



## MEMORANDUM

**To:** Executive Committee of Faculty Council

**From:** Professor Chris Damaren  
Chair, Engineering Graduate Education Committee (EGEC)

**Date:** March 22, 2013 for April 18, 2013 Faculty Council Meeting

**Re:** Department of MIE Proposal to Restructure Approved Fields

## 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 voting to carry).

## BACKGROUND

The Graduate Department of Mechanical and Industrial Engineering currently has nine fields for all programs:

- Applied Mechanics, Robotics and Materials Engineering
- Biomedical Engineering
- Computer Aided Design and Materials Engineering
- Energy Studies, Thermodynamics and Surface Science
- Environmental Engineering
- Fluid Sciences
- Human Factors/Ergonomics
- Information Systems and Enterprise Engineering
- Operations Research

Under this proposal, three of the nine fields remain the same, and one is being renamed. The remaining five are being restructured, although we are neither deleting nor adding any significant areas of expertise. Effectively, three current fields are being restructured into two new fields, and two current fields into three new fields, to better reflect the range of current research expertise of MIE faculty. These changes were agreed upon in 2011 via an MIE-wide consultation.

The nine new fields will be:

Advanced Manufacturing and Materials Engineering  
Applied Mechanics and Design  
Biomedical Engineering  
Energy and Environmental Engineering  
Human Factors/Ergonomics  
Information Engineering  
Operations Research  
Robotics, Mechatronics and Instrumentation  
Thermal and Fluid Sciences Engineering

**PROPOSAL/MOTION**

THAT the MIE proposal to restructure nine fields be adopted.



**University of Toronto  
Major Modification Proposal**

**Department of MIE Proposal to Restructure Approved Fields**

**Section 1**

<b>Graduate Program and Degree Levels (master's, doctoral) :</b> <i>(ie, does this affect both the PhD and Masters programs or only one)</i>	PhD, MAsC, MEng,
<b>Existing, approved fields within the program at each degree level:</b>	Applied Mechanics, Robotics and Materials Engineering Biomedical Engineering Computer Aided Design and Materials Engineering Energy Studies, Thermodynamics and Surface Science Environmental Engineering Fluid Sciences Human Factors/Ergonomics Information Systems and Enterprise Engineering Operations Research
<b>Department / graduate unit (if applicable) with academic responsibility for program:</b>	Mechanical and Industrial Engineering
<b>Faculty / Academic Division:</b>	Applied Science and Engineering
<b>Faculty / Academic Division contact:</b>	Chris Damaren, Vice Dean, Graduate Studies
<b>Department / Unit contact:</b>	Markus Bussmann, Graduate Coordinator
<b>Anticipated Effective date:</b>	May 1, 2013
<b>Version Date:</b>	<b>March 20, 2013</b>

## **Section 2**

### **1. Executive Summary**

This is a proposal to restructure the existing, approved fields within all graduate programs in the Department of Mechanical and Industrial Engineering. These fields were most recently approved by the OCGS on July 24, 2008. This major modification to the existing degree programs will be effective May, 2013.

The Graduate Department of Mechanical and Industrial Engineering currently has 9 fields for all programs:

Applied Mechanics, Robotics and Materials Engineering  
Biomedical Engineering  
Computer Aided Design and Materials Engineering  
Energy Studies, Thermodynamics and Surface Science  
Environmental Engineering  
Fluid Sciences  
Human Factors/Ergonomics  
Information Systems and Enterprise Engineering  
Operations Research

Under this proposal 3 of the 9 fields remain the same, and 1 is being renamed. The remaining 5 are being restructured, although we are neither deleting nor adding any significant areas of expertise. Effectively, 3 current fields are being restructured into 2 new fields, and 2 current fields into 3 new fields, to better reflect the range of current research expertise of MIE faculty. These changes were agreed upon in 2011 via an MIE-wide consultation. The 9 new fields will be:

Advanced Manufacturing and Materials Engineering  
Applied Mechanics and Design  
Biomedical Engineering  
Energy and Environmental Engineering  
Human Factors/Ergonomics  
Information Engineering  
Operations Research  
Robotics, Mechatronics and Instrumentation  
Thermal and Fluid Sciences Engineering

## 2. Academic Rationale

The Department of MIE is proposing a restructuring of 5 of our 9 existing fields, all on the mechanical engineering side of the department, to more clearly represent the breadth of our expertise. To be clear, we are neither deleting nor adding any significant areas of expertise. Rather, a comprehensive review of our existing fields led us to notice duplication (the term Materials Engineering appears in 2 different fields), some outdated terminology (e.g. Computer Aided Design), some missing terminology (e.g. Mechatronics, Manufacturing) that ought to appear in a field, and some terminology (e.g. Surface Science) that we decided was more specific than necessary. As well, the 5 existing fields are poorly organized; for example, the field Applied Mechanics, Robotics and Materials Engineering encompasses what we decided ought to appear as three distinct areas of expertise.

We believe that the new list of 9 fields (3 unchanged, 1 renamed, 5 restructured) does a far better job of representing expertise within the Department of MIE.

## 3. Description of the Proposed Major Modification(s)

The Graduate Department of Mechanical and Industrial Engineering currently has 9 fields:

Applied Mechanics, Robotics and Materials Engineering  
Biomedical Engineering  
Computer Aided Design and Materials Engineering  
Energy Studies, Thermodynamics and Surface Science  
Environmental Engineering  
Fluid Sciences  
Human Factors/Ergonomics  
Information Systems and Enterprise Engineering  
Operations Research

We propose to rename 1 of the fields, and restructure 5 others, by merging 3 existing fields into 2, and expanding 2 existing fields into 3. The 9 new fields would be the following:

Advanced Manufacturing and Materials Engineering  
Applied Mechanics and Design  
Biomedical Engineering  
Energy and Environmental Engineering  
Human Factors/Ergonomics  
Information Engineering  
Operations Research  
Robotics, Mechatronics and Instrumentation  
Thermal and Fluid Sciences Engineering

The following table presents an overview of the proposed changes:

Biomedical Engineering	no change	
Human Factors/Ergonomics	no change	
Operations Research	no change	
Information Systems and Enterprise Engineering	rename	Information Engineering
Applied Mechanics, Robotics and Materials Engineering	A	Robotics, Mechatronics and Instrumentation
Computer Aided Design and Materials Engineering	A	Applied Mechanics and Design
	A	Advanced Manufacturing and Materials Engineering
Energy Studies, Thermodynamics and Surface Science	B	Thermal and Fluid Sciences Engineering
Environmental Engineering	B	Energy and Environmental Engineering
Fluid Sciences	B	

The following are the rationale for these changes:

- The existing field "Information Systems and Enterprise Engineering" was deemed too specific to reflect the diverse research interests of a group of four faculty. The group felt that the more general "Information Engineering" better reflected their areas of expertise. This as a simple renaming.
- Referring to the fields denoted as A (in the above table), the current 2 fields (Applied Mechanics, Robotics and Materials Engineering, and Computer Aided Design and Materials Engineering) are poorly constructed. Notice that Materials Engineering appears in both. Also, the term Computer Aided Design is today redundant, as all design is now computer aided. The proposed restructuring of these 2 fields is based on our assessment that they actually reflect 3 distinct areas of mechanical engineering: robotics, mechanics, and materials.
  - We feel that the new terms "Mechatronics" and "Instrumentation" ought to appear with Robotics, which leads to the new field "Robotics, Mechatronics and

Instrumentation". At least six MIE professors: Ben Mrad, Benhabib, Mills, Nejat, Sun and Zu, identify primarily with this area.

- We believe that the term "Manufacturing" ought to appear in our list of fields, and the area of Materials is closely related to Manufacturing. Thus we propose the new field "Advanced Manufacturing and Materials Engineering". Professors Kesler, Naguib, Park, Sinclair and Spelt identify with this area.
- Finally, in category A, we propose to broaden the area of "Applied Mechanics" to "Applied Mechanics and Design", to reflect the relationship between the two. Professors Behdinin, Cleghorn, Filleter and Meguid identify primarily with this area.
- Referring to the fields denoted as B (in the above table), the current 3 fields reflect two general areas of expertise: the fundamental and interconnected areas of fluid mechanics and heat transfer (including thermodynamics), and the application of these fundamental areas to energy production and the environment, which are related. As a result, we propose to merge the 3 fields into 2. About 12 professors are associated with these 2 fields.
  - The existing field "Fluid Sciences" has been broadened to "Thermal and Fluid Sciences Engineering" to reflect the close relationship between these two fundamental areas, and to encompass the term Thermodynamics.
  - The specific term Surface Science had been deleted because the professor most associated with this field (Wilhelm Neumann) retired a few years ago.

The proposed restructuring of these fields would be effective May, 2013. Under the University of Toronto Quality Assurance process (UTQAP) this change is considered a major modification to an existing program requiring Divisional Council approval. The approval of a major modification is reported as a major modification for information to the Academic Policy and Programs Committee of Governing Council and also to the Quality Council.

#### **4. Requirements**

Please see Appendix A for full, revised calendar copy.

#### **5. Impact of the Change on Students**

There will be no impact on students. MIE students do not choose a field, nor is a field recorded on a transcript. The new fields are only used to characterize the research expertise of faculty within the Department, and the research interests of applicants to graduate programs.

## 6. Consultation

This proposal is the product of extensive discussion and consultation amongst the graduate faculty teaching in this program. The graduate program in Mechanical and Industrial Engineering has also worked closely with the Dean's Office of the Faculty of Applied Science and Engineering, the School of Graduate Studies, and the Office of the Vice-Provost, Academic Programs in bringing this proposal forward in order to ensure that it is conformity with academic institutional norms.

## 7. Resources

This proposal has no resource implications.

## 8. Governance Process:

	<i>Levels of Approval Required</i>
<i>Dean's Office Sign Off</i>	
	Unit level approval
	Faculty/Divisional Council
<i>Submission to Provost's Office</i>	
<i>AP&amp;P – reported annually</i>	
<i>Ontario Quality Council - reported annually</i>	



**Appendix A:** provide the revised calendar copy.

**Revised calendar copy**

The only reference to fields in the MIE entry in the SGS calendar is in the first paragraph of the Overview section at the beginning. The 2011/12 calendar includes the following paragraph:

**Overview**

The Department of Mechanical and Industrial Engineering accepts qualified applicants for study in a wide range of topics, spanning the breadth of mechanical and industrial engineering, including applied mechanics, robotics and manufacturing; biomedical engineering; computer aided design and materials engineering; energy studies, thermodynamics and surface science; environmental engineering; fluid sciences; information systems and enterprise engineering; operations research; and human factors/ergonomics.

The revised calendar entry simply replaces the old list of nine fields with the revised list, in alphabetical order:

**Overview**

The Department of Mechanical and Industrial Engineering accepts qualified applicants for study in a wide range of topics, spanning the breadth of mechanical and industrial engineering, including advanced manufacturing and materials engineering; applied mechanics and design; biomedical engineering; energy and environmental engineering; robotics, mechatronics and instrumentation; thermal and fluid sciences engineering; human factors/ergonomics; information engineering; and operations research.