

FINAL ASSESSMENT REPORT

PERIODIC PROGRAM REVIEW (PPR)
Bachelor of Engineering
In Chemical Engineering
Faculty of Engineering and Architectural Science

In accordance with the 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 **Chemical Engineering** program. The 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 Implementation Plan identifies who will be responsible for leading the implementation of the recommendations; who will be responsible for providing any resources entailed by those recommendations; and timelines for acting on and monitoring the implementation of the recommendations.

SUMMARY OF THE PERIODIC PROGRAM REVIEW OF THE CHEMICAL ENGINEERING PROGRAM

The Chemical Engineering program submitted a self-study report to the Vice-Provost Academic on November 28, 2019. The self-study presented the program description and learning outcomes, an analytical assessment of the program, and program data including the data collected from a student survey along with the standard University Planning data tables. Appended were the course outlines for all core required and elective courses in the program and the CVs for all RFA faculty members in the Department of Chemical Engineering and all other faculty who have recently taught core courses (required and/or elective).

Two arm's-length external reviewers, Dr. Eric Croiset, Professor and Chair of the Department of Chemical Engineering at the University of Waterloo, and Dr. Stephen Wylie, Associate Professor in the Department of Chemistry and Biology at Ryerson University, were appointed by the Dean of the Faculty of Engineering and Architectural Science from a set of proposed reviewers. They reviewed the self-study documentation and then conducted a site visit at Ryerson University on April 24 and 25, 2019.

The visit included meetings with the Provost and Vice-President Academic; Vice-Provost Academic; Dean, Faculty of Engineering and Architectural Science; Chair, Chemical Engineering; and the Associate Chair, Undergraduate. The PRT also met with several members of the Department of Chemical Engineering including staff, students, and faculty members. A general tour of the campus was provided, including a tour of the program facilities and the library.

In their report, dated September 3, 2019, the Peer Review Team (PRT) provided feedback that describes how the Chemical Engineering program meets the IQAP evaluation criteria and is consistent with the University's mission and academic priorities. The Peer Review Team (PRT) also noted that the Chemical Engineering program is strong, as attested by their high-quality and dedicated staff, and the fact that they recently received the highest accreditation ranking from CEAB.

The main areas of strength identified by the PRT include:

- its mandatory co-op component;

- the mechanisms put in place to ensure students' success, such as early intervention, first year in two years, and transitional course offerings;
- a very active CSChE student chapter, which speaks of the leadership quality of some of the students in the Chemical Engineering program.

The PRT also identified areas for improvement. The most significant recommendation for the undergraduate program is to make a current contractual administrative staff permanent for the long-term sustainability of the co-op program. The PRT also noted that 3-4 additional faculty members should be hired in order to accommodate a modest increase in the number of incoming students, from approximately 110 currently to 120.

The Chair of the Chemical Engineering program submitted a response to the PRT Report on October 10, 2019. The response to both the PRT Report and the Program's Response was submitted by the Dean of the Faculty of Engineering and Architectural Science on November 26, 2019.

The Academic Standards Committee completed its assessment of the Chemical Engineering Program Review on January 23, 2020. The Committee indicated that a thorough, analytical and self-critical program review was conducted. The School integrated into the developmental plan feedback from students, alumni, employers and peer reviewers, and outlined a comprehensive plan for program enhancements moving forward.

The Academic Standards Committee recommends that the program continue, as well as provide a one-year follow-up report by June 30, 2021, as follows:

1. Review learning outcomes with Curriculum Quality Assurance to ensure alignment with current practice;
2. Revisit the co-op employer survey to elicit feedback from more employers;
3. Review and ensure course outlines follow the university template, with particular attention to communication regarding policies for academic and religious or other accommodations.

Presented to Senate for Approval: March 3, 2020

Start date of next Periodic Program Review: 2024-25

SUMMARY OF THE REVIEWERS' RECOMMENDATIONS WITH THE PROGRAM'S AND DEAN'S RESPONSES

RECOMMENDATION 1. The Department should look at the reasons behind the relatively low retention and graduation rates. Despite existing mechanisms toward student's success, first year retention rate seems to be too high. Measures should then be taken to at least consistently reach the retention and graduation rates of FEAS.

Department's Response: The Department has also noted these lower statistical numbers for retention and graduation rates. The Department will refer to its Curriculum Committee for further investigation, with the objective to provide possible reasons for the relatively low retention and graduation rates. Furthermore, the Curriculum Committee will provide a plausible course of action to be taken to increase the retention and graduation rates to at least match those of the FEAS rates.

Dean's Response: not specifically addressed.

RECOMMENDATION 2. The curriculum review committee should investigate practical ways to increase the number of professional elective courses offering.

Department's Response: The Department agrees with the PRT to increase the number of professional elective courses offered each year. This greater pool of professional elective courses offered annually will benefit the

students with their educational experience and career choices. The Department will refer to its Curriculum Committee as to ways to increase the number of professional elective courses offered annually. A solution would be to increase the number of professional elective courses in the seventh and eight semesters from which the students can select. This solution would of course require an increase in the number of faculty required to teach the extra professional elective courses, which will increase the teaching workload and cost for the Department. This possible solution and added cost will be discussed with the Dean for additional financial resources.

Dean's Response: The Department will look at ways to improve the range of technical elective course offerings.

RECOMMENDATION 3. The curriculum review committee should critically review the prerequisites for upper year courses and remove them when not absolutely necessary. The department should also investigate options to bring more flexibility in the promotion rules.

Department's Response: The Department realizes that the prerequisites are holding back some students that are not following the normal course sequence for a number of reasons, such as failing a course, not following the co-op work term sequence or taking a lighter course load. The Department will ask its Curriculum Committee to review the prerequisites of all the chemical engineering undergraduate courses, and to provide recommendations for removal if they are not necessary. There are no promotion rules in the department; students are allowed to take courses if they have the necessary prerequisites.

Dean's Response: The Department will review its prerequisite structure to ensure that prerequisites are appropriate and that student progression is not unnecessarily impeded.

RECOMMENDATION 4. The Department should explore best practices to prepare TA for their job (with clear expectation of their duty and time commitment). It is recommended to also initiate a formal TA evaluation process by the students.

Department's Response: The Department has already in place, as required by the CUPE 3 collective agreement, the requirement that instructors meet with their TA at the start of the semester to outline and agree upon the TA's responsibilities and time commitment for each task. The instructor also meets with the TA at midpoint and end of semester to provide evaluative feedback. A formal TA evaluation process by the students will require the agreement between the university and the TA's union (CUPE 3).

Dean's Response: not specifically addressed.

RECOMMENDATION 5. The Department should make every effort to fully establish a departmental culture where students are the priority, to avoid undesired "incidents" like inappropriate comments in class, instructors not showing up regularly for some undergraduate labs, unannounced class cancellation or lax invigilation during tests and exams.

Department's Response: Instructors will be reminded about Ryerson's Workplace Civility and Respect Policy, and are referred to Ryerson's Guide to Civility. In addition, the Department will schedule a civility training session through Ryerson's Human Resources for all faculty and staff this academic year. Instructors are reminded to inform students in advance or through D2L of any class cancellations barring any unforeseen reasons. Moreover, instructors will be asked to attend the undergraduate labs in their courses if possible. They will also be asked to be present during their exams and review, along with their invigilators, their invigilation duties.

Dean's Response: It is a priority for the Faculty to develop a student-centered culture in all Departments. The Faculty has established an "all-in approach" to all Faculty activities which will continue to develop and enhance the student experience.

RECOMMENDATION 6. The Department should establish pre-semester meetings between instructors to ensure reasonable time expectations from students for each course, as well as good distribution of course deliverables.

Department's Response: The Undergraduate Program Director will endeavour to schedule this pre-semester meeting for the purpose of spreading out the course assessments for a given cohort of students and to determine

the time expectations from students for each course.

Dean's Response: Please see response to Recommendation 5.

RECOMMENDATION 7. The Department could better take advantage of the services the Library can offer.

Department's Response: The Department will investigate with Ryerson's library as to the appropriate workshops that are beneficial to the students in the capstone course. This may include literature review techniques and database searches.

Dean's Response: not specifically addressed.

Recommendations that would involve FEAS and possibly the University:

RECOMMENDATION 8: Make the current contractual administrative staff permanent.

Department's Response: The Department thank the PRT for making this recommendation. This contractual administrative staff position is vital for both assisting the department and administrating the large mandatory co-op program. This position became permanent on August 1, 2019.

RECOMMENDATION 9: There are some very old undergraduate lab setups that should be discarded and replaced, likely with financial help of the FEAS and/or University.

Department's Response: The Process Measurements Laboratory was currently renovated and updated. The Department will review the lab equipment in the Unit Operations Laboratory and take the necessary action. Laboratory equipment in the Unit Operations Laboratory is very costly and will require financial assistance from the Dean.

Dean's Response: not specifically addressed. See response to recommendation 10 below.

RECOMMENDATION 10: Address the absence of wheelchair access in some undergraduate laboratories (specifically KHN 002/004).

Department's Response: The Department thank the PRT for this recommendation, which the Department has been working on for some time. The Department has raised this issue with Ryerson's Accessibility Coordinator and a Project Manager in Ryerson's Facilities Management and Development (FMD) Department. This issue is being addressed at FMD; however, any large renovation recommendations from FMD such as for wheelchair access require funding approval from the university. The Department also requests that the Dean work with the Provost in finding funds to pay for this necessary accessibility renovation which the Department has communicated with the Vice-Provost Academic Office in February 2010.

Dean's Response: The Faculty recognizes issues related to accessibility of undergraduate labs, and has been working with Facilities Management and Development (FMD) to secure wheelchair access to the undergraduate labs that are currently inaccessible.

RECOMMENDATION 11: Better communicate with Faculties that offer service courses (Math, Physics, Computer Science) desirable course content that would be more relevant to engineering students. There are also some logistical issues around scheduling that should be looked at.

Department's Response: The Department requests that the Dean place this issue for discussion with the Faculty's Undergraduate Studies Committee, and that the Associate Dean, Undergraduate Studies, communicate and work the math, physics and computer science departments for appropriate course content for engineering students.

Dean's Response: Specific curricular development efforts will be made to improve experiences for greater interdisciplinarity and flexibility for students within the department, across the Faculty and university.

RECOMMENDATION 12: Being the only mandatory co-op program within FEAS is both a strength and a challenge. The challenge is the amount of resources required to effectively run a co-op program. The PRT suggests that the

Chemical Engineering Department further explore with the Dean and Chairs in other FEAS Departments the possibility of expanding mandatory co-op in other programs. With more programs involved, it is likely more resources would be devoted to co-op at both the Faculty and University levels.

Department's Response: The other programs currently have an optional 12-16 months internship program after the third year. The Department requests that the Dean place this issue for discussion with the Faculty's Undergraduate Studies Committee and/or in one of the Dean's group meetings with Chairs and Associate Deans.

Dean's Response: The Faculty of Engineering and Architectural Science recognizes the value of the program to students, faculty and the public at large. As such, needed ongoing investments will be made to ensure its continued contribution to the discipline and community. Specific curricular development efforts will be made to improve experiences for greater interdisciplinarity and flexibility for students within the department, across the Faculty and university. Finally, proper staffing will support these goals in a reliable and sustainable manner.

ADDITIONAL PROGRAM RECOMMENDATIONS IN SELF STUDY

1. Increase the faculty complement
2. Increase the office staff complement
3. Get more resources for the co-op component
4. Offer more courses in spring/summer semester
5. Promote wellness, sensitivity and inclusivity attributes in faculty and staff
6. Continually review and improve program curriculum
7. Promote extra-curricular activities of students

IMPLEMENTATION PLAN

Recommendation #1: The Department should look at the reasons behind the relatively low retention and graduation rates.
Objective: To have the program's Curriculum Committee investigate for plausible reasons behind the relatively low retention and graduation rates.
Timeline: Short term
Responsibility for leading initiative: Curriculum Committee Chair
Responsibly for approving recommendation, providing any resources made necessary by the recommendation, and overall monitoring of the implementation of the recommendation: Faculty Dean

Recommendation #2: The curriculum review committee should investigate practical ways to increase the number of professional elective courses offering.
Objective: To have the program's Curriculum Committee look into possible ways to increase the number of professional elective courses offered annually.
Timeline: Short term
Responsibility for leading initiative: Curriculum Committee Chair
Responsibly for approving recommendation, providing any resources made necessary by the recommendation, and overall monitoring of the implementation of the recommendation: Faculty Dean

Recommendation #3: The curriculum review committee should critically review the prerequisites for upper year courses and remove them when not absolutely necessary.
Objective: To have the program's Curriculum Committee review the prerequisites of all chemical engineering undergraduate courses.
Timeline: Short term

Responsibility for leading initiative: Curriculum Committee Chair
Responsibly for approving recommendation, providing any resources made necessary by the recommendation, and overall monitoring of the implementation of the recommendation: Faculty Dean

Recommendation #4: The Department should explore best practices to prepare TA for their job (with clear expectation of their duty and time commitment).
Objective: To continue the hiring and evaluation process already in place for TAGA.
Timeline: Ongoing
Responsibility for leading initiative: Department Chair & Administrative Manager
Responsibly for approving recommendation, providing any resources made necessary by the recommendation, and overall monitoring of the implementation of the recommendation: Faculty Dean

Recommendation #5: The Department should make every effort to fully establish a departmental culture where students are the priority.
Objective: To have department chair discuss this priority with faculty and staff.
Timeline: Ongoing
Responsibility for leading initiative: Department Chair
Responsibly for approving recommendation, providing any resources made necessary by the recommendation, and overall monitoring of the implementation of the recommendation: Faculty Dean

Recommendation #6: The Department should establish pre-semester meetings between instructors to ensure reasonable time expectations from students for each course, as well as good distribution of course deliverables.
Objective: To have the undergraduate program director meet with instructors before the start of each semester to discuss distribution of course expectations and evaluations.
Timeline: Ongoing
Responsibility for leading initiative: Undergraduate Program Director
Responsibly for approving recommendation, providing any resources made necessary by the recommendation, and overall monitoring of the implementation of the recommendation: Faculty Dean

Recommendation #7: The Department could better take advantage of the services the Library can offer.
Objective: To have the capstone project coordinator continue working with the Ryerson library staff to implement appropriate workshops in the capstone course.
Timeline: Ongoing
Responsibility for leading initiative: Capstone Project Coordinator
Responsibly for approving recommendation, providing any resources made necessary by the recommendation, and overall monitoring of the implementation of the recommendation: Faculty Dean

Recommendation #8: Make the current contractual administrative staff permanent.
Objective: The position became permanent on August 1, 2019.

Timeline: Done
Responsibility for leading initiative: Department Chair
Responsibly for approving recommendation, providing any resources made necessary by the recommendation, and overall monitoring of the implementation of the recommendation: Faculty Dean

Recommendation #9: There are some very old undergraduate lab setups that should be discarded and replaced, likely with financial help of the FEAS and/or University.
Objective: To review the lab equipment in the Unit Operations Laboratory and take the necessary action.
Timeline: Short term
Responsibility for leading initiative: Department Chair
Responsibly for approving recommendation, providing any resources made necessary by the recommendation, and overall monitoring of the implementation of the recommendation: Faculty Dean, Provost

Recommendation #10: Address the absence of wheelchair access in some undergraduate laboratories (specifically KHN 002/004).
Objective: To continue working with university administration to implement and fund renovations for wheelchair access to KHN 002/004.
Timeline: Ongoing
Responsibility for leading initiative: Department Chair
Responsibly for approving recommendation, providing any resources made necessary by the recommendation, and overall monitoring of the implementation of the recommendation: Faculty Dean, Provost

Recommendation #11: Better communicate with Faculties that offer service courses (Math, Physics, Computer Science) desirable course content that would be more relevant to engineering students.
Objective: To request the Dean to place this issue for discussion with the Faculty's Undergraduate Studies Committee, and that the Associate Dean, Undergraduate Studies, communicate and work with the math, physics and computer science departments for appropriate course content for engineering students.
Timeline: Short term
Responsibility for leading initiative: Department Chair
Responsibly for approving recommendation, providing any resources made necessary by the recommendation, and overall monitoring of the implementation of the recommendation: Faculty Dean

Recommendation #12: The PRT suggests that the Chemical Engineering Department further explore with the Dean and Chairs in other FEAS Departments the possibility of expanding mandatory co-op in other programs.
Objective: To request the Dean to place this issue for discussion with the Faculty's Undergraduate Studies Committee and/or in one of the Dean's group meetings with Chairs and Associate Deans.
Timeline: Short term
Responsibility for leading initiative: Department Chair
Responsibly for approving recommendation, providing any resources made necessary by the

recommendation, and overall monitoring of the implementation of the recommendation:
Faculty Dean

Recommendation #13: Review learning outcomes with Curriculum Quality Assurance to ensure alignment with current practice.

Objective: To work with one of Ryerson's curriculum consultants on the language and wording of the learning outcomes.

Timeline: Short term

Responsibility for leading initiative: CEAB Coordinator

Responsibly for approving recommendation, providing any resources made necessary by the recommendation, and overall monitoring of the implementation of the recommendation:

Faculty Dean

Recommendation #14: Revisit the co-op employer survey to elicit feedback from more employers.

Objective: To improve on the number of employer feedback.

Timeline: (e.g., immediate, short term, longer term) Short term

Responsibility for leading initiative: Co-op Faculty Advisor

Responsibly for approving recommendation, providing any resources made necessary by the recommendation, and overall monitoring of the implementation of the recommendation:

Faculty Dean

Recommendation #15: Review and ensure course outlines follow the university template, with particular attention to communication regarding policies for academic and religious or other accommodations.

Objective: To review and ensure course outlines follow the university template each semester.

Timeline: Ongoing

Responsibility for leading initiative: Undergraduate Program Director

Responsibly for approving recommendation, providing any resources made necessary by the recommendation, and overall monitoring of the implementation of the recommendation:

Faculty Dean

Recommendation #16: Consider the additional recommendations outlined in the self- study and take action as required.

Objective: To act upon the following three additional recommendations outlined in the self-study:

1. Promote wellness, sensitivity and inclusivity attributes in faculty and staff
2. Continually review and improve program curriculum
3. Promote extra-curricular activities of students

Timeline: Short term

Responsibility for leading initiative: Department Chair

Responsibly for approving recommendation, providing any resources made necessary by the recommendation, and overall monitoring of the implementation of the recommendation:

Faculty Dean