



Mechanical Engineering Final Assessment Report & Implementation Plan

| | |
|--|---|
| Faculty / Affiliated University College | Faculty of Engineering |
| Degrees Offered | BESc |
| Modules Reviewed | Mechanical Engineering |
| External Consultants | Prof. Markus Bussmann Chair, Dept. of Mechanical and Industrial Engineering University of Toronto Prof. David Sumner Undergraduate Program Chair, Dept. of Mechanical Engineering University of Saskatchewan |
| Internal Reviewer | Prof. Jeffrey Hutter Associate Dean (Academic), Faculty of Science |
| Date of Site Visit | November 26, 2018 |
| Evaluation | Good Quality |
| Approval Dates | SUPR-U: March 20, 2019 SCAPA: April 3, 2019 Senate: April 12, 2019 |
| Year of Next Review | 2026-27 |

In accordance with Western’s Institutional Quality Assurance Process (IQAP), the Final Assessment Report provides a summary of the cyclical review, internal responses and assessment and evaluation of the undergraduate modules delivered by the Department of Mechanical and Materials Engineering. This report considers the following documents: the program’s self-study, the external consultants’ report and the responses from the Department and Faculty. The Final Assessment Report identifies the strengths of the program, opportunities for program enhancement and improvement and details and prioritizes the recommendations of the external consultants and prioritizes those recommendations that are selected for implementation.

The Implementation Plan details the recommendations from the Final Assessment Report that are selected for implementation, identifies who is responsible for approving and acting on the recommendations, any action or follow-up that is required and the timeline for completion.

The Final Assessment Report and Implementation Plan is sent for approval through SUPR-U, SCAPA, Senate and the Ontario Universities’ Council on Quality Assurance and is made

available on a publicly accessible location on Western's IQAP website. The Final Assessment Report and Implementation Plan is the only document resulting from the undergraduate cyclical review process that is made public, all other documents are confidential to the Program/Faculty and SUPR-U.

Executive Summary

During the one-day site visit, the review team met with, among others: the Vice-Provost Academic Programs, John Doerksen; the Dean and Associate Dean of Engineering, Greg Kopp and Jeff Wood, respectively; the Chair and Associate Chair of Mechanical and Materials Engineering (MME), Tony Straatman and Ovidiu-Remus Tutunea-Fatan, respectively; a cross-section of faculty, administrative staff, and technical staff; as well as current students in the program. In advance of that meeting, the Department provided the reviewers with a detailed self-study of the Mechanical Engineering (ME) program that described and mapped the curriculum, discussed resources for the program, and provided quality indicators. Because a review by the Canadian Engineering Accreditation Board (CEAB) was being conducted in parallel, much of the material was provided in the context of CEAB requirements, and the Western Degree Outcomes were mapped to the CEAB Graduate Attributes in an appendix.

The external consultants were "very impressed" by what they saw and described the Department as an "especially strong unit" benefiting from strong leadership and a collegial atmosphere. They noted that the Mechanical Engineering program was similar to other ME programs in Canada, as is to be expected given the oversight by the CEAB. The reviewers were particularly impressed with the strong emphasis on hands-on experience and the variety of elective courses offered. They stated that they had "few concerns" about the Mechanical Engineering program, describing their list of 17 recommendations as "suggestions that would only further improve an already strong program."

Significant Strengths of the Program

Based on the self-study and site visit, the external consultants noted several strengths of the program, including:

- strong leadership by the Chair and Associate Chair.
- a strong sense of collegiality among faculty, staff, and students
- high demand for the program among Engineering students
- strong participation in the Internship program, with ~2/3 of the students participating and ~60% receiving employment offers from their Internship employers upon graduation
- the availability of a wide range of project types in the senior capstone design course, including industry-sponsored, faculty-sponsored, student-sponsored, student design team sponsored, etc.
- the availability of on-campus summer research experiences for students
- early entrepreneurship training through the first-year business course and second-year design class
- a lab-intensive curriculum providing hands-on experience
- a good variety of elective courses, made possible by a good faculty-to-student ratio
- emphasis on safety with mandatory training in shop safety for undergraduate students and appropriate training of teaching assistants in lab equipment
- the opportunity for additional training via the Fanshawe College Practical Elements of Mechanical Engineering program

- the availability of combined degrees with Business and Law, as well as the availability of an accelerated master's program
- regular meetings between the departmental leadership and student representatives to address concerns

Summary of the Reviewers' Key Recommendations and Department/Faculty Responses

The reviewers raised a few minor concerns and listed 17 unranked recommendations, which they described as "suggestions." A summary of the key suggestions, in approximate rank order, is included below, along with Departmental responses.

1. The reviewers noted that the first-year programming course serving all Engineering students was not optimal for ME students, and suggested the introduction of training in advanced Excel functions and data analysis.
 - The Department noted that an introduction to Matlab was now provided in the first-year course, and that they intend to build upon that with the introduction of a second-year course focused on Matlab and Excel.
2. The reviewers had a number of suggestions regarding the availability, use, and training of TA resources.
 - a) The reviewers recommended that the TA budget be maintained and that some labs and tutorials receive a greater allocation of TAs to achieve a lower student-to-TA ratio.
 - The Department pointed out that the TA budget was under Faculty control, and that limited resources were available.
 - b) The reviewers suggested training to improve TA effectiveness.
 - The Department acknowledged an unevenness in TA quality, and stated that they would encourage additional training beyond the minimum compulsory level.
3. The reviewers noted that students had expressed dissatisfaction with some service courses, taught both by other units in Engineering, as well as by departments outside the Faculty.
 - The Department noted that they were in regular contact with other Engineering departments, but that it is difficult to effect change in another department. As well, there is regular interaction at the Faculty level with instructors (e.g., in Applied Mathematics, Statistical and Actuarial Sciences, Writing, etc.) in other faculties.
4. The reviewers suggested that interdisciplinary projects, perhaps in collaboration with Electrical and Computer Engineering, could be included in the capstone design course.
 - The Department noted that this was already being discussed and is being explored further at the Faculty level.

Other Opportunities for Program Improvement and Enhancement

A number of additional points worthy of consideration were raised, as summarized below.

5. The reviewers suggested that more faculty involvement in tutorials would be beneficial.
 - The Department noted that many faculty members do attend tutorials but that this would be further encouraged at the departmental level.
6. The reviewers suggested that students be permitted more time to complete laboratories, and be given more open-ended or creative projects.

- The Department argued that this would be difficult to do for large lab courses, and viewed it as important in lower-level courses that the work be completed during the laboratory session.
7. The reviewers recommended that the Department consider a separate position dedicated to program assessment and improvement.
 - The Department felt that this role was adequately covered by the Undergraduate Chair and Curriculum Committee. The Associate Dean further noted that the addition of a related position at the Faculty level.
 8. The reviewers were concerned that participation in the Internship program could be limited by its high fees.
 - The Department noted that the fee was determined at the Faculty level and was likely required to support the program.
 9. The reviewers suggested that the Co-Curricular Record (CCR) be used to enhance the reporting of student activities.
 - The Department felt that this could be a Faculty-level initiative.
 10. The reviewers suggested that the Department be permitted to directly contact alumni to strengthen its links with industry and gain feedback on the effectiveness of their training.
 - The Department was enthusiastic about this suggestion, but noted that it would depend on discussion between the Dean and Faculty Relations.
 11. The reviewers were unconvinced that ME students were using library resources, and suggested that use, both physical and online, be monitored.
 - The Department was uncertain of the value of such statistics and suggested that it be monitored instead at the Faculty level.

Implementation Plan

The Implementation Plan provides a summary of the recommendations that require action and/or follow-up. The Department Chair/Director, in consultation with the Dean of the Faculty/Affiliated University College Principal will be responsible for monitoring the Implementation Plan. The details of progress made will be presented in the Deans' Annual Report and filed in the Office of the Vice-Provost (Academic).

| Recommendation | Proposed Action and Follow-up |
|--|--|
| 1. Enhance training in data analysis including advanced Excel functions. | Introduce a course at the second-year level to follow up on first-year training. |
| 2. Improved communication with instructors of service courses. | Continue regular meetings. |
| 3. Increase the availability of interdisciplinary design projects. | Discussion with other Engineering departments |