

Two-Year Progress Report

Chemical Engineering (MEng, MAsC, PhD)

December 2022

Background

In accordance with the University's Institutional Quality Assurance Process (IQAP), a self-study of the Chemical Engineering programs (MEng, MAsC, PhD) was completed and submitted to the Associate Vice-President, Graduate Studies and Postdoctoral Affairs (GSPA) on March 31, 2017. The arm's-length external reviewers that were selected by the Associate Vice-President, GSPA were Dr. D. Grant Allen, Professor and Chair of Chemical Engineering and Applied Chemistry, University of Toronto, and Dr. Peter Englezos, Professor and Department Head of Chemical and Biological Engineering, University of British Columbia. The internal reviewer that was selected was Dr. Daniel O'Connor from the Department of Sociology and Legal Studies. A site visit took place on April 24-25, 2017.

A total of 11 recommendations were provided which focused on curriculum and program delivery, student recruitment, and research funding. In response, a plan was created outlining specific actions proposed to address each recommendation, as well as a timeline for implementation. The final assessment report, which was submitted by the department in December 2019, provided detailed responses to each of the 11 recommendations along with an action or set of actions which were to be taken in response to the recommendations.

In this progress report, we describe our progress in implementing these actions along with circumstances which have altered or postponed the original plan of action. The next cyclical review for this program is scheduled for 2024-2025.

Enrollment over the past two years

	Meng	MAsC	PhD
2021-2022 (CURRENT YR)	24	77	103
2020-2021 (LAST YR)	39	76	112

Based on fiscal year (spring, fall, winter)

Progress on Implementation Plan

Recommendations

1. *The Department should engage in a process that looks at its stated learning outcomes for their graduate programs, maps them to specific aspects (e.g. theses, courses) of each of the programs as well as methods of assessment (e.g. grades, term reports, committee meetings, qualifiers/defences, seminars, etc). This can then provide a framework for examining the various elements of their programs including core course requirements, theses, etc.*

Status: **completed**

Details:

Starting in Fall 2019, the graduate curriculum was significantly enhanced through changes including the addition of formalized training in engineering practice, research ethics and methods as well as some changes to course requirements to focus on foundational chemical engineering concepts and give students more options. These actions were taken after departmental discussion and identification of high-level outcomes of the graduate curriculum:

- a) *To teach advanced foundational concepts in Chemical Engineering beyond that of an undergraduate curriculum.*
- b) *To teach scientific and engineering research methods including experimental design, critical analysis, research ethics, scholarly communication.*
- c) *To teach graduate-level introductory concepts in specific research areas strategic to the department faculty.*

Additionally, the MEng curriculum was refined and optional specializations added in research areas of strength for the Department to provide advanced training relevant to the chemical engineering industry. These specializations are in the areas of process systems engineering, polymer science and engineering, and biochemical engineering.

2. *The Department should undertake a review of their course requirements, including their core courses and the held with courses. We suggest that could be done with the elements identified in Recommendation 1 in mind. We also suggest the Department consider a course in Thermodynamics, perhaps connected to the area of energy systems, a subject that would cover a core area and also likely be very attractive to many students given the significant research going on in energy conversion and storage. In addition, a course on Research Methods may be considered.*

Status: **completed**

Details:

In line with the high-level graduate learning outcomes identified in Fall 2019 (see above), a course was created *CHE 600 – Engineering and Research Methods, Ethics, Practice, and Law* which is mandatory for all graduate students (PhD, MSc and MEng). Additionally, the previous curriculum core course list was replaced with two prescribed courses foundational to chemical engineering:

- CHE 601 Theory and Application of Transport Phenomena
- CHE 602 Chemical Reactor Analysis

Degree requirements for PhD, MASC and MEng programs were revised to remove so-called “held-with” courses (courses with both undergraduate and graduate course identifiers) from the graduate program so that only 500-level course offerings include a majority of undergraduate students.

Finally, the department recently approved the addition of a new foundational course, CHE 603 Chemical Engineering Thermodynamics, which could be offered as early as Spring 2023.

3. *The Department continue to hire excellent faculty consistent with our understanding that there are five open positions. Particular attention should be made to reach out to women faculty to be more in line with the President’s initiatives and the fraction of women students in the graduate program.*

Status: **completed**

Details:

The department continues to follow current faculty hiring practices, including the on-going effort to hire more qualified women to join the department. Five positions at the rank of Assistant Professor were recently hired in the areas of Bioengineering, Electrochemical Engineering and Soft Matter Engineering.

4. *The Department should revise the table listing each faculty member’s fields (Table 3) to include more than one field allocated per faculty to more accurately reflect the breadth and depth of expertise. In addition to revamping this, the Department might consider ways to articulate their particular areas of application strengths to prospective students.*

Status: **completed**

Details:

The department has recently hired a Communications & Outreach Officer, who is dedicated to communication and marketing duties, including the promotion of research and graduate studies. This is being achieved through enhancing the Department’s website, including the research and graduate studies information articulating each faculty member’s expertise. We have also provided assistance to individual faculty members without a personal research website to create one and have put procedures in place to help maintain all faculty members’ research websites to be current.

5. *The Department consider if there might be opportunities to build on their excellent reputation of co-op at the undergraduate level and see how it might be used to define a unique strength in any*

one or more of their three graduate degree programs.

Status: in progress

Details:

The department recently approved the introduction of an admission-only MEng Co-op degree program which could be offered as early as Fall 2023, pending faculty and university approval. The department is eager to explore additional offerings with guidance from the Faculty and the GSPA.

- 6. In order to enhance the pool of qualified PhD students and reduce time to completion, the Department consider new methods to determine which qualified students in an MASc would be able transfer to a PhD. There is some concern that the current method is too rigid and that this may be preventing suitable MASc students from transferring to the PhD. This could be done in conjunction with Recommendation 1, articulating the learning outcomes for the PhD.*

Status: completed

Details:

The department continues to facilitate the transfer of MASc students to the PhD program through formalized graduate studies recruitment sessions and one-on-one graduate student advising. Additionally, processes at the faculty level have been created which facilitate and promote direct admission into PhD.

Previously, direct admission to the PhD program special justification and was handled on a case-by-case basis. It was also not clearly advertised on the department and faculty websites. Since 2019 this has changed, where direct-admission is clearly indicated as available to students without a Masters and the admissions processes for direct-admit PhD students are consistent throughout the Faculty.

- 7. The Department explore ways to further maximize their leverage of industrial funding to bring in more funding from other sources (e.g., government). They seem to have an impressive level of industry funding in that it is about the same as their Tri-Council funding, which suggests possible untapped opportunities for further matching/leverage.*

Status: in progress

Details:

The optimization of the research enterprise, for which adequate funding is an essential condition, is an ongoing task for the department's Executive Committee. The committee has analyzed the patterns of research activity to understand the effect of external (pandemic) and internal (faculty demographics) factors and other constraints (faculty workload and space distribution) on the total level, distribution and utilization of research funding. The Chair provides regular updates of this work to the faculty assembly for discussion and collective action.

- 8. The Department should develop a space policy that provides flexibility to allow the space allotted*

to faculty to grow and shrink as their research activity levels shift throughout their careers. Related to this, the Department should continue to look to provide common lab space designed to enhance equipment and technical support sharing.

Status: in progress

Details:

The department has established an Analytical Lab Committee to oversee and establish rules and fees for the operation of the centralized facilities in September 2021. The department is presently (Winter 2023) hiring a second analytical technician to handle the increased workload associated with expanded centralized facilities. The department has also expanded the footprint of shared facilities with the addition of physical space and equipment.

The formation of a Space Committee was significantly delayed due to the prolonged department chair search from early 2020 to mid-2021 and due to the ongoing COVID-19 pandemic. Now that a new department chair has been identified and taken-up the role, progress has been made on these action items since September 2021 including the creation of a new Associate Chair of Operations position, which includes the responsibility of managing space within the department.

- 9. The Department develop incentives for faculty to lead large scale research initiatives, including allocation of CRC chairs, research administration support, etc. This might also be connected to Recommendation 7 to explore increased leverage of industry funds. We note that linking this to CRC chairs is already underway.*

Status: completed

Details:

A research-focused retreat was completed in December 2018 and, following this, department policy regarding CRC chair allocation and renewal was updated to formally include expectations for CRC chairs to lead major grant applications. The department has recently (Fall 2022) approved a change in the annual performance review (APR), whereby large grant applications are explicitly considered when evaluating research, regardless of whether they are successful or not.

- 10. The Department could explore ways to have PhD students interact with other faculty beyond the comprehensive exam and defense. This can provide students and faculty with a broader range of perspectives on their research and also foster collaboration. Examples include having supervisory committee meetings to track progress and provide advice on research and courses, seminars to other students and faculty, etc.*

Status: **completed**

Details:

The Graduate Review Committee (GRC) has investigated the formalization of increased interaction between PhD students and other faculty members. Two different potential improvements were identified: (i) adopting an enhanced PhD advising committee model similar to that used in the Faculty of Science and (ii) the addition of a PhD milestone research seminar.

The department has recently approved the addition of a PhD advising committee model, similar to that used in the Faculty of Science, which would be effective for PhD students starting in and after Fall 2023.

11. *The Department should explore ways to encourage faculty to share some of their best practices in areas related to the graduate program (e.g. student recruitment, mentoring students, etc.). Examples include social gatherings, regular retreats and items that may arise from Recommendations 9 and 10.*

Status: **complete**

Details:

The Manager of Graduate Studies within the department has focused on collecting and reporting best practices through a graduate studies update sent monthly to faculty in advance of departmental meetings. Furthermore, the creation of a seminar course (CHE 600), which all graduate students must take during their first semester, provides students with a direct resource for best practices relevant to their studies, research, and future professional practice.

Participation and consultation with graduate students through CEGSA has improved significantly during the second half of 2022. CEGSA recently held elections and has a refreshed executive. Monthly socialization gatherings have been scheduled since September 2022 and it is expected that continued departmental support of a reinvigorated CEGSA will maintain this momentum.

Explain any circumstances that have altered the original implementation plan

The main alternations from the original implementation of the plan have been extending the timeframe for its implementation. Three significant circumstances have caused this: (i) the ongoing COVID-19 pandemic, (ii) the prolonged department chair search from early 2020 to mid-2021 and, (iii) an ongoing shortage of teaching resources. Now that a new department chair has been found and taken-up the role (September 2021), progress has been made on many of the action items that could not be adequately addressed prior to this.

Address any significant developments or initiatives that have arisen since the program review process, or that were not contemplated during the review

None.

Report on anything else you believe is appropriate to bring to Senate concerning this program

None.

Updated Implementation Plan

	Recommendations	Proposed Actions	Responsibility for Leading and Resourcing (if applicable) the Actions	Timeline for addressing Recommendations
1.	Consider learning outcomes	Unchanged from last report (see previous section)	Graduate Review Committee	Completed
2.	Review course requirements, including core courses and held-with courses	Unchanged from last report (see previous section)	Graduate Review Committee	Completed
3.	Hire excellent faculty, with effort to attract women	Unchanged from last report (see previous section)	Department Advisory Committee on Appointments	Completed
4.	Clearly indicate faculty expertise	Unchanged from last report (see previous section)	Chair and CHE Communicates Specialist	Completed
5.	Consider grad-level co-op	Unchanged from last report (see previous section)	Graduate Review Committee	In progress
6.	Facilitate direct-admit to PhD	Unchanged from last report (see previous section)	Graduate Review Committee	Completed

7.	Maximize research funding	Unchanged from last report (see previous section)	Department Chair and Executive Committee	In progress
8.	Accommodate changing research space and laboratory requirements	Unchanged from last report (see previous section)	Department Chair and Department Assoc. Chair Operations	In progress
9.	Encourage large-scale research	Unchanged from last report (see previous section)	Department Chair	Completed
10.	Support PhD students	Unchanged from last report (see previous section)	Graduate Review Committee	Completed
11.	Share best practices	Unchanged from last report (see previous section)	Graduate Studies Manager, Instructors	Completed

The Department Chair/Director, in consultation with the Dean of the Faculty shall be responsible for monitoring the Implementation Plan.

Date of next program review:

2024-2025

Date

Signatures of Approval:

M. Karamidas

1-Jan-2023

Chair/Director

Date

Faculty Dean

Date

AFIW Administrative Dean/Head (For AFIW programs only)

Date

Note: AFIW programs fall under the Faculty of ARTS; however, the Dean does not have fiscal control nor authority over staffing and administration of the program.

Associate Vice-President, Academic
(For undergraduate and augmented programs)

Date

Jeffrey M. Cauley

17-Aug-2022

Associate Vice-President, Graduate Studies and Postdoctoral Affairs
(For graduate and augmented programs)

Date