



Computer Engineering Final Assessment Report & Implementation Plan

Faculty / Affiliated University College	Faculty of Engineering
Degrees Offered	BESc
Modules Reviewed	Computer Engineering
External Consultants	<p>Dr. Michael Greenspan, Professor and Department Head Department of Electrical and Computer Engineering Queen's University</p> <p>Dr. Vincent Gaudet, Professor and Chair Department of Electrical and Computer Engineering University of Waterloo</p>
Internal Reviewer	<p>Dr. John D. Cuciurean, Associate Professor Associate Dean (Undergraduate Admissions and Programs) Don Wright Faculty of Music</p>
Date of Site Visit	November 26, 2018
Evaluation	Good Quality
Approval Dates	<p>SUPR-U: May 15, 2019 SCAPA: May 29, 2019 Senate (For FYI): June 7, 2019</p>
Year of Next Review	2026-27

In accordance with Western's Institutional Quality Assurance Process (IQAP), the Final Assessment Report provides a summary of the cyclical review, internal responses and assessment and evaluation of the undergraduate modules delivered by the Department of Electrical and Computer Engineering. This report considers the following documents: the program's self-study, the external consultants' report and the responses from the Department and Faculty. The Final Assessment Report identifies the strengths of the program, opportunities for program enhancement and improvement and details and prioritizes the recommendations of the external consultants and prioritizes those recommendations that are selected for implementation.

The Implementation Plan details the recommendations from the Final Assessment Report that are selected for implementation, identifies who is responsible for approving and acting on the recommendations, any action or follow-up that is required and the timeline for completion.

The Final Assessment Report and Implementation Plan is sent for approval through SUPR-U, SCAPA, Senate and the Ontario Universities' Council on Quality Assurance and is made available on a publicly accessible location on Western's IQAP website. The Final Assessment Report and Implementation Plan is the only document resulting from the undergraduate cyclical review process that is made public, all other documents are confidential to the Program/Faculty and SUPR-U.

Executive Summary

The Computer Engineering program is one of the three undergraduate programs offered by the Department of Electrical and Computer Engineering. The program has been continuously accredited by the Canadian Engineering Accreditation Board (CEAB) since 2001. The current IQAP review was being done concurrently with a CEAB review. The IQAP Reviewers were provided with the self-study brief which included: course descriptions, class sizes, module information, teaching evaluations, percentage of courses taught by full-time faculty, library resources, and the curriculum vita of faculty members.

On the day of the review, the reviewers met with the Vice Provost (Academic Programs), the Acting Chair of the Department of Electrical and Computer Engineering, the Associate Dean (Undergraduate Studies), and the Acting Dean of Engineering. Group meetings were held separately with faculty members, students, administrative staff and technical staff. Overall, the reviewers' impression of the program was positive, and they were particularly impressed by "the new Engineering building, including its inviting student study spaces" which they posit, "appears to have given new energy to the department." The reviewers also positively acknowledged the technical staff who, "appear to be very highly engaged and supportive."

The reviewers did not have any concerns with the consistency of the program in relation to Western's mission, values, strategic priorities, academic plans, nor did they express any concerns regarding the clarity and appropriateness of the program's requirements and associated learning outcomes in relation to Western's Degree Outcomes.

The reviewers commented on how the curriculum, which has been revised and modernized since the last IQAP review in 2013, now provides "a greater focus on higher-level aspects of computing, reflecting a contemporary approach to computer engineering." However, they expressed concerns that some courses may be out of sequence and that further revision is still warranted. They also liked the innovative focus on "ubiquitous computing", which they felt "serves to distinguish the Computer Engineering program from both the Electrical Engineering and Software Engineering programs at Western, as well as other similar programs at other universities." But they also felt that the term "ubiquitous" was not being used to its full potential in the curriculum and program structure. (More to follow on this concern below.)

They felt that the modes of delivery (ie. lectures, laboratories) and the modes of assessment were appropriate and effective in meeting the program's identified learning outcomes. They were particularly impressed by the fact that "exams are reviewed by faculty colleagues in order to ensure quality (and as a mechanism to provide guidance to more junior members)." Concerning evidence of the appropriateness and effectiveness of the methods of teaching and assessment in demonstrating achievement of the program learning objectives and the degree level expectations, the reviewers had no concerns. However they did observe that the students they spoke with expressed "a desire to be formally exposed to a greater range of programming languages throughout their program, which is currently heavily slanted toward Java."

The reviewers had some concerns with the “large number of courses that appear to be delivered by non-regular faculty members” (as reported below), but otherwise they had no concerns with the other resources for the program, including the library, information technology, and laboratories. Nor did they have any concerns about the class sizes in relation to the learning objectives or opportunities for, and supervision of, experiential learning.

Significant Strengths of the Program

The following program strengths are identified in both the self-study and the External Consultants’ Report:

- New Engineering building and associated facilities/laboratories
- Greater focus on higher-level aspects of computing reflecting a contemporary approach to the field
- Focus on “ubiquitous computing” as distinguishing and unique approach in the field
- Dedicated and enthusiastic technical staff and laboratories
- High-quality delivery of courses by engaged faculty
- Recently redesigned/introduced first and second year courses that engage students in professional behavior and introduce significant design activity earlier in the program
- Recent increases in program enrollment figures to “healthy levels”

Summary of the Reviewers’ Key Recommendations and Department/Faculty Responses

1. The reviewers were “concerned about the large number of courses that appear to be delivered by non-regular faculty members. ... Since the Computer Engineering program has grown significantly in the past few years, it should be supported by a greater number of regular faculty members with expertise in the area.” The departmental response indicates that they continue to “work with the University administration on expanding the number of regular faculty members.” Moreover, they have “undertaken an initiative to streamline the many programs and options that are offered and expect to find efficiencies as well as being able to quickly respond to student demands in removing courses that lack sufficient enrolment as well as offer new courses that address long-term industry needs.”
2. As indicated above under the ‘Executive Summary’ section, the reviewers felt that “the term ‘ubiquitous’ does not appear to have been specifically included in any course content or title.” They believe that “there is the potential to enhance the prominence of this theme in the program, and toward this end it may be worthwhile having one course per year that is more closely aligned with this innovative theme.” The department responded by acknowledging that “several courses include significant amount of content that covers principles of ubiquitous computing. Examples are: Mobile Networks (ECE 4436) and Digital Communications systems (ECE 4437).” However, the department agrees with the reviewers that “the visibility of this unique characterization can be substantially improved. We will include this aspect as an action item for the Computer Engineering Curriculum Committee (CECC).”
3. The reviewers observed that “the Computer Engineering program appears to have many commonalities with both the Electrical Engineering and the Software Engineering

programs.” They “suggest finding ways to make each program more distinct in nature.” In their response, the department reiterated the fact that they are “undertaking a comprehensive review of all the programs and initial recommendations are slated to be discussed within the program during this summer.”

There were no additional responses at the Faculty level to the External Consultants’ Report for any of the recommendations listed above. The Associate Dean of Engineering considered both the External Consultants’ Report and the Departmental Response Letter to be “fair reflections of the state of the Computer Engineering program,” and believes that the Acting Chair of the Department of Electrical and Computer Engineering “has addressed the comments and suggestions of the Reviewers in a comprehensive manner and I find nothing that would require additional comment from a Faculty perspective.”

Other Opportunities for Program Improvement and Enhancement

1. In their conclusion under “Quality Enhancement,” the reviewers noted that one item that might be considered for further program enhancement “is to further expand and entrench the theme of ubiquitous computing into the curriculum. Also, it would be of benefit to realign some of the fundamental software courses to provide a better flow.” This suggestion for further improvement overlaps significantly with recommendations 2 and 3 above. The Department acknowledged that there remains room for improvement and they are currently reviewing all programs within the Department of Electrical and Computer Engineering. They expect this effort will provide “significant quality enhancements.” They expressed some regret in “not including information about these planned quality enhancements” in the documentation provided to the reviewers.
2. The reviewers reported that “some students expressed concerns about the very low number of female students in the program. [While] this is certainly not unique to Western’s Computer Engineering program, more efforts should be put into recruitment as well as support.” They also pointed out that “there is the opportunity to better promote to the undergraduate cohort the opportunities and benefits of continuing on to a graduate degree.” In response, the department acknowledged that “Western Engineering has deemed this as a key priority and substantial effort has been put toward recruitment of female students. The department recruited two new female faculty members in 2017 and they have been enthusiastically supporting these recruitment efforts.” The department also indicated that they agree “with the need to better promote the opportunities and benefits of continuing-on to graduate studies and will continue building up the promotion activities.”
3. Concerning TA support, the reviewers felt that current support of ca. one TA per fifty undergraduate students is merely sufficient and suggested that “it may be worthwhile considering making use of upper-year undergraduate TA s to aid in the delivery of lower year labs.” Neither the department nor the faculty responded to this suggestion.
4. The reviewers also observed that the three administrative staff members in the student services area, while lean, are well supported by the faculty-level staff and processes. However they recommended that “it would be worthwhile monitoring to make sure that this level of departmental staffing is not too lean, as can happen during cyclically busy

periods, or if someone is on leave.” Again, neither the department nor the faculty responded to this suggestion.

Implementation Plan

The Implementation Plan provides a summary of the recommendations that require action and/or follow-up. The Department Chair, in consultation with the Dean of the Faculty will be responsible for monitoring the Implementation Plan. The details of progress made will be presented in the Deans’ Annual Report and filed in the Office of the Vice-Provost (Academic).

Recommendation	Proposed Action and Follow-up
1. Ensure appropriate faculty resources with expertise in Computer Eng for program delivery purposes	Chair to discuss faculty needs with the Dean and Provost
2. Further expand and entrench the theme of ‘ubiquitous computing’ into the curriculum	Computer Eng Faculty examine their program structure and course outlines with a view toward further updating the program and course offerings such that ‘ubiquitous computing’ is emphasized at the curriculum level across the entire program
3. Find ways to make the Computer Eng program more distinct in nature from both the Electrical & Software Eng programs	ECE Department Faculty Members examine curriculum and respective program structures with the view toward further distinguishing the 3 programs offered by the department