



**Graduate
Studies**

Office of the Vice-Provost and Dean
Yeates School of Graduate Studies

Final Assessment Report and Implementation Plan

Periodic Program Review (PPR)

Mechanical and Industrial Engineering (MEng, MAsc, PhD)

Last Updated: October 12, 2018

FINAL ASSESSMENT REPORT

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 program in **Mechanical and Industrial Engineering (MEng, MAsc, PhD)**. This report identifies the peer review identified 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 also 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

The Mechanical and Industrial Engineering (MIE) graduate programs started with a Master of Applied Science and Master of Engineering in the Fall of 2001 followed by the start of the PhD program in the Fall of 2004. As of November 1, 2016, 291 MAsc students, 282 MEng students and 80 PhD students have graduated from the program. Students take graduate courses and research in the areas of Manufacturing, Materials and Solid Mechanics, Thermofluids and Industrial Engineering.

The curriculum is designed to provide students with ample opportunities to further their knowledge in advanced areas of engineering, apply their knowledge to complex problems and contribute to the body of knowledge in the literature. Survey results have shown that students are satisfied with the delivery of graduate courses in the program and appreciate the opportunities provided for engaging in world class research.

The success of graduate students over the life of the MIE graduate program is the best indicator of the program's sustained worth. Many PhD graduates have gone to careers in academia as professors and instructors, others have joined Research and Development departments of major corporations and some have continued their education or working as post-doctoral fellows. MIE students have also been successful in competition for prestigious awards such as NSERC doctoral scholarships, Ontario Graduate Scholarships, Vanier and Trillium awards and numerous best paper awards. The academic record shows that the majority of students are graduating with high GPAs.

MIE program students are engaged in their education through participation in weekly graduate seminars where each week two students present their research work. As a local decision making body, the MIE Graduate Council benefits from representation by graduate students. Survey of recent graduates has shown broad satisfaction with supervision, quality of research work and financial support. Funding for MIE's PhD and MASc students is the highest in the Faculty of Engineering and Architectural Science (FEAS). Students are also rewarded for exceptional research and academic outcomes by five graduate awards which are presented annually.

MIE faculty are the main reason behind the success of the program. They conduct well funded, relevant research which has generated above average publications per faculty member. An indication of the quality of research done in the program is the citations per publication where the faculty in the program score well above average even when compared to institutions with much longer graduate histories. The faculty is engaged with broader research communities through such activities as editorship in scientific and technical journals, being members of grant selection committees at the national and international levels, organizing conferences and professional meetings.

The challenges facing the program include a low number of domestic applicants, especially at the PhD level. This is not restricted to the MIE graduate program and is a problem in all Ontario universities. The program has taken some initiatives including open houses and updating of the communication tools but more systematic efforts are needed. A second challenge is the career readiness of PhD students who do not find employment in academia. The scarcity of academic positions is not a new fact but with a larger number of PhD graduates, it is important to make sure they have the necessary tools and preparation for a job market beyond academia. There is planning at the Faculty and University level for workshops and professional certificates to address some of these concerns but more is needed.

Periodic Program Review and Peer Review Team Mechanical and Industrial Engineering (MEng, MAsC, PhD)

The graduate program in Mechanical and Industrial Engineering (MEng, MAsC, PhD), Department of Mechanical and Industrial Engineering - Faculty of Engineering and Architectural Science (FEAS), submitted a Self-Study Report to the Yeates School of Graduate Studies that outlined program descriptions and learning outcomes, an analytical assessment of the program, program data including data from student surveys and the standard data packages. Course outlines and CVs for full-time faculty members were also appended.

Two external and one internal arm's-length reviewers were selected from a set of proposed candidates. The Peer Review Team (PRT) for the Periodic Program Review (PPR) of the graduate programs in Mechanical and Industrial Engineering (MIE) consisted of Dr. Alidad Amirfazli (York University), Dr. Chi-Guhn Lee (University of Toronto), and Dr. Murtaza Haider (Ryerson University).

The appraisal committee spent two days at Ryerson. The visit included interviews with the University and Faculty Administration including the Provost and Vice-President Academic, FEAS Associate Dean, Vice-Provost and Dean Yeates School of Graduate Studies (YSGS); Associate Dean YSGS, Graduate Program Director of the Graduate Program, and meetings with Faculty, a group of current students, and support staff.

The PRT site visit was conducted on February 1 and 2, 2018. The PRT report was communicated to the Associate Dean, YSGS on March 29, 2018, and the response to the report from MIE was communicated on June 7, 2018.

Program Strengths, Weaknesses, and Opportunities

The Peer Review Team identified program strengths, weaknesses and opportunities for program improvement and enhancement, outlined below.

Program Strengths

The PRT recognizes research productivity and excellence demonstrated by many faculty members. Some colleagues are at the cutting edge of research in their respective fields. The creation of new scholarship in active research labs is allowing graduate students to engage in cutting-edge research and gain valuable experience in applied research as part of their training and research related to their theses and dissertations.

Graduate students expressed a great degree of satisfaction with the level of service they received from the Department, in particular, the graduate program director and the administrator. The PRT recognizes their commitment and hard work in serving a large body of graduate students.

Being in the heart of downtown Toronto, the Department has a unique ability to attract students of high research calibre. The opportunity to do cutting-edge research in the Department's labs is complemented by proximity to a rich cultural experience made possible by the University's unique location. Similarly, the University's location will help with recruitment of staff and faculty.

Program Weaknesses and Opportunities

The PRT recognizes a misalignment in the curriculum. Numerous courses offered in the past three years of the review period demonstrate very low enrolments. Given the size of the graduate program and student enrolment, courses with very low enrolment are indicative of a mismatch between student preferences and course offerings.

At the same time, many courses are offered only sporadically. This practice has a larger adverse impact on MEng students than others because MEng students are expected to complete more graduate courses as part of the degree requirements. Similarly, if the portfolio of courses is not uniform for each successive cohort, it is likely to lead to a lack of consistency in learning competencies among students.

Some graduate students expressed a lack of guidance in selecting and identifying relevant coursework. They felt unsupported in searching for relevant courses that would allow them to graduate on time.

The PRT observed that sessional instructors taught a greater proportion of courses with large enrolments. For instance, in 2015-16, of the 254 students enrolled in 24 courses offered at the

graduate level, 100 students were enrolled in courses taught by sessional instructors. The number of courses taught by sessional instructors is large when compared to comparable programs at other universities. It appears that courses that attract graduate students are being taught by sessional instructors and not by the full-time tenured or tenure-track faculty.

The PRT observed that graduate students were not fully cognizant of the scale and support the services offered by the University. For instance, some students were not aware of the extent of digital resources available at the University library. Some journals and proceedings that students believed were not available at the University Library were, in fact, available as part of the digital resources curated by the library.

The PRT recognizes that the Departmental leadership is doing a tremendous job in supporting graduate students. However, given the size of the Department and the number of graduate students, the focus is on servicing the immediate needs of graduate students. The PRT finds the absence of a champion or coordinator for research related activities to complement the leadership in graduate program offerings. Perhaps establishing an Associate Chair of Research occupied by a person with experience in high calibre research can aid the Department.

The PRT observed that research-active faculty members are not adequately incentivized for the research productivity that distinguishes them within the Department and the University. Given that some faculty members are leading significantly large research groups with an active research agenda, the absence of incentives to continue and improve on research excellence could be a deterrent in achieving these goals.

The PRT believes that the Department lacks adequate visibility that could hinder its ability to attract quality graduate students. A lack of adequate student participation in international conferences contributes to the lack of awareness about the program. Similarly, the Department appears not to have capitalized on the use of social media and other related web-based technologies to promote its research and learning opportunities. The website of the Department related to research needs immediate attention and improvement.

Summary of PRT Recommendations with Graduate Program and YSGS Responses

ACADEMIC RECOMMENDATIONS

Recommendation 1: Organize courses around natural thematic subjects. This is important to satisfy the educational needs of the diverse graduate student population in the program.

Program Response

Agreement. The MIE program notes that it already organizes courses around natural thematic subjects. The themes are: Thermofluidics, Solid Mechanics and Design, and Industrial Engineering.

YSGS Response

YSGS supports the program response to each of these curriculum-focused issues (i.e., recommendations 1 – 6).

YSGS notes that it will support the program as needed for any minor or major curriculum modifications, per Policy 127.

Recommendation 2: Use directed reading courses to fill boutique gaps for very specialized topics.

Program Response

Agreement. The MIE program notes that it offers a Directed Studies course (ME8135) for this purpose and will continue offering the course as needed.

Recommendation 3: Introduction of core courses to provide solid common competencies for graduates.

Program Response

Taken under consideration. The MIE program notes that it did employ the model of “core courses” at the program’s inception. They were later dropped in favour of elective courses since it was concluded that the model does not match the level of diversity in research topics in this program. The GPC, however, will revisit this decision in the Fall 2018 semester.

Recommendation 4: Ensure that a sufficient and consistent number of courses are offered annually to avoid inconsistency in training.

Program Response

Agreement. The MIE program notes that it offers close to 35 graduate courses each year. It also notes that close to 90% of these courses are repeated each year. The

program will continue its ongoing efforts to offer a sufficient and consistent number of courses.

Recommendation 5: Courses that are popular among MEng students are recommended to be aligned with the needs of a practicing engineer and to have an enriched applied content.

Program Response

Agreement. The MIE program notes that the majority of courses use specialized software used in industry.

Recommendation 6: The seminar course can be improved by including lectures on how to deliver a high-calibre scientific talk.

Program Response

Agreement. The MIE program notes that it has invited guest speakers for a variety of topics including best practices in technical presentations. Nevertheless, it will strive to do so more systematically.

Recommendation 7: To be able to develop actionable proposals around the above points, perhaps the MIE can consider striking a smaller and more nimble and focused graduate curriculum committee.

Program Response

Agreement. The program notes that its Graduate Program Council (GPC) includes all faculty involved in graduate programs and graduate student representatives. The GPC, however, has a number of standing committees including Graduate Admissions and Studies, Awards and Scholarships, etc. The Curriculum committee is an ad hoc committee that is struck from time to time to deal with specific issues brought to the attention of GPC. As per the PRT's suggestion, the mandate and membership of this committee will be determined at the time the committee is constituted.

YSGS Response

YSGS supports the program's response. As noted above, YSGS will support the program as needed for any minor or major curriculum modifications, per Policy 127. YSGS will also provide support to the program as needed if modifications to the GPC bylaws are required.

Recommendation 8: The PRT believes that if the department were to continue running the MEng program, it must consider improving the quality of the students it attracts to the program. Their academic preparation should be on par with those enrolled in the MASc program.

Program Response

Taken under consideration. The GPC will consider this in the Fall 2018 semester. The MIE program does note, however, that the minimum GPA requirement for the MEng program is B, which is in line with all major universities in Ontario. The program also notes that the courses taught are not categorized based on students who take them (MEng or otherwise).

YSGS Response

YSGS supports the program response. Should the program determine modifications to its admissions requirements are needed, YSGS will support the program, per Policy 127.

Recommendation 9: The Department should take steps to improve graduate student support as soon as possible. The minimum guaranteed funding should be increased for all students, particularly international students.

Program Response

Agreement. The MIE program notes that the funding package for research students (MASc and PhD) has been updated since the visit and currently aligns with the visiting team's recommendation. All eligible PhD students will receive the same take home amount after fees are considered. The same holds for all MASc students.

YSGS Response

YSGS supports the program response and encourages the program to continue to pursue opportunities to improve funding packages for its graduate students.

Recommendation 10: The Department should offer opportunities for professional development to students by encouraging them to participate in international conferences.

Program Response

Agreement. The MIE program notes that a number of professional development opportunities exist within the Faculty (FEAS) and the Graduate School (YSGS). The program also notes that it does provide funding for graduate student attendance at international conferences.

YSGS Response

YSGS supports the program response.

Recommendation 11: The Department should consider the possibility of graduate students starting in January and May.

Program Response

Agreement. The Program shares the view that a more streamlined admission process would be helpful. It should be noted that winter and spring admissions have always been possible on a case by case basis.

YSGS Response

YSGS supports the program response. YSGS notes that winter and spring admissions are already possible on a case-by-case basis.

ADMINISTRATIVE AND FINANCIAL RECOMMENDATIONS

Recommendation 1: The PRT recommends implementation of a formal process for scheduling equipment use services provided by technical staff.

Program Response

Agreement. Following the strategic plans of the Faculty and the Department, these recommendations are being implemented.

YSGS Response

YSGS supports the program response.

Recommendation 2: The PRT believes that the number of staff members dedicated to responsibilities related to graduate students might be increased to provide better support to graduate students whose number is likely to expand in the future.

Program Response

Taken under consideration. At the current level of enrollment, the staff numbers (Associate Chair Graduate Program and Graduate Program Administrator) seem to be adequate and in line to other graduate programs in FEAS. There are no plans for growth and increase in number of graduate students in the program under the next strategic plans, both at the Faculty and the university level.

YSGS Response

YSGS supports the program response.

Recommendation 3: The Department should consider creating a new Associate Chair of Research position to streamline research among colleagues and provide mentorship to research graduate students.

Program Response

Taken under consideration. This is being considered as a part of the Faculty and Department strategic plans. The program will consult with the Associate Dean, Research and Dean of FEAS.

YSGS Response

YSGS supports the program response. It notes, however, that the creation of a new Associate Chair position is outside of its purview. YSGS encourages the program to work with the Dean of FEAS to explore this possibility.

Recommendation 4: The Department may consider improving opportunities for social gatherings among faculty members and students.

Program Response

Agreement. The MIE program notes that, currently, a number of social events are organized at the FEAS level specifically for graduate students, by the FEAS Graduate Students Ambassadors team, including: Orientation Networking & Social, Bowling, Pumpkin Carving, Pub Night, Archery Tag and BBQ. As for the Program, some faculty members attend weekly seminars and there are also opportunities for socializing at Awards Night. The Program will explore other faculty-student social events.

YSGS Response

YSGS supports the program response and its efforts to improve the social cohesion of the department.

Recommendation 5: The PRT believes that the program must improve its efforts to engage with alumni

Program Response

Agreement. The recommendation is appreciated. While we do have sample information, a full database would be useful. This will be undertaken with support from the university.

YSGS Response

YSGS supports the program response.

Implementation Plan

Academic Recommendations

Recommendation	Program Response	YSGS Response	Proposed Action	Responsibility to Lead Follow Up	Timeline for Addressing Recommendation
Organize courses around natural thematic subjects. This is important to satisfy the educational needs of the diverse graduate student population in the program.	Agreement. The MIE program notes that it already organizes courses around natural thematic subjects. The themes are: Thermofluidics, Solid Mechanics and Design, and Industrial Engineering.	YSGS supports the program response to each of these curriculum-focused issues (i.e., recommendations 1 – 6). YSGS notes that it will support the program as needed for any minor or major curriculum.	Completed		
Use directed reading courses to fill boutique gaps for very specialized topics.	Agreement. The MIE program notes that it offers a Directed Studies course (ME8135) for this purpose and will continue offering the course as needed.		Completed		
Introduction of core courses to provide solid common competencies for graduates.	Taken under consideration. The MIE program notes that it did employ the model of “core courses” at the program’s inception. They were later dropped in favour of elective courses since it was concluded that the model does not match the level of diversity in research topics in this program. The GPC, however, will revisit this decision in the Fall 2018 semester.		GPC consideration	Associate Chair Graduate	Winter 2019

Recommendation	Program Response	YSGS Response	Proposed Action	Responsibility to Lead Follow Up	Timeline for Addressing Recommendation
Ensure that a sufficient and consistent number of courses are offered annually to avoid inconsistency in training.	Agreement. The MIE program notes that it offers close to 35 graduate courses each year. It also notes that close to 90% of these courses are repeated each year. The program will continue its ongoing efforts to offer a sufficient and consistent number of courses.		Continuing efforts	Associate Chair, Departmental Chair, Home Faculty Associate Dean for Graduate Studies	Ongoing
Courses that are popular among MEng students are recommended to be aligned with the needs of a practicing engineer and to have an enriched applied content.	Agreement. The MIE program notes that the majority of courses use specialized software used in industry.		Continuing efforts	Associate Chair Graduate, Departmental Chair, Home Faculty Associate Dean for Graduate Studies	Ongoing
The seminar course can be improved by including lectures on how to deliver a high-calibre scientific talk.	Agreement. The MIE program notes that it has invited guest speakers for a variety of topics including best practices in technical presentations. Nevertheless, will strive to do so more systematically.		Continuing efforts	Associate Chair Graduate	Ongoing

Recommendation	Program Response	YSGS Response	Proposed Action	Responsibility to Lead Follow Up	Timeline for Addressing Recommendation
<p>To be able to develop actionable proposals around the above points, perhaps the MIE can consider striking a smaller and more nimble and focused graduate curriculum committee.</p>	<p>Agreement. The program notes that its Graduate Program Council (GPC) includes all faculty involved in graduate programs and graduate student representatives. The GPC, however, has a number of standing committees including Graduate Admissions and Studies, Awards and Scholarships, etc. The Curriculum committee is an ad hoc committee that is struck from time to time to deal with specific issues brought to the attention of GPC. As per the PRT's suggestion, the mandate and membership of this committee will be determined at the time the committee is constituted.</p>	<p>YSGS supports the program's response. As noted above, YSGS will support the program as needed for any minor or major curriculum modifications, per Policy 127. YSGS will also provide support to the program as needed if modifications to the GPC bylaws are required.</p>	<p>Completed</p>		
<p>The PRT believes that if the department were to continue running the MEng program, it must consider improving the quality of the students it attracts to the program. Their academic preparation should be on par with those enrolled in the MASc program.</p>	<p>Taken under consideration. The GPC will consider this in the Fall 2018 semester. The MIE program does note, however, that the minimum GPA requirement for the MEng program is B, which is in line with all major universities in Ontario. The program also notes that the courses taught are not categorized based on students who take them (MEng or otherwise).</p>	<p>YSGS supports the program response. Should the program determine modifications to its admissions requirements are needed, YSGS will support the program, per Policy 127.</p>	<p>GPC consideration</p>	<p>GPC</p>	<p>Fall 2018</p>

Recommendation	Program Response	YSGS Response	Proposed Action	Responsibility to Lead Follow Up	Timeline for Addressing Recommendation
The Department should take steps to improve graduate student support as soon as possible. The minimum guaranteed funding should be increased for all students, particularly international students.	Agreement. The MIE program notes that the funding package for research students (MAsc and PhD) has been updated since the visit and currently aligns with the visiting team's recommendation. All eligible PhD students will receive the same take home amount after fees are considered. The same holds for all MAsc students.	YSGS supports the program response and encourages the program to continue to pursue opportunities to improve funding packages for its graduate students.	Continuing efforts	Associate Chair, Department Chair, FEAS Dean, FEAS Assoc. Dean Graduate Studies, Vice-Provost and Dean of YSGS	Ongoing
The Department should offer opportunities for professional development to students by encouraging them to participate in international conferences.	Agreement. The MIE program notes that a number of professional development opportunities exist with the Faculty (FEAS) and the Graduate School (YSGS). The program also notes that it does provide funding for graduate student attendance at international conferences.	YSGS supports the program response.	Continuing efforts	Associate Chair, Department Chair, FEAS Dean, FEAS Assoc. Dean Graduate Studies, Vice-Provost and Dean of YSGS	Ongoing
The Department should consider the possibility of graduate students starting in January and May.	Agreement. The Program shares the view that a more streamlined admission process would be helpful. It should be noted that winter and spring admissions have always been possible on a case by case basis.	YSGS supports the program response. YSGS notes that winter and spring admissions are already possible on a case-by-case basis.	Discussions with YSGS	Associate Chair Graduate, FEAS Associate Dean Graduate Studies, YSGS Graduate Admissions office	Ongoing

Administrative and Financial Recommendations

Recommendation	Program Response	YSGS Response	Proposed Action	Responsibility to Lead Follow Up	Timeline for Addressing Recommendation
The PRT recommends implementation of a formal process for scheduling equipment use services provided by technical staff.	Agreement. Following the strategic plans of the Faculty and the Department, these recommendations are being implemented.	YSGS supports the program response.	Completed		
The PRT believes that the number of staff members dedicated to responsibilities related to graduate students might be increased to provide better support to graduate students whose number is likely to expand in the future.	Taken under consideration. At the current level of enrollment, the staff numbers (Associate Chair Graduate Program and Graduate Program Administrator) seem to be adequate and in line to other graduate programs in FEAS. There are no plans for growth and increase in number of graduate students in the program under the next strategic plans, both at the Faculty and the university level.	YSGS supports the program response.	Department and FEAS Dean consideration	Department Chair, FEAS Dean	Winter 2019
The Department should consider creating a new Associate Chair of Research position to streamline research among colleagues and provide mentorship to research graduate students.	Taken under consideration. This is being considered as a part of the Faculty and Department strategic plans. The program will consult with the Associate Dean, Research and Dean of FEAS.	YSGS supports the program response. It notes, however, that the creation of a new Associate Chair position is outside of its purview. YSGS encourages the program to work with the Dean of FEAS to explore this possibility.	Department and FEAS Dean consideration	Department Chair, FEAS Dean, FEAS Associate Dean Research and Partnership	Unknown

Recommendation	Program Response	YSGS Response	Proposed Action	Responsibility to Lead Follow Up	Timeline for Addressing Recommendation
<p>The Department may consider improving opportunities for social gatherings among faculty members and students.</p>	<p>Agreement. The MIE program notes that, currently, a number of social events are organized at the FEAS level specifically for graduate students, by the FEAS Graduate Students Ambassadors team, including: Orientation Networking & Social, Bowling, Pumpkin Carving, Pub Night, Archery Tag and BBQ. As for the Program, some faculty members attend weekly seminars and there is also opportunities for socializing at Awards Night. The Program will explore other faculty-student social events.</p>	<p>YSGS supports the program response and its efforts to improve the social cohesion of the department.</p>	<p>GPC discussion</p>	<p>Associate Chair Graduate, GPC</p>	<p>Fall 2018</p>
<p>The PRT believes that the program must improve its efforts to engage with alumni.</p>	<p>Agreement. The recommendation is appreciated. While we do have sample information, a full database would be useful. This will be undertaken with support from the university.</p>	<p>YSGS supports the program response.</p>	<p>Part of curriculum review</p>	<p>Associate Chair Graduate Studies, Department and Dept. Chair, FEAS Development and Alumni Officer, Ryerson University Advancement</p>	<p>Ongoing</p>

A report on the progress of these initiatives will be provided in the Follow-up Report which will be due in one year from the date of Senate approval.