FINAL ASSESSMENT REPORT
Institutional Quality Assurance Program (IQAP) Review
Mechatronics Engineering
Undergraduate Program

Date of Review: March 31 – April 1, 2016

In accordance with the University 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 programs delivered by the ***Department of Computing and Software****. This report identifies the significant strengths of the programs, together with opportunities for program improvement and enhancement, and it sets out and prioritizes the recommendations that have been selected for implementation.*

The report includes an Implementation Plan that identifies who will be responsible for approving the recommendations set out in the Final Assessment Report; who will be responsible for providing any resources entailed by those recommendations; any changes in organization, policy or governance that will be necessary to meet the recommendations and who will be responsible for acting on those recommendations; and timelines for acting on and monitoring the implementation of those recommendations.

Executive Summary of the Cyclical Program Review of the Undergraduate Mechatronics Engineering Program

In accordance with the Institutional Quality Assurance Process (IQAP), the Department of Computing and Software submitted a self-study in January 2016 to the Associate Vice-President, Faculty to initiate the cyclical program review of its undergraduate programs. The approved self-study presented program descriptions, learning outcomes, and analyses of data provided by the Office of Institutional Research and Analysis. Appendices to the self-study contained all course outlines associated with the program and the CVs for each full-time member in the department.

One arm's length external reviewer from the United States and one internal reviewer were endorsed by the Dean, Faculty of Engineering, and selected by the Associate Vice-President, Faculty. The review team reviewed the self-study documentation and then conducted a site visit to McMaster University on March 28 – March 29, 2016. The visit included interviews with the Provost and Vice-President (Academic); Associate Vice-President, Faculty, Dean and Associate Dean of the Faculty of Engineering, Chair of the department and meetings with groups of current undergraduate students, full-time faculty and support staff.

The Director of the program and the Dean of the Faculty of Engineering submitted responses to the Reviewers' Report (January 2017). Specific recommendations were discussed and clarifications and corrections were presented. Follow-up actions and timelines were included.

The Final Assessment Report was prepared by the Quality Assurance Committee to be submitted to Undergraduate Council, and Senate (December 2017).

Strengths

In their report (April 2016), the Review Team highlighted the following strengths of the program:

- The program is in line with the university's priorities (identified in the President's letter), and in particular, *interdisciplinarity* (which is one of the components of the first priority) is one of the main characteristics of the program.
- The program is very popular. Very strong students are admitted to the program (as evident from high admission requirements) and they continue to excel academically (as evident from the Dean's/Provost's honor list as well as students' GPA).
- Within each department (and in particular Computing and Software Department), the professors involved are aware of the program details, as far as their department is concerned.
- The Chair of the Computing and Software Department is familiar with all components of the program (including the courses offered by other departments). The Chair is aware of most of the strengths of the program, and some of its weaknesses.
- Learning outcomes (set by CEAB) are measured in great detail, and the results of all measured attributes are very encouraging.
- The professors teaching the courses are, in general, doing a great job in delivering the course material and motivating the students.
- The program includes some of the most popular courses among the students (especially due to their relevance to the current job market).
- Accessibility of open labs for those students who are interested to work on hands-on projects.
- The Department of Computing and Software has plans to address some of the weaknesses of the program.
- The Computing and Software Department has good initiatives for the students (in all programs), in line with the university's priorities.

Areas for Improvement and/or Enhancement

The Review Team noted some areas for improvement for the program:

- Some of the courses delivered by different departments overlap significantly.
- A lack of mechanical system design courses was noted.
- Additional foundational software courses, including algorithms and data structures, and supporting foundations for the current operating systems course would be considered very valuable, while the value of the thermodynamics course as students currently have to take it was questioned.

Summary of the Reviewers' Recommendations with the Department's and the Dean's Responses

Recommendations

Recommendation	**Proposed Follow-Up**	**Responsibility for Leading Follow-Up**	**Timeline for Addressing Recommendation**
1. A committee consisting of the representatives from four departments involved in offering the program should be created to govern the program and address its weaknesses. The Associate Chairs for Undergraduate Programs of the four departments would be the most appropriate representatives to serve on this committee.	The committee of the undergraduate associate chairs exists "automatically" informally; the CAS department is communicating with all involved departments to establish further enhancements to the governance of the Mechatronics programme.		
2. The departments involved in mechatronics course offerings should take action to address the overlap between some of the courses.	CAS Chair will work with the chairs of other department to ensure better communication between instructors of mechatronics courses. Also mechatronics curriculum committee will revisit the course description to avoid unnecessary overlap between courses.	CAS Chair and CAS Associate Chair for Undergraduate Studies	September 2017
3. In order to further grow the program (if such growth is of strategic interest to the university), more resources will be needed in some labs.	CAS Chair submitted a request to the Faculty of Engineering of additional funds of about $309K to renew and expand the labs. An increase by 20 places for Fall 2017 is currently in the works.	Dean's Office and CAS Chair	September 2017

4. A better management of space allocated to the labs, students and professors will become increasingly important in the near future. Therefore, it is recommended that the department revisits its current space allocation priorities.	CAS Chair has developed a space allocation policy and is negotiating with the faculty concerning space for the growth in the Mechatronics Engineering programme.	CAS Chair	It is being discussed with the Faculty of Engineering and the Mechanical Engineering Department.
5. It is desirable to have a mechanism in course evaluation process to separate the results obtained from mechatronics students (it would be good to do the same for all different programs whose students attend the same class).	Some courses are already split into separate sections (2S03) or in the process of being split (MECHENG 2B03). We plan to incrementally assign separate course numbers also for courses that are still co-taught.	CAS Associate Chair for Undergraduate Studies.	September 2017
6. To evaluate the effectiveness of some initiatives such as mentorship program and involving the undergraduate students in research activities, it is important to come up with some measurable success criteria.	The mentoring program for Computer Science students has not been very successful thus far due to a pronounced lack of participation by the students. A mentoring program for Mechatronics students is desirable, but careful consideration is needed to find ways to better engage the students and to provide effective mentoring given that the Department's faculty workload is already excessive. We need to develop a successful pilot program for Computer Science before developing such a mentor program for Software Engineering.	CAS Chair	June 30, 2017

7. There are two specific areas of interest among the students in the program: one is more related to mechanical design and the other related to algorithms and data structure. It would be good to consider two options for the program, with two sets of core courses (and/or elective courses) in focused areas for each.	CAS undergraduate curriculum committee will be considering this suggestion. However, the lack of teaching resources within the department might be an obstacle to implement this suggestion.	Associate Chair for Undergraduate Studies.	September 2017
8. It is recommended that the professors explain to the students, in the beginning of the semester, how the content of the course they teach is related to the objectives of the program	The department is working on designating some courses taken by Mechatronics Engineering students as "home courses", where the instructors have responsibility to communicate programme-level information to the students.	CAS Associate Chair for Undergraduate Studies.	June 30, 2017
9. Given the heavy load of collecting and evaluating CEAB attributes, it is recommended that two professors be involved in the process.	Assessing graduate attributes is really part of the duties of the individual instructors. The Associate Chair for Undergraduate Studies is supported by the Continuous Improvement committee in the process of aggregating and interpreting the amassed information.	Done.	

10. Plagiarism workshops should be held (perhaps at the university level) upon the admission of students, and serious sanctions should be considered for this type of offence.	We agree.	Associate Dean for Undergraduate Studies	
11. It is recommended that the department creates two mailing lists: one for more important messages (such as the ones concerning the program/class updates) and one for less important ones (such as information on social events). The list for less urgent emails should have an opt-out link.	This will be considered as part of the ongoing restructuring of communication with the Mechatronics Engineering students and of the department web offerings. In partnership with CAS student associations, clubs, and societies, we are rethinking how to communicate and better engage students.	Mechatronics Coordinator, Undergraduate Advisor for Mechatronics Engineering, and CAS Chair	December 2016
12. The design and maintenance of the department website needs to be improved.	This will be considered as part of the ongoing restructuring of communication with the Mechatronics Engineering students and of the department web offerings. In partnership with CAS student associations, clubs, and societies, we are rethinking how to communicate and better engage students.	Mechatronics Coordinator, Undergraduate Advisor for Mechatronics Engineering, and CAS Chair	December 2016

Faculty Response:

As detailed in the Chair's response, the recommendations in the review have led to a series of discussions within the Department focused on inter-departmental co-ordination, course overlap, space considerations for growth, section splitting for some courses, the inclusion of more mechanical design/algorithm courses, and enhanced communication with the students. Many of these initiatives have been addressed or are on-going.

Overall, the dean satisfied with the replies of the Department to the concerns raised by the IQAP reviewers.

Quality Assurance Committee Recommendation

McMaster's Quality Assurance Committee (QAC) reviewed the above documentation and the committee recommends that the program should follow the regular course of action with an 18-month progress report and a subsequent full external cyclical review to be conducted no later than 8 years after the start of the last review.