

**FINAL ASSESSMENT REPORT**  
**Institutional Quality Assurance Program (IQAP) Review**  
**Mechanical Engineering**  
**Undergraduate Program**

**Date of Review:** March 31 – April 1, 2016

*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 undergraduate programs delivered by the **Department of Mechanical Engineering**. This report identifies the significant strengths of the programs, 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 Cyclical Program Review of the**  
**Undergraduate Mechanical Engineering Program**

In accordance with the Institutional Quality Assurance Process (IQAP), the Department of Mechanical Engineering submitted a self-study in January 2016 to the Associate Vice-President, Faculty to initiate the cyclical program review of its undergraduate program. 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.

One arm's length external reviewer from Ontario and one internal reviewer were endorsed by the Dean, Faculty of Engineering, and selected by the Associate Vice-President, Faculty. The review team reviewed the self-study documentation and then conducted a site visit to McMaster University on March 31 – April 1, 2016. The visit included interviews with the Provost and Vice-President (Academic); Associate, Faculty, Chair of the department and meetings with groups of current undergraduate 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 (October 2016). Specific recommendations were discussed and clarifications and corrections were presented. Follow-up actions and timelines were included.

The Final Assessment Report was prepared by the Quality Assurance Committee to be submitted to Undergraduate Council, and Senate (January 2017).

### **Strengths**

In their report (September 2016), the Review Team noted several strengths of the Mechanical Engineering program. The ME program is offered in three variants: ME, ME and Society, and ME and Management, all of which can be combined with Co-op to give six different pathways for undergraduate students. The measurement and composite laboratory courses are considered to be strengths in that they introduce students to safety training, experiments that complement lecture theory, and shop activities to expose students to methods of manufacturing. The reviewers were particularly impressed with the ME student shop area and the machines and equipment available to students for project and prototype construction. The technical staff are engaged in laboratory and shop delivery and oversee and enforce safety in the shop area. The office administrative staff provides excellent service to the Department Chair and the Department Associate Chairs. In addition, the faculty members value the staff, which contributes to a pleasant departmental environment. Faculty members consider the department leadership to be strong, supportive and inclusive.

### **Areas for Improvement and/or Enhancement**

The reviewers only noted minor issues through the review process. First, it was mentioned by undergraduate students that more care could be taken in timetabling courses, since in some cases early morning and late day classes were separated by large gaps. This contributes to attendance issues in late-day classes and is a nuisance for students commuting to the campus. Two issues deal with the rotation of people through various activities related to course delivery. It is recommended that graduate TAs in the Measurement and Composite lab courses be rotated through different laboratory activities for the sake of their own interest and development, and to avoid disruption when TAs graduate. In a similar manner, it is recommended that the department consider some rotation of faculty members teaching the core undergraduate courses. It is felt that the department would be at a lower risk of disruption if all faculty members could teach more than one core course. This is not recommended for technical elective and graduate courses as these are more specialized and can be removed to avoid disruption. The ME program currently takes in approximately 120-135 excellent-quality undergraduate students from the common first-year program. The reviewers do not recommend further growth, as it might disrupt the delivery of the program due to lab time restrictions and the faculty and graduate student (TA) complement.

The Dean of the Faculty of Engineering, in consultation with the Chair of the Department Engineering Physics shall be responsible for monitoring the recommendations implementation plan. The details of the progress made will be presented in the progress report and filed in the Associate Vice-President, Faculty's office.

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

### Recommendations

Recommendation	Proposed Follow-Up	Responsibility for Leading Follow-Up	Timeline for Addressing Recommendation
TAs in lab course should be rotated so that they do not work with the same experiment year after year	In assigning teaching assistantships for laboratory courses, we will ask for the students to indicate which labs they would like to be the TA for and encourage rotation of lab assignments.	Chair (M. Lightstone) will work with Dr. Ross Judd who does our TA assignments.	August 2016.
Faculty members should be encouraged to rotate through two or three core courses in their area of specialization. This will lower the risk of disruption due to sabbatical leaves, illness and other absences, in addition to allowing individual faculty members to develop a fresh perspective on their teaching methodology.	This recommendation was discussed at the Mechanical Engineering Department Retreat on May 24, 2016. The department did not support this recommendation for the following reasons: 1. Teaching rotation will add a significant workload to the faculty members as a result of the very large time required to develop a new course. 2. Teaching evaluations are typically at their lowest during the first few years of teaching a new course. The students will not benefit from this rotation. 3. The additional time spent on teaching will negatively impact on research productivity. 4. Teaching rotation will not protect the department in the event that an instructor is unable to continue	Chair (M. Lightstone)  Currently, teaching is reassigned if there is a compelling reason to do so. For example, if an instructor is not performing well with a particular course (and has been given sufficient opportunity to improve), then the teaching will be reassigned. Teaching rotation without a compelling reason to do so was not supported by the department faculty members.	Addressed at Department Retreat on May 24, 2016.

	<p>teaching a course in the middle of term. This is because the faculty are already at full teaching load, so even if they had experience teaching a course that suddenly required a new instructor, it would be unlikely that a faculty member would be willing to take over a course since they are already at their full teaching capacity. In the past, we have been able to replace instructors with sessionals if required.</p>		
<p>The Co-op process and the purpose of the Co-op office needs to be clarified.</p>	<p>Co-op office needs to be informed of this and take steps to address the concern.</p>	<p>Chair (M. Lightstone) to inform Co-op office of this.</p>	<p>June 2016.</p>
<p>Timetabling of courses does not always work well for students.</p>	<p>Timetabling is complex due to the restrictions imposed by classroom availability and avoidance of course and instructor conflicts. We will attempt to ensure that the timetable works well for our students.</p>	<p>Chair (M. Lightstone) to work with administrative staff to try to create better timetable for our students.</p>	<p>June 2016</p>
<p>Growth of student body in Mechanical Engineering.</p>	<p>McMaster Engineering has a common first year and students enter Mechanical Engineering in the second year of the program. The class size in Mechanical is determined by the demand for the program by the first year students and the overall first year class</p>	<p>Chair (M. Lightstone) has worked with the laboratory coordinator to increase lab sections and plan for future growth.</p>	<p>Has already been addressed.</p>

	<p>size (which has been increasing). We have responded to the increased numbers by increasing the number of laboratory sections to ensure that student group sizes remain small. We will further consider sectioning of key courses where it is found that the students would benefit from a smaller class size. The recent growth in faculty numbers will allow for this sectioning to occur. This may also help with timetabling since it would provide more flexibility to the students.</p>		
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**Faculty Response:**

As detailed in the Chair’s response, the recommendations in the review were largely minor and centered around TA cross-training in the Measurements and Level 3 and 4 composite laboratories to minimize disruption after student graduation and cross-teaching of core courses for Faculty members. There were also recommendations concerning accommodating future growth. These recommendations were discussed within the Department and actions have been taken to address the majority of the recommendations.

Overall, the dean is satisfied with the replies of the department to the concerns raised by the IQAP reviewers.

**Quality Assurance Committee Recommendation**

That the Quality Assurance Committee recommend that the undergraduate Mechanical Engineering program 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.