FINAL ASSESSMENT REPORT

Institutional Quality Assurance Program (IQAP) Review

Chemical Engineering, M.A.Sc., Ph.D.

Date of Review: May 26th and 30th, 2025

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 graduate programs offered by the Chemical Engineering department. This report identifies the significant strengths of the program, 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 Review

In accordance with the Institutional Quality Assurance Process (IQAP), the Chemical Engineering Department submitted a self-study in March 2025 to the Vice-Provost and Dean of Graduate Studies to initiate the cyclical program review of its 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 the CVs for each full-time member in the department.

Two arm's length external reviewers and one internal reviewer were endorsed by the Dean, Faculty of Engineering, and selected by the Vice-Provost and Dean of Graduate Studies. The review team reviewed the self-study documentation and then conducted a virtual review to McMaster University on May 26th and 30th, 2025. The review included interviews with the Deputy Provost; Faculty Dean, Vice-Provost and Dean of Graduate Studies, Associate Dean, Grad Studies and Research, Chair of the Department and meetings with groups of current students, full-time faculty and support staff.

The Chair of the Department and the Dean of Engineering submitted responses to the Reviewers' Report (October 2025). Specific recommendations were discussed and clarifications and corrections were presented. Follow-up actions and timelines were included.

Strengths

The reviewers noted the following strengths in our program.

- The reviewers recognized the long-standing research reputation of our program, both within Canada and internationally. The excellence of the faculty is exemplified by the many awards and grants received. Research funding and productivity of the program were considered excellent.
- The variety of courses available to the students is impressive. Courses are available even when only a few students are interested.
- The strong engagement of faculty members, including those in senior administrative roles, the collegial working environment between the faculty and staff, and the general, positive morale of the department were noticed.
- Student experience was found to be generally positive. Quantitative metrics of program performance, such as its student-faculty ratio, percentage of PhD, time-to-completion, gender balance, and the balance between domestic and international students, are healthy and reflects the research-intensiveness of the program and its national and international reputation.

Opportunities for Improvement and Enhancement, including appropriateness of resources:

Recommendation #1: **The reviewers commented on the apparent lack of a coherent department-wide vision for our graduate program. They recommended the department to form a forward vision for the program.**
Department's Response and Actions to be Taken: Historically the department has indeed always put the development of its graduate program in the context of its overall research portfolio and thus, does not develop a separate vision for the graduate program. The department has a clear, long-standing vision for its research portfolio, which focuses on building up its strengths around strategic core areas and creating synergy among faculty members with complementary expertise. Development of graduate training programs has always been seen as part of this overall research development strategy. Considering the reviewers' recommendation, we do recognize the benefits of regularly reviewing the various aspects in our graduate program development, in addition to its research excellence. These aspects include the graduate recruitment strategy, curriculum development, and cross-lab training opportunities. The department's graduate recruitment strategy will be reviewed and discussed in our annual department retreat, while discussion on graduate curriculum and training opportunities can be held more frequently. In particular, our current graduate course development is largely led by

individual faculty members without coordination at the department level. We will review this practice and consider additional measures to ensure that courses offered in each theme area complements one other and offers comprehensive coverage for students in that area. In addition, for curriculum development we will also regularly review the gaps in the training of students' soft and professional skills. The department has recently approved a new course on technical communication skills and will continue to monitor the need for additional training resources, offered either as new courses, components in existing courses, or workshops.

Dean's Response: The department has a clear research focus on four themes: polymer materials and manufacturing, biomaterials and bioprocessing, process systems engineering, and sustainable water and energy technologies. It remains one of the Faculty's most sought after programs, with graduates going on to successful careers in leadership roles in industry and academia. We agree with the department's assessment that the graduate vision should mirror the research expertise within the department, which is well thought out and clearly envisioned in four pillars. We will support the program in their endeavours to improve department-wide review of curricula, and our faculty-wide graduate recruitment team will support them in implementing strategies for student recruitment. The faculty continues to recognize the commitment the department has made to non-technical communication, and will support them with new initiatives in this realm.

Recommendation #2:

The reviewers recommended the creation of a graduate curriculum committee at the department level to monitor the performance of the program, ensure its alignment with the department's vision, and discuss opportunities for program enhancement.

Department's Response and Actions to be Taken:

This recommendation is in line with the previous one especially in terms of having a department-level vision on curriculum development and overall program quality. We are considering the possibility of either forming such a committee or having an alternative mechanism to achieve the same function. One proposal is to select one faculty member from each core research area to form a committee that regularly meets with the Associate Chair (Graduate) to provide the feedback on the quality of student training and suggest opportunity for improvement. The Associate Chair (Graduate) will compile their feedback into specific recommendations for consideration by the department.

Dean's Response: We fully support this plan and look forward to the department having regular review of graduate curriculum.

Recommendation #3:

The reviewers have mentioned several areas where better communication with graduate students to needed to ensure clarity, including (1) funding packages offered to the students, (2) expectation of research outcome for graduate degrees, and (3) availability of mentorship and professional development resources at the University.

Department's Response and Actions to be Taken:

(1): A detailed breakdown of the funding package is indeed provided in each offer letter, which is clearly not as effective as intended, possibly for several reasons. One is the complexity of the language, which mentions different amounts coming from various sources in a lengthy paragraph and is overwhelming to read especially for incoming international students. Moreover, it is probably not the top priority for the incoming students to comprehend the funding package structure while they consider their decision of our offer and prepare for their arrival. The funding package is also explained in an annual Grad Policies and Procedures seminar by the Associate Chair (Graduate), but attendance to that seminar is usually limited because it is not a mandatory seminar. To improve clarity, the department will send annual reminders about the funding package breakdowns for different student groups. We have also brought the issue of offer letter language to the attention of the Associate Dean (Graduate) and are working with her office to provide more clarity on the funding breakdown and net pay.

(2): For the research productivity expectation, currently we are relying on supervisors and supervisory committees to communicate their expectation to the students. It is difficult to have a department-wide communication or standard, because the standard and expectation for productivity can vary substantially between research fields. However, the department will recommend its faculty members to include this discussion in their new student on-boarding process, as well as to give reminders in annual supervisory committee meetings. In our IQAP report, we gave an example heuristic of publication expectations, but we would like to emphasize that those expectations are not set in stone and vary significantly between research groups, topics, and fields. We will be sure to better communicate these expectations in future documents and align group expectations as appropriate.

(3): We will work to improve the visibility of programs available at the University for supporting students' success. Currently, we invite representatives from the union (CUPE), engineering graduate society, and student wellness centre to give an annual seminar on graduate life and well-being. We will add those additional programs such as GEMS to those introductions. We will also include such information to our graduate handbook. Faculty members will be educated about those resources so that they can better advise their students when such a need arises.

Dean's Response:

(1) While the offer letters do outline all the funding, including links to cost of living in Hamilton, we recognize that students may not understand it fully. We will work with the program and the School of Graduate Studies to implement a clearer offer letter, exploring for example providing a tabulated list of support. We are supportive of the department continuing to raise awareness about the levels of support upon arrival, and commend them for doing so and can link to university resources in the Student Success Centre, who offer several seminars for graduate student on financial matters including budgeting, taxes, etc. The School of Graduate Studies has also implemented a new Graduate Pay system this year that will show upcoming payments from all sources (TA, research scholarships, faculty scholarships) in one place, which should assist in alleviating confusion about incoming funding for the year. Overall, we believe the funding offered is clear and transparent.

(2) The department's plan is reasonable. We agree that the annual supervisory meeting and committee serve as the main point of contact for determining the quality and quantity of work expected for the degree.

(3) We fully support the department in this endeavour and will help provide information to resources in the faculty (e.g. TalkSpot, a same-day counsellor service for engineering only students) and across the university (e.g. Student Success Centre).

Recommendation #4:

The reviewers commented that the ratio of female faculty members is low and does not reflect the gender balance in our graduate student body. They recommend a stronger effort to higher female faculty.

Department's Response and Actions to be Taken:

This is an issue that we have been aware of and working to address. The department has an open faculty position which specifically targets female candidates. The position remains unfilled after several unsuccessful searches. The position was posted again in mid-October, and we expect applications from excellent candidates. We will continue to internally evaluate our practice of identifying and attracting female candidates. Experience that we acquire in this search will also be carried over to future searches to ensure that female candidates receive maximum visibility and consideration.

Dean's Response: We have been and remain supportive of the department seeking to improve its gender balance in its faculty complement compared to its graduate student body, as demonstrated by the open position to recruit in this area presently. EDI remains a high priority for the Faculty as it

looks to the future and there are measures in place to ensure that all short lists meet certain metrics across the Faculty.

Recommendation #5:

The reviewers recommended that we outline the guideline for offering graduate courses with low enrolment. They were primarily concerned about faculty workload with the number of courses we are listing.

Department's Response and Actions to be Taken:

We would like to first clarify that despite the large number of course codes available in our program, graduate teaching is not a significant burden to our faculty's teaching load. For 700 level courses, faculty members largely can decide on when and how often each course is being offered depending on their own time availability, subject of course to the demand and interest of the graduate population. Of course, more coordination at the department level can improve the match between course offering and student needs (which will be addressed by our earlier response to the graduate curriculum committee comment). The department monitors the teaching load (undergrad and grad teaching combined) of every faculty member every year. Tenure-track and teaching-track faculty are responsible for teaching nine and 18 units per academic cycle, respectively. Currently, faculty teaching load is not a limiting factor in our graduate course offering.

Among the large number of courses that we list, a significant portion is cross-listed from other programs with no teaching load requirement from us. Several courses were offered by former faculty members who have either retired or left the department. A clean up of the course listing will help clarify the situation.

On courses with low enrolment, we note that we are a moderately sized department with minimal overlap between faculty research expertise areas. In some cases, a course covers a specialty area that is essential for students of a particular faculty member but does not have broader appeal in the department. It is still important to have those courses available for students whose research depend on those knowledge areas. Therefore, we do not plan to impose restriction on graduate course offering based on enrollment numbers, although some courses may (and are) offered every other year in order to balance the workload and accessibility on the students' side.

Dean's Response: Firstly, the workload of the faculty members is not within the scope of this review as it is governed by the employment conditions for each faculty member (generally 40% research, 40% teaching and 20% service) and managed by the department and reviewed by the Faculty, annually. Chemical Engineering utilizes their faculty members to an appropriate load and does not have a high reliance on sessional instructors and therefore, we feel that that teaching loads are reasonable.

Attempts to institute Faculty-wide course-size limits have not been successful, for the important reasons that the department outlines above. Therefore, we support the department in choosing to keep a large offering of courses, if they can adequately manage when they are offered. We will support them in cleaning up course listings not currently offered and making the alternating schedule of courses clear to student for their own planning.

We will look at ways in which class size can be considered in overall distribution of teaching loads, but this is outside the scope of an IQAP review as there is no clear indication provided that the quality of the courses, despite the large number offered, is not sufficient. In fact, that many bespoke classes are offered to students with small class sizes emphasizes a superior quality of graduate education available to learners.

Recommendation #6:

The reviewers noted that our course requirements only specify the number of courses required without mandating students to take courses in core chem eng areas. They were concerned about the possibility that students with non-ChE undergraduate backgrounds may circumvent all courses with core ChE knowledge areas.

Department's Response and Actions to be Taken:

We would like to first clarify that our course requirements not only specify the number of courses required for each degree scenario but also specify the maximum number of non-ChE courses that they are allowed to take. In addition, for PhD students, our comprehensive exam procedure includes questions in general chemical engineering fundamental areas related to the student's research. For a student who demonstrates weakness in certain core topics, the examination committee has the option to require them to take certain courses, including undergraduate courses, to fill the gap. Admittedly, there is not a similar mechanism for MASc student.

The department has briefly already discussed the possibility of additional measures to reinforce chemical engineering core knowledge in graduate teaching, including adding new courses, introducing new modules in existing courses, and/or mandating non-ChE students to take or audit certain undergraduate courses as a part of their degree. In our upcoming retreat, a clear plan will be formulated with careful consideration of faculty and student workloads, together with the expected learning outcomes of graduate degrees according to the student supervisors.

Dean's Response: We support the department in their review of the courses in the program and echo that there are defined limits on the number of courses outside the program (50% must be in the program). The comprehensive exam functions to confirm the depth and breadth of knowledge in Chemical Engineering. At the Master's level, there is also a supervisory meeting required which may serve a similar role to determine areas for focus and additional course work.

Recommendation #7:

The reviewers recommended the department to consider a reassessment of the resources available to the faculty, students and staff to ensure infrastructure needs of the program are met.

Department's Response and Actions to be Taken:

We will consider this recommendation in the formation of a departmental vision on our graduate program. Currently, the department is working on the optimization of office space for graduate students. The department is also compiling a list of research equipment from different labs to improve access allow graduate students easily find the equipment for their research, which is being compiled on a collaborate MS Teams reference site.

Dean's Response: The Faculty notes that the department has recently renovated graduate student offices, and has several faculty having completed recent renovations to laboratory space and central facilities (e.g. the Biointerfaces Institute used by many in Chemical Engineering). Faculty-wide space utilization is regularly evaluated and requests for renovations considered. Given that this comment was rather broad in the report, and in the absence of a specific recommendation, the department's plan is reasonable and supported.

Recommendation #8:

The reviewers commented that in our current funding structure, TAship is part of the students' floor stipend. They considered this unfair since students cannot refuse to do TA. They recommend the department to make some percentage of the TAship income as a top-up in their pay structure.

Department's Response and Actions to be Taken:

Students can choose to decline their TA positions, but that will result in them receiving a lower amount of financial support. Their supervisors can choose to replace this missed income with an increase in their research scholarships but they are not obliged to do so. Making TAship optional for all graduate students while still maintaining the same minimal stipend standard will drastically increase the financial commitment from the department and is currently not fiscally sustainable.

Meanwhile, we also see TA appointments as a training opportunity for graduate students to develop their communication skills, instead of a net burden.
Dean's Response: The broad funding model is determined at the Faculty level with a Faculty-wide minimum (19.5k (Master's) or 21k (PhD) above tuition) and guaranteed TA. The funding is reviewed annually. Chemical Engineering consistently meets and surpasses this amount. We are not surprised that faculty/students could not provide the total – it changes annually and while all students in Chemical Engineering are ~23k over tuition, the proportion of funding from various sources (university, Faculty, faculty member) varies slightly depending on the immigration status and program of each student (meaning there are 4 models which we track and are happy to provide if requested at the time of the review). We support the department's decision to keep the funding model as is. We strongly disagree that TA funding should be a top up. The guaranteed TA support is an important part of ensuring base funding levels that are more competitive than other institutions in Canada that do not provide TA support. It also provides a level of equity in our programs for domestic versus international students. When TA positions are competitive, there is an unfair advantage to those from the undergraduate program which may skew toward domestic students. We also recognize the important value TA work brings to graduate development. We will continue to support the annual review of graduate stipends while TA stipends are governed via the union. Students may choose to decline a TA.

Implementation Plan

In the chart below, please outline the recommendations made by reviewers, briefly outline the actions you plan to take, who will be responsible for leading the action, and a timeline for completion.

Recommendation	**Action(s) to be Taken**	**Responsibility for Leading Action** (specify the role(s) that will be responsible for each action item e.g. Program Chair.)	**Timeline for Completing Action** (indicate specific timelines (e.g. not 'ongoing') for action)
1 Department vision on graduate program	**Discuss and review the department's grad recruitment practice, course offering schedule, overall fit between grad curriculum and student needs, and cross-lab training opportunities**	**Associate Chair (Graduate)**	**May 2026 (Department Retreat) with some topics raised earlier during department meetings.**
2 Graduate curriculum committee	**Form a department graduate curriculum committee or an alternative mechanism for monitoring program development**	**Department Chair**	**By 2026-27 academic year.**
3 Transparency in graduate pay	**1) Relay the issue of offer letter language to the AD Grad Office.** **2) Annual reminder of grad pay breakdown.**	**1) Department Chair** **2) Associate Chair (Graduate)**	**1) Completed (Oct. 2025)** **2) Annual – every September.**
3 Publication and productivity expectation	**Remind supervisors to clarify the expectation in new-student onboarding processes, as well as annual supervisory committee meetings.**	**Associate Chair (Graduate)**	**Nov. 2025, Department Meeting**
3 Resources for grad career development	**Invite reps from relevant offices to give seminars to graduate students and include such**	**Grad Admin**	**By September 2026**

	information in the grad handbook		
4 Ratio of female faculty member	**Complete the hiring of a women in chem eng faculty member**	**Department Chair**	**By April 2026**
5 Number of grad courses	**Clean up of obsolete course codes**	**Associate Chair (Graduate)**	**Winter 2026**
6 Chem eng core areas	**Formulate a plan for reinforcing chem eng core areas, especially for non-ChE students**	**Department Chair and Associate Chair (Graduate)**	**May 2026, Department Retreat**
7 Resources for graduate program	**1) Optimization of grad office space. 2) Coordination of research facility sharing.**	**1) Department Chair and Department manager 2) Associate Chair (Research)**	**By Summer 2026**
8 Optional TA support	**No action (see response)**	**N/A**	**N/A**

Quality Assurance Committee Recommendation

McMaster's Quality Assurance Committee (QAC) reviewed the above documentation at the March 19, 2026, meeting. The committee recommends that the **Chemical Engineering graduate** program should follow the regular course of action with an 18-month progress report and subsequent full external cyclical review to be scheduled in seven years, and to be conducted no later than eight years after the start of the last review.