UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE & ENGINEERING

Report No. 3487

MEMORANDUM

To: Executive Committee of Faculty Council (November 2, 2015)
Faculty Council (December 8, 2015)

From: Dr. Graeme Norval
Chair, Undergraduate Curriculum Committee

Date: October 9, 2015

Re: **First Year ECE and TrackOne Curriculum Changes for the 2016-2017 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 the course changes for the first-year program for the ECE and TrackOne programs.

STRUCTURE

The proposed changes described below come in part as a result of the findings and recommendations of the Core Curriculum Review Task Force after extensive consultations with students, faculty, and external programs and literature. As well, these changes are motivated by ongoing discussion and assessment of the first year program conducted by the First Year Core 8 Curriculum Committee.

Move APS105: Computer Fundamentals from the Fall Term to the Winter Term

First-year students in the ECE and TrackOne programs currently take *APS105: Computer Fundamentals* in the fall term. It is proposed that this course be moved to the winter term for the following reasons:

- It will allow for the new Engineering Chemistry and Materials Science course to be delivered to ECE and TrackOne students in the fall term.
- It will enable students to take their computer programming course after having progressing through the “transition” term in the fall.

- Students will now take computer programming closer in time to when many of them will use this material and programming skills again in the fall term of second-year.
- This will provide a better balance to the number of hours of contact in the fall and winter terms (see summary tables below).

The Creation of a New Engineering Chemistry and Materials Science Course for ECE and TrackOne Students

Currently, ECE and TrackOne first-year students take *APS104H1S: Introduction to Materials and Chemistry* in their Winter term. This course covers the fundamentals of materials science and physical chemistry and fulfills the chemistry basic science requirement for CEAB accreditation. The course description is:

APS104H1 S	**Introduction to Materials and Chemistry**

Lect./Lab./Tut./Weight
3/0.50/1/0.50

I-AECPEBASC, I-AEELEBASC, I-AEENGBASC

This is an introductory course in materials science and physical chemistry. Topics include: fundamentals of atomic, structure, the nature of bonding, crystal structure and defects, the laws of chemical thermodynamics (including a discussion of enthalpy and entropy), reaction equilibrium, and phase equilibria. These basic principles provide the foundation for an exploration of structure-property relationships in metals, ceramics, and polymers, with emphasis on mechanical properties.

Over the years, significant concerns with this course from both students and faculty have been regularly voiced. These relate to the overwhelming amount of material covered by the course, and the seemingly isolated delivery of the chemistry and materials science content. Essentially, many students and faculty members experience this as two courses fit into one.

Therefore, it is proposed that a new Engineering Chemistry and Materials Science course be created to replace APS104H1S. This course would be delivered in the fall term and would act as a model for a potential new course that would be taken by all Core 8 and TrackOne students in the fall of 2017. The course would focus on how the fundamental chemistry principles impact the structure-property relationship, thus the delivery of the content would specifically interweave the chemistry and materials science together.

The course curriculum is the same as the current online course, *APS164: Introductory Chemistry from a Materials Perspective*, and the course description would be:

APS1XX: Engineering Chemistry and Materials Science
This course is structured around the principle of the structure-property relationship. This relationship refers to an understanding of the microstructure of a solid, that is, the nature of the bonds between atoms and the spatial arrangement of atoms, which permits the explanation of observed behaviour. Observed materials behaviour includes mechanical, electrical, magnetic, optical, and corrosive behaviour. Topics covered in this course include: structure of the atom, models of the atom, electronic configuration,

the electromagnetic spectrum, band theory, atomic bonding, optical transparency of solids, magnetic properties, molecular bonding, hybridized orbitals, crystal systems, lattices and structures, crystallographic notation, imperfections in solids, reaction rates, activation energy, solid-state diffusion, materials thermodynamics, free energy, and phase equilibrium.

The CEAB Academic Unit breakdown would be the same as that which currently exists for APS104 and MSE101, 75% Natural Science and 25% Engineering Science.

The unique aspect of this course would be in the nature of how things are taught and learned by students. The organization of the course is designed to interweave topics and concepts such that the most important ideas are revisited and reinforced throughout the term. The detailed course syllabus would be finalized in the winter of 2016 to allow instructors time to prepare for this course through the summer months. The finalized syllabus would be based on a review of the current online offering of *APS164: Introductory Chemistry from a Materials Perspective*.

As a result of these two changes, the ECE and TrackOne first-year program would become that which is summarized in the tables below.

ECE and TrackOne Fall Term (Current)

Course Title	Lecture	Lab	Tutorial	Weight
Engineering Strategies & Practice I	3		2	0.5
Computer Fundamentals	3	2	1	0.5
Linear Algebra	3	1	1	0.5
Calculus I	3		1	0.5
Mechanics	3		2	0.5
Orientation to Engineering	0.5		1	0.25
	Total Contact:		26.5 hours	

ECE and TrackOne Winter Term (Current)

Course Title	Lecture	Lab	Tutorial	Weight
Engineering Strategies & Practice II	2	-	2	0.5
Introduction to Materials and Chemistry	3	0.5	1	0.5
Calculus II	3		1	0.5
Electrical Fundamentals	3	1	2	0.5
Dynamics	3	-	2	0.5
Introduction to Engineering Seminar or Introduction to ECE Seminar	1	-	-	0.15
	Total Contact:		24.5 hours	

ECE and TrackOne Fall Term (2016/17)

Course Title	Lecture	Lab	Tutorial	Weight
Engineering Strategies & Practice I	3		2	0.5
Engineering Chemistry and Materials Science	3	1	1	0.5
Linear Algebra	3	1	1	0.5
Calculus I	3		1	0.5
Mechanics	3		2	0.5
Orientation to Engineering	0.5		1	0.25
	Total Contact:		25.5 hours	

ECE and TrackOne Winter Term (2016/17)

Course Title	Lecture	Lab	Tutorial	Weight
Engineering Strategies & Practice II	2	-	2	0.5
Computer Fundamentals	3	2	1	0.5
Calculus II	3		1	0.5
Electrical Fundamentals	3	1	2	0.5
Dynamics	3	-	2	0.5
Introduction to Engineering Seminar or Introduction to ECE Seminar	1	-	-	0.15
	Total Contact:		26 hours	

PROGRAM(S)

All relevant programs are involved in these changes, and the impact on students in the various programs has been considered.

PROCESS AND CONSULTATION

This proposal has been reviewed and approved by the Undergraduate Curriculum Committee, which is comprised of faculty representatives from each undergraduate program; undergraduate students; the Vice-Dean, Undergraduate Studies; the Chair of First Year; the Associate Dean, Cross-Disciplinary Programs; and the Registrar. The Committee meets regularly and reviews changes to the undergraduate curriculum.

RECOMMENDATION AND MOTION FOR FACULTY COUNCIL

THAT the major curriculum changes to the first year ECE and TrackOne programs for the 2016-2017 academic year, proposed in Report 3487, be approved.