresses lack of co-requisite for Robotics students.

- Remove MIE438H1: Microprocessors and Embedded Microcontrollers from list of Technical Electives

Course has become core in 3W, should no longer be listed as a technical elective.

- Add ECE352H1: Computer Organization as Technical Elective

Addresses a pre-requisite issue for another technical elective listed in the Major.

- Update "ECE557H1: Systems Control" to "ECE557H1: Linear Control Theory"

Updated course title more accurately reflects content of the course.

- Change AER521H1: Mobile Robotics and Perception to ROB521H1 and update 4W

UTIAS owns both AER and ROB postcodes; this course is more reflective of the ROB themes.

- Remove ECE521H1: Inference Algorithms and Machine Learning from Technical Elective List

Addresses an exclusion from the new ROB3XY course.

- Create and add "ROB3XY: Introduction to Learning from Data" to 3W Core

New EngSci owned machine learning course to replace CSC411H1.

- Remove "CSC411H1: Machine Learning and Data Mining" from 3W Core

Replaced by ROB3XYH1: Introduction to Learning from Data.

1.3 Prerequisites

- Prerequisites for all EngSci owned courses will be added to the calendar for the 2018-19 year. Courses that are being modified include: AER407H1, AER521H1, APM384H1, BME344H1, BME346H1, BME350H1, BME358H1, BME395H1, BME396H1, BME410H1, BME489H1, CHE374H1, CHE375H1, CIV355H1, CIV460H1, ECE349H1, ECE350H1, ECE352H1, ECE353H1, ECE354H1, ECE355H1, ECE356H1, ECE357H1, ECE358H1, ECE360H1, ECE363H1, ECE557H1, MAT389H1, MIE303H1, MIE375H1, MIE376H1, MIE377H1, MIE479H1, MSE352H1, ROB301H1, ROB310H1, ROB501H1

Adding pre-requisites improves transparency, particularly for students following a non-traditional curriculum path (exchange students, transfer students, students who have failed courses).

2. **MECHANICAL AND INDUSTRIAL ENGINEERING**

2.1 Revised course description of MIE270 - Materials Science

- In response to the proposed phasing out of MSE101 - Introduction to Materials Science.

2.2 Add pre-requisites for MIE270 – Materials Science to include: APS110 - Engineering Chemistry and Materials Science, APS164 - Introductory Chemistry from a Materials Perspective **or** MSE101- Introduction to Materials Science

- Efficiency in use of instructional resources in delivery of first year chemistry.

3. **CIVIL ENGINEERING**

3.1 New Course Proposal – Fundamentals of Acid Rock Drainage

- Geochemistry of acid rock / acid mine drainage (ARD/AMD) which covers the role of bacteria in generating this global mining pollution issue and how mines currently treat and attempt to prevent it. An introduction to the underlying chemical reactions involved, the role of microbes in these processes and the mitigation and treatment strategies currently available.

4. **FACULTY-WIDE PROGRAMS**

4.1 Change transcript entry course title from “PEY500 Professional Experience Year” to “PEY500 Professional Experience Year Co-Op.”

- Part of the process of eliminating the requirement for students to pay student loans when on PEY.

5. FIRST YEAR OFFICE

First Year Core 8/TrackOne Program

5.1 Change in delivery of CHE112 Physical Chemistry and MSE101 Introduction to Materials Science

- Currently CHE112 and MSE101 are offered in both the fall and winter terms. In order to streamline the delivery of the first year program, it is proposed that CHE112 be only offered in the fall term and MSE101 be only offered in the winter term. This will only affect the first-year curriculum for MIE and MSE students.
- Specifically, MIE students will now take APS110 in the fall term in place of MSE101. Since the contact time and AU breakdown for APS110 and MSE101 are identical this wouldn't impact accreditation in any way (Lecture/Practical/Tutorial = 3/1/1 and 75% NS, 25% ES). Students in MSE would then take CHE112 in the fall term and MSE101 in the winter term (same curriculum as now, just in a different order). It is expected that this would reduce the required teaching complement in first year.
- It is expected that all departments will take APS110 beginning in the Fall of 2019, so this is a preliminary step in that direction.
- Through discussions at the First Year Core 8 Curriculum Committee and within departments, this proposed change has the support of the MIE, MSE, and CHE departments.

5.2 Change to course description for APS100 – Orientation to Engineering (Changes in Red)

Current Course Description

- This course is designed to help students transition into first-year engineering studies and to develop and apply a greater understanding of the academic learning environment, the field of engineering, and how the fundamental mathematics and sciences are used in an engineering context. Topics covered include: study skills, time management, problem solving, successful teamwork, effective communications, exam preparation, stress management and wellness, undergraduate research, extra- and co-curricular involvement, engineering disciplines and career opportunities, and applications of math and science in engineering.

Proposed Course Description

- **This course supports students' transition** into first-year engineering studies by allowing them to develop and apply a greater understanding of the academic learning environment, **the critical academic and professional skills needed for success, and the professional nature of engineering.** Topics covered include: **techniques for effective learning, time management skills, engineering problem solving, test and exam preparation and review, stress**

management and wellness, **engineering ethics and professionalism, academic integrity and the student code of conduct**, applications of math and science in engineering, extra- and co-curricular involvement, and **engineering leadership and careers**.

6. MATERIALS SCIENCE & ENGINEERING

6.1 Change MSE398 - Materials Manufacturing and Design Laboratory weight from 0.75 to 1.0

6.2 Change course code from MSE398H1Y to MSE398Y1Y

7. CHEMICAL ENGINEERING

7.1 Reinstatement of CHE223 Statistics into 2S

7.2 Change in lecture hours from 3 to 2 for CHE223

8. ENGINEERING COMMUNICATIONS PROGRAM

8.1 Remove pre-requisites for APS321H1S Representing Science and Technology in the Popular Media from course calendar

- Pre-requisites have already been removed from all other HSS electives offered by ECP that are eligible for the Certificate in Communication (including APS281, 320, 322, 323, 324, 325, and 445 (offered jointly with ILead)); this change will bring APS321 in line with all the other courses.
- When the courses were originally proposed—ten years ago—the pre-requisites were meant to target engineering students who were already receiving communication instruction in their core courses and who wanted to develop their skills further; at that time, that did not cover students in all departments. However, since then, all departments have integrated communication curricula, and, as a result, any undergraduate student will meet the minimum requirements based on their minimum path.