Degree Completion Programs

DCP Program Stream	Date of Review
Civil Engineering Infrastructure Technology (CIV TECH)	April 22 – 23, 2014
Computing and Information Technology (COMP TECH)	April 21 – 22, 2014
Energy Engineering Technologies (ENR TECH)	March 27 – 28, 2014
Manufacturing Engineering Technology (MAN TECH)	April 3 – 4, 2014
Management (GEN TECH)	February 3 – 4, 2014

*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 graduate programs delivered by the **School of Engineering Technology**. 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 Degree Completion Programs in the School of Engineering Technology

In accordance with the Institutional Quality Assurance Process (IQAP), the School of Engineering Technology submitted five separate self-studies in January - March 2014 to the Associate Vice-President, Faculty to initiate the cyclical program review of its degree completion undergraduate programs. The approved self-studies 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 School.

Two arm's length external reviewers and one internal reviewer for each program were endorsed by the Dean of the Faculty of Engineering, and selected by the Associate Vice-President, Faculty. The review teams reviewed the self-study documentation and then conducted site visits to McMaster University between February – April, 2014. The visits included interviews with the Provost and Vice-President (Academic); Associate Vice-President, Faculty, Dean of the Faculty of Engineering, Director of the School of Engineering Technology, chairs of each of the program streams and meetings with groups of current

and former undergraduate students, full-time faculty and support staff. The reviewers also had the opportunity to tour the School of Engineering Technology.

The Director of the School of Engineering Technology and the Program Chairs submitted a joint response to the Reviewers' Report in July 2014. The Associate Dean Academic submitted a response on behalf of the Faculty of Engineering in December 2014. Specific recommendations were discussed and clarifications and corrections were presented. Follow-up actions and timelines were included. McMaster's Quality Assurance Committee (QAC) reviewed the above documentation and the committee determined that the programs are functioning well and that there are no significant academic issues that are not being addressed. The QAC recommends that the program should follow the regular course of action with an 18-month follow up report and a subsequent full external cyclical review to be conducted no later than 8 years after the start of the last review. The Final Assessment Report was prepared by the QAC to be submitted to Undergraduate Council and Senate (February 2014).

In their reports, the Review Teams provided feedback that describes how the degree completion programs in the School of Engineering Technology meet the Institutional Quality Assurance Process (IQAP) evaluation criteria and are consistent with the University's mission and academic priorities. Executive summaries for each of the stream reviews are below.

DCP Stream	Executive Summary
CIV TECH	The B.Tech. in Civil Engineering Infrastructure Technology is a niche program providing a high *value added* to society by teaching technical and business skills to students who had previously completed college diplomas in civil engineering, architecture or construction management. Some students completing the B.Tech. have gone on to pursue graduate school; some are pursuing licensure as professional engineers (P.Eng.); others are going on to technical careers in the civil engineering domain. The program was initially conceived to serve the Infrastructure Repair and Rehabilitation market, although the extent to which it is doing so is unclear. Enrollment in the program has more than doubled since 2008/09. Satisfaction with the program amongst alumni is 64% (based on a small sample), which is low compared to the three other degree completion programs. This possibly relates to the key issue for the program concerning the pathway of graduates to potential P.Eng. licensure. A high proportion of students taking the program see it as a route to P.Eng. licensure, although many may not have the abilities to become professional engineers. Professional Engineers Ontario is asking graduates of the program to take an average of seven qualifying exams (with high variation) towards the P.Eng. Proposed curriculum changes will likely reduce the number of qualifying exams, but the Program Director and steering committee should wrestle further with the alignment between student expectations and the pathway to P.Eng. While sessional instructors from industry greatly contribute to the B.Tech. program, the quality, reputation and consistency of course offerings may be improved if a further permanent instructor taught in the program. Further suggested enhancements to the program include long term scheduling of courses, orientation and networking sessions for instructors, and improved access to campus facilities during evenings.

COMP TECH   The program is attractive for college students wishing to complete their studies and obtain a degree. It offers students learning opportunities in several areas closely related to software technology, as well as General Technology courses that students seem to like. One weak feature of the program is that it relies heavily on sessional instructors, however the two sessional instructors the reviewers had a chance to meet have been teaching in the program for several years and they seem to be committed and serious about their work. The program is being redesigned to focus on software engineering and technology; however, the students seemed to be concerned about the new focus – that it is going to be harder. The program should maintain its focus on market-ready graduates and shouldn't attempt to compete with B.Eng. programs.

In an effort to increase enrollment and make the program accessible to students beyond the GTA, parts (or all) of the program may be offered completely online. It is suggested that the roll-out of online courses be completed in phases.

The process for making changes to the program curriculum needs to be strengthened, and for this we recommend that a program curriculum committee be established with members from related departments at McMaster, such as the Department of Computing and Software.

ENR TECH   Overall the program is successful, bridging the gap between a technical college education and a university engineering education. The program also provides opportunities for further education and thus career enhancement to full-time working students. The DCP energy stream benefits from high quality curriculum, labs and instructors. The reviewers found the program consistent with the university mission and academic plan. Courses are structured, taught and examined to meet degree level expectations. Several students also benefit from extracurricular opportunities provided through research projects and working in the labs to acquire further skills and develop lifelong learning skills.

The program will significantly benefit by hiring another full-time instructor to ensure the sustainability of the program and implement the proposed program enhancements. As per the reviewers' own experience, the program will also significantly benefit from CEAB accreditation, and the program seems adequate, with some of the enhancements proposed here, to be accredited.

MAN TECH   McMaster is known for its strength in research and for its strong linkages with industry. The B.Tech. DCP program aligns well with the tradition. The B.Tech. DCP program in Manufacturing is oriented towards students who have already graduated with a college diploma and now wish to upgrade to a university degree with the ultimate aim of becoming a licensed Professional Engineer (P.Eng.). The program format allows it to be taken on a part-time or full time basis, with the choice being left up to the student. Many students use this flexibility to hold full time or part-time jobs as they take this program; adding a maturity to the program. The program holds evening classes to accommodate working students. To meet these requirements this particular program is taught by sessional and/or Teaching Stream instructors.

The McMaster Manufacturing B.Tech. Degree Completion Program was designed to fulfill a niche college to university mobility need and is well placed to service it. The program is small both in terms of faculty numbers and the number of students it enrolls, but this size is central to the program character. The program is performing well. It is well on its way with OBA implementation has engaged faculty that is using innovative methods for teaching. The stude attrition

rates are normal. Student performance in PEO exams is good. Students like the program, faculty and the prospect of jobs, but are concerned about not being par

with students in the B.A.Sc. stream.

The admission requirements into the program are adequate as the alumni are successfully pursuing careers in research and in industry. The Ontario colleges are the main source of students coming into the program. As the colleges offer degree granting programs the source of students may be affected or the quality of students may go down. The program is able to attract students with minimal advertisement, but is missing out on a richer source of good students from other provinces and countries.

The current program curriculum has input from both industry and PEO. Upon graduation, the graduates are pursuing careers in industry and in research. In spite of the above, the students and faculty both felt that the curriculum needs an extra course in mathematics (section 10e).

The program faculty is enthusiastic, motivated, uses innovative methods in teaching and is well connected with the students. This engagement has resulted in overwork and over commitment and is a point of concern. A formula for faculty task allotment that recognizes their contribution in and out of class is recommended (see section 10a). The program does not lack space but did not have dedicated labs or equipment. Some dedicated program based space is a must.

The leadership of the program is collegial, helpful but firm. The chair has cultivated a family like atmosphere within the faculty. The chair is inspiring, helpful and firmly believes in student success. Faculty members and students alike respect the chair and acknowledge efforts in furthering the program objectives.

The students speak highly of the program as it enables them to pursue the dream of becoming an engineer while maintaining full time jobs and offers prospects of careers in industry and research. Course scheduling is a point of concern (section 4 and section 10b). The frequency and variety of course offering must be improved. The main goal of the students is PEO licensure; the program leaves them just short of the goal. (They need at least six (6) PEO exams to become eligible for licensure.) See Section 10c and 10d for further recommendations.

The relationship between students and faculty is exemplary and is under threat as the faculty is overworked. Two additional faculty members would ease the current load of the faculty and ensure student-faculty relationship remains exemplary.

GEN TECH   The B.Tech. program, and specifically the GenTech management courses reviewed here, are well positioned to bring career enhancing value to students within the mission of McMaster University. The review team was impressed by the commitment of faculty and the chair and with the success of students completing the program. Quality assessment and evaluation programs are in place and working; many courses were highly valued by students. While the program is fundamentally strong, there were areas identified for improvement. It is suggested that GenTech core management courses be rationalized and coordinated to avoid duplication and also consider adding topics. The reviewers believe it would be highly valuable to pursue a formal mapping process of the curriculum content and the order in which it should be presented. Modest suggestions were made related to the managing of group projects, improved student services during the 4:30 to 6 p.m. time period and the need for formal faculty meetings. The use of 100% sessional faculty and a part-time chair raises sustainability issues. Person-to-person classroom contact and active learning seem particularly important to the students and faculty in this program; it does not seem that an on-line or MOOC format would be well received.

The following program strengths and weaknesses were noted:

Strengths
- CIV TECH: The program has been growing in numbers. Its combination of technical and management courses produces graduates who are highly attractive for employers. The curriculum reflects the current state of the discipline and is both innovative and creative.
- COMP TECH: The program fills a real societal need in providing a pathway for individuals with a three-year technology diploma to upgrade and enhance their skills by earning a four-year equivalent university degree. While providing the required upgrading in fundamentals, the program also offers courses that provide career relevant technical expertise and a substantial management component. Students appreciate the dedication of their instructors and the quality and relevance of the course material.
- ENR TECH: The program is specifically designed to provide well-trained technical staff to the power engineering industry, and has been generally successful in doing so. Labs are well equipped and relevant. The teaching staff is made up of experts, highly experienced in their subjects, and their work is greatly appreciated by students and alumni.
- MAN TECH: The program is small, but this size is central to its character. The program is well in tune with industry needs, addressing its demand for engineers trained with basic management skills. Students are positive about their courses, and the prevailing ethos is collegial.
- GEN TECH: The program is seen as fundamentally strong, its teaching quality high. Students express respect and admiration for the faculty's experience, dedication, and career mentoring.

Weaknesses
The major concern raised by the reviewers of these programs is common to all of them: excessive dependence on sessional lecturers and on part-time or contractually limited administrators. Though their competence is not in question, the stability of the programs is deemed to require the hiring of full-

time faculty. Responses to the reviews indicate that hirings will be made as warranted. The advisability of moving increasingly to online course delivery is also a matter of debate. Both these situations merit careful monitoring.

The Dean of the Faculty of Engineering, in consultation with the Director of the School of Engineering Technology and the chairs of the programs shall be responsible for monitoring the recommendations implementation plan. The details of the progress made will be presented in the 18-month Follow Up Report and filed in the Office of the Associate Vice-President, Faculty.

Summary of the Reviewers' Recommendations with the School's and the Faculty's Responses
Recommendations

DCP Stream	Review Team Recommendations	Program Chair and Faculty's Response	Timeline
CIV TECH	Concern that program may not be fulfilling intended niche in infrastructure rehabilitation and repair	The program chair will seek input and advice from the program advisory committee regarding the program focus/niche	Update at 18-month follow up
	Planned curriculum changes were endorsed Foundation in statics and mechanics needs to be strengthened Sustainability should be made a strong component of new capstone course – CIV TECH 4ED3	Will proceed with planned curriculum changes, which include the addition of a Statics and Dynamics course as a foundation-level course, as well as Probability and Statistics and Structure and Properties of Materials A sustainability component will be added to CIV TECH 4ED3 for its first offering	Update at 18-month follow up
	Students sometimes struggle with courses taught in the same manner as that of the B.Eng. program	Continue to seek the 'optimum level' of course delivery for CIV TECH students and communicate this to instructors This will be done using ongoing meetings and discussions with instructors	Update at 18-month follow up
	Lack of female instruction is a concern Student surveys indicate that "timely communication with students" as well as approachability/relationship with instructors could be improved Low satisfaction rates in surveys	-An additional female faculty member has been hired to teach a course this fall Within the last several years, the speed of communication has increased (with positive student comments) and faculty/student relations are improving as a result of faculty changes The idea of adding another full-time faculty member will be discussed	Update at 18-month follow up

	could be linked to lack of full-time faculty for instruction	Another option might be to 'share' a full-time faculty with another stream (e.g. Manufacturing) - The Faculty will work with the program to increase the number of female instructors and students	
	Course schedule should be made 3 – 5 years in advance to assist students with planning CIV TECH stream needs to "decide" on extent to which program should be communicated/marketed as a pathway to P.Eng. There is a disconnect between those who want to pursue their license (90%+) and the percentage of students that instructors feel are capable of pursing their license (ranging from 0 – 60% in interviews with faculty)	A draft course schedule for the next three years (pending curriculum changes) will be put together for student reference Proposed 2015 curriculum changes will be pursued with the hopes of obtaining a full program review by the PEO within 2 years of the start of the new curriculum This should reduce the number of PEO exams required after graduation to 4 This course of action assumes that only the stronger students will take the steps necessary to pursue their license	Update at 18-month follow up
COMP TECH	Objectives of the program are vague – is it to produce software development professionals or networking technologists? This needs to be clarified and communicated to students	The program was never intended to have a networking focus The reorganization of the curriculum is intended to increase the focus on software Program marketing materials are being reevaluated to ensure that they accurately reflect the curriculum	
	Process for curriculum development should be more consultative at a broader level to help evolve and focus the program	Curriculum changes have been made using internal peer-review and extensive review of external industry reports One such report was the ICTC (Information and Communications Technology Council of Canada) report on competencies in the Computing and Information sector CEAB requirements have also been taken into consideration when making curriculum changes A program advisory committee	Update at 18-month follow up

		consisting of faculty at Mohawk College, McMaster University and industry representatives will be established	
	There appears to be no process for mapping across the program – is there a system for tracking achievement per student? How is data used to make improvements?	The mapping process implemented as part of this review will be continued and expanded over the coming years to address these concerns	Update at 18-month follow up
	Recommend an applied focus be taken to prepare students for jobs and not compete with Software Engineering programs Course prerequisites are neither clear nor enforced. The order of courses is not clear - program map is required.	Program has always had an applied focus All courses have a project component and the new Senior Engineering Project course will centre entirely on practical application Attracts students who have already completed an advanced diploma and is not accredited; therefore, it is not a directly competitive program with Software Engineering The academic calendar acts as a student's official program map For students who are part-way through the old and new program, things become much more complicated and case specific Students should seek help from the B.Tech. Academic Advisor	
	Learning outcomes of the program should be clearly articulated and communicated, especially to existing students	We have identified that more communication needs to be provided from administration about the program in general, rather than just registration minutiae As a result, we have classroom visits planned to help increase transparency surrounding the rationale for program changes and goals	Update at 18-month follow up
ENR TECH	Program seems too focused on training power engineers for	This is an excellent suggestion that can be implemented in the	Update at 18-month follow

	large generation and transmission utilities and operators, rather than local distribution companies	upcoming years, pending enrolment growth and our ability to offer elective courses	up
	The only review team to strongly encourage CEAB accreditation

Recommendation made to replace fluids with one additional math course

Replace one of the three mechanical courses with a more advanced math course

Improve the accuracy of the course outlines. For instance, (1) modify course titles to accurately reflect the content of the course ("Power Quality and Energy Management" should be renamed "Power Quality"); (2) The course "Control Theories and Drive Systems" should be simply "Control Theories" and should relate to control with a power systems perspective; (3) The course "Industrial Electronics" should be "Power Electronics", again with a power systems | Although this is a valuable suggestion, at the moment accreditation is not being sought for a number of reasons
These include, but are not limited to, flexibility in upgrading course materials, introducing new courses as per industry demand and upgrading technical topics in a very short period of time
Doing this would mean that the mechanical courses will not be synchronized with expected learning outcomes
Replacing a mechanical course would go against the recommendations of the experts involved in the program design
The combination of the three mechanical courses is seen as critical for other advanced courses, specifically related to power generation
Both suggested recommendations (Power Quality and Control Theories) are valid and will be implemented
The third suggestion (changing the title "Industrial Electronics" to "Power Electronics" cannot be applied as the main goal of this course is to cover power electronics from an industrial perspective | |
| | Continue to review technical courses and evaluation instruments | -This is an excellent suggestion which falls within B.Tech program mandate through the continuous review of their POS
- As well, this suggestion aligns with the B.Tech vision of including industry advisory committee feedback and recommendations | Update at 18-month follow up |

		with the aim of improving and upgrading the POS	
	Program would benefit from greater linkage with the Electrical Power courses offered in the Electrical and Computer Engineering (ECE) Department at McMaster (and vice versa for the McMaster courses).	Action is in process, as current B.Tech students utilize the ECE department lab facilities in their courses (ENRTECH 3IE3, ENRTECH 3EP3) - Further, there has been some collaborative efforts between B.Tech and ECE to have a two courses (ENRTECH 4PM3, ENRTECH 4PP3) from the B.Tech program to be cross-listed with ECE as elective courses - It should be mentioned that a few years ago the course ENRTECH 4PM3 was cross-listed and taken by ECE students as a fourth year elective. The feedback from the students was positive, and requested similar course delivery in the future	
	Offer official recognition such as a "management" certificate or diploma option to the DCP students to further appreciate the significance of the courses	A Business Management Certificate from Mohawk will be provided to our graduates in the near future	Update at 18-month follow up
MAN TECH	Additional mathematics courses could be added to better prepare students for foundational courses	An advanced mathematics course is being planned for fall 2015. This course will replace CIV TECH 3MN3 – Numerical Solutions in Engineering	Update at 18-month follow up
	Full-time faculty appear to be overloaded/overworked with too little time for professional development May need to increase appeal of program to compete with college degree program offerings	Additional full-time faculty members will be hired (if justified) over the coming years to reduce sessional hiring and decrease full-time faculty workloads One option to increase our competitive advantage is to create a pathway for B.Tech. students with a 9.5 GPA or higher to have direct entry into the M.Eng. Manufacturing degree	
	If the institutional goals permit, CEAB accreditation could be	The possibility of the MAN TECH program being accredited is	Update at 18-month follow

	considered. Addition of a report writing course or co-op report to fulfill PEO requirements could be helpful	dependent on the market demand and also on the effect of colleges offering accredited degrees Will discuss the possibility of writing a final co-op work term report to fulfill PEO technical report requirements	up
GEN TECH	The diversity of the program streams may require a closer look at the GEN TECH content to ensure that needs are being addressed	GEN TECH curriculum is consistently reviewed to ensure relevance. Course content is designed for all four audiences As much as possible, topics are chosen to appeal to the widest audience, or to allow students choice/specialization Project management has been the most difficult course to administer across all streams in terms of content/relevancy. An instructor change has improved the situation and course evaluations have become more positive	
	Students should be provided with a recommended order to take courses (i.e. a program map) The selection of the five required courses appears haphazard There does not appear to be a capstone project/course to tie the material together Topics in Business Strategy and Entrepreneurship should be strengthened	The GEN TECH courses were designed without course pre-requisites to provide students with flexibility and minimal barriers to completing the program as quickly as possible. A recommended order will be provided. GEN TECH courses were designed to represent the "best of an MBA" and were very intentionally selected by the development committee in 2007 Strategy Formulation was originally a required course. It is now elective, but retains its capstone orientation Entrepreneurship has always been a required course	
	Supply chain management topics should be added	This could be added as an elective in the future, but has not been identified as a priority by past Program Advisory Committees	

	Engineering Economics and Sustainability are important topics, but should not crowd out teaching fundaments of management	Decision to make Engineering Economics a mandatory course is intended to help make the pathway to P.Eng. licensing smoother (i.e. by eliminating a technical exam requirement) Sustainability is going to be offered as an elective course beginning in fall 2014	
	Courses with more than 35 students reduce opportunities for interactivity and impact effectiveness of teaching and assessment	Class sizes will be managed to optimize the opportunities for interactivity. Teaching assistants will be provided to improve learning in larger classes.	Update at 18-month follow up
	Student and alumni surveys reveal very mixed reviews regarding the perceived usefulness of GEN TECH courses	Graduates perceive the value of such courses while current students, less so More mature and older current students acknowledge the value of management courses The split in attitude may divide along the line of chronological age/experience rather than current students versus alumni Graduates come to realize that their jobs have them leaving behind technical skills in favour of management skills	
	Lean program operating structure with a part-time Program Chair is not ideal	The Chair's role will be re-evaluated as duties increase and delivery moves online -The use of sessional faculty provides flexibility and industry specialization which is essential to the program	Update at 18-month follow up
	Consider peer review of group projects	Some faculty, as a matter of practice, do partition out individual contributions within group projects to recognize individual effort This could be a discussion topic at the next faculty meeting	Update at 18-month follow up

Common Feedback across all programs	Orientation handbook should be made available to sessional faculty members	A handbook is currently under development and will be available beginning Fall 2014 A potential orientation session is under discussion; however, there are issues related to availability of instructors	Update at 18-month follow up
	Mixed feelings across the reviews in regards to online learning formats	COM TECH and GEN TECH are transitioning to full online delivery in Fall 2014 A learning on demand environment with fewer face to face lectures is being explored for ENG TECH 3MA3 – Mathematics V The Faculty supports the approach being taken by the program; staged introduction of high quality online delivery accompanied by careful monitoring of the outcomes	Update at 18-month follow up
	Additional instructor space could alleviate issues related to lack of access to resources	Beginning in Fall 2014, DCP sessional instructors will have access to a common sessional office space (equipped with computers and networked to the printer/photocopier) They will also have access to the common mail room, rather than being restricted to accessing their mail box only when the evening receptionist is on duty (1.5 hrs per day)	
	Additional student space could improve feeling of community	Student drop-in help centre is being created in a central location that can also potentially be used by student groups wishing to meet to discuss projects Students already have access to empty classrooms prior to their classes, in addition to private study rooms for B.Tech. students only	Update at 18-month follow up
	More/better communication to students about pathway to obtaining P.Eng. and Grad Studies	PEO information session is being planned for Fall 2014 Ensure that graduate studies pathways document on website is updated with listings of known	Update at 18-month follow up

		alumni who have moved on to Master's and Ph.D. programs	
	More access to administration and student services after office hours	a part-time receptionist is available from 5:30 am – 7:00 am Monday through Friday and from 8:30 am – 10:00 am on Saturdays. Considerations could be made for increasing these hours for more administrative support	Update at 18-month follow up
	Lack of full-time faculty, overloaded/overworked full-time faculty, need to hire more CLAs and less sessionals	B.Tech has historically maintained a minimal presence of full-time faculty for degree completion programs. One of the primary reasons for this is to ensure that instructors bring industry relevant material to the classroom. Plans are in place to expand the contingent of full-time faculty in all B.Tech programs, pending enrolment growth. The Faculty will support the program in offering effective support services to DCP students	Update at 18-month follow up

Quality Assurance Committee Recommendation

McMaster's Quality Assurance Committee (QAC) reviewed the above documentation and the committee determined that the programs are functioning well and that there are no significant academic issues that are not being addressed. The QAC recommends that the program should follow the regular course of action with an 18-month follow up report and a subsequent full external cyclical review to be conducted no later than 8 years after the start of the last review