S.18-105

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MEMORANDUM

ATTENTION: Senate | TEL

FROM: Peter Keller, Vice-President, Academic and Provost, and Chair, SCUP

RE: Full Program Proposal for the Master of Engineering in Mechatronic Product Realization (SCUP 18-28)

DATE: October 17, 2018 | TIME

At its October 10, 2018 meeting, SCUP reviewed and approved the full program proposal for the Master of Engineering in Mechatronic Product Realization within the Faculty of Applied Sciences, effective Fall 2019.

Motion:

That Senate approve and recommend to the Board of Governors the full program proposal for the Master of Engineering in Mechatronic Product Realization within the Faculty of Applied Sciences, effective Fall 2019.

c: F. Firmani
M. Moallem
E. Fiume

SFU GRADUATE AND POSTDOCTORAL STUDIES

SCUP 18-28

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Burnaby, BC V5A 1S6

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gradstudies@sfu.ca
www.sfu.ca/grad

MEMORANDUM

ATTENTION Senate Committee on University Priorities (SCUP)

DATE September 24, 2018

FROM Jeff Derksen,
Chair of Senate Graduate Studies Committee (SGSC)

RE: Full program proposal for a Master of Engineering in Mechatronic Product Realization

For approval:

At its meeting of September 11, 2018, SGSC approved full program proposals for and a Master of Engineering in Mechatronic Product Realization and is recommending it to SCUP for approval, effective **Fall 2019.**

Motion:
That SCUP approve and recommend to Senate the full program proposal for a Master of Engineering in Mechatronic Product Realization within the Faculty of Applied Science.

SFU
OFFICE OF THE DEAN
Faculty of Applied Sciences
Simon Fraser University

MEMORANDUM

Attention Dr. Jeff Derksen
Dean, Graduate Studies

Date August 24, 2018

From Dr. Mirza Faisal Beg mfbeg@sfu.ca
Faculty of Applied Science, Graduate Studies Committee

Re: Full Program Proposal for Sustainable Energy Engineering graduate degrees and Professional Master's in Mechatronic Product Realization

The faculty of Applied Sciences Graduate Program Committee would like to send two items to the SGSC for consideration. These are:

1) The full program proposal for the Sustainable Energy Engineering MASc and PhD degrees revised as per the feedback provided by your office.
2) The full program proposal for the Professional Master's in Mechatronic Product Realization revised as per the feedback provided by your office.

FAS GPC has approved both of these submissions via an electronic vote. I request you to place these on the agenda for the next SGSC meeting.

SFU SIMON FRASER UNIVERSITY
SURREY

SCHOOL OF MECHATRONIC SYSTEMS ENGINEERING

250-13450 102 Avenue
Surrey, BC V3T 0A3
Canada

Tel: 778-782-8456
Fax: 778-782-7514

July 24, 2018

From: MSE Graduate Program Committee Chair
To: Faculty of Applied Sciences Graduate Program Committee

Subject: Professional Master's in Mechatronic Product Realization

Dear FAS Graduate Program Committee

Attached please find the following documents for feedback and approval by FAS:

1. Revised program proposal for Professional Master's in Mechatronic Product Realization. The revised proposal was approval by MSE GPC and MSE Faculty on July 23, 2018.

2. New course proposal (MSE 901 Becoming a Professional Engineer):

3. New course: MSE 794 Graduate Co-op Practicum II

4. Course Change: "MSE 793 Graduate Co-op Practicum" to be changed to "MSE 793 Graduate Co-op Practicum I". The proposal has been approved by the MSE GPC and MSE faculty on January 12, 2018.

Sincerely,

Mehrdad Moallem
Professor and Graduate Program Chair
School of Mechatronic Systems Engineering

Phone: 778 782 8156

SIMON FRASER UNIVERSITY
ENGAGING THE WORLD

Master of Engineering in Mechatronic Product Realization

Full Program Proposal

October 15, 2018 (revised proposal)

School of Mechatronic Systems Engineering

PART A: Information required by the Ministry of Advanced Education

EXECUTIVE SUMMARY

Overview of the SFU's history, mission, and academic goals

The School of Mechatronic Systems Engineering (MSE) proposes the creation of a Master of Engineering in Mechatronic Product Realization (MEng). Building upon the success of its undergraduate and graduate programs, *the MEng degree in MPR at MSE provides its students with a premier curriculum, through dedicated courses, design projects, and industrial co-op for professionals seeking to expand their career opportunities in* ***product design and manufacturing.***

From fall 2015 this program was offered as a Cohort Special Arrangements Master's Program in Mechatronic Product Realization through the Office of Graduate Studies at SFU. The special cohort program is now in its third year and has been rapidly increasing in demand. During this period, our students have successfully gained experience in the Canadian workplace through the co-op program and through experience on the job upon graduation. After completing the first two cohort programs, the program is now mature and ready for conversion into a regular program.

Mechatronic Product Realization covers the entire process of design for mechatronic systems and products. Given the rapid growth of new information technologies, digital circuits, and additive manufacturing technologies, the market for new mechatronic products is growing exponentially in all industry sectors such as consumer products and electronics, automotive, medical, industrial, and aerospace.

The primary goal of the MSE Master of Engineering in Mechatronic Product Realization is to help British Columbia and Canada stay competitive in product design and manufacturing in a rapidly changing world. The proposed program is also in line with the vision of assisting the City of Surrey to become a major contender in manufacturing, nationally and globally.[1] As a key academic partner of the City of Surrey, through the MPR program, the MSE offers a unique engineering training program that feeds local companies with highly qualified engineers.

The MPR program's main target is Internationally Trained Engineers (ITEs). According to Engineers and Geoscientists BC (EGBC), nearly 50% of the new Professional Engineer applicants are ITEs. The curriculum of the MPR program focuses on addressing the needs of ITEs to expedite their integration into the Canadian workforce. The MPR also serves as an avenue for Canadian engineering professionals to upgrade their skills to become more competitive in the global manufacturing realm.

MSE is a multidisciplinary accredited engineering program (granted the maximum of six years in 2014)[2] that uniquely integrates mechanical, electronics, control, software, and computer

[1] Western Canada Advanced Manufacturing Conference (2017), Seeding the Revolution The Dialogue for Advancing Manufacturing Innovation & Transformation in Canada Surrey City Hall, 13450 104 Ave, Surrey, BC V3T 1V8

[2] Accredited by the Canadian Engineering Accreditation Board

engineering for the design and development of computer-controlled electromechanical products and systems. The MSE program, which is offered exclusively at the SFU's Surrey campus, also includes business and communications courses to prepare better professional graduates for market challenges. The School is proud to be one of the top-ranked engineering programs in Canada.[3] MSE's graduating engineers (graduate and undergraduate) are trained to work in industries including electronics, automotive, medical, aerospace, etc. with distinctive education in business and entrepreneurship.

Proposed credential to be awarded

Master of Engineering in Mechatronic Product Realization

Location of program

The new program is offered in the School of Mechatronic Systems Engineering at the Surrey campus of SFU.

Academic unit(s) offering proposed program

School of Mechatronic Systems Engineering in the Faculty of Applied Sciences.

Anticipated program start date

Fall 2019.

Anticipated completion time

Four or five terms (16 or 20 months) to complete the Program. The duration depends on whether the students take a four or eight-month co-op placement during the degree.

Summary of proposed program

a) Aims, goals, and/or objectives of the proposed program

According to the City of Surrey market research, manufacturing in Canada directly employs about 1.8 million Canadians. However, because of fierce global competition and fast paced changes in the manufacturing sector, Canada's manufacturing competitiveness may be at risk. The international market is embracing the industry 4.0, or the fourth industrial revolution, which is rapidly altering traditional manufacturing, "providing a huge competitive advantage to economies such as China, U.S.A, Germany, and Japan that are investing strategically in technology and innovation in this sphere."[4]

The School of Mechatronic Systems Engineering has positioned itself to become a top international program in advanced manufacturing. In line with this aspiration, it has successfully partnered with

[3] McLean's Magazine March 2011

[4] Western Canada Advanced Manufacturing Conference (2017), Seeding the Revolution The Dialogue for Advancing Manufacturing Innovation & Transformation in Canada Surrey City Hall, 13450 104 Ave, Surrey, BC V3T 1V8

Siemens to administer the Siemens Mechatronic certification program where three MSE faculty are trained in Berlin to teach these industry standard training courses. Another building block of this plan is the proposed MSE Master of Engineering Program (M. Eng.) in Mechatronic Product Realization (MPR).

The primary goal of MPR is to help British Columbia (and Canada) to become more competitive in a rapidly changing world. By offering a leading edge professional degree program in mechatronics product realization, MSE provides its graduates with training in mechatronic product design and manufacturing technologies, as well as real-world experience through an industrial co-op program that will expedite their absorption into the job market.

Our market research and consultation with various groups including immigrant and community organizations, Society of Internationally Trained Engineers Society (SITE), local industries, MSE industrial advisory board, FAS External Advisory Board, Canadian Manufacturers and Exporters (CME), and Engineers and Geoscientists BC (EGBC) point to a clear need for such a program. As mentioned earlier, the MPR is well in line with the City of Surrey manufacturing aspirations. MPR is expected to have an intake of more than twenty-five (25) students (Fall 2019).

b) Anticipated contribution of the proposed program to the mandate and strategic plan of the institution

The proposed program is a direct outcome of the Faculty of Applied Sciences Academic Plan 2013-18.[5]

"Develop professional graduate programs – FAS plans to develop professional graduate programs directed to selected industry sectors. Potential areas are large-scale data analysis, health informatics, mechatronics and communication engineering. These programs can also be targeted to new immigrants interested in upgrading their qualifications. The potential for collaboration with Life-Long Learning will be explored."

The SFU's strategic plan is to continue the university's growth in globally relevant and strategically important areas by transforming the landscape of teaching and learning. The MPR program is well in line with the mandate of the University to increase experiential learning opportunities in which students "learn by doing." The MPR program provides the student with a premier curriculum—through dedicated courses, design projects, and industrial co-ops —to stay competitive in product design and manufacturing. The program is distinctive as it provides several experiential learning opportunities to effectively train engineers. The program also focuses on enhancing the communication and critical thinking skills of the students.

SFU Surrey: There is a strong public policy to expand post-secondary education in the South Fraser Region. Thus SFU has identified the further development of the Surrey campus as a top priority.

[5] FACULTY OF APPLIED SCIENCES, Academic Plan 2013-18, updated October 2015, p. xiii (Source: http://www.sfu.ca/content/dam/sfu/vpacademic/files/academic_planning/FAS_2013-2018.pdf)

Given that the program is offered in Surrey campus, it is in line with the academic planning of the University.

The program is also in line with the academic plan of the university to improve access for under-represented communities. SFU has long been committed to making education more accessible and puts considerable resources into this. Furthermore, given the changes in the demography of British Columbia one objective of the program has been to provide training for foreign-trained professionals such as landed immigrants for better integration into the workforce. The program is also envisaged to address the worldwide demand for educational programs that focus on highly sought after skills in the area of product design and manufacturing.

c) Linkages between the educational goals and the curriculum.

Rooted in the belief that experiential learning is likely the most effective way to train engineers in mechatronic product realization, the MPR program is planned to have a focus on hands-on product design and manufacturing experiences weaved with selected courses in advanced theory and methods. Among the required 30 units, students will have 15 units directly related to experiential learning, which includes intensive lab work, real-world product design projects, and an industrial co-op. For the rest of the 15 units, students will take at least six units from design and manufacturing methods courses. Based on the suggestions by the MSE industrial advisory board, FAS External Advisory Board, Canadian Manufacturers, and Exporters, and Engineers and Geoscientists BC, there are also six units that students can take from MSE 801-3, which focusses on communications and technical writing; and MSE 900-3 that covers standards and codes, law and ethics, engineering economics, and project management. Students can also take three units or more from other advanced technical courses offered in MSE. Because of a competitive job market, co-op employers mainly prefer students who have completed a minimum of one year of coursework. As a result, an on-line (0 unit) course has been designed in collaboration with the SFU Co-op office and Engineers and Geoscientists BC to allow students to be able to graduate on their co-op term. A support letter from Work Integrated Learning appears in Appendix 5. The curriculum design addresses the needs of ITEs to help integrate them into the Canadian workforce. Their specific needs of technical communication, EGBC recognition, and Canadian work experiences can be addressed through completing this program. The curriculum also addresses the practicing engineers' needs to be well-skilled in the entire design process, to appreciate the role of mechatronics product realization in the context of business development, to gain new knowledge in mechatronics, and to gain project management experience.

In summary, currently there is no similar program in BC or Canada with the following distinctive features:

1) Coursework: Mechatronic Product Realization with intensive hands-on experience,

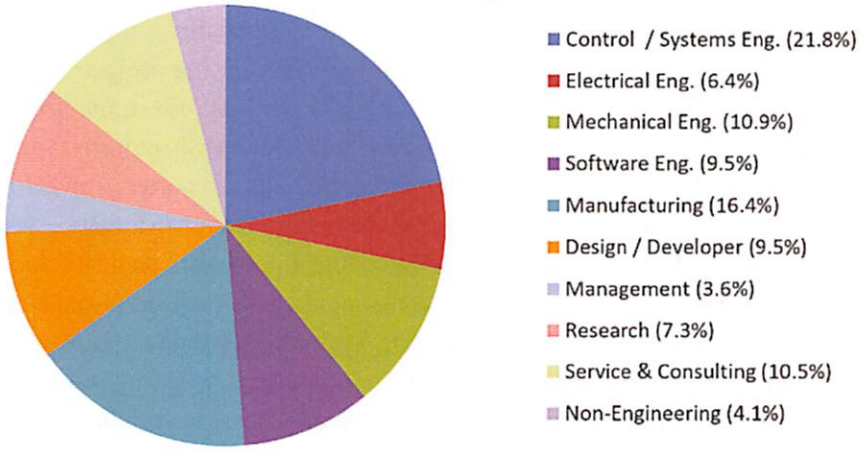
2) Product Realization projects, combined with law, ethics, and business aspects of engineering, and

3) Industrial co-op

d) Potential areas/sectors of employment for graduates and/or opportunities for further study.

The graduates of this program will have potential opportunities similar to those of our undergraduate program alumni. Since mechatronics is a multidisciplinary engineering field, our graduates have the advantage of being qualified for a broader spectra of jobs. The MSE program has an excellent reputation of graduating students who find employment provincially, nationally and internationally. Of note, organizations such as BC Hydro, TESLA, SpaceX, Intel, Kiewit, Arista, and Seaspan have hired our graduates.

For the period 2011-2015, the employment record of our MSE alumni is summarized in the figure below. The data were generated by personal contact with the alumni or by accessing their LinkedIn account. The data include a population of 259 students who graduated during this period.



The List of NOC codes for jobs obtained by our MSE alumni is given below

2132	Mechanical Engineers
2133	Electrical and Electronics Engineer
2147	Computer Engineers
2173	Software Engineers and Designers
2141	Industrial and Manufacturing Engineers
0211	Engineering Managers
0911	Manufacturing Managers
2146	Aerospace Engineers
2145	Petroleum Engineers

e) Delivery methods

The Program will be delivered in a traditional face-to-face classroom-based setting. Students will complete at least 30 units of graduate work: 15 units directly related to experiential learning, which includes an eight-month capstone design project (covered in two consecutive terms), intensive lab

work, and an industrial co-op. For the capstone projects, students may select from an industry-sponsored, a faculty or student-proposed project. The capstone design project is an open-ended student-driven problem that entails components of teamwork, technical communication, engineering ethics and social implications. Teams of students receive the constant guidance of one of our faculty members who act as their supervisor for the eight-month period. For the rest of 15 units, students will take at least six units from design and manufacturing methods courses. The Program will be delivered using a cohort model, but optional courses will provide students with flexibility (primarily in the final term) to deal with their interests.

f) Program Strengths

This Program fills a significant need of highly qualified personnel in the areas of product realization design, manufacturing, and automation. The strength of the program relies on the combination of three critical key areas: experimental learning, academic courses in modern mechatronic systems, and work experience.

This program is intended to provide a transition path from the academic formation to the Canadian workplace. In addition to the specialized courses on mechatronic design, some courses focus on law and ethics, professionalism, standard and codes, engineering economics and project management. The capstone project is proposed by an industrial sponsor, though some projects are proposed by faculty whose research has industrial relevance. Based on our experience with the undergraduate capstone project, the students may also propose their own projects, which have an entrepreneurial spirit. In all cases, students have to solve real-life problems and maintain constant communication with the industrial partners and the project supervisor, who is a faculty member of our school. Once the formative training of academic courses and capstone design are completed, the students are placed on a four or eight-month co-op, where they gain significant experience in the Canadian workplace. All students that are in a co-op term require taking an online course that has been developed in collaboration with the SFU co-op office (see the attached support letter from Work Integrated Learning). It is worth mentioning that the co-op office has a 100% placement record during the three years of the program. This success has been achieved through dedicated workshops on resume writing and interview skills, developing relations with employers, and assisting students on a personal basis.

An overview of the level of support and recognition from other post-secondary institutions, and relevant regulatory or professional bodies, where applicable and plans for admissions and transfer within the British Columbia post-secondary education system.

There is a high demand for engineering professional degree programs in Canada with a few successful Master of Engineering programs established across Canada. The MPR will fill a niche market.

The program was conceived after full discussions and consultation with the following persons and organizations:

- MSE advisory Board including

  - Matt Dion (Chief Executive Officer - Mintent),
  - Bruce Fingarson (General Manager & COO Automation West Technologies, formerly: Surrey Fluid Power Ltd.), and
  - Gillian Pichler, (Director, Registration & Licensing EGBC). Engineering practice is regulated by the Association of Professional Engineers and Geoscientists of the Province of British Columbia (EGBC).
- Faculty of Applied Science External Advisory Board
- Canadian Manufacturers and Exporters (CME)
- Society of Internationally Trained Engineers (SITE) in BC
- S.U.C.C.E.S.S
- Progressive Intercultural Community Services Society (PICS)
- Local manufacturers focus group including
  - Arie Van Muyen, Manager of Engineering, Ellet Industries
  - Chris Campbell, Senior Manager, R&D, Indoor General Area, Philips Lighting North America
  - Dory Meynert, VP Supply Chain, Creation Technologies
  - Ray Wong, Chief of Engineering, SeaStar Solutions
  - Wes Hallam, Director of Manufacturing, Corvus Energy
  - Victor Goncalves, Director of Engineering, Alpha Technologies
  - Laura Petrescu, Manager of Engineering and Technology Development, Avcorp Industries, Inc.

Through the cohort special arrangement program, MSE has built up a close collaboration with the Fraser International College (FIC). FIC has developed a 13-week non-credit program leading to admission into the Master of Engineering in Mechatronic Product Realization program (MPR). FIC promotes the MPR to international students and admits students based on the admissions requirements of the University (https://www.fraseric.ca/programs/pme). A memorandum of understanding was signed between SFU and FIC in June 2016 (Appendix 5).

Related programs in the institution or other British Columbia post-secondary institutions.

The School of Mechatronic Systems Engineering offers a research-based Master's of Applied Science (MASc) degree. This is a thesis-based program focused on an independent project with a significant research component. The student defends the thesis in a public examination (defence), according to the university regulations. Students in the MASc program may complete an optional one-term co-op placement.

The School of Engineering Science (ENSC) at SFU offers a course-intensive Master of Engineering (MEng) program. This program curriculum includes a core set of specified ENSC courses in advanced engineering topics (12 units), a set of elective graduate courses from ENSC (15 units) which can include courses from Computing Science, MSE, or the Faculty of Science (up to 9 units) to broaden and deepen the students' knowledge in their area of interest. Unlike a cohort program, students in the ENSC MEng program provides students the freedom to customize their course choices independently. An additional 3 unit course on engineering project management and development, and the ability to enroll in up to two co-op placements (optional) for real-world industrial experience rounds out this program designed to broaden and strengthen students' knowledge base in engineering.

The University of British Columbia (UBC) has two Master of Engineering programs: Master of Engineering Leadership (MEL) and Master of Engineering (MEng). Both of these programs are course-based programs that have a duration of 12 months with an optional co-op placement. The MEL program targets practicing professionals and it combines business and leadership skills with technical courses on particular specializations, none of which is mechatronics. The MEng program is a field-specific course-based program designed for engineers wishing to upgrade their training. Among the different options, there is one on Mechatronic Design offered by the Department of Mechanical Engineering. This program is distinct from ours as it focuses on the academic aspect of mechatronics, coursework only, whereas our program is designed around the transition between university and industry.

The University of Victoria (UVic) has a generic Master's in Engineering (MEng) program that is designed to strengthen and extend the knowledge gained at the undergraduate level. The program consists of eight graduate-level courses, a graduate seminar, and a research project.

The MSE's MPR program provides its graduates with training in mechatronic product design and manufacturing technologies, as well as real-world experience through a mandatory industrial co-op program that will expedite their absorption into the job market. The combination of technical, communication, engineering law and ethics, and business courses and mandatory co-op, make it unique in Canada.

Contact information

Farid Golnaraghi
Professor and Director, School of Mechatronic Systems Engineering
(778) 782-8054
mfgolnar@sfu.ca

PART B: Information required by Simon Fraser University

PROGRAM DETAILS

a) Graduation requirements, target audience

Students will complete 30 units of graduate work. These units are divided into three sections: 15 units of graduate coursework, 12 units of specialized lab/project work, and 3 units of work experience, which includes a co-op term and an online course titled "Becoming a Professional Engineer" that must be taken in conjunction with co-op.

Six courses must be taken from the choices below:

- The following three courses:
  - MSE 801 – Research and Publication Methods (3)
  - MSE 900 – Engineering in the Canadian Context (3)
  - MSE 901 – Becoming a Professional Engineer (0), in conjunction with co-op
- At least two of the following courses:
  - MSE 726 – Introduction to Engineering Design Optimization (3)
  - MSE 727 – Finite Element Analysis (3)
  - MSE 780 – Manufacturing Systems (3)
- One graduate technical elective course:
  - Any other MSE 700/800 level course (3)

Lab/Project Work

Students must take the following lab/project-based courses. Only students enrolled in the Master of Engineering in Mechatronic Product Realization program will be permitted to enroll in these courses:

- MSE 995 – Advanced Modeling and Prototyping (6)
- MSE 921 – Product Realization Project I (3)
- MSE 922 – Product Realization Project II (3)

Co-Operative Education

A term of co-operative education is an integral part of this program. Students will register in MSE 793 and be expected to find a suitable industry partner for the co-op term with the assistance of the co-op office. Those students who wish to conduct an 8-month coop placement, will have to register to a second co-op course. The students may also opt to work as a paid research assistant under the supervision of a faculty member in an area relevant to the program. Alternatively, if a co-op placement cannot be made due to extenuating circumstances, a student may request to the program

director to take an appropriate graduate course instead (with preference given to MSE graduate courses). Students are required to enrol in the course "Becoming a Professional Engineer" during the co-op term which will be administered by one of the MSE faculty members.

Academic Requirements within the Graduate General Regulations

All graduate students must satisfy the academic requirements that are specified in the graduate general regulations (residence, coursework, academic progress, supervision, completion time, and degree completion), as well as the specific requirements for the program in which they are enrolled, as discussed in this document.

Target Audience

Our intended audience is individuals, both within Canada and internationally, who already have degrees in mechanical engineering, electrical engineering or a related field, but who wish to enhance their career opportunities in the rapidly growing area of mechatronics. It is not intended to prepare students on a research path; that is the focus of existing MSc degrees offered at SFU and elsewhere.

b) Admission requirements

To qualify for admission to the Master of Engineering program in Mechatronic Product Realization, a student must satisfy the university admission requirements for a Master's program as stated in Graduate General Regulations 1.3 in the SFU calendar and the student must hold a bachelor's degree or equivalent in Mechanical Engineering, Electrical Engineering, Mechatronic Engineering, Engineering Science or a related field with a cumulative grade point average (GPA) of 3.0 (on a scale of 0.0 - 4.33) or the equivalent.

Applicants graduated from either a Canadian or a foreign university are welcome to apply. Applicants must meet the minimum University requirements as per graduate admissions policy "1.3.3: Admission to a Master's Program"

c) Evidence of student interest and labor market demand

The School has conducted a significant market survey in support of the MPR program and the attached labor market survey results from our current co-op employers are provided in Appendix 5. This survey was to gauge the likelihood of participating companies supporting practicing engineers taking this program. It is also found through the survey that "Advanced Manufacturing" might not be the best area. Therefore, a focus group of local manufacturers was organized afterwards whose deliberations led to a change in the focus and the title of the program (see below).

A focus group of local manufacturers indicated that the market demand calls for mechatronic product designer and manufacturers. Therefore the program name was changed from "Advanced Manufacturing" to "Mechatronic Product Realization" to address a wide scope of product development technologies that include both product design and manufacturing.

Our largest target student group is the Society of Internationally Trained Engineers (ITE). A focus group of SITEs has been organized at MSE Surrey and overwhelmingly positive responses from the group. Currently, SITE-BC has close to 800 members and the desire to have a higher degree in a Canadian university as well as the Canadian industry experience is very strong. Please see Appendix 5 for the support letter from SITE-BC president.

The Canadian Manufacturers & Exporters (CME) is Canada's leading trade and industry association serving as the voice of 10,000 leading companies. CME has a *path2work* program that is mandated to place ITEs to the workforce. CME is a strong supporter of the proposed MPR program

EGBC will recognize their education in MPR and will deem the graduates having the same credentials as any graduate from a Canadian accredited engineering program, i.e., the graduates are eligible for applying Engineer In Training (EIT) with no need to take additional courses or exams. EGBC will further recognize their co-op experience as Canadian work experience. Please see Appendix 5 for their support letter.

The following is an example of the companies in which the MSE MPR students have been placed for co-op industrial positions

- Affinity Manufacturing Ltd.
- Algo Communications
- Automation West Technologies Ltd.
- Ballard Power Systems Inc.
- BC Hydro
- Empower Operations Corp.
- Laboratory for Alternative Energy Conversion
- Mercedes-Benz Fuel Cell.
- Sierra Wireless
- StandardAero Inc.
- Stem Cells Technologies Inc.
- TransLink
- Vitrum Glass Group
- Weatherhaven Global Resources Ltd. [6]

The following table reflects the number of applicants interested in the program and the actual number admitted individuals who actually showed up. As shown, the demand for the program is on a steady rise. Based on the numbers shown, it is expect to have around 25 students enrolled in the program in 2019-2020 academic year.

[6] The story of a MSE MPR student working at Weatherhaaven caught the attention of SFU News: https://www.sfu.ca/sfunews/stories/2018/05/sfu-graduate-student-applies-engineering-skills-to-advance-natio.html

Year	Number of Applicants	Admits to Program (Actually showed up)
2015	15	2
2016	27	8
2017	45	15
2018	74	23
2019	–	EXPECTED 25

d) Eligibility for scholarships, awards, and financial aid

The current plan is to offer two graduate awards valued at $6,000 each from the School of Mechatronic Systems Engineering to attract top students to our program. With increasing enrollment in the program, potentially more awards can be given. The budget for the above awards will be allocated from the MPR tuition transfers to MSE.

Students admitted to the program can make use of the financial aid program. The School of Mechatronic Systems Engineering program manager has contacted the financial aid office concerning this eligibility.

e) Program evaluation and academic/administrative oversight

The steering committee for the Master of Engineering Program consists of the Program Chair (currently Dr. Flavio Firmani), the Chair of the Graduate Program Committee (currently Dr. Mehrdad Moallem), and the Director of the School (currently Dr. Farid Golnaraghi).

The program will be reviewed internally using the same mechanisms that are used to review the other graduate programs in the School of Mechatronic Systems Engineering. Changes to the program will be administered through the MSE Graduate Program Committee.

f) Main competitors outside BC

At its conception, the MSE was the second Mechatronics undergraduate degree program in Canada. At this point, there are at least five programs in place in the country. However, SFU MSE is the only independent degree program.

Our key competitor is the University of Waterloo's Department of Mechanical and Mechatronics Engineering which has an MEng program with a Graduate Diploma in Design. This diploma also requires a 2-term capstone design project, which is equivalent to ours; however, it does not have a mandatory co-op requirement.

The University of Toronto's Department of Mechanical and Industrial Engineering offers an MEng coursework program. Students may customize their degree by taking some mechatronic-related courses towards a technical specialization certificate in the area of Robotics and Mechatronics. The program has neither a design capstone project nor a mandatory co-op requirement.

McMaster's Electrical and Computer Engineering department offers two MEng programs, Electrical and Biomedical Engineering and Electrical and Computer Engineering. Neither of these programs has a mechatronic design content nor a mandatory co-op requirement.

The University of Ottawa's Faculty of Engineering offers a generic MEng program where students take a variety of courses including some courses in the area of dynamics, controls, automation and robotics. The program neither has a dedicated stream in Mechatronics nor a mandatory co-op requirement.

The majority of MEng programs offered in other Canadian universities are more generic, where students take a variety of courses that are not specific to a particular field.

PART C: RESOURCES

a) Enrolment Plan

Year	Number of Applicants	Admits to Program (Actually showed up)
2015	15	2
2016	27	8
2017	45	15
2018	74	23
2019	–	EXPECTED 25

b) Resources required and/or available to implement the program (financial and personnel) including any new faculty appointments

The program will require three MSE faculty (and one backup to address study leaves) to teach its specifically designed MPR courses ($342,000/yr.). These courses are treated in the same fashion as the other courses offered in the School, as far as the faculty workload is concerned. The program will required an Academic Program Coordinator ($30,000/yr), who will be in charged of administrative, recruitment and admission requirements of the program. The courses are laboratory heavy, and require participation of the MSE technical staff, and teaching assistants who will be paid through the funds generated by the MPR tuition fees (expected to be around $50,000/yr.). Also MSE has agreed to contribute in-part towards the salaries of a co-op coordinator, and a co-op advisor (the total amount is under negotiation at this stage but should not exceed $20,000/yr.) until the university overheads can sustain these expenses. An additional $20,000/yr. will be devoted to the course operational needs.

For 25 students per year, the program will be self funding and would not require additional resources.

c) Faculty member's teaching/supervision

Three faculty members are required to specifically teach

- MSE 900 – Engineering in the Canadian Context (3)
- MSE 995 – Advanced Modeling and Prototyping (6)
- MSE 921 – Product Realization Project I (3)
- MSE 922 – Product Realization Project II (3)
- MSE 901 – Becoming a Professional Engineer (0)

The other program courses are offered at the School on a regular basis and are absorbed internally.

d) Proposed tuition and other program fees including a justification

Tuition for the full Program will be charged on a term basis, as presented in the original cohort arrangement program, with a 25% continuing fee after the compulsory 16-month program. The reduction on the continuing fee structure has the purpose of promoting students to take a two-term co-op. Many industrial companies prefer longer co-ops because of the time that is required for training students. However, the co-op salary of our MSE MPR students is considerably less than the salary received by students in other SFU professional programs, making the cost of extending their work experience to two terms less affordable.

The regular program (one-term co-op) will have a cost of $28,143 per student for domestic students and $33,782 for international students. The extended program (two-term co-op) will have a cost of $29,902 for domestic and $35,893 for international students. The co-op fees are included in the term fees. The tuition fees are summarized in the following table:

Regular Program (4 terms)

	Term 1	Term 2	Term 3	Term 4	Total
Domestic	$7,035.81	$7,035.81	$7,035.81	$7,035.81	$28,143.24
International	$8,445.41	$8,445.41	$8,445.41	$8,445.41	$33,781.63

Extended Coop Program (5 Terms)

	Term 1	Term 2	Term 3	Term 4	Term 5	Total
Domestic	$7,035.81	$7,035.81	$7,035.81	$7,035.81	$1,758.95	$29,902.19
International	$8,445.41	$8,445.41	$8,445.41	$8,445.41	$2,111.35	$35,892.98

Since each year there will be a new cohort, the expenses are calculated on a yearly basis. The tuition fees will offset the following expenses:

Program Expenses	Cost per Unit	Number of Units	Total
Full-Time Faculty	$121,379.00	2.0	$242,7528.00
Full-Time Lecturer (manufacturing)	$99,934.50	1.0	$99,934.50
Program Coordinator	$60,836	0.5	$30,418.00
Co-op Coordinator/Advisor	$20,000.00	1.0	$20,000.00
Technical Support	$24,000.00	1.0	$24,000.00
Teaching Assistants	$1,392.00	17.0	$23,664.00
Marketing	$10,000	1.0	$10,000.00
Lab Material/Maintenance	$16,000.00	1.0	$16,000.00
Course Development	$10,000.00	1.0	$10,000.00
Graduate Awards	$6,000.00	2.0	$12,000.00
EAL Curriculum	$500.00	1.0	$500.00
		Subtotal Program Expenses	**$489,274.50**

Budget Justification

Full-Time Term Faculty

Three full-time term faculty members are required to teach specifically designed MPR courses. We follow Policy A 12.05 on full-time term research faculty. The salary for each full-time term faculty will be at the Assistant Professor salary scale and combined with a market differential; the salary will be $103,240 plus 17.57% benefits for the full-time faculty ($121,379 ea). The full-time term lecturer salary is $85,000 plus 17.57% benefits ($99,934.50).

The specifically designed MPR courses include 27 units related to the Graduate Coursework and the Laboratory Courses (8 courses). This request also accounts for anticipated faculty leaves. An intake of 20 students in every cohort will cover for two full-time term faculty members. The hirings will be made as the student intake stabilizes towards the maximum of 25 students.

Academic Program Coordinator

The program assistant will be an APSA staff member (Grade 6, Step 7, 0.5 FTE) who will assist with admissions, ongoing paperwork related to the program, assisting students with their visa letters, collecting feedback from students and coordinating with the co-op program. This position is equivalent to the program coordinator in the MEng in Computer Science. The salary will be $60,836.00 for 1.0 FTE, thus $30,418.00 for 0.5 FTE.

Technical Support

The three lab courses would require significant technical support from our technicians and machinists. It is anticipated some of the lab courses may be offered in evenings to avoid conflict

with existing curriculum and to accommodate working students. The cost is estimated to be $8,000.00 per term (excluding coop term) to pay for their time.

Teaching Assistants

Teaching assistants will be paid at $1392 per base unit (for PhD students; the rate is slightly lower for master's students). We have allocated 17 base units for the courses in this program totaling $23,664.00. This is more TA support than in our normal graduate program, but warranted by the lab coursework in this program.

Co-op Coordinator and Co-op Advisor

The unit expects the co-op personnel salaries to arrive from the program overhead funds. Until then, we aim to support, in part, the co-op program with two positions. The first position is a half-time Co-op Coordinator Position (APSA, Grade 10, Step 8, 0.5 FTE) who will be responsible for developing the employer relations and generating postings within the program to help ensure that all the students are placed in a co-op position. The second position is a half-time Co-op Student Career Advisor (APSA, Grade 7, Step 6, 0.5 FTE) who will be responsible of assisting students with resume writing, interview skills, etc. The contribution of MSE to the total amount is under negotiation at this stage but should not exceed $20,000/yr. until the university overheads is sustainable to pay these costs.

Lab Material and Maintenance

The new lab courses demand high material consumption, machine shop maintenance, and machine tool repair costs. The material costs for machining, 3D prototyping, and product prototyping are high; and the maintenance and repair costs for high-end machines such as CNC, 3D Printers, and CMC are high. We thus budget for $16,000 per year as on-going expenses for the purposes.

Graduate Awards

The current plan is to offer two graduate awards at $6,000 each from the School of Mechatronic Systems Engineering to attract top students to our program. With increasing enrollment in the program, potentially more awards can be given.

EAL Curriculum

Since most of the students are anticipated to be international, they will face barriers in language and communication skills while seeking placements for employment. To this end, MSE will support students having English as a second language. The online course Job Search Success offered by the Work Integrated Learning (Co-op Education) is $20.00 per student, $500.00 for the cohort.

PART C: Appendices

Appendix 1. Calendar entry

Mechatronic Product Realization

MASTER OF ENGINEERING

Description of Program

The Mechatronic Product Realization program trains students with leading-edge product development techniques, processes, and manufacturing systems.

Mechatronics is a multi-disciplinary engineering field that incorporates three areas of study: mechanical, electrical and computer engineering. Given the rapid growth of new information technologies, digital circuits, and additive manufacturing technologies, the market for new mechatronic products is growing exponentially in all industry sectors, including consumer products and electronics, automotive, medical, industrial and aerospace.

Offered by the School of Mechatronic Systems Engineering at Simon Fraser University, this program provides students with a premier curriculum—through dedicated courses, design projects, and industrial co-ops—to stay competitive in product design and manufacturing.

Admission Requirements

Applicants must satisfy the University admission requirements as stated in Graduate General Regulations 1.3 in the SFU Calendar and hold a bachelor's degree, or equivalent, in mechanical engineering, electrical engineering, mechatronic engineering, engineering science or a related field with a cumulative grade point average (CGPA) of 3.0 or the equivalent.

Program Requirements

This program consists of required courses, lab courses, and a co-op for a minimum of 30 units.

Students must complete
MSE 801- Research and Publication Methods (3)
MSE 900 – Engineering in the Canadian Context (3)
MSE 901- Becoming a Professional Engineer (0)
MSE 995- Advanced Modeling and Prototyping (6)

and two of

MSE 726 – Introduction to Engineering Design Optimization (3)
MSE 727 – Finite Element Analysis (3)
MSE 780 – Manufacturing Systems (3)

and one graduate MSE course

and two projects
MSE 921 – Product Realization Project I (3)
MSE 922 – Product Realization Project II (3)

and a minimum of one co-op term
MSE 793 – Graduate Co-op (3) *

*students must enrol in MSE 901 – Becoming a Professional Engineer (0) concurrently

Program Length

Students are expected to complete the program requirements in 4 or 5 terms (16 or 20 months).

Other information

Co-op

A co-op internship is an integral part of this program. Students will register for one or two co-op terms. With assistance from the co-op coordinator for this program, students will be expected to find a suitable industry partner for the co-op placement. The students may also opt to work for a faculty member as a paid research assistant. Alternatively, in extenuating circumstances, a student may appeal to the program director to take an elective course from the list of electives for this program instead of a co-op. Students are required to enroll in the course becoming a Professional Engineer during the co-op term. This course is administered by the MSE faculty. The duration depends on whether the student takes a 4 month or 8 month co-op placement during the degree.

Academic Requirements within the Graduate General Regulations

All graduate students must satisfy the academic requirements that are specified in the Graduate General Regulations, as well as the specific requirements for the program in which they are enrolled.

Appendix 2. New course

- MSE 901 – Becoming a professional Engineer (0)

SFU SIMON FRASER UNIVERSITY
GRADUATE STUDIES & POSTDOCTORAL FELLOWS

Graduate Course Change

Attach a separate document if more space is required.

Course Subject/Number MSE793	Units 3	Effective Term and Year Fall 2019
Course Title Graduate Co-op Practicum I		
Rationale for Change: Introduction of a second course: Graduate Co-op Practicum II (MSE 794)		

Proposed Changes (Check all that apply)

☐ Course number ☐ Units* ☑ Title ☐ Description ☑ Prerequisite ☐ Other _____

Complete only the fields to be changed

FROM	TO
Course Subject/Number	Course Subject/Number
Units	Units*
Course Title Graduate Co-op Practicum	Course Title (max 100 characters) Graduate Co-op Practicum I
Course Short Title	Course Short Title (max 30 characters)
Description	Description
Prerequisite	Prerequisite Co-req MSE 901
Other	Other

* Program requirements may need to be revised when course units are changed. Please review the calendar and submit any relevant program revisions resulting from this course change.

REMINDER: All course changes must be identified on a cover memo and confirmed as approved when submitted to FGSC and SGSC.

CONTACT PERSON

Department / School / Program	Contact name	Contact email
Mechatronic Systems Engineering	Mehrdad Moallem	mmoallem@sfu.ca

DEPARTMENTAL APPROVAL

Department Graduate Program Committee M. Moallem	Signature	Date July 24, 18
Department Chair Acting Ahmad Rad	Signature	Date July 24, 2018

FACULTY APPROVAL

Faculty Graduate Studies Committee (FGSC)	Signature Mirza Faisal Beg Digitally signed by Mirza Faisal Beg DN: cn=Mirza Faisal Beg, o=Simon Fraser University, ou=Faculty of Applied Science, email=mfbeg@sfu.ca, c=CA Date: 2018.09.01 00:43:29 -07'00'	Date

SENATE GRADUATE STUDIES COMMITTEE APPROVAL

Senate Graduate Studies Committee (SGSC) Jeff Derksen	Signature	Date SEP 24 2018

ADMINISTRATIVE SECTION (for DGS office only)
Course Attribute: _____
Course Attribute Value: _____
Instruction Mode: _____
Attendance Type: _____

If different from regular units:
Academic Progress Units: _____
Financial Aid Progress Units: _____

SFU GRADUATE AND POSTDOCTORAL STUDIES

New Graduate Course Proposal

Course Subject (eg. PSYC) MSE	Number (eg. 810) 794	Units (eg. 4) 3

Course title (max. 100 characters)

Graduate Co-op Practicum II

Short title (for enrollment/transcript - max. 30 characters) Grad Co-op II

Course description for SFU Calendar (course descriptions should be brief and should never begin with phrases such as "This course will..." or "The purpose of this course is..." If the grading basis is satisfactory/unsatisfactory include this in the description)

To complement their academic studies, students in the MSE graduate program may complete this optional one-semester co-op practicum (MSE 794) of paid practical experience in an appropriate industrial setting. The practicum will appear on the student's transcript, but does not count towards the student's CGPA and course requirements for the degree. Students require a pre-approval from the senior supervisor and Graduate Program Chair in order to apply for the practicum. Arrangements for the practicum are made through the School's co-op coordinators and SFU's Co-op office.

Rationale for introduction of this course

Some co-op employers and students would prefer to have 8 months of co-op. The course can be taken following MSE793 (Graduate Co-op Practicum I) to fulfill the above requirement.

Term of initial offering (eg. Fall 2019) Fall 2019	Course delivery (eg. 3 hrs/week for 13 weeks) At least 420 hrs per semester (e.g., 32 hrs/week for 13 weeks)
Frequency of offerings/year 3	Estimated enrollment per offering 10

Equivalent courses (courses that replicates the content of this course to such an extent that students should not receive credit for both courses)

Prerequisite and/or Corequisite Pre-req: MSE 793; Co-req: MSE 901

Criminal record check required? ☐ Yes if yes is selected, add this as prerequisite	Additional course fees? ☐ Yes ☑ No

Campus where course will be taught ☐ Burnaby ☐ Surrey ☐ Vancouver ☐ Great Northern Way ☑ Off campus

Course Components * ☐ Lecture ☐ Seminar ☐ Lab ☐ Independent ☐ Capstone ☑ co-op

Grading Basis ☐ Letter grades ☑ Satisfactory/ Unsatisfactory ☐ In Progress / Complete

Repeat for credit? ☐ Yes ☑ No	Total repeats allowed? _____	Repeat within a term? ☐ Yes ☑ No
Required course? ☐ Yes ☑ No	Final exam required? ☐ Yes ☑ No	Capstone course? ☐ Yes ☑ No

Combined with a undergrad course? ☐ Yes ☑ No If yes, identify which undergraduate course and the additional course requirements for graduate students:

* See important definitions on the curriculum website.

RESOURCES

If additional resources are required to offer this course, provide information on the source(s) of those additional resources.

Faculty member(s) who will normally teach this course
MSE faculty supervising graduate students
Additional faculty members, space, and/or specialized equipment required in order to offer this course
No such resources are required to offer this course

CONTACT PERSON

Academic Unit / Program	Name (typically, Graduate Program Chair)	Email
Mechatronics	Mehrdad Moallem	mmoallem@sfu.ca

ACADEMIC UNIT APPROVAL

A course outline must be included.

Non-departmentalized faculties need not sign

Graduate Program Committee M. Moallem	Signature	Date July 24, 18
Department Chair Acting Ahmad Rad	Signature	Date July 24, 2018

FACULTY APPROVAL

The course form and outline must be sent by FGSC to the chairs of each FGSC (fgsc-list@sfu.ca) to check for an overlap in content

Overlap check done? [✓] YES

This approval indicates that all the necessary course content and overlap concerns have been resolved. The Faculty/Academic Unit commits to providing the necessary resources.

Faculty Graduate Studies Committee	Signature	Date
Mirza Faisal Beg	Mirza Faisal Beg Digitally signed by Mirza Faisal Beg DN: cn=Mirza Faisal Beg, o=Simon Fraser University, ou=Faculty of Applied Science, email=mfbeg@sfu.ca, c=CA Date: 2018.09.01 00:45:26 -07'00'	

A library review will be conducted. If additional funds are necessary, DGS will contact the academic unit prior to SGSC.

SENATE GRADUATE STUDIES COMMITTEE APPROVAL

Senate Graduate Studies Committee	Signature	Date
Jeff Derksen		SEP 24 2018

ADMINISTRATIVE SECTION (for DGS office only)
Library Check: SEP 06 2018
Course Attribute: _____
Course Attribute Value: _____
Instruction Mode: _____
Attendance Type: _____

If different from regular units:
Academic Progress Units: 6
Financial Aid Progress Units: 6

SFU GRADUATE AND POSTDOCTORAL STUDIES

New Graduate Course Proposal

Course Subject (eg. PSYC) MSE	Number (eg. 810) 901	Units (eg. 4) 0

Course title (max. 100 characters)

Becoming a Professional Engineer

Short title (for enrollment/transcript - max. 30 characters) Becoming a PEng

Course description for SFU Calendar (course descriptions should be brief and should never begin with phrases such as "This course will..." or "The purpose of this course is..." If the grading basis is satisfactory/unsatisfactory include this in the description)

Core competencies and skills required by a Professional Engineer (PEng) are presented including code of ethics and the fundamental steps in becoming a professional engineer in British Columbia (BC). The course teaches students how to report and substantiate their work experience to Engineers and Geologists BC (EGBC), the licensing and regulatory body in BC; and how to document their skills and experience by critiquing prior documentation and through documentation of their coop experience. It should be noted that there would be no formal evaluation of skills by SFU.

Rationale for introduction of this course

Co-op office requires that students should not finish their studies with a co-op semester being their last semester. This 0-credit online course is proposed to resolve the issue. The students can take it online while doing their co-op.

Term of initial offering (eg. Fall 2019) Fall 2019	Course delivery (eg. 3 hrs/week for 13 weeks) Online
Frequency of offerings/year 3 per year	Estimated enrollment per offering 25

Equivalent courses (courses that replicates the content of this course to such an extent that students should not receive credit for both courses)

N/A

Prerequisite and/or Corequisite Students in Mechatronics Product Realization MEng program; co-requisite: MSE 793 or MSE 794

Criminal record check required? ☐ Yes if yes is selected, add this as prerequisite

Additional course fees? ☐ Yes ☑ No

Campus where course will be taught ☐ Burnaby ☐ Surrey ☐ Vancouver ☐ Great Northern Way ☑ Off campus

Course Components * ☐ Lecture ☐ Seminar ☐ Lab ☐ Independent ☐ Capstone ☑ online

Grading Basis ☐ Letter grades ☑ Satisfactory/ Unsatisfactory ☐ In Progress / Complete

Repeat for credit? ☐ Yes ☑ No	Total repeats allowed? 0	Repeat within a term? ☐ Yes ☑ No
Required course? ☑ Yes ☐ No	Final exam required? ☐ Yes ☑ No	Capstone course? ☐ Yes ☑ No

Combined with a undergrad course? ☐ Yes ☑ No If yes, identify which undergraduate course and the additional course requirements for graduate students:

* See important definitions on the curriculum website.

RESOURCES

If additional resources are required to offer this course, provide information on the source(s) of those additional resources.

Faculty member(s) who will normally teach this course
Krishna Vijayaraghavan
Additional faculty members, space, and/or specialized equipment required in order to offer this course
No space or specialized equipment required

CONTACT PERSON

Academic Unit / Program	Name (typically, Graduate Program Chair)	Email
Mechatronics	Mehrdad Moallem	mmoallem@sfu.ca

ACADEMIC UNIT APPROVAL

A course outline must be included.

Non-departmentalized faculties need not sign

Graduate Program Committee M. Moallem	Signature	Date July 24, 18
Department Chair Acting Ahmed Rahman	Signature	Date July 27, 2018

FACULTY APPROVAL

The course form and outline must be sent by FGSC to the chairs of each FGSC (fgsc-list@sfu.ca) to check for an overlap in content

Overlap check done? [V] YES

This approval indicates that all the necessary course content and overlap concerns have been resolved. The Faculty/Academic Unit commits to providing the necessary resources.

Faculty Graduate Studies Committee	Signature	Date
Mirza Faisal Beg	Mirza Faisal Beg Digitally signed by Mirza Faisal Beg DN: cn=Mirza Faisal Beg, o=Simon Fraser University, ou=Faculty of Applied Science, email=mfbeg@sfu.ca, c=CA Date: 2018.09.01 00:46:48 -07'00'	

A library review will be conducted. If additional funds are necessary, DGS will contact the academic unit prior to SGSC.

SENATE GRADUATE STUDIES COMMITTEE APPROVAL

Senate Graduate Studies Committee	Signature	Date
Jeff Derksen		SEP 24 2018

ADMINISTRATIVE SECTION (for DGS office only)
Library Check: SEP 06 2018
Course Attribute: _____
Course Attribute Value: _____
Instruction Mode: _____
Attendance Type: _____

If different from regular units:
Academic Progress Units: 0
Financial Aid Progress Units: 0

Becoming a Professional Engineer (MSE 901)

School of Mechatronic Systems Engineering

Description:

This course has been developed in consultation with the Engineers and Geoscientists British Columbia (EGBC) to familiarize students with the fundamental steps needed to become a professional engineer (P.Eng.) in BC. Through this course, students will be exposed to the core competencies and skills required by a P.Eng. and the P.Eng. code of ethics. The course also teaches students how to report and substantiate their work experience to EGBC, the licensing and regulatory body. The students will learn to document their skills and experience by critiquing prior documentation and through hands on documentation of their coop experience.

Credit: 0 credit; SAT/UNSAT grading

Pre-Requisite/Co-requisite:

To be taken in co-op term

Outcome:

- Explain the responsibilities of a P.Eng.
- Recognize the steps need for becoming a P.Eng.
- Documenting skills under the competency reporting systems.
- Critique work experience/skills reporting and substantiation.
- Introduce the concept of lifelong learning.
- Understands steps to apply to be an Engineer-In-Training (EIT).

Instructor:

MSE faculty

Delivery Method:

The course will be delivered via online lectures.

Course Modules

- Overview of EGBC and on registering as a professional engineer (P.Eng.)
- Review of the core competencies and skills required by a P.Eng.
- Evaluation and licensure process undertaken by EGBC
- EGBC process of evaluation of experience such as international experience, prior experience and non-P.Eng supervision

- Identification skills within the categories of the seven core competencies and proper documentation of skills* for career development
- Introduction to the mandatory EGBC Overview of Legal and Ethical Issues Course.
- Procedure for Engineer-In-Training (EIT) with EGBC

* Documentation is the main area people fail in doing well and are denied designation. EGBC has agreed to provide resources and examples.

Course Assessment:

Grade will be based on the following:

Assignments	90%
Report	10%
Total	**100%**

Assignment Grading: Assignments will be assigned and assessed by the instructor and the relative weightages will be determined by the degree of difficulty and time required for its completion.

Report: Students will create a detailed report to self-evaluate the prior experience and reflect on competencies (identifying skills gap). Students will also present a plan for lifelong learning to acquire their missing competencies.

Late Work: Late or missed work will not be tolerated. Failure to meet assignment deadlines will result in a loss of two points per calendar day, up to five calendar days. On the sixth calendar day, it will not be accepted. If emergencies arise, and sometimes they do, communicate with your instructor to see if the deadline can be moved to help you get back on track.

Plagiarism: Any instance of cheating or plagiarism will result in loss of credit for the work and will be reported to the Director of the School of MSE.

Grading Scheme: Student will receive a satisfactory ('S') grade if they receive a total score of 70% or more.

Appendix 3. Details of program steering committee (if applicable)

Dr. Flavio Firmani, Program Chair

Dr. Mehrdad Moallem, Chair of the Graduate Program Committee

Dr. Farid Golnaraghi, Director of the School of Mechatronic Systems Engineering

Appendix 4. Abbreviated curriculum vitae for faculty

FLAVIO FIRMANI Ph.D., P.Eng.

School of Mechatronic Systems Engineering, Simon Fraser University, Surrey BC, V3T 0A3.
Office: Galleria 4378, Tel: 778.782.9940, email: ffirmani@sfu.ca

ACADEMIC EMPLOYMENT

2014 – Present	Lecturer, School of Mechatronic Systems Engineering, Simon Fraser University
2012 – 2014	Coordinator in Engineering Design, Faculty of Engineering, University of Victoria
2007 – 2014	Research Associate, Department of Mechanical Engineering, University of Victoria
2004 – 2014	Sessional Lecturer, Faculty of Engineering, University of Victoria

EDUCATION

2006	Doctor of Philosophy (Ph.D.) in Mechanical Engineering, Department of Mechanical Engineering, University of Victoria, Victoria, B.C., Canada. Thesis: *Force-Unconstrained Poses of Redundantly Actuated Planar Parallel Manipulators*
1999	Bachelor (B.Eng.) in Mechanical and Electrical Engineering, Faculty of Engineering, UNAM, Mexico City, Mexico. Thesis: *Kinematic Analysis of a Hexapod and its Application to Controlling the Secondary Mirror of a Telescope (in Spanish)*

TEACHING EXPERIENCE

2014 - Present Lecturer at School of Mechatronic Systems Engineering, SFU, Surrey.

MSE 210 – Engineering Measurement and Data Analysis
MSE 211 – Computational Methods for Engineers
MSE 221 – Statics and Strength of Materials
MSE 380 – Systems Modelling and Simulation
MSE 410 – Capstone Design Technical Project I
MSE 411 – Capstone Design Technical Project II
MSE 428 – Design of Mechanisms
MSE 490 – Advanced Kinematics of Robotic Systems

2004 – 2014 Sessional Lecturer at University of Victoria.

MECH 430 / MECH 580 – Robotics
MECH 335 – Theory of Mechanisms
ELEC 426 – Robotics

Flavio Firmani Ph.D., P.Eng.
4378 Galleria | 778.782.9940 | ffirmani@sfu.ca

GRADUATE STUDENT CO-SUPERVISION

- Soheil Sadeqi, Ph.D., "Design of a Hybrid Spherical Manipulator for Lower Limb Exoskeleton Applications", 2013-2017
- Shaun Bourgeois, M.Sc., 2016-Present

AWARDS AND NOMINATIONS

- Teaching Excellence of the Faculty of Engineering, UVic (Nominated, 2014)
- Gilian Sherwin Award for Excellence in Teaching, UVic, (Nominated, 2009)
- IFToMM Young Delegate Award, (2007)
- Andy Farquharson Award for Excellence in Graduate Student Teaching, (2006)
- Best Paper of the Year 2005 in the Transactions of the CSME, (2005)
- University of Victoria Fellowship, (2000)
- Distinguished Student Scholarship, Faculty of Engineering, UNAM, (1993)

SELECTED PUBLICATIONS

Journal Publications

Firmani F., Robinovitch S., and Park E.J., "Biometric System for Measuring Gait and Fall Characteristics Captured on Video," J Biomech Eng, 136(7), 2014.

Firmani F. and Park E.J., "Theoretical Analysis of the State of Balance in Bipedal Walking," J Biomech Eng, 135(4), 2013.

Firmani F. and Park E.J., "A Framework for the Analysis and Synthesis of 3D Dynamic Human Gait," *Robotica*, 30(1), pp. 145 – 157, 2012.

Conference Publications

Firmani F., *et al.*, "Expanding Engineering Design with Mini Projects - Theory of Mechanisms a Pilot Course," *CEEA Conference,* Canmore, Canada, June 2014.

Firmani F., *et al.*, "Training Program in Engineering Design for Graduate Teaching Assistants," *CEEA Conference,* Montreal, Canada, June 2013.

Soylu S., **Firmani F.**, Buckham B. J., and Podhorodeski R.P., "Integrated Operating Scheme for Underwater Mobile Manipulators," *In Proceedings of OCEANS 2010 MTS/IEEE,* Seattle, WA, USA, September 20-23, 2010.

SELECTED SERVICE ACTIVITIES

- Coordinator of the Professional Master's Program: Mechatronic Product Realization
- Coordinator of the Manufacturing and Automation Specialization
- Member of the Undergraduate Course Curriculum (UCC)
- Member of the Teaching Appointments Review Committee (TARC)
- Co-op Liaison Representative
- Supervisor of Capstone Projects – 4 teams (2017) and 2 teams (2016)

BRUCE FINGARSON, ENG.L., ASCT.
10710 Doncaster Crescent
N. Delta, B.C. V4C 8A5

Home: (604) 589-0860 **Cell:** (604) 318-0321 **E-Mail:** bfingarson@gmail.com

PROFILE:

- A highly creative and motivated VP of Operations and Engineering for a $50 million company facilitating a successful team in the distribution and automation of electrical, hydraulic, mechanical and pneumatic systems in an industrial sales environment.
- Successfully created, implemented and maintain the QA, TQM and OHSA programs to acquire and maintain full IsNetworld compliance. These programs include document control, quality assurance, safety and health standards, policies and programs.
- 29 years experience in the aviation field enabled an in-depth understanding of the cultures and quality requirements within the pilot, Department of Transport, mechanic and maintenance groups. Fully responsible for simulator certification bi-annually.
- Advanced skills in technical operations, maintenance management, analysis of programs, processes and projects for improved quality assurance, efficiency and strategic planning, coaching and leadership is enhanced with 4 years of instructing in the Robotics and Automation department of BCIT, guest lecturing for the Mechatronics System Engineering students Capstone project course and Sessional Professor, Mechatronics System Engineering for both a graduate and undergraduate course for Simon Fraser University.
- Direct operational and functional control of a team delivering value added lean manufacturing, engineered systems and research and development of proprietary systems for the Oil and Gas industry.
- Excellent management, coaching, creativity and interpersonal skills developed during multifaceted Board experiences and coaching development.
- Excellent ability with Excel, Word, PowerPoint and various industrial CAD software products.

HIGHLIGHTS OF QUALIFICATIONS:

Business Development and Retention

- Cultivated and managed the relationship with key suppliers to enhance sales and revenue opportunities.
- Design engineer and consultant for Enbridge and their BC gas infrastructure to move toward fully green solutions for gas control.
- Provided product, installation, commissioning, on-site training and remote consulting for TransCanada Pipeline in Mexico to assist their implementation of LNG pipelines. Additional control assessment, design, commissioning and installation support has occurred for both newly installed compressor stations at Tamazanchale and Naranjos as well as existing pipeline infrastructure.
- Created all TQM and OHS policy documentation to fulfill industry requirements to work in the Oil and Gas industries in BC. Fully IsNetworld compliant for controls and actuation in the Gas industry, including design, engineering consulting, fabrication and installation.
- Guided research and development for proprietary systems while ensuring full certification specifications of all equipment to applicable CSA standards and regulations.

Leadership

- Specified product selection and team member inclusion, then led the team in the full installation, implementation and cutover of the Enterprise Resource Planning (ERP) system for Automation West Technologies, resulting in no lost revenue events. The new ERP system facilitates a personal dashboard yielding "up to the hour" financial status of the company allowing for key indicator monitoring and responsive financial management. Assisted in the migration of the ERP system to the new corporate structure after the acquisition of AWT by Proax Technologies Ltd.
- Facilitated key employee growth yielding reduced shipping costs, tighter purchasing control of inventory (reducing inventory overhead and allowing the write down of 30% of inventory dead stock), higher compliancy to OSHA and QA programs and production enhancements.
- Created a new warehouse inventory strategy and led a team to completion of the re-organization and implementation resulting in cost saving to the company by reduced order picking to shipping times as well as an increase in work load availability. Introduction of lean manufacturing concepts to the shop enhanced product quality and increased throughput.
- Participated with a team to accredit the curriculum of the Robotics and Automation Program at BCIT resulting in a clear understanding of the link between industry and academia.

Operations and Project Management

- Creation and implementation of a strategic plan to ensure functional duplicity for all key company roles (Automation West Technologies Ltd.).
- Creation and implementation of industry specific Quality Assurance and Health and Safety Policies for Automation West Technologies Ltd. to ensure ISNetworld certification is maintained, resulting in continued and growing revenue flows, with a focus on continued growth and expanded revenue opportunities in the Oil and Gas industry.
- Created and presented emergency preparedness, fire safety, HAZOP standards and safety procedures for the flight simulator department as well as Automation West Technologies Ltd.
- Created, implemented and monitors the TQM and OHS programs to ensure maintained quality and safety for our employee groups.

Financial

- Reduced IT costs by 35% by introducing strategic maintenance practices and equipment standardization (Automation West Technologies Ltd.).
- Grew overall company margins by 8% in the last fiscal year through negotiations with suppliers, managing customer expectations and tightly controlling quality and operational costs resulting in the highest margins to date.
- Allocated resources to ensure all 11,000 inventory items, orders, AR and AP transfers were accurate and timely. In addition, ensured all personnel were trained fully and the ERP system setup yielded appropriate financial data for enhanced, accurate decision making.

WORK HISTORY:

VP Operations and Engineering — 2007 – present

Automation West Technologies Ltd., BC

- Strategic planning for improving business opportunities in wider and more diverse fields.
- Corporate Safety Officer responsible for approving all TQM, OSHA, and QA policies and processes.
- Scheduling and implementation of human resources to meet company requirements.
- Managing and monitoring all operational aspects of the company.
- Responsible for full P & L with unlimited signing authority.

Flight Simulator Operations Duty Manager, YVR — 2001 - 2007

Air Canada, Richmond, BC

- Managed all technical aspects for a team of simulator technologists to ensure the flight training devices maintained certification by Transport Canada allowing for uninterrupted training for flight crews.
- Emergency Warden, responsible for all WHIMIS, Emergency Preparedness, HAZMAT and First Aid program maintenance in the Flight Simulator Department.
- Conducted annual performance evaluations.

Flight Simulator Technologist / senior Technologist — 1979 - 2001

Canadian Airlines / CP Air, Richmond, BC

- Designed and engineered, fabricated, tested, verified and installed critical subsystems within the simulator environment.
- As Chairman of CAST (Canadian Association of Simulator Technologists), sat on the Council of Canadian Airlines Employees to ensure the continuing operation of Canadian Airlines during periods of high financial distress and hostile takeover attempts by Air Canada.

Assistant Instructor, Robotics and Automation (50% part time) — 1984 - 1988

British Columbia Institute of Technology, Burnaby, BC

- Specified and set up robotic lab equipment to ensure quality course delivery.
- Ran various Robotics and Automation labs and courses.

EDUCATION:

Graduated with 1st class, Control Electronics, British Columbia Institute of Technology
Two year Arts and Science, University of British Columbia

PROFESSIONAL AFFILIATION:

Applied Science Technologists and Technicians of BC, certified AScT since 1985.
Association of Professional Engineers and Geoscientists of BC, certified Eng. L. in 2015

PROFESSIONAL ENHANCEMENTS:

- EWP (Electrical Work Practitioner) certification board member for AScTT (current)
- Member of the Master's Program Development Committee, Mechatronics Engineering, Simon Fraser University (current)
- Guest Lecturer for design criteria, Mechatronics Engineering, Simon Fraser University (currently)
- Sessional Professor, Mechatronics System Engineering, Simon Fraser University (currently)
- Co-founder, President and Head Sensei, 4th Dan, Delta Kaigan Judo Club (2005 - present)
- Certified Level III Coach (2008) and Master Coach Developer for Judo BC (2011 - present)
- 2nd Vice President, Judo BC (a not for profit society) (2013 - present)
- President and Director, Marpole Curling Club, Director, Pacific Coast Curling Assoc. (1997-99)
- Member of the Accreditation Board for Robotics and Automation, BCIT (2004)
- Chairman and Vice Chairman, Canadian Assoc. of Simulator Technologists sitting on the Council of Canadian Airline Employees (1992 - 96)

G. GARY WANG, PH.D., P. ENG.

School of Mechatronic Systems Engineering, Simon Fraser University, Surrey BC, V3T 0A3.
Office: Galleria 4378, Tel: 778.782.8495, email: gwa5@sfu.ca

ACADEMIC EMPLOYMENT

Professor (2011-present), Simon Fraser University (SFU), Mechatronic Systems Engineering

Associate Professor (2008-2011), SFU, Mechatronic Systems Engineering

Associate Professor (2004-2007), The University of Manitoba (UM), Dept. of Mech. and Manuf. Engr.

Assistant Professor (1999-2003), UM, Dept. of Mech. and Manuf. Engr.

EDUCATION

PhD	Mechanical Engineering, University of Victoria, BC	1999
MSc	School of Mechanical Science and Engineering, Huazhong University of Science and Technology (HUST), Wuhan, China	1995
BSc	School of Mechanical Science and Engineering, HUST, China	1992

AWARDS AND NOMINATIONS

- Fellow, American Society of Mechanical Engineers (ASME) (2013-present), member since 1998
- Associate Editor, *Engineering Optimization Journal*, geographically representing North America
- Associate Editor, *ASME Transactions, Journal of Mechanical Design*
- Co-chair, Inaugural International Symposium on Frontiers in Engineering Design, National Science Foundation of China, 2016
- Excellence in Teaching, 2014, SFU, one of the three recipients of the year, $2500 cash award
- Award of Teaching Excellence, 2015, SFU Faculty of Applied Science
- Rh Award for Outstanding Research, 2007, The University of Manitoba, $10000 cash award, the only one in the Applied Science Category
- I. W. Smith Award for Creating Engineering, 2005, The Canadian Society for Mechanical Engineering
- Leader of the Design Automation Committee in the premier International Design Engineering Technical Conferences (IDETC)

SELECTED PUBLICATIONS

1. Saremi, A., Jula, P., ElMekkawy, T., and Wang, G. G., "Bi-Criteria Appointment Scheduling of Patients with Heterogeneous Service Sequences Expert Systems with Applications," *Expert Systems with Applications*, Vol. 42, pp. 4029-4041, 2015.
2. Long, T., Wu, D., Guo, X., Wang, G. G., Liu, Y., "Efficient Adaptive Response Surface Method Using Intelligent Space Exploration Strategy," *Structural and Multidisciplinary Optimization*, Jan 2015. Vol. 51, No. 6, pp. 1335-1362.
3. Cutbill, A., Wang, G. G., "Mining Constraint Relationships and Redundancies with Association Analysis for Optimization Problem Formulation," *Engineering Optimization*, Vol. 48, No. 1, pp. 115-134, Jan 6, 2015.
4. Pirmoradi, Z., Haji Hajikolaei, K., Wang, G. G., "Design Scalable Product Families by RBF-HDMR Metamodeling Technique," *Engineering Optimization* Vol. 47, No. 10, pp. 1423-1439, 2015, doi: 10.1080/0305215X.2014.971776.
5. Cheng, G., Younis, A., Haji Hajikolaei, K., Wang, G. G., "Trust Region based MPS Method for Global Optimization of High Dimensional Design Problems," *ASME Transactions, Journal of Mechanical* Design, 2015, Vol. 137 (2), 021407 (9 pages); doi:10.1115/1.4029219.

6. Haji Hajikolaei, K., Wang, G. G., "High Dimensional Model Representation with Principal Component Analysis," *ASME Transactions, Journal of Mechanical Design*, Vol. 136, pp. 011003-1:011003:11, January 2014.
7. Haji Hajikolaei, K., Pirmoradi, Z., Cheng, G., Wang, G. G., "Decomposition based on quantified variable correlations uncovered by metamodeling for large scale global optimization," *Engineering Optimization*, Vol. 47, No. 4, pp. 429-452, 2014.
8. Shahi, K. S., Wang, G. G., An, L., Bibeau, E., Pirmoradi, Z., "Using the Pareto Set Pursuing Multiobjective Optimization Approach for Hybridization of PHEV," *ASME Transactions, Journal of Mechanical Design*, 134(9) - September 2012.
9. Shan, S., Wang, G. G, "Turning Black box Into White Function," *ASME Transactions, Journal of Mechanical Design*, Vol.133, Iss.3, DOI: 10.1115/1.4002978, Feb. 2011.
10. Shan, S., and Wang, G. G., "Metamodeling for High Dimensional Simulation-Based Design Problems," *ASME Transactions, Journal of Mechanical Design*, Vol. 132, Issue 5, May 2010, 051009:1-11.
11. Shan, S., and Wang, G. G., "Survey of Modeling and Optimization Strategies for High-Dimensional Design Problems," *Structural and Multidisciplinary Optimization*, Vol. 41, No. 2, 2010, Page 219-241.
12. Sharif, B., Wang, G. G., and ElMekkawy, T., "Mode Pursing Sampling Method for Discrete Variable Optimization on Expensive Black-box Functions," *ASME Transactions, Journal of Mechanical Design*, Vol. 130, 2008, pp.021402-1-11.
13. Wang, G. G., Shan, S., "Review of Metamodeling Techniques in Support of Engineering Design Optimization," *ASME Transactions, Journal of Mechanical Design*, Vol. 129, No. 4, April 2007, pp. 370-380.
14. Wang, D., Wang, G. G., and Naterer, G., "Collaboration Pursuing Method for Multidisciplinary Design Optimization Problems," *AIAA Journal*, Vol. 45, No. 5, May 2007, pp. 1091-1103.
15. Shan, S., and Wang, G. G., "Failure Surface Frontier for Reliability Assessment on Expensive Performance Function," *ASME Transactions, Journal of Mechanical Design*, Vol. 128, November 2006, pp. 1227-1235.
16. Shan, S., and Wang, G. G., "An Efficient Pareto Set Identification Approach for Multi-objective Optimization on Black-box Functions", *ASME Transactions, Journal of Mechanical Design*, Vol. 127, No. 5, 2005, pp. 866-874.
17. Wang, L., Shan, S., and Wang, G. G., "Mode-Pursuing Sampling Method for Global Optimization on Expensive Black-box Functions," *Journal of Engineering Optimization*, Vol. 36, No. 4, August 2004, pp. 419-438.

SELECTED INDUSTRY PROJECTS

General Motor Company (GM), Auto-body Assembly Process Optimization
Toyo Pumps, New Pump Design, Modeling, and Optimization
Aurel Systems Inc., Knowledge Assisted Large-scale Production Optimization for Chemical Plants
Exro Technologies, Modeling and Optimization of Racing Electrical Cars Using Reconfigurable Motors
St. Paul's Hospital, Emergency Department Modeling and Process Optimization for Wait Time Reduction
Manitoba Hydro, System Planning Optimization for Maximum Profit
Westland Helicopters, Engine Air Intake Shape Optimization
Monarch Industries, Incorporating Rapid Prototyping into Mold Making Process
Philips and Temro, Design Automation of Industry Silencers

TEACHING

Developed and taught: Statics and Strength of Material (MSE 221), Machine Design (MSE 320), Intro to Engineering Design Optimization (MSE426/726), Finite Element Analysis (MSE 427)

Taught at U of Manitoba: Computer Aided Design and Analysis, Quality Control, Facilities Planning, Capstone Design, Engineering Optimization.

Kevin Oldknow, Ph.D., P.Eng.

Senior Lecturer, School of Mechatronic Systems Engineering
Associate Dean, Faculty of Applied Sciences

Education

2004	Ph.D.	Mechanical Engineering (Manufacturing Controls), University of British Columbia, Canada Dynamically Reconfigurable Machining Systems, with research focusing on control strategies and architectures, system dynamics and metal cutting processes
2000	M.A.Sc.	Mechanical Engineering (Manufacturing Controls), University of British Columbia, Canada A Dynamically Reconfigurable System Architecture and FPGA Based Servo Controller for Distributed Machine Tool Control
1996	B.A.Sc	Engineering Physics, University of British Columbia, Canada

Other Professional Training

May 2012 - May 2012	University of Chicago Booth School of Business, Certificate: Finance for Executives
December 2009 - December 2010	MIT/Sloan School of Management, Executive Certificate: Strategy and Innovation
June 2008 - June 2008	Kellogg School of Management, Certificate: IRI/Kellogg Shaping Innovation Leaders

Employment History at Academic Institutions

January 2017 - Current	Associate Dean, Undergraduate Studies, Applied Sciences, Simon Fraser University
September 2016 - Current	Senior Lecturer, Mechatronic Systems Engineering, Simon Fraser University
September 2015 - Current	Faculty Teaching Fellow, Applied Sciences, Simon Fraser University
August 2012 - August 2016	Lecturer, Mechatronic Systems Engineering, Simon Fraser University
January 2011 - April 2011	Adjunct Professor, Mechanical Engineering, University of British Columbia
September 2009 - December 2009	Sessional Lecturer, Mechanical Engineering, University of British Columbia
September 2007 - December 2007	Sessional Lecturer, Mechanical Engineering, University of British Columbia
January 2003 - April 2003	Sessional Instructor, Mechanical Engineering, University of British Columbia

Kevin Oldknow, Ph.D., P.Eng.
Senior Lecturer, School of Mechatronic Systems Engineering
Associate Dean, Faculty of Applied Sciences

Other Employment History

June 2016 - Current	President, Oldknow Consulting Inc.
September 2012 - June 2016	Principal Engineer, Wheel / Rail Interface, L.B. Foster Rail Technologies
May 2011 - August 2012	Vice President, Technology and Business Development, LB Foster Friction Management
January 2009 - May 2011	Corporate Vice President, Friction Management, Portec Rail Group, Corporate Division
September 2007 - December 2008	Vice President, Applications and Operations, Portec Rail Group, Kelsan Technologies Division
September 2005 - August 2007	Manager, Friction Control Technology, Portec Rail Group, Kelsan Technologies Division
February 2005 - September 2005	Group Leader, Field Applications, Portec Rail Group, Kelsan Technologies Division
June 2004 - February 2005	Field Application Engineer, Portec Rail Group, Kelsan Technologies Division
September 2000 - May 2004	Product Development Consultant, Cameleon Controls
August 1996 - April 1998	Technical Project Manager, Procter & Gamble

Teaching Experience

At Simon Fraser University:

MSE 102 - Applied Science, Technology and Society (2013-2016)

MSE 300 - The Business of Engineering, I (2013-2017)

MSE 352 - Digital Logic and Microcontrollers (2012)

MSE 380 - Dynamic Systems Modelling and Simulation (2012-2014, 2016)

MSE 403 - Technology Entrepreneurship I (2015, 2016)

MSE 404 - Technology Entrepreneurship II (2015, 2016)

MSE 480/780 - Manufacturing Systems (2013-2018)

MSE 481 - Industrial Control Systems (2013, 2015, 2016)

MSE 893 - Advanced Dynamics (2013)

MSE 900 - Engineering in the Canadian Context (2015)

At the University of British Columbia:

MECH 563/464 - Industrial Robotics (2011)

Kevin Oldknow, Ph.D., P.Eng.

Senior Lecturer, School of Mechatronic Systems Engineering
Associate Dean, Faculty of Applied Sciences

MECH 506 - Linear Vibrations (2007, 2009)

MECH 365- Machine Dynamics and Vibrations (2003)

Thesis, Dissertation or Major Project Supervision / Co-Supervision

Name	Degree	Project/Thesis Title	Status	Began	Completed
Kamali, Seyed Hossein	Ph.D.	Regenerative Control of Vibration Systems	Active	2017-3	
Kaur, Manpreet	Ph.D.	3D printed micro-truss development for soft robotics application	Active	2017-3	
Zihajehzadeh, Shaghayegh	Ph.D.	Wearable Sensor System for Human Localization and Motion Capture	Completed	2016-1	2017-1
Andersen, Kimball	M.A.Sc.	Optimization of a Low-melting Alloy for Fused Filament Fabrication	Completed	2015-1	2015-2
Hamidi, Farzad	M.A.Sc.	Development of a GPS-enabled Localization Device	Completed	2015-1	2015-2
Stoll, Jonas	B.A.Sc	Resistive Spot Welding with SS316L	Completed	2014-2	2014-3

Selected Publications

Oldknow, K. and Lubik, S. (2016) Technology Entrepreneurship @ SFU: Experiential, Interdisciplinary Learning through an Immersive Two-Year Program, Proceedings of the 2016 Canadian Engineering Education Association (CEEA16) Conference, Halifax, 6pp

Oldknow, K., Cotter, J., Eadie, D., Elvidge, D., Kennedy, W., Weitzel, L., Nedunoori, S., Peters, J., Replogle, J., Ronasi, H. and Stevens, R. (2015) Inertial Tractive Effort as an Explanatory Variable in the Analysis of Locomotive Fuel Savings, Proceedings of the International Heavy Haul Association Conference (IHHA 2015), Perth, Australia, June 21-24, 2015

Oldknow, K., Eadie, D. and Stock, R. (2013) The influence of precipitation and friction control agents on forces at the wheel / rail interface in heavy haul, Journal of Rail and Rapid Transit 227,1, 8pp

Oldknow, K. and Eadie, D. (2010) Top of Rail Friction Control as a Means to Mitigate Damaging Lateral Loads due to Overbalanced Operation of Heavy Axle Load Freight Traffic in Shared High Speed Rail Corridors, Proceedings of the 2010 Joint Rail Conference JRC2010-36010, April 27-29, 2010, Urbana, Illinois, USA, 9pp.

Roney, M., Bell, S., Paradise, S., Oldknow, K. and Igwemezie, J. (2010) Implementation of distributed power and friction control to minimize the stress state and maximize velocity in Canadian Pacific's heavy haul / heavy grade train operations, Journal of Rail and Rapid Transit September 1, 2010 vol. 224 no. 5 465-471

Roney, M., Eadie, D., Oldknow, K., Sroba, P., Caldwell, R. and Santoro, M. (2009) Total Friction Management on Canadian Pacific, Proceedings of the IHHA Conference, Shanghai, China, June 2009, 10pp. 2009

Eadie, D., Elvidge, D., Oldknow, K., Stock, R., Pointner, P., Kalousek, J. and Klauser, P. (2008) The Effects of Top of Rail Friction Modifier on Wear and Rolling Contact Fatigue: Full Scale Rail Wheel Test Rig Evaluation, Analysis and Modelling, Wear 265, pp. 1222-1230

Eadie, D., Oldknow, K., Maglalang, L., Makowsky, T., Reiff, R., Sroba, P. and Powell, W. (2006) Implementation of Wayside Top of Rail Friction Control on North American Heavy Haul Freight Railways, Proceedings of the 7th World Congress on Railway Research (WCRR2006), Montreal, Quebec, 10pp.

Sroba, P., Oldknow, K., Dashko, R. and Roney, M. (2005) Canadian Pacific Railway 100% Effective Friction Management Strategy, Proceedings of the IHHA Conference, Rio de Janeiro, Brazil, June 2005, 9pp. 2005

Oldknow, K. and Yellowley, I. (2004) FPGA based servo control and three-dimensional dynamic interpolation, IEEE/ASME Transactions on Mechatronics, 10, 1, 98-110

Oldknow, K. and Yellowley, I. (2003) Implementation and validation of 3-dimensional dynamic interpolation using an FPGA based controller, International Journal of Machine tools and Manufacture, 43, 937-945

Oldknow, K. and Yellowley, I. (2002) Three-dimensional dynamic interpolation using state line based control architectures, International Journal of Machine Tools and Manufacture, 42, 1627-1641

Oldknow, K. and Yellowley, I. (2001) The design, implementation and validation of a system for the dynamic reconfiguration of open architecture machine tool controls, International Journal of Machine Tools and Manufacture, 41, 795-808

Selected Service Activities

University, Faculty and Departmental Committees

November 2017 - Current	Member, Student Data Governance Council (SDGC)
July 2017 - Current	Member, Student Systems Priority Setting Committee (PSC)
April 2017 - Current	Member, Senate Committee on Undergraduate Studies (SCUS) Working Group
January 2017 - Current	Member, Strategic Enrolment Management Committee (SEMC)
January 2017 - Current	Member, Surrey Campus Coordinating Committee (SCCC)
November 2016 - Current	Member, Senate Committee on Undergraduate Studies (SCUS)
January 2017 - Current	Chair, Faculty of Applied Sciences Undergraduate Curriculum Committee (FAS UCC)
October 2016 - Current	Chair, Sustainable Energy Engineering Program Task Force
May 2015 - October 2016	Member, Mechatronic Systems Engineering Executive Committee
May 2013 - October 2016	Co-Director, Technology Entrepreneurship@SFU program
May 2013 - October 2016	Member, Mechatronic Systems Engineering Undergraduate Curriculum Committee
November 2012 - December 2015	Member, Professional Master's in Mechatronic Product Realization (MPR) Program Development Committee

Other Service to the University

September 2015 - Current	Faculty Teaching Fellow, Faculty of Applied Sciences
January 2013 - August 2017	Supervised a total of 13 Mechatronic Systems Engineering Senior Undergraduate (Capstone) project teams as follows: 2017 – 2 teams 2016 – 3 teams 2015 – 4 teams 2014 – 3 teams 2013 – 1 team

Active Service to the Academic Community

July 2016 - Current	Reviewer, International Journal of Embedded Systems (IJES)
March 2016 - Current	Referee, ASME Journal of Manufacturing Science and Engineering
September 2015 - Current	Referee, Wear: An International Journal on the Science and Technology of Friction, Lubrication and Wear
November 2013 - Current	Referee, IMechE Journal of Rail and Rapid Transit (JRRT)

Service to the Community At Large

September 2015 - Current	Member of Board of Examiners (P.Eng.), Engineers and Geoscientists British Columbia (formerly APEGBC)
February 2013 - Current	Athlete and fundraiser: Racing for Orphans with Down Syndrome (RODS - www.rods.org). Participate in multi-sport (swim, bike run) events, raising funds towards the placement of orphans with Down Syndrome in adoptive homes, Racing for Orphans with Down Syndrome
June 2015 - September 2016	National Advisory Committee Member: Working in Canada Seminar, Association of Professional Engineers and Geoscientists of BC (APEGBC)
September 2015 - March 2016	Coach, Steve Nash Youth Basketball - North Vancouver (Seymour)

Selected Awards, Honors and Scholarships

2015	**Title:** Faculty Teaching Fellow, Faculty of Applied Sciences **Type:** Fellowship **Organization:** Simon Fraser University **Details:** Three year term (September 2015 - August 2018) as Faculty Teaching Fellow
2010	**Title:** IMechE Railway Division Prize - A.R. Bennett Premium/ C.S. Lake Award **Type:** Research **Organization:** IMechE **Details:** Award for paper: Implementation of Distributed Power and Friction Control to Minimise the Stress State and Maximise Velocity in Canadian Pacific's Heavy Haul/Heavy Grade Operations
2000	**Title:** NSERC PGS B Post-Graduate Scholarship **Type:** Scholarship **Organization:** NSERC
1999	**Title:** BC Advanced Systems Institute Graduate Student Scholarship **Type:** Scholarship **Organization:** BC Advanced Systems Institute

Dr. Krishna Vijayaraghavan, P.Eng

Mechatronic Systems Engineering, Simon Fraser University
250-13450 102 Ave, Surrey BC Canada V2T 0A3
www.krishna-vijayaraghavan.com
email: krishna@sfu.ca, ph: 778-782-9077

CV OUTLINE

Dr. Vijayaraghavan works on enhancing alternative energy systems. He has specifically been developing a research program to advance new system models as well as new theories in nonlinear controls and fault diagnostics to improve the reliability of these systems. While his primary research area and much of his long-term research plan falls within the area of nonlinear control systems, Dr. Vijayaraghavan was hired as part of the design group at MSE. Hence his research also focuses on integrated physical system and control system optimization in alternative energy systems. Recently he took the leadership role in writing a $5-million grant proposal to NRCan in collaboration with researchers at SFU and Powertech Labs. The requested equipment along with the in-kind contribution and planned funding would develop fault-diagnostics technologies and improve system design of chargers for electric vehicles. Dr. Vijayaraghavan's application area aligns well with the strategic research plan at SFU, which is currently exploring an energy systems program. Renewable energy is also a key area of focus for the Innovation Boulevard being established by the city of Surrey. Dr. Vijayaraghavan has also teachers several core engineering courses and has strived to improve his teaching through teaching development programs. Dr. Vijayaraghavan is currently instituting an innovative intelligent tutoring system (ITS) that aims to revolutionize the way assignments are integrated into course curriculum. After successful pilot implementation, Dr. Vijayaraghavan is keen to expand this ITS to other courses in MSE and eventually across SFU. Dr. Vijayaraghavan has also served the department as a member of several departmental committees and thesis committees and has initiated work to offer MSE courses through distance education (pending UCC and departmental approval). Dr. Vijayaraghavan is also committed to outcome-based education (OBE) and has recently created a web-software (hosted at obe.mse.surrey.sfu.ca) to evaluate student learning outcomes for OBE. He will be working closely with the UCC chair to develop this into a more comprehensive tool for OBE roll-out. The contents of Dr. Vijayaraghavan's curriculum vitae are as follows.

INTERESTS

Enhancing energy systems through integrated physical system and control system design.

BACKGROUND

Education

Ph.D., Mechanical Engineering, University of Minnesota (Twin cities), Minneapolis, U.S.A, July 2010.
M.S., Mechanical Engineering, University of Minnesota (Twin cities), Minneapolis, U.S.A, Dec 2005.
B.Tech., Mechanical Engineering, Indian Institute of Technology (I.I.T) Madras, Chennai, India, Aug 2003.

Skills

Linux and Windows operating system.
Installation and programming with real-time application interface (RTAI) for Linux.
Embedded control using Microcontroller.
SolidWorks, ProE, AutoCAD, Ansys, Ansys CFX, Ansys Fluent and OpenFOAM.
Expertise in C/C++ and knowledge of PHP, HTML, SQL, C#, Fortran, Pascal and Basic.
National Instrument LabVIEW®, Matlab Simulink® and Matlab XPC target (real-time system).
Power electronic circuit design and Printed Circuit Board (PCB) design.

WORK EXPERIENCES

Assistant Professor of Mechatronic Systems Engineering at Simon Fraser University (Surrey, BC, Canada, Jul 2011-current)

- Enhancing alternative energy systems through integrated physical system and control system design.
- Teaching core undergraduate and graduate course.
- Active participation in several committees within the department.
- Service to the broader community through youth mentorship.

Design and optimization for the next generation semiconductor manufacturing at Applied Materials Inc.
(Santa Clara, CA, USA, Jul 2010-Jul 2011)

- Design of semiconductor manufacturing equipment to achieve capabilities for processing the next generation of semiconductor chips.
- Part of an interdisciplinary team and design lead in the development of delivery systems for next generation precursors resulting in patents P1 and P2.

Research Assistant in the Department of Mechanical Engineering at the University of Minnesota (Minneapolis, MN, USA, Jan 2006-Jul 2010)

- Novel traffic sensor powered by harvesting energy from short duration vibrations arising from passing automobiles.
- A fundamental contribution to the field of energy harvesting from short duration vibrations.
- Collaborator on a project developing implantable battery-less wireless sensors for Total Knee Replacement Implants (TKRs).

- Patent for a Battery-less Wireless Weigh-in-Motion (WIM) sensor (P3).

Graduate Teaching Assistant in the Department of Mechanical Engineering at the University of Minnesota

(Minneapolis, MN, USA, Jan 2006-Jul 2010)

- Received consistently high evaluations from students as a Senior Teaching Assistant for ME 4231 Motion Control Laboratory (Jan 2009 – Jun 2009; Aug 2006 - Dec 2007; Jan 2004 - Dec 2005).
- Led laboratory classes on implementing control systems using code written in C language, National Instrument's LabVIEW®, and Matlab's Simulink.

Graduate research intern at Honeywell Inc.

(Golden Valley, MN, USA, Jun 2009-Dec 2009)

- Energy usage model to maximize the energy efficiency of heating and ventilation systems.
- Control strategies for issuing air filter change notification to minimize energy wastage.
- Analytical flow models for monitoring indoor air quality in buildings and for determining the optimal location for air quality sensors.
- Computational droplet evaporation and transport model for optimal design of humidifiers.
- Comprehensive furnace and air conditioner models for Fault Detection and Isolation and thermo-hydraulic model for the air conditioner (AC) performance deterioration due to refrigerant leaks.

RESEARCH CONTRIBUTIONS

Dr. Vijayaraghavan's primary research area and much of his long-term research plan falls within the area of nonlinear control systems. As part of the design group at MSE, he has also focused his efforts on integrated physical system and control system optimization of alternative energy system as a secondary research area. Dr. Vijayaraghavan's contributions are listed below.

Contribution 1: *Nonlinear controllers for fault detection and parameter identification in alternative energy system.*

Faults and parameter degradations in even a small subsystem, a sensor or an actuator of a complex system can result in severe performance degradation and may indicate imminent catastrophic failure. With the growth in highly nonlinear systems such as wind-turbines and fuel-cells, fault detection and parameter identification (FD-PI) has become increasingly important in alternative energy systems. Additional sensors may increase redundancy and enable the control system to monitor every single subsystem. However adding new sensors will become prohibitively expensive in many systems. Additionally, a controller may misidentify nonlinear effects and sensor noise as faults in these systems. Dr. Vijayaraghavan and his team have been developing observers and observers based FD-PI for noisy nonlinear which have resulted in seven journal articles (five since joining SFU) being published/accepted. Here a nonlinear observer utilizes a system model and measurements to generate virtual sensor outputs. This response is then compared to the expected system response to perform FD-PI. Dr.

Curriculum Vitae

Shahram Amiri

#202-125 Milross Ave • Vancouver, BC, V6A 0A1, Canada
Cell: (778) 822-2581; Email: shahram.amiri@outlook.com

Discipline Specializations

Design and Development of Medical Devices
Biomechanics of Human Musculoskeletal Systems
Medical Imaging – Image Processing
Orthopaedic Biomechanics
Computer Assisted Radiology & Surgery
Image-Guided Therapy

Education

Post-doc., Dept. of Orthopaedics, University of British Columbia, Vancouver, BC, Canada .....2009 - 2012
Intra-op and post-operative image-based assessments of knee and hip arthroplasty; Surgical device development for enhancing component alignments in arthroplasty; Design and development of a novel knee prosthesis

Ph.D., Mechanical Engineering, Queen's University, Kingston, ON, Canada, ... 2008
DISSERTATION: *Conceptual design for a surface-guided total knee replacement with normal kinematics*

M.Sc., Biomedical Engineering, Amir Kabir University, Tehran, Iran, ... 2001
DISSERTATION: *Optimization of the shape of the tibial component of a knee prosthesis to minimize wear*

B.Sc., Mechanical Engineering, K.N.Toosi University of Technology, Tehran, Iran, ... 1999

Academic Experience

Adjunct Professor, School of Mechatronic Systems Engineering, SFU, ... May 2015 – Present

Adjunct Professor, Department of Orthopaedics, University of BC, ...June 2015 – June 2016

Research Associate, Department of Orthopaedics, University of British Columbia, ... Oct 2012 – June 2015
Independent research program on: *Innovative image-based technologies for total hip arthroplasty, Developing smart surgical tools based on intraoperative three-dimensional imaging*

Faculty Member, Biomedical Engineering Program, University of British Columbia, ... Sep 2013 – June 2016

Associate Faculty Member, Department of Mech. Eng., University of BC, ... Sep 2013 – June 2016

Industrial Experience

Founder and Director, Torus Biomedical Solutions Inc., ... Jun 2015 – Present
Medical Imaging Technologies for Orthopaedic Surgery Applications

Orthopaedic Research Engineer, Zimmer GmbH, Winterthur, Switzerland, ...2008 - 2009
Developing a virtual dynamic assessment tool for prosthesis design
Finite element analysis of knee replacement prostheses

Design and Manufacturing Inspector, TAM IKCO, Tehran, Iran, ...2001 - 2003
Inspection of various stages of design and manufacturing of automotive stamping dies

Design Engineer, NMI Co, Tehran, Iran, ... Feb 2001 - Nov 2001
Design of quality assessment testing devices based on Peugeot-Citroen quality standards

Design Engineer/Project Manager, Maham Co, Tehran, Iran, ... 1999 - 2001
Reverse engineering, process planning, and tooling the manufacturing line of various products

Consulting Experience

Founder and Consultant, Torus Biomedical Solutions Inc., ... Jun 2012 – Jun 2015

ACADEMIC GRANT FUNDING

UBC Orthopaedic Research Excellent Fund (OREF) Application, 2014 [Awarded]
PROJECT: *New C-arm based techniques for quick and safe intraoperative imaging of the pelvis and stereotactic guiding of fixation screws in pelvic fracture reductions*
ROLE: *Co-Principal Investigator*, AMOUNT: *$ 20,000*, CONTRIBUTION EFFORT: *95%*
Co-Applicants: *Dr. Kelly A. Lefaivre, Dr. Pierre Guy, Dr. David R. Wilson, Dr. Antony Hudgson*

Vancouver Coastal Health Research Institute Innovation and Translational Research Award, 2014 [Awarded]
PROJECT: *Innovative Intra-operative Image-based Solutions for Total Hip Arthroplasty*
ROLE: *Principal Investigator*, AMOUNT: *$ 49,800*, CONTRIBUTION EFFORT: *100%*
Co-Applicants: *Dr. Bassam A. Masri, Dr. David R. Wilson, Dr. Donald Garbuz*

Collaborative Health Research Program (CHRP) Application 2014-2017, [Awarded]
PROJECT: *Development and Clinical Efficacies of an Innovative Quantitative Intraoperative C-arm System*
ROLE: *Co-Principal Investigator*, AMOUNT: *$ 470,000 ($157,000/year)*, CONTRIBUTION EFFORT: *50%*
Co-Applicants: *Dr. Carolyn Anglin, Dr. Pierre Guy, Dr. Anthony Hodgson, Dr. Bassam A. Masri*

NSERC Discovery Grant (Individual) Application 2013-2017, [Awarded]
PROJECT: *Innovative Solutions for Patient-Specific Needs in Joint Arthroplasty*
ROLE: *Principal Investigator*, AMOUNT: *$120,000 ($24,000/year)*, CONTRIBUTION EFFORT: *100%*

UBC Orthopaedics Research Excellence Fund (OREF), 2012 [Awarded]
PROJECT: *Validation of an Innovative Measurement Method for Cup Orientation in Total Hip Arthroplasty*
ROLE: *Co-Principal Investigator*, AMOUNT: *$15,000*, CONTRIBUTION EFFORT: *90%*
Co-Applicants: *Dr. David R. Wilson, Dr. Bassam A. Masri, Dr. Donald Garbuz*

Discovery Advancement Program (DAP) Canadian Arthritis Network (CAN), 2012 [Awarded]
PROJECT: *An Innovative Radiographic Method to Measure Acetabular Cup Orientation in Total Hip Arthroplasty*
ROLE: *Co-Principal Investigator*, AMOUNT: *$55,000*, CONTRIBUTION EFFORT: *90%*
Co-Applicants: *Dr. David R. Wilson*

Commercial Development Grant Program (CDGP) Canadian Arthritis Network (CAN), 2011 [Awarded]
PROJECT: *Novel Knee Replacement with Physiological Motions*
ROLE: *Co-Principal Investigator*, AMOUNT: *$40,000*, CONTRIBUTION EFFORT: *90%*
Co-Applicants: *Dr. David R. Wilson*

ACADEMIC HONOURS AND AWARDS

Canadian Arthritis Network (CAN) Post-Doctoral Fellowship, 2009 to 2010
Queen's Thesis Completion Bursary, 2008
Queen's Graduate Award, 2003 to 2006
Duncan & Urlla Carmichael Fellowship, 2006
Queen's Tuition Bursary, 2003 to 2005
Huntly MacDonald Sinclair Tuition Fellowship, 2004

TEACHING QUALIFICATIONS AND EXPERIENCE

Professional Development Training/Certificates
Teaching and Learning in Higher Education, *SGS901 Course - 35 hours, Queen's University, 2008*
Teaching and Learning Scholarship certificate, *Queen's University, 2008*
Teaching and Learning Practical Experience certificate, *Queen's University, 2008*
Teaching and Learning Professional Development certificate, *Queen's University, 2008*

Workshop Instructor
International workshop on imaging-based measures of osteoarthritis, Vancouver, 2010
Instructor of a course on joint modeling and applications in osteoarthritis-related research (80 participants)

Instructor
University of British Columbia, Vancouver, BC, Canada, 2014
Instructor for selected sessions in Orthopaedic Biomechanics *as parts of MECH 435/535 combined undergraduate and graduate course of Mechanical Engineering program (40 students)*

Queen's University, Kingston, ON, Canada, 2003-2008
Instructor for Fluid Dynamics, Robotics, Dynamics, and Heat Transfer labs *as parts of MECH398/MECH399 course required for students in the third year of Mechanical Engineering program (160 students in each semester)*
Redesigned a third year lab in Mechanical Engineering *(MECH399/Heat Transfer) to improve the delivery of the content (160 students in groups of up to 8)*

Teaching Assistant
Queen's University, Kingston, ON, Canada, 2003-2008
Teaching assistant in several courses including Manufacturing Processes (MECH215) and Mechanics of Materials (MECH321) *second and third year courses in the Mechanical Engineering program*

Course Instructor
Pooya Technical Institute, Tehran, Iran, 2002
Taught SolidWorks software *to a class of 20 engineers in 12 sessions*

INTELLECTUAL PROPERTY

Knee Prosthesis; Inventor(s): Amiri S., Wyss U.P., Cooke T.D.V.; International Publication: WO/2011/018441; US Patent Application:US2012/0179265; Date filed: 2009-08-10; US Patent Publication Date: 2012-07-12; Other Countries Filed: Canada/Europe/Japan/China; Acquired by the Orthopaedic Innovation Centre Inc. (Concordia Hip & Knee Institute, Winnipeg, MB, Canada) on 2013-01-24

Image-based Device for Guiding Surgical Tools; Inventor(s): Amiri S., Masri B.A., Wilson D.R.; US Provisional Patent Application through the UBC University-Industry Liaison Office. Date filed: 2012-10-03

Tracking System for Imaging Machines and Related Apparatus; Inventor(s): Amiri S.; Provisional US Patent; Application No: 61889473; EFS ID: 17100241; Date filed: 2013-10-10; PCT Patent Application No. PCT/CA2014/050986; Date filed: 2014-10-10

PUBLICATIONS

Peer-Reviewed Publications

1. Esfandiari H., **Amiri S.**, Lichti D.D., Anglin C., (2015) A fast, accurate and closed-form method for pose recognition of an intramedullary nail using a tracked C-arm. Int J Comput Assist Radiol Surg. 2015 Oct 8. [Epub ahead of print] [DOI: 10.1007/s11548-015-1294-y]
2. Osterhoff G., **Amiri S.**, Unno F., Dodd A., Guy P., O'Brien P.J., Lefaivre K.A., (2015) The "Down the PC" view - A new tool to assess screw positioning in the posterior column of the acetabulum. *Injury* 46(8), 1625-8
3. **Amiri S.**, Masri B.A., Anglin C., Wilson D.R., (2014) A method for assessing joint line shift post knee arthroplasty considering the preoperative joint space. *The Knee 21(2), 359-63*
4. **Amiri S.**, Wilson D.R, Masri B.A., Anglin C., (2014) A low-cost tracked C-arm (TC-arm) upgrade system for versatile quantitative intraoperative imaging. International Journal of Computer Assisted Radiology and Surgery (JCARS). 9(4), 695-711
5. **Amiri S.**, Wilson D.R., Vanhouwelingen A., Anglin C., Masri B.A., (2013) Isocentric 3-dimensional C-arm imaging of component alignments in total knee arthroplasty with potential intraoperative and postoperative applications. *Journal of Arthroplasty.* 28(2), 248-254
6. **Amiri S.**, Masri B.A., Garbuz D.S., Anglin C., Wilson D.R., (2012) A multi-planar radiography method for assessing cup orientation in total hip arthroplasty. *Journal of Biomechanical Engineering* 134 (10), 101008

Appendix 5. Support Letters:

- Support Letter from Co-op
- Memorandum of understanding between SFU and FIC
- Labour market survey results
- Support Letter from SITE-BC
- Support letter from EGBC (formerly APEGBC)

SFU WORK INTEGRATED LEARNING | CO-OPERATIVE EDUCATION

Tel: (778) 782-2667
Simon Fraser University
8888 University Drive
Burnaby BC
Canada V5A 1S6

December 13, 2017

Senate of Simon Fraser University
Regarding: Mechatronics System Engineering Professional Master's Program

Dear Senate Committee,

When the MSE PMP program was initially developed there was agreement to support a mandatory co-operative education component as an integral part of the program.

During the mapping of the program MSE needed to schedule the co-op work term on a student's final semester in the program. However, SFU Co-op's accreditation through Co-operative Education and Work Integrated Learning Canada (CEWIL) requires students to complete their degree on an academic semester.

If students could concurrently enroll during the co-op work term in an MSE course this would satisfy the accreditation criteria of completing their studies on an academic semester.

Sincerely,

Shauna Tonsaker
Director *pro tem*, Work Integrated Learning

VI.2 Support Letter from SITE-BC

Society of Internationally Trained Engineers of British Columbia

October 28, 2014

School of Mechatronic Systems Engineering

Simon Fraser University

250-13450 102 Avenue

Surrey BC Canada V3T 0A3

To whom it may concern.

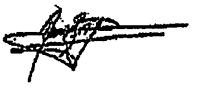
Re: Letter of Support for the "Mechatronic Product Realization Master's Degree at School of Mechatronic Systems Engineering, Simon Fraser University".

I am writing this letter in support of the project to create the "Mechatronic Product Realization Master's Degree at School of Mechatronic Systems Engineering".

SITE BC (Society of Internationally Trained Engineers) is fully in support of this project as an option for internationally trained engineers (ITEs) to advance their careers in BC and Canada in general. Since SITEBC creation in 2004 as a non-profit organization, we have worked to represent the interests of British Columbia's internationally trained engineering community. SITE BC promotes utilizing the full potential of ITEs so they can more meaningfully contribute their knowledge and skills to strengthening the Canadian economy.

Being aware of the barriers that our members have to overcome in order to contribute their full potential, I am confident that this Master's Degree program will help the participants to enhance their technical and soft skills as a resource to improve their employability. The different topics addressed by this program in areas like leading edge advanced manufacturing technologies, technical communication, Canadian work experience, professional association recognition, and professional mentoring will be a powerful tool to facilitate the ITEs integration into the Canadian work force in the field of professional engineering.

Should you have any questions regarding this letter, please do not hesitate to contact me.



Sincerely yours,

Fernando Borja P.Eng., MBA

SITE BC President

Cell: (604) 376 4987

info@sitebc.ca

www.sitebc.ca

Professional Engineers
and Geoscientists of BC

Building progress through innovation every day

200 - 4010 Regent Street, Burnaby, BC V5C 6N2
T. 604-430-8035 | F. 604-430-8085 | 1-888-430-8035
www.apeg.bc.ca

by email: gary_wang@sfu.ca

February 24, 2015

Dr. G. Gary Wang, P.Eng., FASME,
Professor and Acting Associate Director
School of Mechatronic Systems Engineering,
Simon Fraser University
School of Mechatronic Systems Engineering
250-13450 102 Ave.
Surrey, BC, V3T0A3

Dear Dr. Wang,

Re: Professional Master's Program in Mechatronic Product Realization

I am writing to express my support for Simon Fraser University's proposed Professional Master's in Mechatronic Product Realization. This innovative program will provide its graduates with a strong diverse skill set and introduction into the engineering practice in Canada in an area commensurate with their skills.

It is important to the Association that all those who wish to become academically-qualified to practice professional engineering in British Columbia have access to practical routes to achieve this goal. Currently, close to 50% of APEGBC's new applicants for professional engineer registration are educated outside of Canada. Your proposed program will offer a path to internationally educated and trained engineers that gives them enhanced business and communication skills in addition to advanced knowledge for practice in Canada, all of which are important to successful and fulfilling employment in Canada.

As described in the *Program Proposal for Professional Master's in Engineering in Mechatronic Product Realization (December 19, 2014), m*any of the facets of the proposed program align with APEGBC requirements for entry to the profession:

i. In accordance with APEGBC policy, graduates from Professional Master's of Engineering in Mechatronic Product Realization at Simon Fraser University who have previously graduated from a four- to five-year university level undergraduate engineering program in a directly-related discipline of engineering (mechanical, electrical/electronic, manufacturing or mechatronics engineering) would be considered to be academically qualified for registration as a professional engineer in a directly-related field of practice. Graduates with other academic backgrounds will be evaluated on a case-by-case basis.
ii. APEGBC policy also allows that the co-operative experience element of a program if aligned with APEGBC's competency requirements and directly supervised by a professional engineer with expertise sufficient to take responsibility for the work, can be credited towards the required one year

(of a total of four years of qualifying engineering experience) that must be in a Canadian Environment;

iii. The application fee for graduates who apply for APEGBC Engineer-in-Training status will be waived if they apply for enrolment within 12 months of graduation from the program; and

iv. Program participants may sign up as APEGBC Student Members and report their experience on APEGBC's online Competency Experience Reporting System.

Please accept my best wishes for continued positive development of the program. I look forward working closely with you and your faculty to welcome its graduates into the engineering profession in British Columbia.

Sincerely,

Gillian Pichler, P.Eng.
Director, Registration

cc: Ann English, P.Eng. – Chief Executive Officer & Registrar, APEGBC
Tony Chong, P.Eng. – Chief Regulatory Officer & Deputy Registrar, APEGBC

Memorandum of Understanding ("MOU") dated **7 June, 2016**

between:

Fraser International College Limited ("FIC")

-and-

Simon Fraser University ("SFU")

Preamble

A. FIC and SFU entered into a *Recognition and Educational Services Agreement* dated October 1, 2010 (the "Agreement"), and pursuant to the Agreement FIC develops and offers a range of educational services to students and SFU.

B. FIC is developing a non-credit pre-Master's preparatory program called the Pre-Master's in Engineering (the "PME") to prepare students for SFU's Mechatronic Product Realization Professional Master's Program (the "MPR"). The PME is described in Schedule 1 of this MOU.

C. FIC and SFU believe that it will be mutually beneficial for FIC to offer the PME at the FIC campus as a preparatory program leading to admission into the MPR at SFU.

D. FIC and SFU enter into this MOU to set out their understanding of the basis upon which the PME curriculum will be developed and delivered by FIC to international students as a Program and Courses under the Agreement.

1. Responsibilities of FIC

FIC agrees to:

1.1 Promote the PME to international students as a preparatory program leading to admission into the MPR at SFU.

1.2 Continuously monitor the PME and all associated curriculum to prepare students to be successful upon entry in the MPR.

1.3 Attend to all administrative functions pertaining to the program development and delivery of the PME, in consultation with SFU's School of Mechatronic Systems Engineering and the Dean of Graduate Studies, including hiring instructors, program advertising and recruiting international students that meet the admissions requirements outlined in Schedule 2 of this MOU.

1.4 Admit students based on the admissions requirements outlined in Schedule 2, which will be jointly reviewed from time to time, and subject to final approval by Graduate Studies.

1.5 Set, and collect from students, the tuition fees for the PME.

1.6 Pay to SFU a fee (the "PME Fee") equal to 20% of the gross PME tuition fees paid to FIC (exclusive of any taxes that FIC must charge and collect from its students, whether or not such taxes are separately disclosed to its students), as per clause 1(c) of the Third Schedule of the Agreement. Payment of the PME Fee to SFU will be by electronic transfer to the Office of the Vice-President, Academic, and will include a reconciliation statement of program enrolments.

2. Responsibilities of SFU

SFU agrees to:

2.1 Conditionally accept, on the recommendation of FIC and approval of the School of Mechatronic Systems Engineering, subject to approval by SFU Graduate Studies, PME applicants into the MPR. Such acceptance will be conditional upon the applicant satisfying the academic requirements approved by the SFU Senate Graduate Studies Committee (SGSC) and set out in Schedule 2, successfully completing the PME program and achieving at least a minimum 3.0 CGPA in the PME courses listed in Schedule 1.

2.2 Provide letters of offer of conditional acceptance into the MPR as contemplated by Schedule 2 on a rolling basis, within 10 days of FIC's recommendation of the applicant, as approved by SGSC.

2.3 Guarantee admission into the MPR to any student who successfully completes the FIC PME with at least a 3.0 CGPA, as approved by SGSC.

2.4 Provide classroom space and appropriate classroom resources for the delivery of the PME in accordance with clause 7(c) of the Agreement.

3. General

3.1 As per the First Schedule of the Agreement, SFU and FIC agree that the courses within the PME shall constitute Courses, the PME shall constitute a Program, and students in the PME shall constitute Students of the College.

3.2 SFU acknowledges and agrees that FIC will promote the PME to international students who meet the admissions requirements set out in Schedule 2 as a pathway to the MPR.

3.3 On an annual basis, the School of Mechatronics Systems Engineering and FIC will agree to recruitment targets for the upcoming PME intake.

3.4 SFU's School of Mechatronic Systems Engineering and FIC will review the PME collaboratively every year following the end of term for the Program. The School of Mechatronic Systems Engineering will monitor the quality of students coming through the PME program as they transition to the MPR program to ensure the quality of students introduced by FIC in future intakes.

4. Termination

This MOU may be terminated at any time by either party upon sixty (60) days' prior written notice to the other, in which case a two-semester sunset period will apply during which FIC may continue to deliver the PME to ensure any student in the PME at the time of dissolution will not be disadvantaged and may complete the PME. Unless terminated in accordance with this clause 4, this MOU will apply for the term of the Agreement.

IN WITNESS WHEREOF the parties have executed this Memorandum of Understanding.

Fraser International College Limited

PER: Beverly Hudson
Executive General Manager
Navitas North America

Date: 8 June 2016

Simon Fraser University

PER: Jonathan Driver
Vice-President, Academic and Provost
Simon Fraser University

Date: 8 June 2016

Schedule 1: Program

The FIC Pre-Master's in Engineering ("PME") is a non-credit pre-Master's preparatory program designed to prepare students for SFU's Mechatronic Product Realization Professional Master's Program ("MPR").

The curriculum for the PME has been collaboratively designed by the SFU School of Mechatronic Systems Engineering and FIC to achieve two main goals: (1) to assess students' ability to succeed in the full-time MPR; and (2) to prepare those students who gain entry into the MPR program to succeed in it. The PME curriculum is designed to achieve these goals through the development and assessment of students' (a) communication and language skills; (b) ability to work effectively in a collaborative environment; (c) critical thinking skills; and (d) maturity. The PME will help manage students' expectations regarding the rigor of the MPR program and opportunities available once completed, and will also emphasize academic integrity.

The PME shall consist of the four core courses and one capstone project outlined below. The curriculum will be delivered in small classroom settings with face-to-face, full-time instruction. Instructors will be selected by FIC in consultation with the School of Mechatronic Systems Engineering. Students will be required to complete all of the following course offerings:

- Communication Skills: Practical and Intercultural Issues
- Introduction to Quantitative Business Analytics: Statistics and Engineering Economics
- Introduction to Collaborative Work Environments
- Academic Literacy in Context: Business and Technical Writing
- Product Realization Capstone Project.

Communication Skills: Practical and Intercultural Issues

To be successful in their careers and in graduate study, students require effective communication skills. It is also important to be able to transfer and adapt their current skills to new situations. This course provides an opportunity for students to improve the communication skills that are important to graduate study in the context of a Canadian university. It explores communication through the intercultural domain, meaning that it helps students to build on and extend their current intercultural skills, while ensuring that they are equipped to respond appropriately in the varied and multicultural environments they will experience in Canadian graduate studies. During the course students will work individually and in teams to improve their verbal, non-verbal and written communication skills.

Introduction to Quantitative Business Analytics: Statistics and Engineering Economics

Today's engineers must have a basic understanding of the economic reality of the world they work in as well as basic business practices to succeed in their careers. In this course, students will be introduced to core concepts in financial accounting, designed to help students understand the "language of business". This will include understanding the purposes of the financial statements that firms use to describe and analyse the financial state of their operations, how to construct these financial statements, and some simple ratios that capture key elements of firm performance. After completing the course, students should be able to understand many of the fundamental financial accounting issues and challenges faced by

managers today. The Business Statistics module aims to give students a foundation in fundamental statistics knowledge, covering basic concepts such as distributions, standard deviations, correlations, and regression analyses. The Engineering Economics module will provide a sound introduction to key concepts in this important field.

Introduction to Collaborative Work Environments

In order to succeed in today's world, professionals must be able to work collaboratively with others. This often requires that they learn to work with people from different countries with different cultures, customs, and expectations. Further, given the nature of the MPR program, students must work effectively with others in order to succeed in the program. In this course, participants will develop their ability to work collaboratively in a team-based environment.

Academic Literacy in Context: Business & Technical Writing

This course will prepare students for the rigor and requirements of academic writing at the graduate level with a technical focus. It will make students aware of and competent in all aspects of business and technical writing, including memos, reports, briefings and pitches. Students will practice brainstorming, outlining, researching, drafting, revising, and presenting finalized written work. They will learn to use data to support their ideas and express opinions with confidence. In this course, students must be highly engaged and prepared to interact in group discussions and peer-review as well as work independently to complete larger assignments outside of class time.

Product Realization Capstone (CCC)

This capstone course will provide a practice ground for students as they begin to explore the importance of product realization. This course will allow students to practice their skills in a supportive environment, and then present in a realistic setting. Students will have the opportunity to put all the theory they learn in the PME to practice by becoming part of a high-functioning cross-cultural team as they work together to create a functioning prototype. By engaging in this course, students will learn effective time management and presentation skills, and be able to confidently introduce their product while making sound recommendations backed up with careful research and analytics.

Schedule 2: Admissions Requirements

Students in FIC's non-credit Pre-Master's in Engineering program ("PME") are anticipated to be selected from new Canadian immigrants and/or international applicants who have industry/professional experience in a relevant engineering discipline but wish to upgrade their knowledge in the area of mechatronics product realization. It is understood that the English proficiency of applicants may fall below the direct-entry requirement of IELTS 7.0 for graduate studies at SFU. Through the FIC PME program, accepted students will have the opportunity to further develop their communication, critical thinking, and interpersonal skills. The PME coursework identified in Schedule 1 is expected to enable applicants to compensate for any English language deficiency and help with adjustment to Western academic culture, bring them up to the SFU admission standards.

Students will receive a joint Letter of Offer from FIC and SFU's School of Mechatronic Systems Engineering outlining entry into FIC's non-credit Pre-Master's in Engineering ("PME"), a pre-Master's preparatory program designed to prepare students for SFU's Mechatronic Product Realization Professional Master's Program ("MPR"), and outlining the conditions of entry into the School of Mechatronic Systems Engineering and the MPR.

Progression into the MPR will be granted to all students who are admitted to and successfully complete the PME with at least a 3.0 CGPA.

Students may only be admitted to the PME by FIC and receive a conditional offer for admission to the MPR from SFU if they have the following:

- Undergraduate degree in Mechanical Engineering, Electrical Engineering, Mechatronic Engineering, Engineering Science or related field from a recognized post-secondary institution, with the minimum academic requirement set by SFU for admission into graduate studies; and
- 6.5 IELTS overall band score (or its equivalent as determined by SFU Graduate Studies), as approved by the Senate Graduate Studies Committee.

VI.1 Survey and Results

SFU Professional Master's Degree in Advanced Manufacturing[4]

Simon Fraser University's School of Mechatronic Systems Engineering (MSE) is considering offering a Professional Master's Program in Advanced Manufacturing. Key areas of training will include: Advanced Modelling and Prototyping, Modern Product Design, Additive Manufacturing, Manufacturing Controls, Engineering Communication, Project Management and Documentation, Business of Engineering and Entrepreneurship, Engineering Law and Ethics, Capstone Projects, and Industry Mentor-ship.

Q1 . Please indicate the size of your company (number of employees)

- 0 - 50
- 50 - 100
- 100 - 500
- 500+

Q2 . Please indicate your company's industry sector
*

Q3 . Please provide your company's name (optional)

Answer :

Q4 . Please provide your position (title) at your company (optional)

Answer :

Q5 . Given the description of the proposed Professional Master's Program in Advanced Manufacturing, please indicate how likely you would be to hire a 4-month intern (total salary approx. $12,000)

- Definitely would hire
- Might hire
- Definitely would not hire

Q6 . Given the description of the proposed Professional Master's Program in Advanced Manufacturing, please indicate how likely you would be to hire an 8-month intern (total salary approx. $24,000)

- Definitely would hire
- Might hire
- Definitely would not hire

Q7 . Given the description of the proposed Professional Master's Program in Advanced Manufacturing, please indicate how likely you would be to hire a permanent employee that has completed this program.

[4] The old name for the proposed program, which is subsequently changed to MPR to cover a wider scope.

- Very likely
- Somewhat likely
- Not likely

Q8 . Given the description of the proposed Professional Master's Program in Advanced Manufacturing, please indicate how likely you would be to support one of your existing employees in taking the program (total expected tuition approx. $30,000)

- Very likely
- Somewhat likely
- Not likely

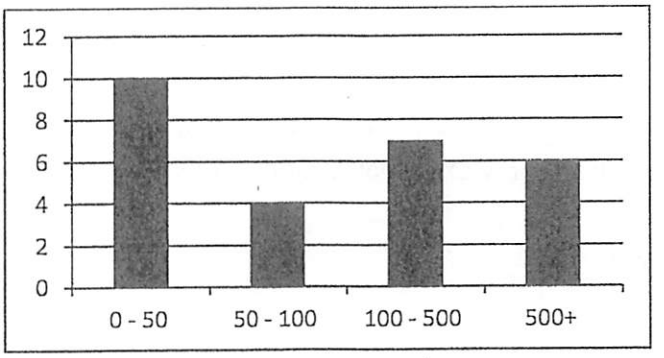
Q9 . Given the description of the proposed Professional Master's Program in Advanced Manufacturing are there any specific areas of training that you would recommend including / excluding from the program?

*

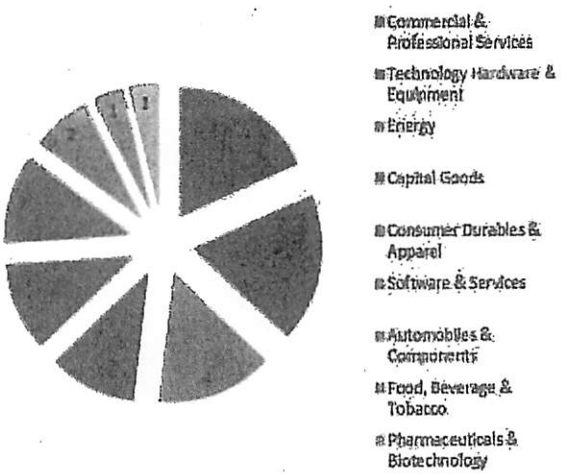
Results:

In total 27 responses have been received. The survey results are summarized as below:

Q1 . Please indicate the size of your company (number of employees)



Q2 . Please indicate your company's industry sector



Q3 . Please provide your company's name (optional)

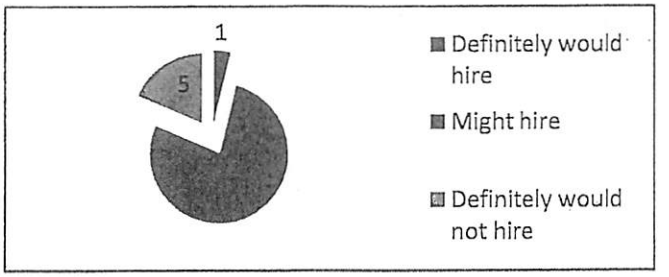
Mustang Survival
AstroGraphic Industries Ltd.
Unifiller Systems
International Market Access, Inc.
Murray Latta Progressive Machine
Surrey Fluid Power Ltd.
SNC-Lavalin Inc.
Mustang Survival
Lange Installations Ltd
International Submarine Engineering
Schneider Electric
Eaton
AFCC
Sanjel
Photon Control R&D Ltd.

Q4 . Please provide your position (title) at your company (optional)

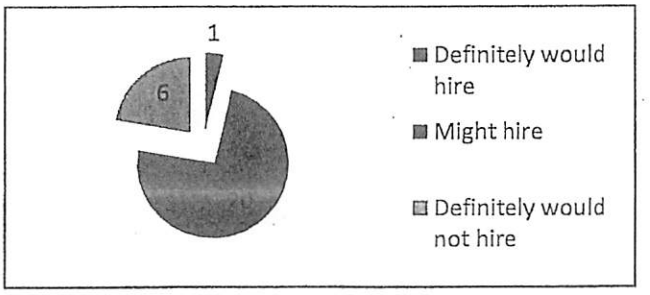
President
Owner and President

CEO
Communications Director
President
HR Manager
General Manager and COO
Director, Facility Engineering
senior process engineer
Manager, Research & Technology
Owner
VP Operations
Project Manager
University Recruiter
Mechanical Manager

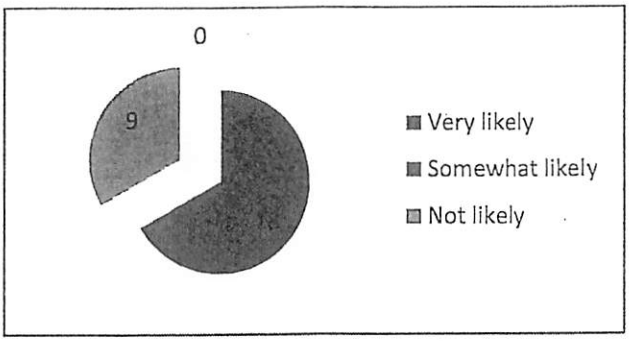
Q5 . Given the description of the proposed Professional Master's Program in Advanced Manufacturing, please indicate how likely you would be to hire a 4-month intern (total salary approx. $12,000)



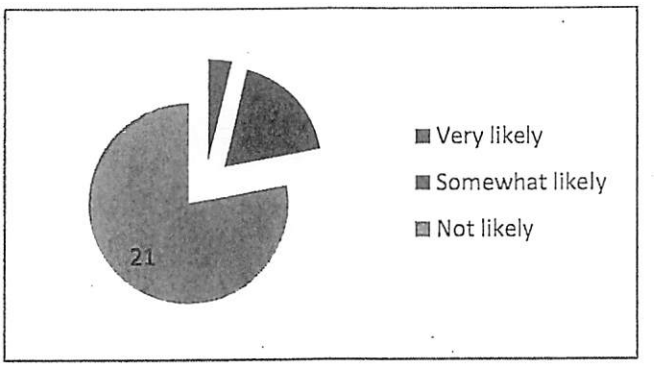
Q6 . Given the description of the proposed Professional Master's Program in Advanced Manufacturing, please indicate how likely you would be to hire an 8-month intern (total salary approx. $24,000)



Q7 . Given the description of the proposed Professional Master's Program in Advanced Manufacturing, please indicate how likely you would be to hire a permanent employee that has completed this program.



Q8 . Given the description of the proposed Professional Master's Program in Advanced Manufacturing, please indicate how likely you would be to support one of your existing employees in taking the program (total expected tuition approx. $30,000)



Q9 . Given the description of the proposed Professional Master's Program in Advanced Manufacturing are there any specific areas of training that you would recommend including / excluding from the program? (CommentBox)

Only the 5 most recent submissions are displayed for brevity.

Insufficient information to properly reply to this question

A good basic understanding in the field specific to the direction of manufacturing in question.

Understanding of costs and financials is very important to be able to make realistic decisions.

International logistics / supply chain management, Canada-USA Cross-border issues. The Border Policy Research Institute at Western Washington University might be a good partner.

Definitely include innovation as well as adapting change to new technologies