Electrical and Computer Engineering
Final Assessment Report & Implementation Plan
March 2023

Faculty / Affiliated University College	Engineering	
Degrees Offered	MEng-GDip, MEng, MESc and PhD	
Date of Last Review	2013-2014	
Approved Fields	Applied Electrostatics & Electromagnetics Biomedical Systems Communication Systems and Data Networking Microsystems & Digital Signal Processing Power Systems Engineering Robotics & Control Software Engineering	
External Reviewers	Dr. Abraham Fapojuwo, Dept. of Electrical & Software Engineering University of Calgary	Dr. Jiying Zhao, School of Electrical Engineering & Computer Science (EECS) University of Ottawa
Internal Reviewers	Dr. Catherine Nolan, Don Wright Faculty of Music	
Date of Site Visit	October 24, 25 & 27, 2022	
Date Review Report Received	November 17, 2022	
Date Program/Faculty Response Received	Program: March 9, 2023 Faculty: March 9, 2023	
Evaluation	Good Quality	
Approval Dates	SUPR-G: April 24, 2023 ACA: May 10, 2023 Senate (for information): May 19, 2023	
Year of Next Review	Year of next cyclical review: 2029-2030	
Progress Report	June 2025	

Overview of Western's Cyclical Review Assessment Reporting Process

In accordance with Western's Institutional Quality Assurance Process (IQAP), the Final Assessment Report (FAR) provides a summary of the cyclical review, internal responses, and assessment and evaluation of the Electrical and Computer Engineering Graduate Program delivered by the Faculty of Engineering.

This FAR considers the following documents:
- the program's self-study brief;
- the external reviewers' report;
- the response from the Program; and
- the response from the Dean, Faculty of Engineering.

This FAR identifies the strengths of the program and opportunities for program enhancement and improvement, and details the recommendations of the external reviewers – noting those recommendations to be prioritized for implementation.

The Implementation Plan details the recommendations from the FAR that have been selected for implementation, identifies who is responsible for approving and acting on the recommendations, specifies any action or follow-up that is required, and defines the timeline for completion.

The FAR (including Implementation Plan) is sent for approval through the Senate Graduate Program Review Committee (SUPR-G) and ACA, then for information to Senate and to the Ontario Universities' Council on Quality Assurance. Subsequently, it is publicly accessible on Western's IQAP website. The FAR is the only document from the graduate cyclical review process that is made public; all other documents are confidential to the Faculty of Engineering, the School of Graduate & Postdoctoral Studies (SGPS), and SUPR-G.

Executive Summary

The Department of Electrical and Computer Engineering offers graduate programs at the masters (M.ESc. and M.Eng.) and doctoral (Ph.D.) levels in the following research areas: biomedical systems, communications systems and data networking, applied electrostatics and electromagnetics, microsystems and digital signal processing, power systems engineering, robotics and control and software engineering.

The graduate programs offered in the Department of Electrical and Computer Engineering (ECE) have two themes with distinct objectives: (i) a Professional theme that leads to the MEng degree (total enrolment of 112 in 2019-20), and (ii) a Research theme that leads to the MESc degree (total enrolment of 49 in 2019-20) and PhD degree (total enrolment of 91 in 2019-20).

The program self-study was informed by a combination of graduate student and faculty surveys. The results of which were discussed in an annual retreat as well as with the

graduate committee. Student surveys in 2020 (n=95) and in 2021 (n=112) covered questions about research facilities and resources; supervision; courses; and program quality.

The external reviewers shared a positive assessment of the Electrical and Computer Engineering Graduate Program. They offer 18 recommendations for further enhancement.

Strengths and Innovative Features Identified by the Program

- ECE participates in multiple collaborative specializations: Artificial Intelligence, Musculoskeletal Health Research, Planetary Science & Exploration, Machine Learning in Health and Biomedical Sciences, and Engineering in Medicine.
- Collaborative relationships with Robarts Research Institute (RRI), the Canadian Surgical Technologies and Advanced Robotics (CSTAR) research centre, and Western Institute for Earth & Space Exploration provide graduate students with opportunities to conduct inter-disciplinary research.
- Thirty travel grants are awarded every academic year to enable graduate students to participate in National and International Conferences.
- Graduate students have the opportunity to present their research to faculty members in that field at a 2-day Graduate Symposium which is held every year.
- Annual awards are presented to graduate students who excel in TAships and research.
- An annual Distinguished Lecturer Series exposes students to field specific industry perspectives.
- International experts are routinely invited to deliver special lectures to enable students to gain advanced knowledge in that field.
- Student professional development is supported by career planning services offered by the Engineering Career Services Office.
- The required Research Communication Module milestone in the PhD program helps students clearly articulate their research plan from a critical perspective both orally and in writing and communicate research to various types of audiences.
- An online spreadsheet is available to the MEng student which details the core courses and suggested technical and non-technical electives that are offered in the current academic year. This facilitates efficient planning and timetabling for the student for smooth progression through the program.

Concerns and Areas of Improvement Identified and Discussed by the Program

- Staff workload and retention continues to be an issue which has the potential to create disruptions.
- Areas of improvement identified by MEng students include:
    - Offering greater choice and relevance of courses.

    - Extending program length to make student workload more manageable and more favorable for the visa process experienced by international students.
- Areas of improvement identified by MESc/PhD students include:
    - Greater diversity of courses needed, especially for Software Engineering students.
    - More “research-oriented courses”.
    - Increased funding/financial support packages.

Review Process

As part of the external review, the review committee, comprising two external reviewers, one internal reviewer and a graduate student reviewer, were provided with Volume I and II of the self-study brief in advance of the scheduled review and then met virtually (due to pandemic restrictions) over two days with the:

- Associate Vice-Provost of the School of Graduate & Postdoctoral Studies
- Vice-Provost, Academic Planning, Policy and Faculty
- Director, Academic Quality & Enhancement
- Dean of the Faculty of Engineering
- Associate Dean, Faculty of Engineering
- Department Chair
- Graduate Program Chair
- Graduate Program Committee Members
- Associate University Librarian
- Graduate Program and Department Staff
- Program Faculty Members
- Graduate Students

Following the virtual site visit, the external reviewers submitted a comprehensive report of their findings which was sent to the Program and Dean for review and response. Formative documents, including Volumes I and II of the Self-Study, the External Report, and the Program and Decanal responses form the basis of this Final Assessment Report (FAR) of the Electrical and Computer Engineering Program. The FAR is collated and submitted to the SGPS and to SUPR-G by the Internal Reviewer with the support of the Office of Academic Quality and Enhancement.

Summative Assessment – External Reviewers’ Report

External reviewers shared that “*the ECE program at Western is distinguished by three innovative aspects: 1) inter-disciplinary research and collaboration, 2) strong leveraging of the medical uniqueness and strength of Western, and 3) involvement in emerging and new technologies in the program’s six fields of study.”*

Strengths of the Program

- A combination of technical courses and non-technical professional development courses makes graduates of the ECE program at Western well-rounded individuals that are ready for the job market.
- Very strong relationships and collaboration between the Department and other units across Western.
- The cross-appointment of several ECE faculty members stimulate inter-disciplinary research among faculty and graduate students.
- ECE faculty are very well qualified with very strong expertise in their fields of research.
- The curriculum is creative in its design as it allows students flexibility to select up to two courses as substitutes from another field or department according to their research interest and professional goals.
- The facilities are current and make Western very attractive to prospective graduate students.

Areas of Concern or Prospective Improvement

1. Greater emphasis should be placed on depth (5 core courses) over breadth (3 technical electives).
2. The project component in graduate courses should be relevant to the student's thesis project topic, which could result in shorter time to completion.
3. Provide support to ECE faculty member(s) whose expertise is in the discontinued field to enable them transition to other research fields and boost morale.
4. Professors listed as "Supporting" could be more engaged to enhance their participation in teaching and/or supervision of graduate students.
5. Provide clarity on "Equivalent qualifications" that may be considered for Master's Programs admission, as well as qualifications "equivalent to Master's degree" for Doctoral programs admission.
6. Annual progress review for PhD students begins somewhat late in the program.
7. Consider equally integrating the research communication module as a milestone in the MESc program.
8. Student and Faculty dissatisfaction with split technical courses.
9. Administrative staff workload is particularly high.

Summary of the Reviewers' Recommendations and Program/Faculty Responses

The following are the reviewers' recommendations in the order listed by the external reviewers. Recommendations requiring implementation have been marked with an asterisk (*).

Reviewers' Recommendation	Program/Faculty Response
1. Place emphasis of the M.Eng. course requirements on depth rather than breadth. Specifically, let the M.Eng. students take 5 core courses in their field of specialization and 3 technical electives.*	**Program:** The ECE Graduate Committee approved a revised MEng course structure on January 13, 2023, to offer two course categories- core, and technical electives. The core course category will include 5 courses in the field of specialization of the respective stream, and it emphasizes depth. The technical elective category will include at least 6 courses in each stream where the students are required to select 3 courses. The elective courses include courses offered in ECE department and those in the similar field offered by other departments (e.g., MME and Computer Science). A respective program modification has been drafted for approval at various levels before it becomes effective from Fall 2023. **Faculty:** Dean's Office supports ECE's plan to change the course structure of MEng streams.
2. Give priority to hiring additional faculty in the research fields: Communication systems & data networking, Microsystems & digital signal processing, and Power systems engineering.	**Program:** In 2022, shortly after the IQAP review site visit, two new faculty members were hired – one in Communications and one in Power Systems. A position in the area of signal processing will be advertised in the winter of 2023. **Faculty:** ECE Department has recently hired faculty members in these fields and is currently planning an additional hire.
3. Increase the minimum GPA for M.Eng. admission to 78%.	**Program**: The minimum GPA requirement of 70% is used for MEng admissions for the following reasons: • set by SGPS as the university's minimum GPA requirement. • designed primarily for professionals in the industrial sector. This course-based program offers a healthy combination of breadth, depth, and application of knowledge in the field of specialization. • As in the case of this applied graduate program; it is common practice for Canadian universities offering this program to require a slightly lower GPA. It is notable that over 90% of applicants admitted to the MEng programs have GPAs higher than 75%. **Faculty:** Dean's Office supports the program decision to keep the minimum GPA for MEng admissions to the current level.

4. Commence the annual progress review of Ph.D. students after the first year, for both the normal entry and direct entry.	**Program:** As of June 2021, the Faculty of Engineering implemented a policy to monitor the progress of research graduate students; which emphasizes the need for annual advisory committee meetings. Students who are beyond their normal program length have their progress reviewed on a term-by-term basis. **Faculty:** As mentioned in the program's response, a faculty-wide policy was implemented to monitor the progress of research graduate students.
5. Introduce the research communication module to the students enrolled in the MESc. program.	**Program:** The current communications module that is required of all PhD students in the program is offered through the Faculty of Arts and Humanities. At this time, the program is unsure if it possible to offer to MESc students due to limited resources. **Faculty:** The Dean's Office covers the cost of the Research Communications Module for PhD students that is offered through the Faculty of Arts and Humanities. Due to budgetary constraints, it is not possible to offer it to all MESc students, however, due to the enrolment cap in each section, if spots become available in a section, they will be opened to interested MESc students.
6. Eliminate the split technical courses. *	**Program:** Eliminating split technical courses offered in the MEng programs and substituting them with sole MEng courses may address the issue of diverse curriculum needs between MEng and research students; however, the ECE department requires more faculty for this implementation. In the interim, the department is planning to hire Limited Duty instructors towards implementing this recommendation. **Faculty:** The split of technical courses for MEng and research students is crucial to ensure effective learning for students in each program. The hiring of new faculty members is subject to budgetary constraints. The Program may need to consider a transition plan to split courses through a combination of current faculty members and LD instructors.
7. Introduce an informal mechanism to document and demonstrate the level of research productivity performance of currently enrolled MESc. and Ph.D. students.*	**Program:** A mechanism for academic reporting of program students exists in the Pathfinder platform. The program will begin to review this data annually and present at the Department Council. **Faculty:** Dean's Office supports the program's proposed plan.

8. Introduce annual research productivity awards (i.e., cash awards) to reward MESc. and Ph.D. students who publish their research results while they are enrolled in the program.*	**Program:** The ECE graduate committee will need to review if this is feasible. The program will need to determine what the motivation for such an award is, then define a fair process and selection criteria. **Faculty**: The Dean's Office supports program's proposed plan but wishes to register some misgivings regarding the reviewers' recommendation.
9. Provide sufficient administrative staff resources commensurate with the expected increased enrolment in the M.Eng., MESc. and Ph.D. programs.	**Program:** A new Graduate Assistant has recently been recruited as a full-time administrative staff member who is primarily dedicated to the MEng program in the department. **Faculty:** The hiring of a new full-time Graduate Assistant to support MEng program provided sufficient administrative resources.
10. Make the Library a top priority for allocation of funding to acquire the required resources to support students and faculty.*	**Program:** ECE will appoint a representative to identify the necessary library resources that better support ECE and relay such information to the Library through regular interactions. **Faculty:** The funding allocations to Western's libraries are decided centrally. The Program will work with Western Libraries to ensure the availability of required resources and support for students and faculty, within libraries' available financial resources.
11. Revise the minimum funding policy to make students' take home amount match with their cost of living and attractive to prospective applicants.	**Program:** The graduate student funding policy is set by the Faculty Graduate Office in Engineering. The minimum financial support package in the Faculty of Engineering has recently been increased by $1,200 per year for both PhD and MESc students (effective January 2023). **Faculty:** As mentioned in the Program's response, the Faculty of Engineering has recently increased the minimum funding package by $1,200 per year for both PhD and MESc students. The Faculty will continue to review funding levels and seek opportunities to increase them.
12. Set the class size of M.Eng. courses appropriately to maintain high quality learning experience of students.*	**Program:** This issue pertains to very few courses; ECE 9013, ECE 9014 and one toggled course – ECE 9016. Through hiring Limited Duty instructors, efforts are being made to cap these courses to 60. **Faculty:** Dean's Office supports program's proposed plan.
13. Create at least two new research chairs, to attract more research funding and elevate the profile of the Department.	**Program:** Please refer to the Dean's response. **Faculty:** The Faculty will continue to seek every opportunity to hire high profile researchers to elevate its research profile.

14. Provide seed funding for collaborative research grants to faculty in the same and/or different research fields in the department.	**Program:** Western's Research Office provides seed funding for collaborative research through an open competition. **Faculty:** Such initiatives are supported through various programs offered by Western's Research Office and through start-up packages provided by the Faculty.
15. Offer the M.Eng. program via a modular delivery (a.k.a microcredentials).*	**Program:** Offering the MEng program in the modular format is certainly a good consideration. However, such an initiative needs thorough consultations and resource allocations. **Faculty:** The Dean's Office supports the program in considering such an initiative in future.
16. Reduce the TA workload to a similar level as at other Universities.*	**Program:** The typical TA workload is 140 or 70 hrs per term and is impacted by the availability of students with specific knowledge backgrounds to teach specific courses. While the heavier TA workload impacts students' time commitment to research activities, due to partial decoupling of the TA stipend from the guaranteed funding package, it is an additional financial source for students. The program will review the workload distribution of TAs and explore possible options to reduce the TA workload without affecting their financial benefits, which may include further decoupling of the TA stipend from the funding package. **Faculty:** Dean's Office agrees with the program's plan to explore possible options to reduce TA workload without affecting their financial benefits.
17. Evaluate the pros and cons of having one centralized graduate office at the Faculty level, in order to find a balance between efficiency and independence.*	**Program:** The Faculty Graduate Office and Departments in the Faculty of Engineering are discussing a plan for more central support to graduate programs. **Faculty:** The Faculty of Engineering has seen a significant growth in the graduate programs, particularly the MEng program. Providing sufficient administrative support to graduate programs is crucial to ensure the sustainability of graduate programs and student support. The Dean's Office is currently reviewing a plan to provide additional administrative staff support centrally through the Faculty Graduate Office to complement the graduate programs in the departments without infringing on department autonomy.
18. Continue to pay attention to the M.Eng. common space and office space for research students.	**Program:** Currently, a study space is available in the Spencer Engineering Building (dedicated space for MEng students only). Research students are allocated to the corresponding supervisors; since Covid, there has not been any major issues. **Faculty**: As mentioned in the program's response, currently a dedicated study space for MEng student is available in the Spencer Engineering Building. Western Engineering is constructing a new building. The

	building is expected to be ready by 2025. There is a plan to include additional study space for MEng students in the new building.

Implementation Plan

The Implementation Plan provides a summary of the recommendations that require action and/or follow-up. In each case, the Graduate Program Chair, in consultation with the SGPS and the Dean of the Faculty is responsible for enacting and monitoring the actions noted in the Implementation Plan.

The number of recommendations prioritized for implementation has been reduced as some are already being actioned (#2, #9, #11, #13, #14, #18) or have been deemed not to move ahead (#3, #4, #5) as described in the program and faculty responses above. As a result, the recommendations appearing in the implementation table are recommendations #1, #6, #7, #8, #10, #12, #15, #16, and #17.

Recommendation	Proposed Action and Follow-up	Responsibility	Timeline
Recommendation #1: Have the M.Eng. students take 5 core courses in their field of specialization and 3 technical electives.	Once approved, implement changes to the course structure of the MEng streams. Collect feedback from students and feedback following the first year of implementation.	Graduate Chair ECE Graduate Committee	By September 2023
Recommendation #6: Eliminate the split technical courses.	Recruit Limited Duty instructors to offer sole MEng courses. In the longer term, tie the instruction of these courses into the justification of faculty hiring requests.	Graduate Chair Dean's Office	By September 2024 (for recruitment of LD instructors)
Recommendation #7: Introduce an informal mechanism to document and demonstrate the level of research productivity performance of M.ESc. and Ph.D. students.	Use the Pathfinder platform to annually review data on MESc and PhD students research output and present this at the Department Council.	Graduate Chair ECE Graduate Committee	By September 2023

Recommendation #8: Introduce annual research productivity awards to reward M.ESc. and Ph.D. students who publish their research results while they are enrolled in the program	Review feasibility of this type of initiative. If favorable and feasible, outline and communicate a process and selection criteria.	Graduate Chair ECE Graduate Committee	By January 2024
Recommendation #10: Ensure that the Library has the required resources to support students and faculty.	Appoint a representative to liaise with the Library to identify the necessary library resources that best support ECE students and faculty members.	Graduate Chair ECE Graduate Committee	By May 2024
Recommendation #12: Set the class size of M.Eng. courses appropriately to maintain high quality learning experience of students.	Hire Limited Duty (LD) instructors to help reduce class sizes in courses such as ECE 9013, ECE 9014, and ECE 9016 with a cap at 60 students per course.	Graduate Chair Dean's Office	By September 2024
Recommendation #15: Offer the M.Eng. program via a modular delivery (a.k.a microcredentials).	Begin consultation to determine the feasibility of this recommendation as well as the resource implications to action it.	Graduate Chair ECE Graduate Committee	By September 2024
Recommendation #16: Reduce the TA workload to a similar level as at other Universities.	Review TA workload distribution with the aim of reducing this workload without affecting TA financial benefits.	Graduate Chair ECE Graduate Committee Associate Dean	By September 2024

Recommendation #17: Evaluate option of having one centralized graduate office at the Faculty level, in order to find a balance between efficiency and independence.	Review and implement the plan to provide additional administrative staff support centrally through the Faculty Graduate Office to complement the graduate programs in the departments.	Dean's Office	By September 2024

Other Opportunities for Program Improvement and Enhancement

- A blended delivery mode may be appropriate for M.Eng. part-time students. Also, some students enrolled in the M.Eng. full-time program may benefit from a blended delivery, depending on the course.