

FINAL ASSESSMENT REPORT

PERIODIC PROGRAM REVIEW (PPR)

Bachelor of Engineering

Mechanical Engineering

Faculty of Engineering and Architectural Science

In accordance with the Institutional Quality Assurance Process (IQAP), this final assessment report provides a synthesis of the external evaluation and the internal response and assessments of the undergraduate Mechanical Engineering Program. This report identifies the strengths of the program, together with opportunities for program improvements and enhancements, and it sets out and prioritizes the recommendations that have been selected for implementation.

This 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, who will be responsible for leading those recommendations; and timelines for acting on and monitoring the implementation of those recommendations.

SUMMARY OF THE PERIODIC PROGRAM REVIEW OF MECHANICAL ENGINEERING

The Mechanical Engineering program has an innovative curriculum with a focus on hands-on experience. The program is currently ranked as the 13th best in the country as per the 2021 QS World University Ranking. It has a dedicated faculty body with interest in the continuous improvement of the curriculum and its delivery. The faculty is extensively engaged in scholarly, research, and creative (SRC) activities. The Mechanical Engineering program currently has one tier Two CRC chair, four fellows of the Canadian Academy of Engineering, and a recipient of the Ontario Confederation of University Faculty Association (OCUFA) Teaching Award.

This document comprises the Faculty of Engineering and Architectural Science's Dean's response to the Peer Review Team (PRT) Report and the School's response, in accordance with the directions of the 2016 and 2022 Periodic Program Review (PPR) Manuals and with Section 8.2 of Senate Policy 126, Periodic Program Review of Graduate and Undergraduate Programs. The site visit by the external PRT for the Periodic Program Review was carried out between June 24 and 25, 2024. The School of Mechanical Engineering submitted a list of potential Peer Review Team (PRT) candidates to the Office of the Dean, who then selected

Dr. Marilyn Lightstone, Professor, Mechanical Engineering, McMaster University

Dr. A.G. Straatman, Professor and Department Chair, Mechanical and Materials Engineering, Western

University

Dr. Ali Miri, Professor, Computer Science, Toronto Metropolitan University

The PRT felt the faculty were well-qualified and committed to mentoring students. The program's co-op options, culture, first-year office, and laboratory funding were all strengths identified by the PRT. There are opportunities, as well, to further enhance the student experience by re-evaluating the structure of labs, extending the capstone course to two years and providing students with more exposure to the machine shop. The PRT also raised several issues and concerns. They noted that the PPR was fourteen years late, and suggested that steps be taken to improve compliance with the PPR process. Additionally, there was concern about succession planning, the gap in time between departmental retreats, and the poor representation of women amongst the program faculty and student body.

The PRT Report offered the following three critical recommendations, and the School has responded thoughtfully to each to generate their Implementation Plan. The Dean's Office is in full support of the School's responses to the PRT recommendations.

The School of Mechanical Engineering has submitted its response to the PRT report to the Dean of the Faculty of Science, to which the Dean responded on August 6, 2024.

The Academic Standards Committee completed its assessment of the School of Mechanical Engineering on February 6, 2025. The Committee indicated that a thorough, analytical and self-critical program review was conducted. The program provided a detailed plan for future growth and support for development.

The Academic Standards Committee recommends that the program continue, as well as provide a one-year follow-up report, as follows:

The mandated One-Year Follow-up Report be submitted by June 30, 2026 to include:

1. A report on how EDI is being implemented into curriculum development plans
2. A progress report on the program's current periodic program review cycle

Presented to Senate for Approval: March 4, 2025

Start date of next Periodic Program Review: 2025/26

SUMMARY OF THE REVIEWERS' RECOMMENDATIONS WITH THE PROGRAM'S AND DEAN'S RESPONSES

RECOMMENDATION ONE: Women in Engineering.

The department needs to take steps to understand why Mechanical Engineering is considered unpopular (possibly even hostile) towards women and take affirmative steps to improve the culture. Targeted hiring of one or more female faculty members for the next open positions is recommended.

PROGRAM'S RESPONSE:

The Dean's office has a Women in Engineering unit that is actively promoting engineering to elementary and high school female students. The department will continue to support the activities of the Dean's office, which includes surveys of elementary and high school students, examination of the operations of other engineering schools, lab visits, and assistance with presentation material. The department supports the provision of entrance scholarships to equity seeking groups – those identifying as females, Black, and Indigenous people – as a way of increasing enrollment. Finally, the department will continue to work with the Dean's office in creating an inclusive environment in the faculty.

Regarding the issue of female faculty, the department is amenable to targeted hiring of female faculty, Black, and Indigenous people and would seek approval from the university.

DEAN'S RESPONSE:

FEAS is actively working to encourage female student applications and hiring by implementing various strategies aimed at addressing gender disparity. This includes outreach programs targeting young girls in schools, promoting STEM education through workshops, and collaborating with organizations such as the Society of Women Engineers to provide role models and resources and participation in the Hydro One Consortium for Women in Engineering.

On-campus, we strive to create a supportive environment through women-focused and women-lead student groups, scholarships, and networking opportunities. Departments also prioritize diversity in hiring practices, to strive for a fair representation of female faculty members, which helps create an inclusive atmosphere and provides mentors for female students.

Moreover, FEAS and the University promote policies that support work-life balance, such as flexible working hours and parental leave, making the field more attractive to women. They also conduct bias training for faculty and staff to ensure an equitable environment.

Nevertheless, more can always be done, and we are aware of our shortcomings in female hiring and enrollment in Mechanical Engineering. Our undergraduate admissions team is aware of this and is working towards targeting female applicants through more focussed and intense outreach programs, including summer workshops and camps for young female students (e.g., starting as early as grade 6). In regard to hiring, a number of future positions will become available due to faculty retirements and for program expansion and we will be considering targeted hiring.

RECOMMENDATION TWO: Re-evaluation of the labs.

Many of the lab activities are more observational than experiential. Furthermore, many of the labs are antiquated and not necessarily useful for modern engineering education. The laboratory experience should be evaluated for the entire program with strong consideration towards what a suitable number of lab exercises is per course. The department may also wish to evaluate the number of formal reports the students should be required to hand in. It is also possible that the technicians may be too involved in the lab delivery which would likely be done by well-trained teaching assistants. This could free up technician time to work on the development of new open-ended labs and potentially to provide training on the use of machine shop tools.

PROGRAM'S RESPONSE:

The department supports the re-evaluation of labs as recommended. An audit and review of labs will be implemented with a view to (1) modernize the equipment, (2) revisit the goals of labs, and (3) reduce the number of labs requiring formal reports. The department would welcome a situation where lab groups are smaller, allowing the active engagement of all students. The department will work on the matter with and seek support from the university.

DEAN'S RESPONSE:

We agree fully with the PRT's recommendation to improve the labs and lab experience for the Mechanical Engineering program. The department will be actively pursuing this along with support from the FEAS Dean's office. The addition of the Mechatronics Engineering program and the addition of lab rooms and equipment for that program will also help to augment the regular mechanical engineering program. Furthermore, the department is working on creating a two-term 4th year capstone course, rather than the current two individual course capstone, to improve the capstone design experience and to bring the program in-line with other departments to allow for future cross-disciplinary projects.

RECOMMENDATION THREE: Academic leadership and planning.

It was noted by the current Chair that he entered a "vacuum" when he took over as Chair with little information on the status of current accreditation documents, PPR documents and deadlines for either. While there appears to be some training and onboarding for new Chairs, the training needs to be more comprehensive and should be done in-person since much of the training may focus on human interaction. The reviewers note that a 3-year term for department Chair is extremely short and limits the ability of the Chair to accomplish anything "strategic".

PROGRAM'S RESPONSE:

The response to this recommendation would involve FEAS and the university. The search, appointment, and tenure of Department Chair are outlined in Article 26 of the TFA Collective Agreement. The department welcomes more comprehensive training and onboarding for new Chairs organized by the university, particularly to include information and practice on program review. The department would promote opportunities for faculty to be more involved in academic administration.

DEAN'S RESPONSE:

The onboarding of new Department Chairs, and also Associate Chairs, is something that we also agree is problematic and can be improved. We thank the PRT for alerting us to this issue. We will be creating resources, e.g., shared drives and archives, onboarding sessions, and training, for incoming and existing chairs to aid in their transition and tenure. As for the 3-year term for a department chair (renewable up to 2 times), we agree that such a short term makes it difficult for a department chair to make meaningful changes and long-term plans, however this is a provision in the collective agreement of the Toronto Metropolitan University Faculty Association and cannot be changed unless changed in future bargaining negotiations.

IMPLEMENTATION PLAN: SCHOOL OF MECHANICAL ENGINEERING

Priority Recommendation#1: Develop better lab experiences that better engage students through access to more experiential learning.
<p>Rationale:</p> <ul style="list-style-type: none"> - The PRT determined, through the thermos-fluids labs visit and speaking with the Technical Manager, that students have limited engagement in labs. They also determined that some of the goals of the labs are better achieved using more modern equipment. - Students will be better prepared to tackle open-ended real-world problems by solving open-ended laboratory problems.
<p>Implementation Actions:</p> <ul style="list-style-type: none"> - Curriculum committee will address lab experiences with input from the Technical Manager to determine methods for maximizing students' experiences in labs. - Curriculum committee will submit a proposal for curricular modification and lab resources if necessary.
<p>Timeline:</p> <p>Form committee (Winter 2025);</p> <p>Review and recommendation (Fall 2025)</p>
<p>Responsibility for:</p> <p>a) leading initiative: Program Chair</p> <p>b) approving recommendation, providing resources, and overall monitoring:</p> <p>Implementation: Program Chair, Curriculum Committee</p> <p>Resources: Dean</p> <p>Approvals: Dean</p>
Priority Recommendation#2: Develop ways to increase the enrollment of females in the program
<p>Rationale:</p> <p>The PRT determined through observation and conversation with all stakeholders that the percentage of female-identifying students was low.</p>
<p>Implementation Actions:</p> <ul style="list-style-type: none"> -... Survey students to understand the culture in the program -... Continue to support and work with the Engineering Admissions Office on developing outreach material. -... Advocate for the hiring of female-identifying faculty and the use of targeted hiring - Look at retention data for women in Mechanical Engineering

Timeline:

- Survey to be included in PPR survey for Winter 2025
- Meet with Engineering Admissions Office for 2025/2026 (ongoing)
- Request data from UPO and OVPECI on admission and retention of women students Winter 2025

Responsibility for:

a) leading initiative: Program Chair

b) approving recommendation, providing resources, and overall monitoring:

Implementation: Program Chair, Associate Chair

Resources: UPO

Approvals: Dean

Priority Recommendation#3: Hire more faculty that represent the demographics of the community

Rationale: The PRT recommended targeted hiring of female-identifying faculty as well as decreasing the student to faculty ratio in the program. As well, the faculty composition is not reflective of the community demographics, particularly for Black and Indigenous faculty, as per the diversity survey by the office of the Vice-President Equity, Community, and Inclusion.

Student experiences are negatively impacted by large class sizes and the overall quality of the program, including research, is compromised by high student-to-faculty ratio.

Implementation Actions:

- Examine representation for female, Black and Indigenous faculty and student to faculty ratios in comparator programs
- Meet with faculty to discuss hiring priorities
- Work with the Associate Chair of the mechanical engineering program to develop a compendium on enrollment in the program vis-à-vis the number of faculty and, if possible, provide comparisons with other mechanical engineering programs.
- Meet with the Dean to discuss targeted hiring

Timeline:

- Examine representation as part of next PPR cycle (Winter 2025)
- Provide report on enrollment (Fall 2025)
- Discuss hiring priorities (Spring 2025)
- Meet with the Dean (Spring/Fall 2025)

Responsibility for:

a) leading initiative: Program Chair

b) approving recommendation, providing resources, and overall monitoring:

Implementation: Program Chair, Associate Chair, Curriculum Committee

Resources: Dean

Approvals: Dean

Priority Recommendation#4: Improve onboarding of a new Chair

Rationale:

The PRT observed deficiencies in the current onboarding process.

Implementation Actions:

-...Prepare a document on major deadlines and activities of the chair

Timeline:

Prepare a working draft (W2025/S2025); Prepare a working version (F2025)

Responsibility for:

a leading initiative: Program Chair

b approving recommendation, providing resources, and overall monitoring:

Implementation: Program Chair

Resources: NA

Approvals: NA

Priority Recommendation#5: Establish a mechatronics engineering program

Rationale:

The enrollment of students in the mechatronics engineering option and requests from students and their parents/guardians, particularly during the Ontario University Fair, are overwhelming. Preliminary investigation, and as supported by Engineers Canada, indicates that there will be a significant shortage of mechatronics engineers in the next five years. The establishment of the mechatronics engineering program will increase the focus on the mechanical engineering program and provide an opportunity to increase the number of mechanical-focused core electives. Further, it will enhance the research in mechanical engineering because of the opportunities for collaboration with faculty hired into the mechatronics engineering program.

Implementation Actions:

-...Prepare and submit the proposal (complete)

Timeline:

Completed and enrollment of the first cohort of students was in the Fall 2023 semester.

Responsibility for: N/A

a leading initiative: Program Chair

b approving recommendation, providing resources, and overall monitoring:

Implementation: Mechatronics program proposal committee

Resources: UPO, Registrar

Approvals: Department Council, Dean

Priority Recommendation#6: Increase the enrollment of students who identify in any of the following equity seeking groups: Indigenous and Black students.

Rationale:

-...The student composition is not reflective of the community demographics as per the diversity survey by the office of the Vice-President Equity, Community, and Inclusion.

Implementation Actions:

-... Survey students for input and satisfaction

-... Continue to support and work with the Engineering Admissions Office on developing outreach material.

Timeline:

- Survey as part of next PPR cycle(W2025, W2026)

Responsibility for:

a leading initiative: Program Chair

b approving recommendation, providing resources, and overall monitoring:

Implementation: Program Chair

Resources : UPO, Career and Co-op office, Registrar, OVPECI

Approvals: Dean

Priority Recommendation#7: Increase the number of core electives in design, solid mechanics, and advanced mathematics.

Rationale:

-...This is an outcome of a student survey. The increase will give more options to students and better prepare those who want to go to graduate school.

Implementation Actions:

-...The curriculum committee shall discuss the matter and make recommendations

Timeline:

- This will take place as part of the broader examination of the curriculum in line with the next PPR cycle in Winter and Fall 2025

Responsibility for:

a leading initiative: Associate Chair

b approving recommendation, providing resources, and overall monitoring:

Implementation: Curriculum Committee

Resources: UPO, Registrar

Approvals: Department Council, Dean

Priority Recommendation#8: More teaching and labs space

Rationale:

-...The student is negatively impacted by the limited teaching and lab space. The student population is growing, and it is getting more and more difficult to engage all students in labs. Teaching time is also lost because midterms cannot be easily held outside teaching time.

Implementation Actions:

-...Work with the Associate Dean, Research and External Partnership (who is currently responsible for space) for new space.

Timeline:

This will be further examined as part of the next PPR cycle in Winter and Fall 2025 (Ongoing.)

Responsibility for:

a leading initiative: Program Chair

b approving recommendation, providing resources, and overall monitoring:

Implementation:

Resources: Dean

Approvals: Dean

Priority Recommendation#9: Examine the possibility of making the capstone project course a two-semester course.

Rationale:

-...Students will be involved in more extensive projects and there is increased opportunity of inter-department projects

Implementation Actions:

-... Survey students to seek their input

-... Discussions in curriculum committee

Timeline:

- To be addressed as part of the next PPR cycle in Winter and Fall 2025

Responsibility for:

a leading initiative: Associate Chair

b approving recommendation, providing resources, and overall monitoring:

Implementation: Curriculum Committee

Resources: UPO, Registrar

Approvals: Department Council, Dean