

Report No. 3442

MEMORANDUM

То:	Executive Committee of Faculty Council (November 4, 2014) Faculty Council (November 25, 2014)
From:	Dr. Graeme Norval Chair, Undergraduate Curriculum Committee
Date:	October 29, 2014
Re:	Proposed Undergraduate Nanoengineering Minor

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 Faculty offered the first nanoengineering undergraduate program in the world, founding the Nanoengineering Option in Engineering Science in 2001. Nanoengineering and its underlying science and engineering skills has now become embedded in academic and industrial sectors spanning the electronics industry, communications, sustainable and legacy energy, medical diagnostics and devices, micro electrical mechanical systems, and new materials for the automotive, aviation, and manufacturing sectors. Commensurably, nanoengineering has become embedded in the core and elective courses in many of the Faculty's Core-8 programs.

Given the pervasive nature of this field, it is time to provide students with a wider suite of options to pursue a recognized specialization in nanoengineering.

The core courses for the minor were chosen to focus first on the structure and characterization of nanomaterials and then on the creation and fabrication of nanomaterials. Utilizing existing courses from the various departments, there is a wide range of electives for the remaining four courses to facilitate completion of the minor for students from Chemical Engineering, Electrical Engineering, Mechanical Engineering, Materials Science and Engineering, and the Engineering Science Biomedical Systems Engineering, ECE and Physics Options. Some programs (Mechanical, and the Engineering Science Options) may be required to take one or two extra courses beyond their degree requirements to meet the requirements of the minor.

STRUCTURE

Students in the Nanoengineering minor must successfully complete six courses equaling 3.0 credits as follows. Courses in italics are currently listed for Engineering Science students only.

- 1) Choose one of:
 - MSE219H1 F Structure and Characterization of Materials
 - MSE358H1 S Structure and Characterization of Nanostructured Materials
- 2) ECE442H1 F Introduction to Micro- and Nano-Fabrication Technologies
- 3) Choose four electives, of which at least two are in the Advanced Category. Thesis/Design Project may count as Advanced electives.

Intro electives:

- BME346H1 S Biomedical engineering and omics technologies
- ECE335H1 F Introduction to Electronic Devices
- ECE350H1 S Semiconductor Electronic Devices
- PHY358H1 S Atoms, Molecules and Solids

Advanced Electives:

- BME440H S Biomedical engineering technology and investigation
- CHE475H1 S Biocomposites: Mechanics and Bioinspiration
- CHE562H1 F Applied polymer chemistry
- CHM325H1 Introduction to Inorganic and Polymer Materials Chemistry
- CHM328H1 Modern Physical Chemistry
- CHM338H1 Intermediate Inorganic Chemistry[
- ECE525H1 S Lasers and Detectors
- ECE527H1 F Photonic Devices
- ECE535H1 F Advanced Electronic Devices
- FOR424H1 S Innovation and Manufacturing of Sustainable Materials
- MSE430H1F Electronic Materials
- MSE432H1 S Macromolecular Materials Engineering
- MSE459H1 F Synthesis of Nano Structured Materials
- MSE462H1 S Materials Physics II
- MSE550H1 S Advanced Physical Properties of Structural Nanomaterials
- MSE558H1 S Nanotechnology in Alternate Energy Systems
- MIE506H1 S MEMS Design and Microfabrication
- MIE517H1 S Fuel Cell Systems
- PHY427H1 F/S Advanced Physics Laboratory
- PHY450H1 S Relativistic electrodynamics
- PHY452H1 S Statistical mechanics

- PHY456H1 F Quantum Mechanics II
- PHY485H1 F Advanced classical optics
- PHY487H1 F Condensed Matter Physics

Enrollment

Undergraduate Engineering students from any program are eligible to apply for enrollment in the Nanoengineering minor, with the exception of students in Engineering Science's Nanoengineering Option while it continues to exist. The program is designed to fit well with the 3rd and 4th year programs in Chemical Engineering, Electrical Engineering, Mechanical Engineering, Materials Science and Engineering, and the Engineering Science Biomedical Systems Engineering, ECE and Physics Options utilizing their technical and free electives.

PROCESS

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

PROGRAMS

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

PROPOSAL/MOTION FOR FACULTY COUNCIL

THAT the Nanoengineering minor be approved and introduced in the 2015-2016 academic year.