

FINAL ASSESSMENT REPORT

Institutional Quality Assurance Program (IQAP) Review

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

Date of Review: February 6th and 7th 2018

In accordance with the University Institutional Quality Assurance Process (IQAP), this final assessment report provides a synthesis of the external evaluation and the internal response and assessments of the graduate programs delivered by Materials Science and Engineering. This report identifies the significant strengths of the program, together with opportunities for program improvement and enhancement, and it sets out and prioritizes the recommendations that have been selected for implementation.

The report includes an Implementation Plan that identifies who will be responsible for approving the recommendations set out in the Final Assessment Report; who will be responsible for providing any resources entailed by those recommendations; any changes in organization, policy or governance that will be necessary to meet the recommendations and who will be responsible for acting on those recommendations; and timelines for acting on and monitoring the implementation of those recommendations.

Executive Summary of the Review

In accordance with the Institutional Quality Assurance Process (IQAP), the Materials Science and Engineering program submitted a self-study in December 2017 to the Vice-Provost and Dean of Graduate Studies to initiate the cyclical program review of its graduate programs. The approved self-study presented program descriptions, learning outcomes, and analyses of data provided by the Office of Institutional Research and Analysis. Appendices to the self-study contained all course outlines associated with the program and the CVs for each full-time member in the department.

Two arm's length external reviewers and one internal reviewer were endorsed by the Dean, Faculty of Engineering and selected by the Vice-Provost and Dean of Graduate Studies. The review team reviewed the self-study documentation and then conducted a site visit to McMaster University on March 30 - 31, 2017. The visit included interviews with the Provost and Vice-President (Academic); Associate Vice-President, Faculty, Associate Vice-President and Dean of Graduate Studies, Associate Dean, Grad Studies and Research, Chair of the department and meetings with groups of current students, full-time faculty and support staff.

The Chair of the department and the Dean of the Faculty of Engineering submitted responses to the Reviewers' Report (April 2018). Specific recommendations were discussed and clarifications and corrections were presented. Follow-up actions and timelines were included.

- **Strengths**

The Reviewers have highlighted the following as clear strengths of the Department's Graduate Program: (i) reputation for research excellence and achievement, (ii) world class resources housed within the Department's research centres (CCEM, SRC and CAMC) and (iii) quality of the student experience. The global reputation for research excellence and achievement is based on two key aspects. First, is the Department's record of research excellence awards, as contributed by both graduate students and faculty members. Second, is the Department's healthy and sustainable funding lever per full-time equivalent, which is viewed as being above average for a Materials Science and Engineering program in Canada. The world class resources are based on the state-of-the-art research instrument and tools that have been acquired over the past decade and half as part of successful capital grants applications along with the associated modernized space that is available for graduate research. The quality of the student experience is based on the generous level of financial support that is provided along with the incorporation of graduate students into the Department's administrative functions.

An emerging strength recognized by the Reviewers is the set of recent faculty hires at both the assistant and associate levels, as these hires have both expanded the breadth of research offerings in the department and increased the gender diversity of the faculty. The biomaterials hires in particular were called as having significant potential for expansion into biomedical research by coupling with the School of Medicine, which is a globally recognized area of strength for the University.

- **Areas for Enhancement or Improvement**

The Reviewers have highlighted the following relevant areas for enhancement: (i) future hires, (ii) career planning initiatives and (iii) additional course offerings. A future hire in the field of computational materials science would strengthen this under represented areas at the Department and serve to enhance the breadth and depth of research expertise available. Expanding the career planning initiative to include follow up activities and incorporate industry involvements will serve to enhance the quality of the quality of the student experience. Leveraging courses offered at other universities via video link will serve to provide increased coursework options such that the associated program learning objectives can be realized in more student-specific manner.

The Reviewers have highlighted the following areas for improvement: (i) website, (ii) removal of the Materials Science degree designation and (iii) modification of the graduate seminar course. An improved website will serve as an effective tool to better promote the Department's programs and research opportunities that are possible taking advantage of world class faculty and research infrastructure whilst enjoying a high-quality student experience. A simplified offering of two, rather than four, core degree programs (one at the Master's level and the other at the PhD level) will remove a "quirk" that is not typical of Materials Science and Engineering programs worldwide and, thus avoid confusion for potential graduate students. A modified graduate seminar course will ensure that the both the "speaker" (feedback assessment) and "audience" (active learning) roles are indeed aligned with the program learning objectives, as indicated on the Department's curriculum map.

Summary of the Reviewers' Recommendations with the Department's and Dean's Responses

Recommendation	Proposed Follow-Up	Responsibility for Leading Follow-Up	Timeline for Addressing Recommendation
Update website and make it more exciting for potential graduate students	-Work with Faculty web masters to share resources to decide on layout and acquire content for updated website	Department Leadership (Chair, Associate Chair - Undergraduate and Associate Chair - Graduate)	Summer Term 2018
Remove Materials Science Degree (at both Master's and PhD level)	-Held Department meeting in March to discuss this specific recommendation -Consensus to offer one degree each at level (Master's and PhD): Materials Science and Engineering	Department Leadership (Chair and Associate Chair - Graduate)	-Prepare and submit necessary paper work to GCPC during 2018-2019 academic year
Modify graduate seminar course	-Strike a Department committee to examine the recommendation in detail and then propose a solution strategy	Associate Chair – Graduate to chair the Department committee	<ul style="list-style-type: none"> - Committee meetings to be held during Summer and Fall Terms - Decision early in Winter Term - Prepare and submit necessary paper work to GCPC during before deadline for 2019-2020 academic year
Future hire in computation materials	Already identified as priority area in Department's strategic hiring plan	Department Chair	<ul style="list-style-type: none"> - Discussions are ongoing with local industry to develop and industrial research chair in this area. - Our hiring plan also aligns with the Faculty's <i>Smart Systems</i> priority area. We will submitting a proposal for hiring in the area of AI.
Expand career planning initiatives	-The Faculty of Engineering is already in the process of	Associate Chair - Graduate	Summer Term 2018

	releasing online career planning modules. -Work to promote these modules and encourage graduate students to complete them.		
Additional course offerings through video-link	Strike a Department committee to examine the recommendation in detail and possible pathways forward	Associate Chair – Graduate to chair the Department committee	- Committee meetings to be held during summer term as trail run could be offered as Special Topics course in 2018-2019 academic year

Dean’s Response, Faculty of Engineering:

The Faculty extended its gratitude to the reviewers, department staff, graduate students and faculty members who carried on this important task. Materials Science and Engineering (MSE) is the oldest department in the Faculty and represents a strong foundation upon which the Faculty has built its international reputation. The Faculty accepted the report as a very positive indicator of the high quality academic programs it offers and the open, collaborative social environment it creates for its graduate students.

The faculty has undergone substantial growth over the past four years, with MSE hiring four tenure track professors in areas of biomaterials and materials processing/characterization. Requests for future hires will be accommodated in the fullness of time as student demand requires, but for the moment the Faculty will be unable to cover the requested computational faculty position. Neither the program nor reviewers are identifying computational research as a knowledge deficit impairing the quality of the programs or reputation of the institution, and so they will accept the recommendation as meant for future discussions with the department on their strategic plan.

The overlap in degree requirements between the science and engineering degrees (both Master’s and Doctoral) has been a recent source of confusion and the Faculty was happy to acknowledge that the department will be eliminating the science degrees. The Associate Dean will assist the department in moving these changes, along with the course changes, through the mechanisms of the university starting in the fall of this year.

Quality Assurance Committee Recommendation:

McMaster's Quality Assurance Committee (QAC) recommends that the Materials Science and Engineering graduate programs should follow the regular course of action with an 18-month progress report and a subsequent full external cyclical review to be conducted no later than 8 years after the start of the last review.