



Mechatronic Systems Engineering Program Final Assessment Report & Implementation Plan

Faculty / Affiliated University College	Faculty of Engineering
Degrees Offered	B.E.Sc.
Modules Reviewed	Mechatronic Systems Engineering
External Consultants	Dr. Ridha Ben Mrad, Professor, Department of Mechanical and Industrial Engineering, University of Toronto Dr. Alejandro Ramirez-Serrano, Professor, Department of Mechanical and Manufacturing Engineering, University of Calgary
Internal Reviewer	Christopher Sherrin Associate Professor and Associate Dean (Academic) Faculty of Law
Date of Site Visit	November 26, 2018
Evaluation	Good Quality
Approval Dates	SUPR-U: June 10, 2019 SCAPA: September 11, 2019 Senate:
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 program in Mechatronic Systems Engineering (MSE) delivered by jointly by the Departments of Mechanical and Electrical Engineering. This report considers the following documents: the Program's self-study, the external consultants' report and the responses from the Program 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/School/Faculty and SUPR-U.

Executive Summary

The MSE Program is a relatively new program at the Faculty of Engineering, initiated in 2012/13. While housed administratively in the Electrical Engineering Department, the teaching load is shared between Mechanical and Electrical Engineering. It has experienced significant growth, from an original cap of 25 students per year to a current cap of 75.

The current IQAP review was done concurrently with a Canadian Engineering Accreditation Board review. The IQAP Reviewers were provided with a variety of documents, including a lengthy self-study brief. On the date of the review, the Reviewers met with the University's Vice-Provost (Academic Programs), faculty members, the Faculty Dean and Associate Dean (Undergraduate Studies), the Program Director, second-, third- and fourth-year students, administrative staff, technical staff, and departmental leadership from Electrical Engineering and Mechanical Engineering. They also toured the relevant Faculty facilities and the associated library.

The overall view of the Reviewers was that the MSE Program "is an excellent program that is run by a dedicated and highly competent staff (both faculty members and technical staff)." The student body is also excellent and appreciative of the commitment of both faculty and staff to the Program. The "curriculum is based upon a solid core of knowledge and supports the entire learning experience for students." The Program "continues to have a strong focus on quality and excellence," "reflects contemporary trends in the discipline and engages students in an intensive experience with mechanical and electrical systems, self-learning, engineering and critical analysis, research, and writing and oral communication." The primary concerns of the Reviewers related to the stresses placed on the Program due to the significant enrolment growth that has not been accompanied by an increase in administrative, technical and faculty personnel. There are also limitations in the size and availability of laboratories and other facilities.

Significant Strengths of the Program

The following program strengths are identified in both the self-study and the External Consultants' Report

- Modern, well-equipped and highly relevant facilities
- Excellent technical staff with outstanding knowledge and commendable commitment
- Valuable experiential learning opportunities, including internships and opportunities to study abroad
- Courses are taught by experts in the relevant fields, providing a strong educational experience for students
- Students are acquiring the desired Program learning outcomes
- Students report satisfaction with the intellectual rigor of the Program and believe it is preparing them well for future careers or advanced studies
- Great camaraderie amongst students

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

1. The Reviewers wrote that “there is a concern from not just students but also from the administrative, technical and academic staff about the support provided by the university to the program.” The Program has grown significantly with little visible increase in academic, technical and administrative staff. While everyone is doing everything possible to ensure quality is maintained, and the Program is delivered adequately and very efficiently, there is little if any room for improvements or expansion. A larger number of faculty is needed. The Reviewers highly recommend that Western reviews the administrative, technical and faculty staffing needs in the Program “to ensure that it does sufficiently address the current (and potentially growing) needs of the Mechatronics program as well as maintain a well-balanced workload among the people that provide support to each of the elements of such program.” The Program largely agreed, noting that “only a handful of faculty members are qualified to teach many of the core MSE courses,” “technical staff regularly work overtime to prepare labs and support student work,” and “due to inadequate administrative support, it remains a significant challenge to manage the demands of running the program.” The Program wants additional faculty members, extra technical staff, and a full-time administrative assistant. The Faculty stated that the issue is well-understood by former and current Deans.
2. The Reviewers opined that the facilities used by MSE students, while modern and well-run, “are limited in size for a program of 75 students per cohort.” Lab design space is largely targeted for classroom instruction and students have somewhat limited space to work on projects that fall outside of an official classroom. Lab space lacks “large open testing areas where the students could test their designs and prototypes on an on-going basis” and “there is no extra space for [students] to work on their capstone design projects which tend to be more focused on paper-work (e.g., assignments, presentations, talks, etc.) that on an actual experiential learning opportunity.” The Program acknowledged that space limitations have been an ongoing challenge for students working on extended projects and that the times students can work in the lab are limited. However, additional space has recently been made available for students working on capstone design projects and a permanent dedicated space is expected to be in place prior to the start of the 2019-2020 academic year. MSE students also have access to extensive prototyping space and equipment not specifically designated for the MSE Program. Large open spaces can be created in the MSE undergraduate lab, albeit not on an ongoing basis. The Program is working towards providing evening and weekend access to key laboratory facilities throughout the term.

Other Opportunities for Program Improvement and Enhancement

- The Reviewers recommended the addition of required annual safety courses to remind students of best practices in labs and for use of equipment. The Faculty is now considering a series of online safety modules to augment the currently available training programs.
- The Reviewers suggested that Western provide support for students to participate in international competitions where students work on real world mechatronics challenges. The Program responded that it “does provide support to a wide variety of student teams that participate in international competitions.”
- The Reviewers offered that a more formal mentoring program could be beneficial. The Program will consider this.

- The Reviewers observed that the Program’s emphasis on biomedical-related technologies and design projects may limit the options for learning in other areas, including some related to very large sectors of the economy. They suggested that the Program expand the options available so that graduating students will be able to more easily integrate into diverse sectors of the economy. The Program commented that, each year, “students are presented with an extensive list of potential project topics suggested by faculty members.” While biomedically-oriented projects have proven popular, “the majority of project topics in a given year are from different areas.”
- The Reviewers recommended enhanced collaboration between faculty members from Mechanical and Electrical Engineering who participate in the MSE Program in proposing integrated design projects.
- The Reviewers noted that students expressed a desire for greater instruction in the tools currently being used in industry. While recognizing that the pace at which the world changes precludes training in all tools, the Reviewers suggested that MSE students could receive more information about how the fundamental skills learned at university enable them to address any problems in industry. The Program commented that, while students “may not know how to use a particular tool, they have the background to learn how to use it quickly and effectively.”
- The Reviewers recommended “that any changes in TA support are done carefully in order to ensure that any negative impact on the course delivery and student experience is negligible and/or there is a better resource allocation of the TA hour to ensure improved course delivery.” The Program believes it can continue to deliver high quality labs and experiential learning components even with the recent reduction in TA hours, although additional hours would be required were the Program to grow.

Implementation Plan

The Implementation Plan provides a summary of the recommendations that require action and/or follow-up. The Department Chair, in consultation with the Dean of the Faculty 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	Responsibility	Timeline
1. Review administrative, technical and faculty staffing needs	Program Director to discuss with Department Chairs, Deans and Provost		
2. Expand lab space and/or availability as appropriate for enrolment	Program Director to monitor opening of permanent dedicated lab space and pursue expanded weekend and evening access		