

**CARLETON UNIVERSITY COMMITTEE ON
QUALITY ASSURANCE
Cyclical Review of the undergraduate programs
in Mechanical Engineering, Aerospace Engineering and Biomedical and Mechanical
Engineering
Executive Summary and Final Assessment Report**

This Executive Summary and Final Assessment Report of the cyclical review of Carleton's undergraduate programs in **Mechanical Engineering, Aerospace Engineering and Biomedical and Mechanical Engineering** are provided pursuant to the provincial Quality Assurance Framework and Carleton's Institutional Quality Assurance Process (IQAP).

EXECUTIVE SUMMARY

The undergraduate programs in Mechanical Engineering, Aerospace Engineering and Biomedical and Mechanical Engineering reside in the Department of Mechanical and Aerospace Engineering, a unit administered by the Faculty of Engineering and Design.

As a consequence of the review, the programs were categorized by Carleton University's Senate Quality Assurance and Planning Committee (SQAPC) as being of good quality. (Carleton's IQAP 7.2.13-7.2.14).

The External Reviewers' report offered a very positive assessment of the programs. Within the context of this positive assessment, the report nonetheless made a number of recommendations for the continuing enhancement of the programs. These recommendations were productively addressed by the Director of the Department of Mechanical and Aerospace, and the Dean of the Faculty of Engineering and Design in responses to the External Reviewers' report and Implementation Plan that was submitted to SQAPC on June 23, 2022.

UNIT RESPONSE AND IMPLEMENTATION PLAN

Programs Being Reviewed:

Prepared by (name/position/unit):

External Reviewer Recommendation & Categorization	Unit Response (choose only one for each recommendation): 1- Agreed to unconditionally 2- Agreed to if additional resources permit (describe resources) 3- Agreed to in principle 4- Not agreed to Rationales are required for categories 2, 3 & 4	Action Item	Owner	Timeline	Will the action described require calendar changes? (Y or N)
1. The four year plan for students is inflexible and poses equity concerns for students experiencing difficulty both with their academic career and in their personal lives. Suggest providing a five year timeline in addition to the four year timetable for each program such that students could opt for a longer degree program with less coursework per term. This would also provide additional options for students that must retake courses. (Opportunity)	<i>4- Not agreed to</i>	<i>Associate Chair (Undergraduate Student Affairs - Academic Advising) is already advising students with choices when a four-year timeline is no longer possible.</i>	<i>N/A</i>	<i>N/A</i>	<i>N</i>
2. While steps are clearly being taken by the Dean to provide better inclusion for female students, indigenous students, and students of colour, there remains a distinct lack of equity programming designed to level the playing field. Through no fault of their own some students may be coming from disadvantaged communities that are not capable of properly preparing them for their undergraduate education period suggest investigating ways in which students from disadvantaged backgrounds could be ramped up during their first year (potentially during a gap	<i>3- Agreed to in principle</i>	<i>Engage Associate Dean to implement EDI instruction during first-year ECOR course. Longer term, we will investigate creating an associate chair position for EDI. In exchange for teaching relief, this faculty member would create specific supports for minorities and underrepresented groups.</i>	<i>Chair and Associate Chair</i>	<i>2022/2023</i>	<i>N</i>

<p>filling year) to improve student equity. (Opportunity)</p>					
<p>3. The University Strategic Mission #2 is to ‘serve Ottawa/serve the world.’ It is clear that the existing co-op program, while only used by 30% of students, serves the Ottawa area, there is little evidence that the department of mechanical and aerospace engineering is doing much to ‘serve the world’ (a lofty goal, indeed). There are references to some international collaborations in the supplied documentation with the University of Toulouse, Nagoya university, and Tohoku University, but the nature of the collaboration seems unclear. Suggest exploring opportunities for Carleton to establish student exchange opportunities with one or two universities in foreign countries to augment the existing co-op program in relation to experiential learning. (Opportunity)</p>	<p><i>2- Agreed to if additional resources permit (describe resources)</i></p>	<p><i>Explore inside the department the possibility of creating steady interchange of students between sister departments in the world. For example, Prof. Xiao Huang has international research collaborations with the University of Toulouse that could be expanded towards undergraduate endeavors.</i></p> <p><i>Discuss with the University’s administration (international office) regarding course equivalency, tuition fees, scholarships, and accommodations.</i></p>	<p><i>Chair and Associate Chair</i></p>	<p><i>2022/2023</i></p>	<p><i>N</i></p>
<p>4. Through interviews, the external reviewers discovered that most courses offered in the Department of Mechanical and Aerospace engineering, especially the earlier courses, are being offered asynchronously during online teaching. In some cases students said that they did not even know what their professor looked like. In other cases students noted that the posted lectures were not even from their instructor, but rather from professors at other universities. In some instances of professor would pose to an asynchronous lecture and then made themselves available during the scheduled lecture time to answer questions, forcing</p>	<p><i>3- Agreed to in principle</i></p>	<p><i>The department is striving to return to in-person course delivery during the winter/2022, but major decisions are made at the University level. Current guidelines indicate online teaching until February/2022.</i></p>	<p><i>Chair</i></p>	<p><i>2022/2023</i></p>	<p><i>N</i></p>

students to have to spend twice the amount of time on the lecture if they wanted or needed to ask questions. Earlier students need live FaceTime with their instructors to gain confidence and learn the appropriate material. Suggesting a thorough review of acceptable online teaching formats, with an eye towards the goal of most first and second year courses (at a minimum) being offered synchronously (live) with recording of the lecture posted on line, even in online formats. (Weakness)					
5. Students reported confusion and frustration the lack of consistency in exam proctoring in the on line format. Some courses required specific time for online exams, while others provided a 24 hour window, enabling students in different time zones to choose a convenient time to take the exam. Suggest establishing department wide guidelines for exam taking that is consistent across all courses. (Weakness)	<i>3- Agreed to in principle</i>	<i>Proctoring is decided at the University level. During the fall/2022, COMAS software was used smoothly with Big Blue Button for questions.</i>	<i>N/A</i>	<i>N/A</i>	<i>N</i>
6. While the industrial Advisory Board is an excellent mechanism for seeking industrial feedback, recent graduates may provide additional insight into useful/transferable skills for industry. Suggest establishing an annual survey of recent graduates currently working in the industry, asking them for feedback on their level of preparedness owing to their Carleton training. (Opportunity)	<i>1- Agreed to unconditionally</i>	<i>Engage Associate Dean to implement survey on a Faculty level. Study the possibility or performing the survey from the departmental level (obtain mailing list from Alumni president). Office staff to conduct the survey.</i>	<i>Chair</i>	<i>N/A</i>	<i>N</i>
7. Teaching Assistants appear to be struggling with their workload, particularly with online instruction (likely leading to the challenges with timely grading). Suggest increasing that TA assignments, potentially drawing upon unused funding for course improvement. Potentially create a two- tier system for TAS bracket senior and junior TAS bracket to offload team management responsibilities from the faculty. (Opportunity)	<i>3- Agreed to in principle</i>	<i>Senior TAs are already being used to offload management responsibilities from the faculty. When resources permit, TAs also help in course improvements.</i>	<i>N/A</i>	<i>2022/2023</i>	<i>N</i>

<p>8. It appears to be the case that courses without a laboratory or project component do not have TA positions. This adds extensive workload to the teaching faculty. Suggest providing TA positions based on the class size. In addition, the process to assign TAs does not appear to be transparent. While most faculty stated that TA requests were granted some were not aware that these requests were possible. Suggest creating a more well defined process for assigning TAs. (Concern)</p>	<p><i>4- Not agreed to</i></p>	<p><i>Make faculty aware that TA or ½ TA positions can be assigned to a course upon request depending on necessity.</i></p> <p><i>Chair to add a section to the e-mail directed to faculty members when consulting about teaching assignments (yearly) that will also ask about TA requirements.</i></p> <p><i>TA assignment will be discussed during departmental meeting.</i></p>	<p><i>Chair</i></p>	<p><i>2022/2023</i></p>	<p><i>N</i></p>
<p>9. It is clear that the Dean is making great strides to improve the student to faculty ratio by freezing enrollment and dramatically increasing hiring. However what is unclear is whether or not this will result in the desired effect of reducing the teaching load for faculty. Some of the people interviewed seemed to suggest that additional faculty will only result in smaller classes, but that most faculty will continue to teach four courses for each academic year. Three are one term courses and the 4th is an assignment as lead engineer to one capstone design project. This will do little to remove the teaching burden. Further some faculty noted that their course Simons frequently changed, forcing them to continually be learning new courses to teach. This overload leads to an inability for faculty to work on research, and virtually no incentive to innovate in courses, because they are barely hanging on as it is. Suggest using additional faculty already budgeted for to reduce the average teaching load to three courses for each academic year as opposed to just drinking the class sizes. (Concern)</p>	<p><i>- Agreed to if additional resources permit (describe resources)</i></p>	<p><i>Chair is already reducing the teaching load by providing teaching relief to:</i></p> <ol style="list-style-type: none"> <i>1) Capstone project managers (12 projects in the department)</i> <i>2) Large research grant holders (for the duration of the project)</i> <p><i>We are studying the possibility of providing teaching relief to:</i></p> <ol style="list-style-type: none"> <i>3) Faculty members willing to develop new undergraduate laboratories (with added TA support)</i> <i>4) New faculty members (extension from 1 to 3 years)</i> <i>5) Faculty members trying to regain discovery grants</i> <i>6) A faculty member to provide mentorship to minorities</i> 	<p><i>Chair</i></p>	<p><i>2023-24</i></p>	<p><i>N</i></p>

<p>10. The Department of Mechanical and Aerospace engineering receives funds per year, earmarked for undergraduate course/laboratory improvement. This fund does not support teaching assessments at the capstone courses bracket those recovered from separate funds bracket. The external reviewers discovered that this fund is almost never fully utilized, and some faculty do not know that it exists. Further many faculty noted that even with the unlimited money and space, they still cannot consider course enhancements because what they lack is time period suggest using some of the fund allocation to hire a staff member who can assist faculty with course improvement.</p> <p>This could follow or even pair with the model set by the students academic partners program (where students provide help to improve courses). This new staff could also actively approach professors teaching stale courses, in need of invigoration, as opposed to relying on the overloaded professors to take proactive action to innovate in their courses.</p>	<p><i>2- Agreed to if additional resources permit (describe resources)</i></p>	<p><i>Chair to provide teaching relief, TA, and equipment funding to faculty members willing to develop or considerably revamp a new undergraduate laboratory.</i></p>	<p><i>Chair</i></p>	<p><i>2023/2024</i></p>	<p><i>N</i></p>
<p>11. Reports from faculty and staff noted that while they feel well prepared to handle mental health challenges from students, they are woefully not prepared or her staff to handle the dramatic increase in academic dishonesty cases. The external reviewers suspect there's a strong link between mental health and the prevalence of academic dishonesty, although some of the faculty strongly and vocally dispute this link. The external reviewers suggest that the programs, department, and faculty explore proactive methods that promote mental health, without waiting for students to reach out when they feel overwhelmed. Perhaps some of the existing, underloaded mental health resources could be reaching out to students proactively to assess their situations and provide assistance before</p>	<p><i>1- Agreed to unconditionally</i></p>	<p><i>Invite Health and Counselling Services to provide a small presentation for guidance during a departmental meeting in 2022.</i></p>	<p><i>Chair</i></p>	<p><i>2022</i></p>	<p><i>N</i></p>

<p>the students feel their only pathway to success is to cheat. (Opportunity)</p>					
<p>12. Courses need to be structured such that students receive assessment results in a more timely manner. This is particularly true for the ECOR courses where some of the modules are often only six weeks long. (Concern)</p>	<p><i>1- Agreed to unconditionally</i></p>	<p><i>All faculty members need to submit final marks in 10 days following the final exam. This is handled at the Faculty Level.</i></p> <p><i>Engage Associate Dean regarding ECOR assessment results.</i></p> <p><i>Remind faculty during departmental meetings about returning assessment results in a timely manner. Consider creating a coaching system for faculty members.</i></p>	<p><i>Chair and Associate Chair</i></p>	<p><i>2022</i></p>	<p><i>N</i></p>
<p>13. In discussions with students, it emerged that many students of colour feel welcomed and included within the Carlton community, instances of obvious and blatant misogyny between students (not faculty) are still common. These instances include teaching assistants making romantic advances towards female students, and male group members degrading and minimizing fellow female students. Further students who experience misogyny seemed confused about where/how to report it. Suggest improved/more widespread training and awareness of both the intolerance of misogyny within Carleton (perhaps in every course syllabus and discussed openly and at least the ECOR courses) and easier access to reporting mechanisms. In addition TA training should not be optional and should include sensitivity training. (Concern)</p>	<p><i>2- Agreed to if additional resources permit (describe resources)</i></p>	<p><i>Overlap with Item 2 in this list.</i></p> <p><i>Engage Associate Dean Jerome Talim to implement EDI instruction during first-year ECOR course.</i></p> <p><i>Investigate the possibility of providing teaching relief for a faculty, and hire TA facilitators (one for each program) to support minorities proactively.</i></p> <p><i>Include a sentence in the course outline for every course, regarding EDI and misogyny. Discuss with Jerome Talim regarding implementation on a Faculty level.</i></p>	<p><i>Chair and Associate Chair</i></p>	<p><i>2022</i></p>	<p><i>N</i></p>

<p>14. Students mentioned that those who struggle with English, at times feel disadvantaged, ignored and excluded. Suggest highlighting existing ESL student support in courses (especially ECOR) and striving to promote greater inclusion in discussions for improved EDI training for faculty, staff, and students. (Concern)</p>	<p><i>2- Agreed to if additional resources permit (describe resources)</i></p>	<p><i>Overlap with Items 2 and 13 in this list.</i></p> <p><i>Engage Associate Dean Jerome Talim to implement EDI instruction during first-year ECOR course.</i></p> <p><i>Investigate the possibility of providing teaching relief for a faculty, and hire TA facilitators (one for each program) to support minorities proactively.</i></p> <p><i>Include a sentence in the course outline for every course, regarding EDI and misogyny. Discuss with Jerome Talim regarding implementation on a Faculty level.</i></p>			
<p>15. Encourage faculty to take their sabbatical leaves abroad to exchange their teaching/research experience with people from the hosting universities, government laboratories or companies to meet the University Strategic Mission #2 ‘serve Ottawa/serve the world.’ (Opportunity)</p>	<p><i>1- Agreed to unconditionally</i></p>	<p><i>Chair Ron Miller to encourage faculty to explore sabbaticals to meet the University Strategic Mission #2 ‘serve Ottawa/serve the world.’</i></p> <p><i>Note that the Dean’s office has already created an incentive for this, in the form of a grant.</i></p>	<p><i>Chair</i></p>	<p><i>2022</i></p>	<p><i>N</i></p>
<p>16. Technical elective courses taught by adjunct professors from industry or government laboratories with relevant experience can improve experiential learning through case studies and applied research projects. (Opportunity)</p>	<p><i>1- Agreed to unconditionally</i></p>	<p><i>Chair Ron Miller is already assigning teaching loads to instructors from industry and government laboratories as the opportunities arise (for example, from the National Research Council).</i></p>	<p><i>Chair</i></p>	<p><i>2022</i></p>	<p><i>N</i></p>
<p>17. Interaction between industrial Advisory Board and departmental faculty board in the curriculum improvement process can be extended to all faculty on an annual schedule (eg: in one of the department meetings including Q&A.) (Opportunity)</p>	<p><i>4- Not agreed to</i></p>	<p><i>To make the annual meeting more productive, a smaller committee is engaging with the advisory board. The department is reaching the number of 50 faculty members, and so it would not be an effective meeting to engage the IAB with the entire faculty.</i></p>	<p><i>N/A</i></p>	<p><i>N/A</i></p>	<p><i>N</i></p>

<p>18. Provide clearer and more tangible mechanisms for students to provide feedback on their program, including, but not limited to, an opportunity for students to rate their teaching assistants. (Weakness)</p>	<p><i>3- Agreed to in principle</i></p>	<p><i>This item needs to be discussed at the University level. Surveys in general are strictly controlled.</i></p> <p><i>Study the possibility to conduct anonymous TA survey by office staff (Ms. Irene Helder).</i></p>	<p><i>Chair</i></p>	<p><i>2022/2023</i></p>	<p><i>N</i></p>
<p>19. It seems to be possible for professors to opt out of their course evaluation, leading to disenfranchised students and limiting the visibility into courses that need improvement. Suggest removing the opt out option for course feedback, (considering the class/sample size for faculty annual performance evaluation purposes.) (Weakness)</p>	<p><i>3- Agreed to in principle</i></p>	<p><i>The opt out option was still valid until the Fall/2021, but the decision to remove the option is handled at the University level.</i></p>	<p><i>N/A</i></p>	<p><i>N/A</i></p>	<p><i>N</i></p>
<p>20. The Department of Mechanical and Aerospace engineering has a multilayered continuous improvement plan that seeks input from many different sources including industry students and faculty. However upon interviewing the faculty, it emerged that the trigger for course improvement seems to be limited to missed or inadequate CEAB attributes. Courses that meet the CEAB requirement of 70% compliance with the prescribed learning outcomes do not receive attention. The external reviewers feel that continuous program improvement should occur even on courses that are meeting the bar set by the CEAB. Suggest a periodic review of course material including assignments, projects, laboratories, and exams from all courses, even if they continue to meet the ceeb bar. (Weakness)</p>	<p><i>4- Not agreed to</i></p>	<p><i>In addition to the CEAB attributes, curriculum and strand committees meet regularly to assess and propose course adjustment and delivery. There is also an annual retreat, thus giving another opportunity to discuss about course delivery.</i></p> <p><i>If resources permit, we will consider providing one teaching relief for every two years for chairing a curriculum committee.</i></p>	<p><i>Chair</i></p>	<p><i>2022/2023</i></p>	<p><i>N</i></p>

<p>21. Existing teaching awards exist at the university and faculty level, however very few of the faculty see these awards as particularly incentivizing (unless they are pre tenure in which case the teaching award is useful to include in teaching dossier) For most faculty salary bonus and grant to further innovate their course is not worth the lengthy application process for the award. Suggest shortening the application process to a simple nomination form, increasing the value, and potentially explore rewards that may incentivize faculty more such as better parking, dinner vouchers for families, or weekend retreat packages for either the faculty's family or research group. These suggestions attempt to return 'time' to the professor, potentially enabling them to reconnect with their families, and to focus on their research programs. (Weakness)</p>	<p><i>1- Agreed to unconditionally</i></p>	<p><i>Engage Provost and VP Academic and the Dean regarding changing the application process to a simple nomination. However, this is not within the department's purview to change.</i></p>	<p><i>Chair</i></p>	<p><i>2022</i></p>	<p><i>N</i></p>
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