

**FINAL ASSESSMENT REPORT**  
**Institutional Quality Assurance Program (IQAP) Review**  
**Chemical Engineering and Chemical Engineering and Biosciences**  
**Undergraduate Programs**

**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 Chemical 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 Chemical Engineering Programs**

In accordance with the Institutional Quality Assurance Process (IQAP), the Department of Chemical Engineering submitted a self-study in January 2016 to the Associate Vice-President, Faculty to initiate the cyclical program review of its undergraduate programs. 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 Vice-President, 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 that overall, the Chemical Engineering program is an excellent program that is attracting top students and that the program has excellent faculty and staff committed to high quality teaching, student support and to continuous improvement. The Department leadership team (Chair and Associate Chair) are committed to the program and its students and this is well recognized by students, faculty and staff.

Program strengths include a strong sense of community among and between students, faculty and staff, and a demonstrated commitment to teaching excellence. The program continues to innovate and experiment with new modes of course delivery (e.g. on-line, project based), building upon its historical reputation for introducing problem based learning over 2 decades ago. The program offers students several choices including CO-OP placements, specialization options in upper years and five-year programs (bioengineering, engineering and society, management).

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

The reviewers noted that overall, there are no significant areas that require improvement. Some areas that could be enhanced include: in the Bioengineering combined program, a review of the biochemistry courses and earlier timing of the MatLab course; improved TA training and mentoring; improve the tracking of graduates from the program; balancing project loads between Fall and Winter terms; exploring opportunities to list upper year courses from other Departments (e.g. polymers in chemistry); continuing to work with the Math Department to improve math courses; improving access to midterm examination facilities.

The Dean of the Faculty of Engineering, in consultation with the Chair of the Department of 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**

<b>Recommendation</b>	<b>Proposed Follow-Up</b>	<b>Responsibility for Leading Follow-Up</b>	<b>Timeline for Addressing Recommendation</b>
Continue with the Quality Assurance process that has been recently setup with	This is maintained	Chair and Associate Chair (Undergraduate)	This is done yearly

<p>Stakeholder meetings etc. Keeping this maintained in a regular way and adjusting as required will require attention from the Department's leadership team.</p>			
<p>Review the combined Chemical Engineering and Bioengineering program to look for redundancies in courses and opportunities for better timing of some (e.g. numerical methods) courses.</p>	<p>We absolutely agree with this recommendation. This was discussed in our retreat (May of 2016) and the Associate Chair will create a working group, which includes students, alumni, faculty and staff, to improve on these issues.</p>	<p>Chair and Associate Chair (Undergraduate)</p>	<p>To be completed before October 2016</p>
<p>Develop a program for enhanced TA training and best practices for faculty/TA interaction.</p>	<p>A significant part of our retreat was dedicated to this particular issue. We all agreed, as a department, to implement a multi-level strategy to improve TA quality/training/support. This includes awareness of faculty members about the fact that graduate students are also employees of the Faculty for their TA duties and as such, the ability to be effective TAs needs to be considered when recruiting graduate students. Starting in September 2016, all graduate students will have a TA training session (this will be part of the 130 hours of paid work). Moreover, faculty members all agreed to provide more feedback</p>	<p>Chair and Associate Chair (Graduate). All faculty members agreed to work towards improving the experience for the TAs and the undergraduate students working with the TAs.</p>	<p>To be started in September 2016</p>

	to their TAs during the term – problems should be addressed directly and brought to the attention of the Departmental Chair if the issue is not resolved.		
Explore the potential to better balance project workloads across terms.	For the next two years, we will be revamping our capstone project. Balancing the load is one of the aspects we will certainly be focusing on.	Chair and Associate Chair (Undergraduate)	Starting in September 2016 for a period of two years
Enhance the tracking of graduates from the program.	This issue is quite difficult to tackle and one that is present in essentially every program we know of. Our faculty has an alumni office that keeps the contact with former students. As a department, we will increase our presence in social media and we hired a person to redesign our web page and how we communicate with potential new students and former students.	Chair and Department Administrator	Already started
Explore the potential to cross list courses in other programs (e.g. Chemistry) for students in upper years.	We agree and already talked with Chemistry about at least one course being included. There is a limit on the amount of technical electives our students can take because of highly constraining accreditation requirements.	Chair and Associate Chair (Undergraduate)	Already started and ongoing for 2 years
Explore the potential to provide spaces for students to work on computers, including bookable computing facilities and/or exploring ways to	We appreciate the comments from the reviewers and we realize that ours is not the only department struggling with space. We will make a department	Dean has been extremely supportive of the undergraduate student experience, but there is only so much that can be done with the current space.	This is a problem for the ages.

ensure all students have a computer so that regular classrooms could be used.	laptop available and encourage students to bring laptops to tutorial rooms where possible.		
Improve access to midterm examination facilities	We agree that this is an issue, but one beyond departmental control. As new infrastructure is built, some pressure may be relieved. We may need to explore alternate assessment methods as well.	University level	Ongoing.
Improve Math Department courses	The first year office has been working closely with the Math Department, and the Engineering Faculty as a whole recognises the need for improvements.	Dean, first year office and curriculum committee	Ongoing

#### Faculty Response:

As detailed in the Chair's response, the recommendations in the review have led to a series of discussions within the department focused on TA training and obligations, an examination of redundancies in the Chemical and Bioengineering program, means to balance workloads across terms in senior undergraduate years and the enhancement of alumni tracking after leaving McMaster. Many of these initiatives have been addressed or are on-going. Several initiatives at the Faculty level – such as improvements to the mathematics courses offered – are also on-going.

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

#### Quality Assurance Committee Recommendation

McMaster's Quality Assurance Committee (QAC) reviewed the above documentation and recommends that the undergraduate Chemical Engineering programs 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.