



MEMORANDUM

To: Executive Committee of Faculty Council

From: Dr. Graeme Norval
Chair, Undergraduate Curriculum Committee

Date: November 28, 2011 for December 2, 2011 Faculty Council Meeting

Re: **Proposed Substantive Curriculum Changes for the 2012-2013 Academic Year**

REPORT CLASSIFICATION

This is a **Major Policy Matter: Regular Motion** 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 voting to carry).

BACKGROUND

Several programs are proposing substantive changes to their curriculum, which are worthy of discussion at Faculty Council.

STRUCTURE

Chemical Engineering

It is proposed that in term 4S, to change 1 Technical Elective to a Free Elective (a Free Elective is any course on any campus). This allow students to take science-based electives, such as those for the Bioengineering and Sustainable Energy Minors. This also enables students to complete the Engineering Business Minor as part of the regular program. The AU totals are presented below, with the assumption that the Free Elective is a CS course – the program continues to exceed all requirements.

Chemical Engineering AU totals – 2012-13 Academic Year

Table	Item	5 Total AU	CURRICULUM COMPONENTS						
			6 Math + NS	7 Math	8 Natural Science	9 Comp. Studies	10 Eng'g Science	11 Eng'g Design	12 ES+ED
2C.3A	Compulsory Courses (hourly)	1585.3	643.5	254.4	389.1	142.4	554.9	244.5	799.4
2C.3B	Compulsory Courses (proportionally)	103.6	0.0	0.0	0.0	0.0	0.0	103.6	103.6
2C.3C	Option Compulsory	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2C.4	Electives	380.0	160.0	0.0	160.0	180.0	40.0	0.0	40.0
TOTAL		2068.9	803.5	254.4	549.1	322.4	594.9	348.1	943.0
PRIOR STUDIES, (if claimed)									
PROGRAM TOTAL		2068.9	803.5	254.4	549.1	322.4	594.9	348.1	943.0
CEAB REQUIREMENTS		1950.0	420.0	195.0	195.0	225.0	225.0	225.0	900.0

Civil Engineering

A new course CIV382Y1- Civil Engineering Communication Portfolio (-/-/0.25/0.25). This is similar to the existing CHE and MIE portfolio courses.

Cross-Disciplinary Office

A new course is proposed:

APS530H1 S: Appropriate Technology & Design for Global Development

Engineering design within the context of global society, emphasizing the needs of users in order to support appropriate, sustainable technology. A design project will comprise the major component of the course work. The course will take the approach of “design for X”. Students are expected to be familiar with design for functionality, safety, robustness, etc. This course will extend the students’ understanding of design methodologies to design for “appropriateness in developing regions”. Readings and discussions will explore the social, cultural, economic, educational, environmental and political contexts in which third world end users relate to technology. Students will then incorporate their deepened understanding of this context in their design project. The projects will be analyzed for functionality as well as appropriateness and sustainability in the third world context. Upon completion of the course, students should have a deeper appreciation of the meaning of appropriate technology in various international development sectors such as healthcare, water & sanitation, land management, energy, infrastructure, and communications in both urban and rural settings.

Engineering Science

The Division of Engineering Science proposes to modify the curriculum for the Biomedical Option. It began in 1995, as an Option with two distinct streams, chemical and electrical; the two streams were subsequently eliminated. The curriculum was last revised in 2004, with streamlining of technical electives and the introduction of three new core courses.

Since the last review, much has changed: the field of Biomedical Engineering has evolved with the emergence of new sub-disciplines; the Year I/II foundation curriculum in Engineering Science was revised to emphasize “systems engineering”; and there are several new opportunities available for students to pursue bioengineering at the University of Toronto, including a Faculty-wide Minor in Bioengineering (which is available to all Engineering Science students as of 2011-12) and a proposed core program Major in Biomedical Engineering (Fig. 1). These developments in particular motivated the current review and proposal for renewal of the Biomedical Engineering Major.

The option is to have a new name “Biomedical Systems Engineering”, which requires that a new POST code be generated. Students currently in the Biomedical Option will be grandfathered under the current name.

Course slot	3F	3W	4F	4W
1	BME350 - Biomedical Systems Engineering I: Organ systems (modified BME350)	BME496 – Biomedical Systems Engineering III: Cells and Molecules (existing course)	BME4XX – Biomedical Systems Engineering IV: Computational Systems Biology (new course)	BME4XX – Capstone Design (new course)
2	BME395 – Biomedical Systems Engineering II: Tissues and Cells (existing course)	BME3XX – Molecular Biophysics (new course)	ESC499 – Thesis	ESC499 – Thesis
3	BME3XX/ECE3XX – Modeling, Dynamics and Control of Biological Systems (new course)	MSE352 – Biomaterials and Biocompatibility (existing course)	Technical elective	Technical elective
4	APM384 Partial Differential Equations (existing course)	MIE439 – Biomechanics (existing course)	CHE374 Economics (existing course)	Technical elective
5	CHE391 - Organic Chemistry (slightly modified)	BME3XX – Omics technologies (new course)	Complementary studies elective	Complementary studies elective
6	ESC301 Option seminar (existing seminar)	ESC301 Option seminar (existing seminar)	BME4XX Design Seminar (new seminar)	-

Features of the core curriculum include:

- An expanded core curriculum that is distinct nationally and ensures all graduates meet a common standard
- Biomedical-related courses in 3F to capture student interest
- A series of four ‘flagship’ courses in quantitative engineering analysis of organ to molecular systems, with strong integration of biology fundamentals
- A new course in modeling and control of biological systems
- Core courses in bioelectricity, biomaterials, and biomechanics
- Modification of bioinstrumentation to focus on ‘omics’ technologies
- A new major-specific capstone design course

The new curriculum would be offered beginning in fall 2012 (3rd year students), with in program students grandfathered to the old curriculum.

English Communication Program

It is proposed to cancel MIE201 – Essays in Technology and Culture.

It is proposed to introduce a new course APS3XX – Engineering and Science in the Arts. The course description is: “This course examines the connections between engineers, scientists, and artists. Taking examples from architecture, sculpture, painting, and the performing arts, this course will show how these artistic disciplines have grown through their interplay with engineering and science. Weekly lecture and tutorial.”

Mineral Engineering

The Mineral Engineering program proposes a series of program changes. In term 2S, MSE301 – Mineral processing and a CS/HSS elective are moved to 3rd year (term 3S), with CME362 Engineering Mathematics II moving in from 3F, and a new course MIN2XX – Surface Mining introduced.

In term 3F, CME362 is moved to term 2S and MIE262 Operations Research I is removed from the program, with CME368 – Engineering Economics moving in from 3S and MIN430 – Mining Environmental Management moving in from 4F.

Term 3S sees CME368 moved out (to term 3F) and removal of a technical elective; in lieu are MSE301 and a CS/HSS elective (from 2S). Also, MIN350 – Underground and Open Pit Mining is deleted, and being split into two courses, the first of which is MIN3XX – Underground Mining. Finally, MIN429 has a name change to Engineering Rock Mechanics.

In term 4F – MIN450 – Mineral economics become core, rather than elective. The students then choose two (not the current three) technical electives, with CIV280 – Management of Construction removed from the list of allowable technical electives (as well as MIN430 which is now in 3F) and CHE565 – Aqueous Process Engineering added to the list.

Term 4S remains the same with course CIV250 – Hydraulics and Hydrology removed from the list of allowable technical electives.

Mechanical and Industrial Engineering

A new course MIE5XXF – Biotransport Phenomena is added (replacing CHE393), which becomes the required course for the Bio-engineering stream (replacing MIE439F – Biomechanics), which changes to the second term as MIE439H1S).

A new course MIE54X Human Factors Integration is proposed, as a technical elective.

PROCESS

The Committee is composed of representatives from each program; the Vice-Dean, Undergraduate Studies; the Chair, First Year; the Associate Dean, Cross-Disciplinary Programs; and the Registrar's Office. The Committee meets regularly, and reviews changes to the curriculum.

PROGRAM

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

PROPOSAL/MOTION

THAT the Executive Committee recommend to Faculty Council the following motion –

“THAT the proposed substantive curriculum changes be approved and introduced in the 2012-2013 academic year.”