



Program Review Quality Assurance Plan – Engineering

Quality Assurance Plan for: Engineering Program

Date submitted to SSCPR: June 2, 2017

Date Self-Study Report approved by SSCPR: October 26, 2016

Date of External Review: November 25, 2016

SUMMARY

The Engineering program at KPU is designed to replicate the first-year engineering curriculum with the purpose of preparing students for their second-year of studies in any engineering undergraduate program in B.C. The strong labour market for engineers, projected population growth of the KPU catchment area, and strong engineering enrolment of neighbouring post-secondary institutions, suggest that demand for KPU's Engineering program should be high. Unfortunately, some changes in the KPU admissions model have influenced enrolment and student numbers have declined over the past two years. One of the challenges will be working within the new admissions model to bring enrolment in the Engineering program back to full capacity. The Engineering program curriculum provides students with the skills and knowledge needed to progress to the next level in their academic career, namely, the second-year of an engineering undergraduate degree. There are opportunities to further improve the curriculum by incorporating current trends and topics practised in industry and being taught in the engineering-degree granting institutions. The KPU Engineering program has been successful in its purpose of preparing students for second-year engineering. On average, KPU students who transfer into a second-year engineering program perform as well as their counterparts from other institutions. Establishing transfer agreements with other institutions and better coordination of courses across the KPU Engineering program are ways to facilitate student success entering and succeeding in a second-year engineering program. Alumni, current students and faculty are strongly supportive of KPU's Engineering program, citing the quality of instructors and small class sizes as being the strongest attributes of the program. There is a desire on all levels to expand the Engineering program at KPU with opportunities and challenges to creating a full engineering undergraduate degree at KPU.

QUALITY ASSURANCE GOALS

GOAL 1: To ensure that students who complete the KPU engineering program are prepared for further engineering studies.

RATIONALE FOR THIS GOAL:

The KPU Engineering program serves as a stepping stone on the path towards an engineering undergraduate degree. Preparing the student for further studies incorporates both curricular currency of the program, and academic success of the student.

Program currency has been identified in the program review as one aspect of KPU's Engineering program that could be improved. Keeping the program curriculum up-to-date, by following current trends in software used by industry and other post-secondary institutions and adapting to curricular changes at the engineering undergraduate institutions, will ensure that graduating students have the necessary qualifications to progress in their engineering studies. The annual Engineering Articulation meeting sponsored by BCCAT (B.C. Council on Admissions and Transfer) provides the forum for introducing and discussing curricular changes at every B.C. post-secondary institution that offers an engineering program. Any required or recommended changes to the KPU Engineering program curriculum can then be implemented through KPU's process for course and program revisions.

While the program review showed that graduates of the KPU Engineering program who transferred into a second-year engineering undergraduate program performed as well as their counterparts from other post-secondary institutions, it was also noted that more could be done to facilitate student success. As with other KPU programs, the Engineering program strives to support and facilitate student learning and achievement. This is particularly important for graduates of the KPU Engineering program who need to satisfy the academic admission requirements of the receiving institution and maintain academic success in their continuing years of study. KPU already has academic support services – Teaching and Learning Commons for instructors, and the Learning Centers for students – that can be utilized to facilitate student learning and achievement.

Recommendation(s) this Goal Addresses	Report (page number)
Adapt the engineering graphics course to include some solid modelling.	Self-study (19)
Discuss with the Math department the possibility of switching math-applications software from MAPLE to MATLAB.	Self-study (19)
Investigate what KPU may have to offer in terms of a technical writing course for engineers.	Self-study (19)
Encourage faculty to use a flipped-classroom approach to instruction, and encourage the implementation of experiential, rather than results-based labs.	Self-study (22)
Obtain student data from Institutional Analysis and Planning on a regular basis.	Self-study (33)
Discuss with the departments responsible for linear algebra, chemistry and computer program regarding the negative comments from alumni and students.	Self-study (34)
Approach Information Technology to encourage moving PC's back to the labs and the library.	Self-study (37), External (8), External (10)

Determine specific relationships of the core competencies to engineering content and include aspects of them in relevant courses through the curriculum.	External (3)
Review APSC 1151 course content for currency – removal/addition of topics.	External (3)
Additional exploration of instructional methods to determine areas of weakness and formulate a plan for improvements.	External (5)
Examine areas where coordination, integration, and synergy are possible in the program, to provide a more cohesive and connected educational experience.	External (5)
Use of workbooks to continue with considerations of expanding to other subjects.	External (5)
Review how the Learning Center and class schedules line up and that KPU supports more access outside of Engineering program class time.	External (8), External (10)
Explore an investment in remote classroom technology to allow the class to run simultaneously on both campuses, with a single instructor/speaker.	External (8)
Participate in the annual Canadian Engineering Education Association (CEEA) conference.	External (12)

GOAL 2: To support and enhance opportunities for students to pursue an engineering degree through KPU.

RATIONALE FOR THIS GOAL:

The strong labour market forecast for engineering combined with population growth of the KPU catchment area are strong indicators for potential growth of KPU's Engineering program. The KPU Engineering program serves as a stepping stone on the path towards an engineering undergraduate degree so one must enhance the opportunities on both the admissions side and the graduate side of the program. Both the self-study report and the external review report have identified a need to increase accessibility and enrolment by opening multiple entry point into the Engineering program, while developing formal transfer agreements with engineering-undergraduate institutions will increase the options and opportunities to continue engineering studies beyond the KPU program. Revising the existing Engineering program, or developing a new Engineering program, can be accomplished within KPU's procedures for revising or creating new programs. Supporting and enhancing student opportunities is part of KPU's mission and mandate to increase access through transition programs, multiple entry points and bridging opportunities.

Recommendation(s) this Goal Addresses	Report (page number)
Reinstate the open-enrolment admissions stream into the Engineering program, or create a new two-year diploma program.	Self-study (15), External (2)
Enlist opportunities to promote enrolment of female students in engineering as a means of supporting and enhancing the opportunities for female KPU students to pursue a degree in engineering.	Self-study (15), External (2)
All qualified faculty involved with engineering design begin the process of obtaining professional engineering credentials.	Self-study (22), External (12)

Obtain student data from Institutional Analysis and Planning on a regular basis.	Self-study (33)
Continue discussions with SFU Burnaby and SFU Surrey with the intention of establishing a memorandum of understanding regarding engineering transfer between the institutions.	Self-study (34)
Continue discussions with UVic with the intention of establishing a memorandum of understanding regarding engineering transfer between the institutions.	Self-study (34), External (3)
Consider a pathway towards a fully-accredited engineering-undergraduate program at KPU.	Self-study (34)
Approach the Future Students Office about how to correctly promote the KPU Engineering program to potential students.	Self-study (37), External (10)
Form a program advisory committee with local Engineering professionals and meet once or twice per year to assess and support the program's initiatives.	External (12)

RECOMMENDATIONS THE QUALITY ASSURANCE PLAN DOES NOT ADDRESS

Recommendations	Report (page number)	Explanation
<i>Use of open textbooks</i>	<i>External (8)</i>	<i>KPU is one of the leading institutions in B.C. with regards to adopting open textbooks for students. While it is acknowledged that the cost of textbooks can be prohibitive, the author does not feel the need to address the textbook choice in the quality assurance plan, unless the choice of textbook adversely affects student outcomes. The student concerns were regarding expense, online usage and expiry. While open texts may address the issues of expense and expiry, these issues do not fit with the goals of the program review.</i>

QUALITY ASSURANCE FIVE-YEAR ACTION PLAN

YEAR ONE: Jan 2017 to Dec 2017

OBJECTIVE: **Adapt the Engineering curriculum to maintain program currency.**

GOAL(S) THIS OBJECTIVE SUPPORTS: Goal 1 – To ensure that students who complete the KPU engineering program are prepared for further engineering studies.

RATIONALE FOR THIS OBJECTIVE: To address some of the program review recommendations associated with the goal.

Action(s) Required to Achieve this Objective	To be Led by	To Begin on (M/YY)	To be Completed By (M/YY)	Notes
Investigate acquisition of Solidworks educational license.	Engineering Coordinator	May/2017	Sep/2017	Part of 2-year plan to update APSC 1151
Investigate acquisition of MatLab site license.	Eng. Coord.	May/2017	Sep/2017	Part of 2-year plan to use MatLab in MATH courses.
Investigate what KPU may offer to serve as a technical writing course for engineers	Eng. Coord.	May/2017	Sep/2017	Part of multi-year plan for introducing technical writing course.

OBJECTIVE: **Improve support for student learning.**

GOAL(S) THIS OBJECTIVE SUPPORTS: Goal 1 – To ensure that students who complete the KPU engineering program are prepared for further engineering studies.

RATIONALE FOR THIS OBJECTIVE: To address some of the program review recommendations associated with the goal.

Action(s) Required to Achieve this Objective	To be Led by	To Begin on (M/YY)	To be Completed By (M/YY)	Notes
Contact IT about possibly moving PCs back to the labs and library, to facilitate student access to AutoCAD	Eng. Coord.	May/2017	Sep/2017	
Discuss with the Math, Chemistry and Computer science departments regarding negative comments from alumni and students.	Eng. Coord.	May/2017	Sep/2017	If necessary, implementation to address the issues will be in Year 2.
Coordinate with tutoring and learning centers to provide access times that fit the Engineering program schedules.	Eng. Coord.	May/2017		Coordination should continue on a semester-by-semester basis.
Implement changes to scheduling APSC 1124 to allow better content delivery.	Eng. Coord.	Jan/2017	Sep/2017	

OBJECTIVE: Improve admissions opportunities for prospective engineering students.

GOAL(S) THIS OBJECTIVE SUPPORTS: Goal 2 – To support and enhance opportunities for students to pursue an engineering degree through KPU.

RATIONALE FOR THIS OBJECTIVE: To address some of the program review recommendations associated with the goal.

Action(s) Required to Achieve this Objective	To be Led by	To Begin on (M/YY)	To be Completed By (M/YY)	Notes
Investigate opportunities to allow open enrolment – if implementation of engineering open enrolment only requires program revision, implementation can occur in Year 2. If implementation of engineering open enrolment requires program development, implementation will occur in Year 3.	Eng. Coord.	Jan/2017		Program revision can be completed in one year; new program development will require up to 3 years.
Meet with Future Students Office (FSO) to discuss recruitment to engineering	Eng. Coord.	Jan/2017		Ongoing with every admissions cycle.
Coordinate with IAP to obtain student entry and exit data to look for correlations.	Eng. Coord.	May/2017		Ongoing with every academic cycle.
Begin dialogue about gender imbalance in engineering program with appropriate stakeholders – FSO, KPU advisors, high-school guidance counselors.	Eng. Coord.	May/2017	Dec/2017	Subsequent actions will depend on the outcome of the dialogue.

OBJECTIVE: Improve exit opportunities for graduates of the KPU engineering program.

GOAL(S) THIS OBJECTIVE SUPPORTS: Goal 2 – To support and enhance opportunities for students to pursue an engineering degree through KPU.

RATIONALE FOR THIS OBJECTIVE: To address some of the program review recommendations associated with the goal.

Action(s) Required to Achieve this Objective	To be Led by	To Begin on (M/YY)	To be Completed By (M/YY)	Notes
Make curricular revisions/new course for Engineering Mechanics to allow formal transfer agreement with University of Victoria Engineering, and begin MOU process with UVic.	Engineering Articulation Rep.	Jan/2017	Sep/2017	
Begin formal MOU process with UVic for engineering transfer agreement	Eng. Articulation	Jan/2017	Sep/2017	Will depend on UVic accepting proposed curricular changes.
Coordinate with IAP to obtain student entry and exit data to look for correlations.	Eng. Coord.	May/2017		Ongoing with every academic cycle.

OBJECTIVE: **Expand KPU Engineering beyond the first-year transfer program.**

GOAL(S) THIS OBJECTIVE SUPPORTS: Goal 2 – To support and enhance opportunities for students to pursue an engineering degree through KPU.

RATIONALE FOR THIS OBJECTIVE: To address some of the review recommendations associated with the goal.

Action(s) Required to Achieve this Objective	To be Led by	To Begin on (M/YY)	To be Completed By (M/YY)	Notes
Faculty involved with engineering design should begin the process of obtaining a P. Eng. or Eng. L. professional designation.	Eng. Coord.	Sep/2017		Application fees could be paid from department operating or faculty PD funds. Timeline for obtaining P. Eng. or Eng. L. designation will depend on engineering qualifications of faculty member.

YEAR TWO: Jan 2018 to Dec 2018

OBJECTIVE: **Adapt the Engineering curriculum to maintain program currency.**

GOAL(S) THIS OBJECTIVE SUPPORTS: Goal 1 – To ensure that students who complete the KPU engineering program are prepared for further engineering studies.

RATIONALE FOR THIS OBJECTIVE: To address some of the program review recommendations associated with the goal.

Action(s) Required to Achieve this Goal/Objective	To be Led by	To Begin on (M/YY)	To be Completed By (M/YY)	Notes
Implement adding Solidworks or some other 3-D modelling software into the APSC 1151 curriculum.	Eng. Coord.	Jan/2018	Dec/2018	
Discuss with the Math department the possibility of using MatLab in the math courses.	Eng. Coord.	Jan/2018	Dec/2018	
Review and revise course outlines – PHYS 1120, 1220 and PHYS 1141/1170 – for currency and inclusion of core competencies related to engineering practice.	Physics Chair	Jan/2018	Dec/2019	Allow 2-years for review and revision
Review and revise course outlines – APSC 1124, APSC 1151 and APSC 1299 – for currency and inclusion of core competencies related to engineering practice.	Eng. Coord.	Jan/2018	Dec/2019	Allow 2-years for review and revision
Review and revise course outlines – CHEM 1154, MATH 1152, CPSC 1103 – for currency and inclusion of core competencies related to engineering practice.	Department representatives	Jan/2018	Dec/2019	Allow 2-years for review and revision

OBJECTIVE: **Improve support for student learning.**

GOAL(S) THIS OBJECTIVE SUPPORTS: Goal 1 – To ensure that students who complete the KPU engineering program are prepared for further engineering studies.

RATIONALE FOR THIS OBJECTIVE: To address some of the program review recommendations associated with the goal.

Action(s) Required to Achieve this Goal/Objective	To be Led by	To Begin on (M/YY)	To be Completed By (M/YY)	Notes
To address negative comments by students and alumni regarding specific MATH, CHEM and CPSC courses – If necessary, develop and implement plan to address issues identified through consultation with departments.	Determined through consultation.	Jan/2018	Dec/2018	

Begin discussion and consultation with all faculty involved with delivering Engineering program curriculum regarding instructional methods and areas where coordination, integration and synergy across courses may be possible (maybe include a round-table discussion at the KPU Teaching, Research and Learning Symposium)	Eng. Coord.	Jan/2018	Dec/2019	Allow 2-years, to coincide with course outline review and revisions.
Participate in the annual Canadian Engineering Education Association (CEEA) conference.	Eng. Coord.	Jun/2018		Funding may come from Faculty PD fund.

OBJECTIVE: **Improve admissions opportunities for prospective engineering students.**

GOAL(S) THIS OBJECTIVE SUPPORTS: Goal 2 – To support and enhance opportunities for students to pursue an engineering degree through KPU.

RATIONALE FOR THIS OBJECTIVE: Part of the recommendations associated with the goal.

Action(s) Required to Achieve this Objective	To be Led by	To Begin on (M/YY)	To be Completed By (M/YY)	Notes
Investigate opportunities to allow open enrolment – if required, develop new program for engineering open enrolment.	Eng. Coord.	Jan/2018	Oct/2019	Must be completed by Oct 2019 for roll-out Sep 2020; new program should be developed from existing courses

OBJECTIVE: **Improve exit opportunities for graduates of the KPU engineering program.**

GOAL(S) THIS OBJECTIVE SUPPORTS: Goal 2 – To support and enhance opportunities for students to pursue an engineering degree through KPU.

RATIONALE FOR THIS OBJECTIVE: Part of the recommendations associated with the goal.

Action(s) Required to Achieve this Objective	To be Led by	To Begin on (M/YY)	To be Completed By (M/YY)	Notes
Begin discussions with Simon Fraser University (SFU) Engineering Science and Mechatronics schools about engineering transfer agreements with KPU.	Eng. Articulation	Jan/2018	Dec/2018	
Investigate options for KPU/BCIT Engineering transfer agreement.	Eng. Articulation	Jan/2018	Dec/2018	

OBJECTIVE: **Expand KPU Engineering beyond the first-year transfer program.**

GOAL(S) THIS OBJECTIVE SUPPORTS: Goal 2 – To support and enhance opportunities for students to pursue an engineering degree through KPU.

RATIONALE FOR THIS OBJECTIVE: To address some of the review recommendations associated with the goal.

Action(s) Required to Achieve this Goal/Objective	To be Led by	To Begin on (M/YY)	To be Completed By (M/YY)	Notes
Form a program advisory committee with local Engineering professionals and meet once or twice per year to assess and support the program's initiatives.	Eng. Coord.	Jan/2018	Dec/2018	

YEARS THREE TO FIVE: Jan 2019 to Dec 2021

OBJECTIVE: **Adapt the Engineering curriculum to maintain program currency.**

GOAL(S) THIS OBJECTIVE SUPPORTS: Goal 1 – To ensure that students who complete the KPU engineering program are prepared for further engineering studies.

RATIONALE FOR THIS OBJECTIVE: To address some of the program review recommendations associated with the goal.

Action(s) Required to Achieve this Goal/Objective	To be Led by	To Begin on (M/YY)	To be Completed By (M/YY)	Notes
Complete review and revisions of course outlines associated with the Engineering program.	Various		Dec/2019	

OBJECTIVE: **Improve support for student learning.**

GOAL(S) THIS OBJECTIVE SUPPORTS: Goal 1 – To ensure that students who complete the KPU engineering program are prepared for further engineering studies.

RATIONALE FOR THIS OBJECTIVE: To address some of the program review recommendations associated with the goal.

Action(s) Required to Achieve this Goal/Objective	To be Led by	To Begin on (M/YY)	To be Completed By (M/YY)	Notes
Complete review of instructional methods and areas of coordination, integration and synergy across courses.	Eng. Coord.		Dec/2019	

OBJECTIVE: **Improve exit opportunities for graduates of the KPU engineering program.**

GOAL(S) THIS OBJECTIVE SUPPORTS: Goal 2 – To support and enhance opportunities for students to pursue an engineering degree through KPU.

RATIONALE FOR THIS OBJECTIVE: Part of the recommendations associated with the goal.

Action(s) Required to Achieve this Objective	To be Led by	To Begin on (M/YY)	To be Completed By (M/YY)	Notes
Complete course revisions/new courses to allow direct and complete transfer to SFU Engineering Science and Mechatronics schools second-year engineering programs.	Eng. Articulation	Jan/2019	Dec/2021	Dependent on SFU participation and requirements for MOU.
Complete course revisions/new courses to allow direct and complete transfer to BCIT.	Eng. Articulation	Jan/2019	Dec/2021	Dependent on BCIT participation and requirements for MOU.

OBJECTIVE: **Expand KPU Engineering beyond the first-year transfer program.**

GOAL(S) THIS OBJECTIVE SUPPORTS: Goal 2 – To support and enhance opportunities for students to pursue an engineering degree through KPU.

RATIONALE FOR THIS OBJECTIVE: To address some of the review recommendations associated with the goal.

Action(s) Required to Achieve this Goal/Objective	To be Led by	To Begin on (M/YY)	To be Completed By (M/YY)	Notes
Based on discussions with engineering advisory committee, generate market survey for an expanded engineering program in the KPU catchment.	Eng. Coord.	Jan/2019	Dec/2019	
Based on market survey and advisory committee, begin and complete program proposal for new Engineering program (undergraduate program, professional development program for foreign trained engineers, or other programs).	Eng. Coord.	Jan/2020	Dec/2021	

June 2, 2017

Senate Standing Committee on Program Review

Institutional Response: Engineering Certificate Program

I would like to extend congratulations to Dr. Michael Poon (Physics Department Chair and Engineering Program Coordinator) and the team from the Physics Department for compiling a high quality, comprehensive review of a long-standing, highly successful program which has not been previously internally reviewed.

Dr. Poon outlines two (2) overarching Quality Assurance Goals and five (5) main Objectives addressing recommendations outlined in the Self-Study and found in the External Review Team Report. In consultation with Dr. Salvador Ferreras, Provost and Vice-President Academic, I approve of the goals and steps outlined to achieve said goals. This program epitomizes both Vision 2018 and the Academic Plan 2018 and the successful achievement of these goals will ensure that the program evolves to continue to fit the needs of students and the industry.

Goal 1: Ensure Engineering Certificate graduates are prepared for further engineering studies. The QA report outlines two major objectives addressing this goal: 1. adapting curriculum to maintain program currency, and 2. improving support for student learning. Many of the actions pertaining to these objectives are already underway including changes to curriculum, software assessment and plans to create a new technical writing course. Existing course outlines will be revised and content adapted as required to account for changing core engineering competencies. Several courses making up the Engineering Certificate are taught by instructors from other FSH Departments and Faculties hence removing any control over who is chosen to teach Engineering students. This can, and periodically has, resulted in non-ideal selections of instructors. To address this issue, the plan is to hold periodic discussion groups to better address any shortfalls. The many actions listed to facilitate Goal 1 are appropriate, relevant and receive my full support. There are many 'quick wins' that can be achieved in a short time frame.

Goal 2: Student support and enhanced opportunities. The QA report outlines three major objectives addressing this goal: 1. increase admission access, 2. provide more exit opportunities, and 3. internal (KPU) degree completion opportunities. **Objective 1** will require working closely with support units such as the FSO and OREG, particularly concerning recruitment and establishing an open enrolment stream. These discussions are underway but it will take several admissions cycles to start to see the results. **Objective 2** is already in process and an agreement for transfer to UVic has already been signed. Reaching out to SFU and BCIT will take place in subsequent years as such agreements will require more substantive curricular changes to take place. **Objective 3** is more of a long term goal and will require substantial resource commitments (budget, space, capital, personnel) from KPU. Several years ago a draft Full Program Proposal



(including IAP report) for a B. Sc. in Industrial Engineering was produced with a keen vision to serve the needs of the South Fraser industrial community. Such an endeavor is very resource rich and would require that all instructors of APSI or other Engineering courses have P. Eng or Eng. L. professional status. We certainly will encourage existing faculty to pursue this but will require a boost to the Physics Department operating budget to cover fees. The original draft proposal can be the starting point of a revised program proposal. Regardless, I support the establishment of an Engineering Program Advisory Committee which will meet yearly and would be tasked with updating the degree program proposal if there is an appetite from KPU Senior Admin to pursue this initiative. The development of a full Engineering degree is a future project and will only be pursued if support is present.

In summary, I am fully supportive of the goals and timelines outlined by Dr. Poon and pleased to see that many are already well on their way to fruition. In addition, I congratulate Dr. Poon for an exemplary program review and look forward to seeing the above goals implemented.

Respectfully yours,

A handwritten signature in cursive script that reads "Elizabeth Worobec".

Elizabeth (Betty) Worobec, Ph.D.
Dean, Faculty of Science and Horticulture