UNIVERSITY OF TORONTO

OFFICE OF THE GOVERNING COUNCIL

FOR INFORMATION **PUBLIC** **OPEN SESSION**

TO: Agenda Committee

SPONSOR: Sioban Nelson, Vice-Provost, Academic Programs
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PRESENTER: Doug McDougall, Chair, Committee on Academic Policy and Programs
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DATE: October 22, 2013 for November 6, 2013

AGENDA ITEM: 1i

ITEM IDENTIFICATION:

Reviews of Academic Programs and Units: April – October 2013

JURISDICTIONAL INFORMATION:

The Agenda Committee receives the program review summary reports and record of the discussion of the Committee on Academic Policy and Programs. It is responsible for identifying any specific academic issues raised by the overview of reviews that warrant discussion by the Academic Board (*Policy for Approval and Review of Academic Programs and Units, Appendix A*).

GOVERNANCE PATH:

1. Committee on Academic Policy and Programs [for Information] (October 29, 2013)
2. **Agenda Committee of the Academic Board [for Information] (November 6, 2013)**
3. Academic Board [for Information] (November 21, 2013)
4. Executive Committee of the Governing Council [for Information] (December 2, 2013)
5. Governing Council [for Information] (December 12, 2013)

PREVIOUS ACTION TAKEN:

Governing Council approved the *Policy for Approval and Review of Academic Programs and Units* in 2010. The *Policy* outlines University-wide principles for the approval of proposed new academic programs and review of existing programs and units. Its purpose is to align the University's quality assurance processes with the Province's Quality Assurance Framework through establishing the authority of the *University of Toronto Quality Assurance Process* (UTQAP).

HIGHLIGHTS:

External reviews of academic programs and units are important mechanisms of accountability for the University and a vital part of the academic planning process. Academic reviews are critical to ensuring the quality of our programs through vigorous and consistent processes that assess the quality of new and existing programs and units against our international peers.

In the period between March and September 2013, since the last report to AP&P, the Office of the Vice-President and Provost received one external review of a unit, commissioned by the Dean of the Faculty of Applied Science and Engineering. The submission to AP&P includes the signed administrative response from the Dean, which highlights action plans in response to reviewer recommendations.

This review echoed common themes of previous reviews: the excellence of our faculty and students, the strength of our research reputation, and the innovativeness and quality of programs. In addition, this review highlighted the many well-structured, interactive and innovative learning opportunities available to undergraduate students; the Department's strong, highly productive research programs; and the faculty's positive morale.

As always, the review noted areas for development and made important recommendations on how these matters could be improved. The administrative response from the Dean addresses these issues and others.

Additional reviews of programs are conducted by organizations external to the University. Reviews of academic programs by external bodies form part of collegial self-regulatory systems to ensure that mutually agreed-upon threshold standards of quality are maintained in new and existing programs. A summary listing of these reviews is presented in the Appendix.

FINANCIAL IMPLICATIONS:

n/a

RECOMMENDATION:

This item is *for information and feedback only*.

DOCUMENTATION PROVIDED:

Compendium of Reviews of Academic Programs and Units

UNIVERSITY OF TORONTO

OFFICE OF THE VICE-PROVOST, ACADEMIC PROGRAMS

Reviews of Academic Programs and Units

March 2013 – September 2013

Report to the Committee on Academic Policy and Programs
October 29, 2013

Reviews of Academic Programs and Units

March 2013 – September 2013

Report to the Committee on Academic Policy and Programs

October 29, 2103

Decanal Reviews

Review Summary

Program(s):	Materials Engineering, B.A.Sc. Materials Science and Engineering, M.A.Sc. Materials Science and Engineering, M.Eng. Materials Science and Engineering, Ph.D.
Division/Unit:	Department of Materials Science and Engineering
Commissioning Officer:	Cristina Amon, Dean, Faculty of Applied Science & Engineering
Reviewers (Name, Affiliation):	1. Dr. Lorna J. Gibson, Matoula S. Salapatas Professor of Materials Science and Engineering, MIT 2. Dr. Hani Henein, Professor, Department of Chemical and Materials Engineering, University of Alberta 3. Dr. Gary R. Purdy, Professor, Materials Science and Engineering, and former Dean of Engineering, McMaster University 4. Dr. Stephen Yue, James McGill Professor and Chair, Department of Mining and Materials Engineering, McGill University
Date of review visit:	May 13 – 14, 2013

Previous Review

Date: June 26-27, 2008

Summary of Findings and Recommendations:

1. Undergraduate Program: Materials Engineering, B.A.Sc.

The reviewers observed the following strengths:

- Students enthusiastic about their program and have many opportunities for research
- Nanoscience curriculum represents an excellent future direction

The reviewers identified the following areas of concern:

- Undergraduate laboratories are strongly in need renovation to match curriculum
- Retention rates lower than Faculty average

The reviewers made the following recommendations:

- Conduct an undergraduate curriculum review
- Conduct a study related to retention

2. Graduate Programs: Materials Science and Engineering, M.A.Sc.; Materials Science and Engineering, M.Eng.; Materials Science and Engineering, Ph.D.

The reviewers observed the following strengths:

- Internationally recognized strengths in nano-materials, electronic materials and materials processing

The reviewers identified the following areas of concern:

- Education in core competencies may be lost as the study of materials science broadens

The reviewers made the following recommendations:

- Enhance communication of programmatic strengths
- Develop a set of core courses or qualifying exams in core topics

3. Faculty/Research

The reviewers observed the following strengths:

- One of Canada's leading programs in Materials Science
- Academic staff are dedicated to undergraduate teaching

The reviewers identified the following areas of concern:

- Gender and cultural diversity are limited

The reviewers made the following recommendations:

- Restructure curriculum so that faculty can increase research productivity
- Consider gender, cultural diversity, and diversity of intellectual thought in new faculty hires

4. Administration

The reviewers made the following recommendations:

- Update facilities to support teaching and research
- Develop a new strategic plan to define areas of excellence, distinguish the Department from other Materials departments internationally, and clarify undergraduate and graduate teaching

Last OCGS Review(s) Date(s): 2007/08

Current Review: Documentation & Consultation

Documentation Provided to Reviewers:

Self-Study; 2008 Review Committee Report; Department Strategic Plan; Department Faculty CVs; FASE Annual report; FASE Five-Year Academic Plan; University of Toronto Quality Assurance Process (UTQAP); excerpts from graduate and undergraduate calendars.

Consultation Process:

The reviewers met with the Dean; Vice-Dean, Undergraduate Programs; Department Chair; Associate Chair, Undergraduate Studies; Associate Chair, Graduate Studies; Advisory Committee on the Appointment of Chair; faculty, administrative and technical staff; and a small group of undergraduate and graduate students.

Current Review: Findings & Recommendations

1 Undergraduate Program

Materials Engineering, B.A.Sc.

The reviewers observed the following strengths:

- Overall quality
  - Program attracts high quality students
- Curriculum and program delivery
  - Well-structured and effective first year courses using innovative teaching techniques
  - "Highly successful" use of Portable Tabletop Labs
  - PEY program, with placements in a broad range of materials and engineering companies
  - Student access to study abroad opportunities
- Quality indicators
  - Students generally satisfied with the program and the quality of teaching

The reviewers identified the following areas of concern:

- Curriculum and program delivery
  - Department devotes considerable resources to teaching high-enrolment service courses for other programs
  - Students would like more instruction in practical applications
  - Students are concerned about post-graduation opportunities and the level of career advice that they receive
  - High undergraduate teaching loads translate into a limited number of specialized graduate courses

The reviewers made the following recommendations:

- Curriculum and program delivery
  - Develop a curriculum reform plan which streamlines offerings; reorders fundamentals and electives; coordinates clusters of subjects; eliminates certain "quarter" courses; and makes the thesis optional, reducing undergraduate teaching load
  - Consider the future of the Nanoengineering major in Engineering Science, which could include establishing an optional track for Computational Materials Science instead of Nanoengineering
  - Enhance focus on practical applications instruction in concert with the Department of Mathematics
  - Promote and enhance study abroad opportunities and career resources available to students
  - Encourage students to participate in professional societies

2 Graduate Program

Materials Science and Engineering, M.A.Sc.
Materials Science and Engineering, M.Eng.
Materials Science and Engineering, Ph.D.

The reviewers observed the following strengths:

- Quality indicators
  - High level of student satisfaction with programs and supervision

The reviewers identified the following areas of concern:

- Curriculum and program delivery
  - Graduate students noted difficulty accessing specialized courses at the appropriate stages during the program
  - Previous review recommendation regarding development of core courses still needs to be addressed
- Quality indicators
  - Exit survey results reveal “small but significant” dissatisfaction among graduates
- Enrolment
  - The additional, high cost of supporting international graduate students internally is a disincentive to admissions
  - The differential cost of international graduate students could diminish quality and diversity in the student body

The reviewers made the following recommendations:

- Curriculum and program delivery
  - Develop a core set of regularly-offered graduate courses and offer specialized courses in alternating years, improving the graduate experience and evening the faculty teaching load
  - Collaborate with other universities and offer reading courses to further increase the number of specialized courses offered
- Quality indicators
  - Determine the cause of graduate dissatisfaction
- Enrolment
  - Address the issue of funding for international graduate students, possibly through endowed scholarships

3 Faculty/Research

The reviewers observed the following strengths:

- Research

  - Strong, highly productive research with vibrant, diverse programs, including nano, bio and electronic materials
  - Recognized strengths in advanced materials
- Level of activity relative to national and international comparators
  - Success in obtaining funding for both research and infrastructure
  - Sustained interaction with industry
  - "Commendable" number of NSERC Strategic Grants awarded to faculty
- Faculty
  - Assistant professors are pleased with the resources available to them and expectations of service work
  - Hire in Process Metallurgy will renew research in this area and provide avenues to connect with industry

The reviewers identified the following areas of concern:

- Research facilities
  - Space issues impede the experimental research programs of new faculty
- Complement
  - The 49% cross-appointments in MSE disadvantage the Department relative to student registration and have implications regarding overhead costs and space
  - Concern whether planned hire in process metallurgy will produce an anticipated increase in enrolment

The reviewers made the following recommendations:

- Level of activity relative to national and international comparators
  - Direct more efforts to sustaining relationships with industry via NSERC C&D and IRC grants given the Department's increased focused on energy and sustainability
- Faculty
  - Introduce a mentoring process for new professors relative to grants, the path to promotion, etc.
- Complement
  - Increase the research credits allocated to MSE via cross-appointment collaborations
  - Make junior faculty hires to address faculty balance
  - Increase the complement of computational materials professors
  - Strengthen the recognition of diversity in hiring

4 Administration

The reviewers observed the following strengths:

- Morale of faculty, students and staff
  - "Well-grounded" faculty with high morale
  - Positive morale in the Department attests to the efforts of the chair
- Resource allocation

  - The recently-obtained research and industrial funding in support of research and undergraduate teaching
  - Computational resource needs are met
- Staff
  - Administrative staff are “very efficient, collegial and seem well connected to the undergraduate and graduate students’ needs”
  - Administrative staff support faculty in accounting and administrative functions, and faculty appreciate their efforts
  - Technical staff are “professional and very knowledgeable”
- Department/unit/programs relative to the best in Canada/North America and internationally
  - Department is strong and highly successful

The reviewers identified the following areas of concern:

- Resource allocation
  - Though well-maintained, undergraduate laboratory space is limited, reducing the possibility for hands-on learning
- Management and leadership
  - The ability to implement change is hindered by “one-man committees”

The reviewers made the following recommendations:

- Relationships
  - Strengthen relationships with other universities, industries, professional societies and alumni
  - Ensure enhanced visibility of visiting lectures and technical seminars
- Resource allocation
  - Address space allocation issues
- Management and leadership
  - Establish committees of active faculty members to consider changes in the programs

ADMINISTRATIVE RESPONSE – Appended

UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE & ENGINEERING

Cristina Amon, Dean

September 19, 2013

Professor Sioban Nelson
Vice-Provost, Academic Programs
University of Toronto
27 King's College Circle

Dear Professor Nelson

I write in response to Professor Regehr's letter of August 26, 2013 regarding the spring 2013 External Review of the Department of Materials Science and Engineering (MSE) and its undergraduate (Materials Engineering, B.A.Sc.) and graduate programs (Materials Science and Engineering, M.A.Sc., M.Eng., and Ph.D.). The external review process is a valuable exercise that affords us the opportunity to take stock of the state of our academic units and of the Faculty as a whole. We were pleased with the positive nature of the reviewers' report, particularly with regard to the innovative learning opportunities that have been developed for our undergraduate programs as was noted.

The following is in response to the issues raised by the reviewers in their report. For ease of reading, a summary of each area identified in the review (in bold) is followed by the administrative response.

CURRICULUM & PROGRAM DELIVERY

The reviewers emphasized the need for undergraduate curriculum reform to both streamline offerings and better position courses within the programs.

Over the last two years, the MSE department's Associate Chair Undergraduate has been working with a student task force to map content in each of the existing courses in order to determine which knowledge is core to the program, and where there are overlaps and gaps in the material delivered. In addition, MSE's undergraduate programs were reviewed by the Canadian Engineering Accreditation Board in 2012. The preparation for that review, which included a newly required assessment of graduate attributes, was helpful in assessing the undergraduate program as a whole. The MSE curriculum committee is now working on a plan to carry forward a comprehensive review of the undergraduate curriculum.

In addition, in order to address the issue of service course teaching in first year, the MSE department has started an initiative (Materials One) to modularize and standardize the materials-related content currently delivered as three courses taught to different audiences: MSE101, APS104, and MSE 160. Standardizing content and providing other supporting material

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online will allow faculty to teach first year with greater ease. Standardization will also allow our Faculty to consider whether to merge some of these courses in the future. This project will run over the next three years.

Short term goals (within the next year):

- The curriculum committee will complete its content mapping exercise and will start proposing course content realignment to MSE faculty for feedback.
- The department is making an immediate change for fall 2014 regarding MSE 238, Engineering Statistics, which will be changed from a quarter course to a half year course, and another quarter course (MSE 201, Materials Selection in Design I) will be eliminated since it largely overlaps with a more advanced fourth year course on the same subject. This will strengthen the program mathematics content, which was just above the CEAB's accreditation requirement, including statistics, which has been identified by alumni and industrial partners an area of weakness. This is a first step toward a long-term goal to phase out all the quarter courses in MSE, aside from those in the Engineering Communications track.
- In parallel with the above, the Materials One initiative will compare MSE-related content in the three classes (MSE101, APS104, and MSE 160), and will begin to identify common course content that will be modularized in stages over the next three years.

Medium term goals (2-3 years):

- The curriculum committee will flesh out concrete changes to the curriculum, to be implemented in stages with a goal of implementing major changes starting in the fall of 2015. The first series of changes will be brought forward to the Faculty's curriculum committee in the fall of 2014.
- The overall goals of this reform will be to:
  - streamline the number of core course required by eliminating some course overlap, and to reduce the number of technical electives offered
  - devote the second and third years to fundamental knowledge and to move most electives to fourth year, and
  - ensure that core concepts are reinforced throughout the program for students to understand the relationships between different courses and areas of knowledge, and to "get the big picture".
- The first year course content will continue to be modularized and tested in the classroom in stages for the last two years of this three-year project.

Long term goals (4-5 years):

- The outcome of the curriculum reform will be assessed in the 4-5 year time period, in advance of the department's next CEAB accreditation review.

The reviewers encouraged the development of a core set of graduate courses and to regularize the offering of specialized courses.

One of the motivations for streamlining undergraduate course offerings is to release faculty time to teach more graduate courses. While the department has been increasingly successful in offering more graduate courses, the reviewers are correct to note that there is no overall structure to the graduate curriculum.

MSE's graduate curriculum committee has focused in the last several years on clarifying some of the departmental policies with regard to the graduate programs. One of the issues identified has been the creation of core courses, in particular the need to strengthen the background knowledge of graduate students who do not have an MSE undergraduate degree. This has been dealt with in the past with the departmental qualifying exam for Ph.D. candidates, which to some extent tests general MSE knowledge. No equivalent test of knowledge is given to Masters candidates. At the same time the number of M.Eng. students, who are required to take a large number of classes for their degrees, has steadily grown.

Short term goals (within the next year):

- The Faculty graduate curriculum committee will be asked to consider core graduate courses, and to what extent students with MSE undergraduate degrees could be exempted from some of them.
- The committee will also consider whether to offer a set of courses that are specifically designed for the M.Eng. track.

Medium and long Term Goal (2-5 years):

- A revised graduate course structure will be rolled out in stages over the next 2-4 years.

RESOURCES

The reviewers observed that allocation of space can impede research programs of newer faculty.

We recognize that allocating sufficient space to newly hired faculty is extremely important. The department has re-established a Space Committee that will examine the current space audit for the department. At the same time, it will consider the development of a space policy similar to those currently in force in other FASE departments.

Short term goals (within the next year):

- We anticipate the recommendations from MSE's Space Committee to be received by the spring of 2014, at which time the Chair will begin reallocating space.

Long term goal (4-5 years):

- The department will develop a space policy that will provide a guide and a rationale for future space allocations.

The department has also received a large CFI grant to completely renovate the MSE department electron microscopy facilities. This common research facility will benefit all research programs in MSE and across FASE. This renovation has no impact on faculty lab space.

While the reviewers praised the innovative use of Tabletop Labs, they noted that undergraduate laboratory space is limited, reducing the possibilities for further hands-on learning.

We acknowledge that the undergraduate labs have been in need of updating for many years. Some progress has been made over the last years by using funds from the undergraduate student levy. The care and supervision of the undergraduate labs has also improved with the creation of a permanent staff position specific to these labs; this was done in January 2012.

Short term goals (within the next year):

- This fall, the department will open the Walter Curlook Materials Characterization and Processing Laboratories. This new facility was made possible by a generous donation from an alumnus. The labs will be made available to undergraduate courses and will support both undergraduate thesis projects and graduate research. The space for these labs was reallocated from research space, and adds to the existing inventory of lab space for undergraduate students.

Long term goals (4-5 years):

- The renovation and expansion of undergraduate laboratories remains one of the primary fundraising goals for MSE. The department will make efforts to attract more donations to update the undergraduate labs.

In addition, one of the primary fundraising goals for the Faculty during the BOUNDLESS Campaign has been for the construction of a new building: the Centre for Engineering Innovation and Entrepreneurship (CEIE), to open in the fall 2016. This building will expand significantly FASE's inventory of classroom space, with TEAL and tutorial rooms which can be used for labs. The new building will also include a student workshop, and light fabrication facilities for general design and build. While not specific to MSE, CEIE will provide students with many more opportunities for hands-on and laboratory experience.

FACULTY

The reviewers identified the need for a mentoring program for new faculty.

The reviewers are correct in noting that mentoring new faculty has been done on an informal basis in the past, with the Chair having monthly meetings with each assistant professor. The reviewers' report also noted that some associate professors were unclear on the criteria for promotion to full Professor.

Short term goals (within the next year):

- The department will formalize a mentoring program at the assistant professor level by pairing new faculty with specific experienced faculty, and by continuing the practice of providing examples of past portfolios from candidates who have successfully undergone either their third year review or their tenure review.
- Monthly meetings with the Chair will continue.
- The department will ask its representative on the Faculty's promotions committee to meet with all its associate professors to clarify the criteria used for promotion to full Professor.

Long term goals (4-5 years):

- The department hopes to revitalize the activity of the Research Committee, so that MSE faculty are made better aware of cross-Faculty initiatives and funding opportunities that are identified by the Vice-Dean Research, and so that new faculty can be guided in the development of proposals in any of these new initiatives.

The reviewers identified the need for equity and diversity training for search committees.

The Faculty has made great strides in being proactive in finding a diverse pool of qualified candidates, and in fact over the last six years, a very large proportion of newly hired assistant professors have been women. The MSE department is acutely aware that it has only one female faculty member, and thus has a weak record in gender balance in FASE.

Short term goal (within the next year):

- MSE currently has an open faculty search in extractive metallurgy and the search committee has been tasked with actively recruiting candidates, with a focus on identifying excellent female candidates.

Long term goals (4-5 years):

- The department will explore opportunities for diversity training for future search committees.
- The long term goal is to have a faculty gender balance that meets or exceeds the gender ratio in the MSE student population, which is about 25-30% female.

The reviewers suggested making strategic junior faculty hires and increasing the complement of computational materials professors.

We recognize the importance of computational materials science, particularly in the context of two broad trends in the MSE discipline: Integrated Computational Materials Engineering (ICME), and the Materials Genome Initiative (US). Both of these initiatives are built around accelerating the development of new materials with modeling. Professor Chandra Veer Singh was the first hire in this area, joining MSE two years ago.

Short term goal (within the next year):

- The department will continue to support Professor Singh in his efforts to introduce more computation and facility with different software packages as an integral part of our undergraduate population.

Long term goals (4-5 years):

- As outlined in the current departmental strategic plan, MSE plans to hire at least two new faculty in the area of process metallurgy within the next few years. One of these hires could be a computation person. A new faculty member in the area of computational thermodynamics would complement Professor Singh's expertise, and at the same time support the department's effort to rebuild its metallurgical expertise.

Thank you very much for the opportunity to respond to the report of the external review team. Their comments and concerns have helped sharpen the vision and future priorities for the Department of Materials Science and Engineering.

Sincerely

Cristina Amon

APPENDIX

Externally commissioned reviews of academic programs completed since the last report to AP&P

Additional reviews of programs are conducted by organizations external to the University most commonly for accreditation purposes. These reviews form part of collegial self-regulatory systems to ensure that mutually agreed-upon threshold standards of quality are maintained in new and existing programs. Such reviews may serve different purposes than those commissioned by the University. A summary listing of these reviews is presented below.

These reviews are reported semi-annually to AP&P as an appendix to the compendium of external reviews.

Unit	Program	Accrediting Agency	Status
Faculty of Applied Science and Engineering	Chemical Engineering, BASc Civil Engineering, BASc Computer Engineering, BASc Electrical Engineering, BASc Engineering Science, BASc Industrial Engineering, BASc Materials Engineering, BASc Mechanical Engineering, BASc Mineral Engineering, BASc	Canadian Engineering Accreditation Board (CEAB)	Accredited for six years to June 30, 2019: Chemical Engineering, BASc; Civil Engineering, BASc; Industrial Engineering, BASc; Materials Engineering, BASc; Mechanical Engineering, BASc Accredited for three years to June 30, 2016; report required by June 30, 2015: Computer Engineering, BASc; Electrical Engineering, BASc; Engineering Science, BASc; Mineral Engineering, BASc
Faculty of Medicine	Bachelor of Science Medical Radiation Science (3 streams all accredited individually by CMA)	Canadian Medical Assocation (CMA)	Accredited for six years to April 30, 2019 : all streams – Nuclear Medicine Technology, Radiation Therapy, Radiological Technology
Faculty of Medicine	Bachelor of Science Physician Assistant	Canadian Medical Assocation (CMA)	Accredited for six years until December 31, 2017
Faculty of Pharmacy	Post Baccalaureate PharmD Pharmacy, BScPhm PharmD (entry to practice)	Canadian Council for Accreditation of Pharmacy Programs	Post Baccalaureate PharmD fully accredited for six years, 2013-2019. Pharmacy, BScPhm fully accredited for two years, 2013-15. PharmD (entry to practice) provisionally

			accredited for three years, 2013-2016. ("Provisional status is awarded to new programs that have students enrolled but has not graduated a class of students. This status denotes a developmental program that is expected to mature in accord with stated plans and within a defined time period.")