**FINAL ASSESSMENT REPORT**

# Institutional Quality Assurance Program (IQAP) Review
# Automation Engineering Technology
# Date of Review: May 18 - 19, 2021

*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 Automation Engineering Technology (AET) Program. This 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 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 Review

In accordance with the Institutional Quality Assurance Process (IQAP), the W Booth School of Engineering Practice and Technology submitted a self-study in April 2021 to the Vice-Provost Faculty to initiate the cyclical program review of the Automation Engineering Technology (AET) undergraduate program. 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 the CVs for each full-time member in the department.

Two arm's length external reviewers and one internal reviewer were endorsed by the Faculty Dean, W Booth School of Engineering Practice and Technology, and selected by the Vice-Provost Faculty. The review team reviewed the self-study documentation and then conducted a review on May 18-19, 2021. The review included interviews with the Provost and Vice-President (Academic), Faculty Dean, Vice-Provost Faculty, Associate Dean Academic, Program Chair of the B.Tech. Automation Engineering Technology within W Booth School of Engineering Practice and Technology and meetings with groups of current students, full-time faculty and support staff.

The Chair of the B.Tech. Automation Engineering Technology and the Dean of the Engineering submitted responses to the Reviewers' Report (April 2022). Specific recommendations were discussed and clarifications and corrections were presented. Follow-up actions and timelines were included.

The reviewers found the Automation Engineering Technology (AET) Program to be highly successful and very well aligned with McMaster's vision and mission through its innovative and creative curriculum. They also found the program to be supportive of McMaster's current priorities and strive for excellence.

**The following program strengths were identified:**

- Affiliation with industry through the Program Advisory Committee, an interdisciplinary curriculum combining business and technical courses, CO-OP experience, and applications-oriented learning based on experiential learning supported by strong laboratory program.
- Collaboration with Mohawk college give students access to well-equipped facilities, thus providing them with a rich and rewarding experience.
- Community engagement through capstone projects of multidisciplinary nature involving community or industry partners.
- Instructors with industry experience, involved in pedagogical and applied discipline research
- Graduates find employment easily upon graduating from the AET program. They adduced their fast success in securing gainful employment to their unique hands-on experiential training and employment-ready skills.

**The following areas of improvement were suggested:**

- Provide opportunities of online learning in post-pandemic to support continuing blended delivery of content.
- The is no formalized or recognized support for technical or discipline research, neither does it count towards faculty opportunity for promotion. The reviewers think that supporting research initiatives among the AET faculty will serve as a good complement to the "applications-oriented teaching approach" of the program.
- Invite guest lecturers in courses taught by regular teaching track faculty.

More specific areas program enhancement described in the report are directly reflected in the recommendations, discussed below.

**Implementation Plan**

| **Recommendation** | **Proposed Follow-Up** | **Responsibility for Leading Follow-Up** | **Timeline for Addressing Recommendation** |
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| Form a committee to discuss and implement supplementary application processes that identify the best part-time and mature degree completion students suitable for the BTech program. | This is not applicable to the Automation Engineering Technology Program as its students are admitted predominately straight out of high school. | No follow-up. | Not applicable. |
| Systematically integrate the business and management courses | Valuable observation. It will be shared with instructors and there will | **Tom Wanyama & Michael Justason** - Liaise with the | May 2023. |

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| within the technical courses. | be discussion on how to liaise between Technical and GENTECH instructors to identify opportunities to integrate and apply both concepts at all levels of the program. | Program Chairs of the technical and GENTECH courses to collect information on how to integrate their subject matter and create an implementation plan. | |
| Increase of the level of teaching from intermediate to advanced level for the Smart Tech. courses (SMRTTECH 4HM3, 4ES3, 4ID3, 4SC3, and 4AI3). | Valuable observation. It will be shared with the lead of the Smart Systems stream. In summer of 2022 the content of these courses will be reviewed to identify areas of improvement, and then the instructors will create a plan for upgrading the courses. The courses will be reviewed again in the summer of 2023 to determine how the improvements were implemented. | **Tom Wanyama** - Identify areas of improvement, create a plan, and implement the improvements. | Improvements should be ready by Sept 2022.<br><br>The second course review should be ready by July 2023. |
| Include a new Level 2 course on networking and a new Level 4 technical elective course that may focus on emerging smart areas. | We are aware of the suggestion to include the level 2 course but find it difficult to identify which course to "sacrifice". Simply combining the curriculum of Chemical Engineering courses may affect the requirements for the college diploma that our students get.<br>We already have level 4 technical electives on human health (smart health) or machine condition monitoring. The human health course has not been developed because of the challenges caused by the COVID19 pandemic. | **Tom Wanyama -** Develop the smart health course.<br><br>Revisit the ensue of including a level 2 networking course.<br><br>We will review creating a space for this course by merging the contents of PROCTECH 2CE3 and PROCTECH 2EC3, into a new 3 units course.<br><br>Such a change will need approval of Mohawk College that awards an Advanced Chemical Engineering | July 2022 |

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| | All this will be revisited in the summer of 2022. | diploma to our students. | |
| Make all industrial automation systems and smart systems technical elective to give students an option of which courses to select, based on their interest within each minor. | We are aware of the suggestion. It should be noted that the Smart Systems stream was born out of the effort to create electives in the fourth year. We quickly realized that many smart systems courses did not compliment industry systems courses and vice versa. We therefore decided to bundle the courses into streams. We currently have only two fourth year electives PROCTECH 4MH3 – Machine Health and Remote Monitoring, and SMRT TECH 4HM3 - Human Monitoring and Smart Health Systems. | **Tom Wanyama** - We intend to take no specific action on this suggestion, but we will continue to review the possibility of creating more electives. | Not applicable. |
| Include at least one technical elective course in each of the major areas of electrical engineering— machines and power systems, communications, and electronics – this might help the graduates that are interested in P. Eng. Designation. | We are aware of the suggestion but the issue comes down to sacrificing courses that help our students to get jobs for courses that help the few graduates interested in P. Eng designation. | **Tom Wanyama** - We intend to take no specific action on this suggestion, but we will continue to review the possibility of creating such electives. | Not applicable. |
| Involve industry partners in the whole process of capstone projects including the assessment of the final products. | We have always involved industry professionals in assessment of capstone projects. However, we noticed that they provide the best contribution to the assessment of proposals and not to the final products. Since they do not have the time to follow the project process, they tend to award grades | **Tom Wanyama** - This suggestion will be communicated to instructors, but we do not intend to take specific action on it. | Not applicable. |

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| | based mainly on the final product.<br><br>For the project with community partners, they are involved in the entire process except the final assessment. | | |
| Incorporate peer evaluation in the assessment of group projects. | Peer evaluation was standard in most Automation Engineering Technology courses until 2016 -2018, when instructors noticed that many students were rewarding or penalizing their peers in assessment due to reasons that had nothing or little to do with the projects. | **Tom Wanyama** - This recommendation will be communicated to instructors to make decisions appropriate for their courses. | Not applicable. |
| Include oral presentation component in more courses involving group projects, to help students practice and strengthen their oral communication skills. | Valuable observation. It will be shared with instructors and there will be discussion on how implement this recommendation. | **Tom Wanyama & Michael Justason** - Liaise with instructors of both technical and GENTECH courses to increase the number of courses with oral presentations.<br><br>Create a list of courses that have oral presentation and explanation of how the presentations are used to meet the course learning outcomes. | September 2022 |
| Students interviewed felt that going back and forth between McMaster and Mohawk was inconvenient. Scheduling the labs at Mohawk to take place only on some specific days of the week, with no lectures held at McMaster on such lab days, could reduce this issue. | Labs are scheduled at Mohawk on a specific day. There is no going back and forth unless the student is off-cycle and they have lower year courses they are taking to catch up. | **Tom Wanyama** - We intend to take no specific action on this suggestion, but we will continue to work with scheduling to ensure that students have a specific day to do labs at Mohawk. | Not applicable. |

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| SEPT staff are overloaded. One of the most pressing needs is the amount on time spent on scheduling of courses and activities. A possible recommended solution for course scheduling will be to give staff more lead time while still allowing staff preferences to be incorporated into scheduling. Another possibility will be to pass on some of the less critical scheduling to the Central Administration at McMaster. | We are aware of the suggestion. This suggestion will be shared with B.Tech. Program Chairs, the Administrative team, and the school Director and there will be discussion on how implement the recommendation. Ultimately the scheduling process sits with the University and Mohawk College, and is above the school itself. | **Tom Wanyama** - Liaise with other Program Chairs, the Administrative team, and the Director on how to address this suggestion. | July 2022 |
| Teaching support in the form of teaching assistants (TA)s and technical support was not enough. The reviewers suggest the AET program chair meet with the program advisory committee to determine minimum enrollment number to provide one teaching assistant (TA) support (e.g., at the rate of 3 hours/week). TAs can then support faculty with the grading the students' assignments, quizzes and lab reports. This will free up time for the regular teaching faculty to engage in pedagogical and applied research. | The Automation Engineering Technology program has always had small classes, with labs counted toward instructor teaching load. But as the program grows in student numbers, we have started assigning TA to classes with more than 50 students and in other special circumstances. | **Tom Wanyama** - We intend to take no specific action on this suggestion, but we will continue to update and improve the TA program. | Not Applicable |
| The reviewers encourage the program authorities to continue keeping their labs current as well as improving access to labs for students within the McMaster University campus to improve | Every summer all Automation Engineering Technology labs are reviewed and/or upgraded. | **Tom Wanyama** - We will continue the annual review and upgrade of our lab facilities. | Not applicable. |

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| commute time used by the students travelling between the two partner institutions. | | | |
| There is need for a clear mechanism that will allows recognition of faculty research and teaching productivity while indicating a clear path towards promotion. The reviewers recommend that a committee is created to define and communicate the guidelines and metrics for the career projection of the regular teaching track faculty. | This is a valuable observation that we are aware of. Consequently, there is several efforts within the School and the Faculty of Engineering to develop mechanisms for recognising teaching productivity. What is missing in these efforts is the development of recognising discipline research for teaching stream faculty. This recommendation will be shared with instructors and there will be discussion on how implement it.<br><br>There is a need to direct funding towards discipline research. | **Tom Wanyama** - Liaise with other chairs and the director on setting up a mechanism for recognising discipline research for teaching stream faculty. | July 2022 |
| The reviewers recommend prioritizing efforts to continue to reduce the percentage of technical courses taught by non-permanent (sessional) instructors. The current numbers are concerning. | This is a valuable suggestion that we are aware of. We have hired two more permanent faculty since the last IQAP, two faculty have attained permanence, one is on teaching track, and we are in the processing of filling another teaching track position.<br><br>We will continue to advocate for more full-time positions in the AET program. | **Tom Wanyama** - The Program Chair will continue to liaise with the School Director to address this issue. | Not applicable. |
| A possible immediate solution to reducing sessionals in the AET program could be to ensure that Mohawk | We have tried this approach. Until recently we had four Mohawk instructors with their teaching load counted | **Tom Wanyama** - We intend to take no specific action on this suggestion because | Not applicable. |

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| instructors teaching courses and labs at McMaster do have these courses counted toward their overall teaching load at Mohawk. | towards the college load. This incentive was ended because it had many administrative complications. | we tried it and did not work out well. | |
| Occasional class sizes of 150 were mentioned as a problem during interviews with faculty and students, which the reviewers agree is rather too high and recommend being avoided. | Our largest class is 120 students for lectures with two tutorials of 60 students each. We believe this is an appreciate class size. We will discuss with instructors o determine any changes to the class sizes. | **Tom Wanyama** - We intend to take no specific action on this suggestion, but we will continue to ensure that classes have appropriate sizes. | Not applicable. |
| The reviewer team recommends that the ECCS office along with the teaching faculty should continue their effort in finding CO-OP opportunities for all the eligible students by intensifying employer awareness and involving industry more heavily in capstone projects. | This is a valuable recommendation that we are aware of. We have monthly team meetings where coop is discussed. There is an ECCS representative. | **Tom Wanyama** - We will continue to engage ECCS, our community partners, and Program Advisory Committee members to find coop opportunities for our students | Not applicable. |
| Alumni interviewed wished that there exists more active engagement with McMaster as not so many of them have been contacted since graduating. The reviewer team recommends that McMaster put in place an exit survey and/or any other necessary process to engage with the alumni of the AET program. | The is a valuable recommendation that is beyond the role of the Program Chair. | **Tom Wanyama** - The Program Chair will bring it to the attention of the Director. | December 2021 |
| The reviewers recommended that a formal standard process for introducing sustainability principles | The is a valuable recommendation that the Program Chair will follow up on by drafting a standard process for | **Tom Wanyama & Michael Justason** Draft a standard process for introducing | December 2022 |

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| into courses be developed by the program chair in coordination with the advisory committee and communicated to all the instructors. | introducing sustainability principles into courses and bring to the advisory committee for discussion. Once approved the process will be communicated to all instructors. | sustainability principles into courses.<br><br>Bring the process to the advisory committee for discussion.<br><br>Communicate final process to instructors.<br><br>Review the implementation of the process.<br><br>This can be done in conjunction with the new course, GENTECH 1BZ3 – Foundations of Business, where the concept of Sustainability is introduced to the students. | |
| To make the governance more consultative and inclusive, the reviewers recommended that the steering committee considers the inclusion of student representatives (alumni and/or current students) either the McMaster-Mohawk Joint Meetings, and/or the Program Advisory Committee. | Membership of the steering committee is beyond the Program Chair's role, but the issue will be brought to the Director. Including students on the PAC committee will be discussed with the committee members. | **Tom Wanyama** - Include expanding PAC committee membership to include student representation in the PAC meeting agenda. | December 2021 |
| Provide opportunities of online learning in post-pandemic to support continuing blended delivery of content. | The effort to provide online learning resources in the AET program did not start due to COVID-19. The pandemic only accelerated this effort. We started offering remote lab access in 2015 for PROCTECH4AS3. In 2018 we started developing the take home labs used in | **Tom Wanyama** - We intend to take no specific action on this suggestion, but we will continue to increase online resources for our students.<br><br>We create a budget item to support | September 2022 |

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| | ENGTECH1EL3 and PROCTECH2EE3. We have now expanded this program to include SRMTTECH3CC3 and SMRTTECH3DE3.<br><br>We will review other courses for which online resources and be developed and engage the associated instructors. | continuous development and use of online learning resources. | |
| Invite guest lecturers in courses taught by regular teaching track faculty. | This is a valuable recommendation. It will be discussed with instructors and community partners to create an AET lecture series. | **Tom Wanyama** - Create a program for inviting guest lecturers. | September 2022 |

## Dean's Response

It is clear that the reviewers dug into the program in a great deal of depth. Program responses are very appropriate and it is clear that the feedback will be implemented. In cases where no action will be taken, the department has provided a thoughtful response; in cases where there are changes to be implemented, the department has put into place a clear implementation plan. Additional staffing was again discussed, suggesting that there is a clear need. Overall, like other BTech programs, this one is strong.

## Quality Assurance Committee Recommendation

**McMaster's Quality Assurance Committee (QAC) reviewed the above documentation, and the Committee recommends that the B.Tech. Automation Engineering Technology program should follow the regular course of action with an 18-month progress report and a subsequent full external cyclical review to be conducted 7 years after the start of the last review.**