Strategic Plan 2013 - 2020

Vision 2020

Faculty of Engineering and Applied Science
Progress Report 2018/19

Memorial Engineering
December 2019

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1 Introduction

In the Fall 1969, a new Faculty of Engineering and Applied Science (FEAS) at Memorial University welcomed an incoming class of 155 students into a full engineering program for the first time. Prior to 1969, back to 1930, Memorial Engineering offered a 3-year engineering diploma, after which graduates moved to another province to obtain their engineering degree. The Faculty celebrated its 50th anniversary this year with events on the weekend of August 9 – 10, 2019, at the new Signal Hill Campus. The evening event on August 9 was a wonderful success with over 280 alumni and friends in attendance. It featured a special guest speaker, Dr. Roberta Bondar, Canada's first female astronaut. Dr. Bondar is the recipient of NASA's Space Medal, Companion of the Order of Canada, and over 28 honorary degrees.

Over the past year, FEAS successfully received full accreditation of all six of its undergraduate programs. With recent changes to the accreditation system, in 2017, the Faculty received accreditation to June 2020 with a report required in June 2019 to demonstrate progress on graduate attributes and continual improvement processes. This report was approved by the Canadian Engineering Accreditation Board (CEAB) and therefore the overall outcome was a full 6-year accreditation from 2017 to 2023 for all six programs. Graduate attributes and continual improvement requirements were new elements added in the accreditation system. It was the first time that FEAS was assessed using this new accreditation model.

The Faculty had many significant achievements over the past year. FEAS co-founded the Memorial Centre for Entrepreneurship (MCE) in 2014 along with the Faculty of Business Administration. In October, 2019, MCE was named one of the top five emerging entrepreneurship centres in the world by the Global Consortium of Entrepreneurship Centers (GCEC). MCE has grown significantly in the past few years, initially with about 20 students per year engaged in entrepreneurship programming in Engineering and Business, to currently over 300 per year across all faculties / schools at Memorial University.

FEAS faculty members are renowned researchers, dedicated teachers and award-winning professors in their respective areas of research. For example in the past year, Professor Claude Daley received a prestigious international award (Dr. Kenneth S.M. Davidson Medal) from the Society of Naval Architects and Marine Engineers (SNAME) for exceptional contributions to ship design, particularly ice-class ship structures. Dr. Geoff Rideout received the 2018 AAU Teaching Excellence Award of the Association of Atlantic Universities (AAU). Several other prestigious awards were received by faculty members. FEAS honoured three professors over the past year who made exceptional contributions to teaching, research and administrative leadership over their careers – Drs. John Quaicoe, R. (Venky) Venkatesan, and Leonard Lye.

Many new research grants and contracts were secured over the past year. Over $5.5 million was awarded by Fisheries and Oceans Canada for research on oil spill response to preserve marine ecosystems. The research team includes Profs. Bing Chen, Helen Zhang, Neil Bose and Tahir Husain. Prof. Bing Chen and his team from six countries also secured a national NSERC CREATE network grant of $1.65 million. The global PEOPLE network led by Dr. Chen is

developing innovative solutions to reduce organic pollutants in oceans and estuaries. Also, approximately $24 million was secured for a high-bay lab expansion of the SJ Carew Building and new building annex for a Harsh Environment Research Facility, led by Dr. Yuri Muzychka. Funding partners include the Canada Foundation for Innovation, Husky Energy, ACOA, NL Government (TCII) and Memorial University.

Memorial's engineering students also had many impressive accomplishments over the past year. The Paradigm Hyperloop team competed at the 4th Hyperloop Pod Competition in Los Angeles and placed 1st in Canada, 3rd in North America, and 8th in the world, among over 300 teams around the world that entered the competition. Their pod design had an impressive top speed of 470 km/hr! At its annual charity fundraiser, the Student Society B raised $23,617 for the Special Olympics NL at the 13th Annual Winter Charity Ball. There was also wonderful student success on co-op work terms. Angela Stacey worked at Britax, South Carolina, where she created five patents for new car seats to keep children safer. Along with the good news, there was unfortunately a sad loss. With heavy hearts, Memorial University marked the passing of Kayla Anderson, a Civil Engineering Term 7 student, with university flags at half-mast on May 4, 2019. Kayla was known for her happy and generous personality – always giving of herself.

Memorial's engineering alumni had remarkable accomplishments over the past year. Verafin co-founders – Jamie King, Raymond Pretty, Brendan Brothers – led Verafin to secure the largest ever Canadian venture deal of $515 million in becoming the world's largest financial crime management software company. Kate O'Brien (Electrical '96) was appointed as a judge of the NL Supreme Court. Jennifer Williams (Civil '98) was appointed as the first female President of NL Hydro. There were many other impressive alumni achievements.

The provincial government has paused the growth funding of the Engineering Expansion Strategic Initiative. Over the past year, FEAS has been challenged with expectations of growth in high-demand areas such as Computer Engineering, while simultaneously absorbing budget cuts and attrition as a result of lower operating grants from the Province to Memorial University. Last year's annual progress report on Vision 2020 reconsidered and paused the Faculty's original growth plan in light of the current budgetary climate. Figure 1 compares the faculty and staff complement with other similar size engineering schools in Canada. Note the sharp increase in 2018 occurred because co-op coordinators and staff were included for the first time, i.e., not included in totals for prior years.

This progress report provides an overview of the progress and achievements towards the Faculty's strategic plan [1] over the past year. It provides a summary of actions completed on each of the four theme areas of the strategic plan – student success; research excellence; external partnerships; and distinguished workplace. The initiatives are well aligned with the University's capstone strategic plan and frameworks. This report further reconsiders the growth targets of Vision 2020 in light of the challenging budgetary situation at Memorial University. Also, it reconsiders a number of targets and actions from the Vision 2020 plan which have either been completed, or else became repetitive each year without any substantive changes, as they are now firmly established and regularized elements of the Faculty.

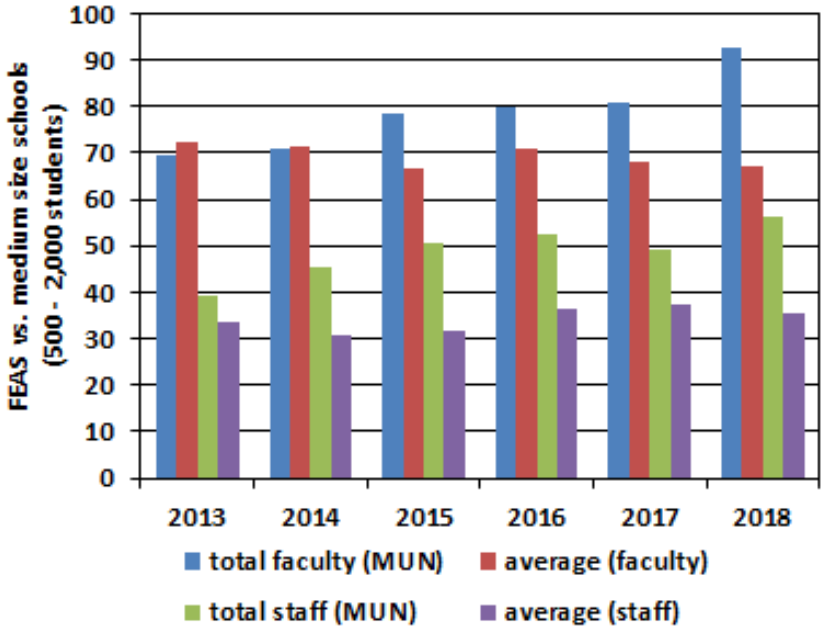

Figure 1: Number of faculty / staff members relative to other Canadian engineering schools [2] (note: co-op coordinators and staff included for the first time in 2018)

2 Alignment with MUN's Capstone and Strategic Frameworks

MUN's Capstone Plan comprises the university's three strategic frameworks in teaching and learning, research, and public engagement. As outlined in Table 1 below, the FEAS Vision 2020 goals, priorities and action plans are well aligned with the directions outlined by these strategic frameworks of Memorial University.

Memorial's Capstone Goals	**FEAS Vision 2020 Goals**
Teaching and Learning Framework	
1. Build relationships – Memorial University establishes connections among educators, students, staff and members of the broader community.	1.2.2, 3.2.2
2. Engage people – Memorial University recognizes that engagement is important in all settings where teaching and learning occur.	1.2.4
3. Create synergies – Memorial University maximizes the benefits that occur when various components of the teaching and learning enterprise come together.	1.2.3
4. Focus on the learner – Memorial University engages its students, educators and staff to develop curricula, programs, support services and spaces that address learner needs and support achievement of clearly identified learning outcomes.	1.1.4, 4.3.1

5. Provide support – Memorial University supports educators, staff and all students it admits by aligning its policies and procedures with the distribution of resources to advance teaching and learning.	1.1.1, 4.2.1, 4.2.2, 4.4.2
6. Commit to quality – Memorial University provides high quality curricula and learning experiences that are current, relevant, creative, innovative and appropriately challenging.	1.1.3, 4.3.3
7. Foster transformation – Memorial University provides a supportive and inclusive environment that fosters individual transformation.	1.2.1, 3.3.5
8. Value contributions – Memorial University recognizes and values the contributions of all individuals who are involved in the teaching and learning enterprise.	1.1.2, 4.1.1
9. Acknowledge responsibility – At Memorial University, educators, students, staff and the institution as a whole share responsibility and accountability for effective teaching and active learning.	1.1.5, 1.2.5, 4.4.1
10. Support lifelong learning – Memorial University models enthusiasm for continuous learning.	3.3.4
Research Framework	
1. Attract, retain, support and celebrate people engaged in and supporting research.	2.1.2, 2.2.3, 2.3.2, 4.3.2
2. Support an environment of research collaboration.	2.1.4, 2.2.2, 2.2.4, 3.1.1
3. Engage with community partners and collaborators locally, nationally and internationally.	2.3.1, 2.3.3, 2.3.4, 3.1.2
4. Support fundamental and applied research excellence in areas of strategic opportunity.	2.1.1, 2.1.3, 2.2.1
Public Engagement Framework	
1. Make a positive difference in our communities, province, country and world.	3.2.3
2. Mobilize Memorial for public engagement.	3.2.1, 3.3.6
3. Cultivate the conditions for the public to engage with us.	3.3.1, 3.3.3
4. Build, strengthen and sustain the bridges for public engagement.	3.3.2

Table 1: Alignment of FEAS Vision 2020 and MUN's Capstone Plan

The action items of Vision 2020 plan have been updated and adjusted over time to align with emerging opportunities / challenges in MUN's Capstone plans. These evolving initiatives will be described in the following sections.

3 Vision 2020 Progress Report

The four primary pillars of the FEAS strategic plan – teaching; research; partnerships; and workplace – will be outlined in this section, including specific outcomes that have been achieved over the past year towards the goals of these priorities. In each of the sub-sections, a selected list of completed action items over the past year will be provided. It is a sample list including some of the main outcomes but not an exhaustive complete list. Most items are new initiatives that have been launched over the past year, while others were continued from a prior year but recently completed this year.

3.1 Creating the Conditions for Student Success

FEAS has achieved a number of significant outcomes and accomplishments over the past year as part of the Vision 2020 goals for enhancing student success and providing an exceptional teaching and learning environment.

Goal 1.1: Support Teaching Excellence

1.1.1 Reward and foster teaching excellence for faculty and graduate students

- Engineering professors received several teaching related awards over the past year, e.g., Association of Atlantic Universities Teaching Award (Dr. Geoff Rideout), Fellow of the Engineering Institute of Canada (Dr. Yuri Muzychka), Terra Nova Young Innovator Award (Dr. Xili Duan), and Fellow of the Canadian Academy of Engineering (Dr.Octavia Dobre).

- Faculty awards were given to recognize outstanding teaching and graduate student supervision: Dr. Stephen Bruneau (Dean's Award for Teaching Excellence) and Dr. Eric Gill (Dean's Award for Excellence in Graduate Student Supervision).

- Performance evaluations were used for TA selection. All TAs receive TA training prior to a TA placement. Five Outstanding TA Awards were given to graduate students over the past year to recognize their excellent TA performance.

1.1.2 Support curricular development

- A new program of Supplemental Instruction (SI) for student retention was implemented by the Office of the Associate Dean, Undergraduate Studies. The SI program focuses retention of 1st year students by providing additional targeted instruction, tutorials, and one–on–one tutoring on course material.

- Student competitions continue to be held in various courses to increase student engagement, e.g., annual Civil Engineering Cube Competition (Prof. Assem Hassan).

- New curricula and a pan-University Certificate in Innovation and Entrepreneurship are under development in partnership with Business, Humanities and Social Sciences, and Music (led by the Engineering Entrepreneurship Chair, Prof. Carlos Bazan).

- Several program revisions were implemented, started, or under development, by Electrical and Computer Engineering – including a revamp of the MASCE course-based graduate program; new MESE graduate program launched in September 2019 (with Mechanical Engineering); and partnership with Computer Science on a new Master of Data Science.

- Faculty members continue to improve and develop new distance delivery courses. Examples of existing and new courses include ENGI 4102, 8151, 8104, and 8672.

- "Mastering Engineering" web access was introduced in ENG 1000 (Statics) through video tutorials, online access to course materials, and online assignments with individual problems and diagnostic charts for performance evaluation.

- Course changes of the co-op ENGI 200W course (Professional Development) were successfully implemented for first time in the Fall 2019 term for 1st year students.

- New industry engagement opportunities were provided for students in various courses. Examples include site visits in Civil Engineering to Capital Ready Mix (ENGI 3731, Materials for Construction, Prof. Assem Hassan), Windsor Lake WTP, and Robin Hood Bay Waste Management Facility (ENGI 4717, Apple Environmental Science and Engineering, Prof. Bing Chen).

Goal 1.2: Encourage Student Engagement

1.2.1 Update courses / curriculum

- New curriculum committees were created over the past year in each department for continual improvement of courses and programs. The committee meets monthly to identify issues and perform continuous monitoring. At the first curriculum meeting of each semester, the committee reviews the course offerings with instructors from the previous semester to discuss the assessment of outcomes in the course.

- The Department of Ocean and Naval Architectural Engineering launched new initiatives in support of curriculum development, including: a new Accreditation Information Management System (AIMS), new Deputy Head (to manage the graduate attributes of accreditation), Academic Development Committee (ADC), ONAE Advisory Board for curriculum feedback, and ONAE data aggregation software.

- Through meetings between class representatives and the Department Head, students in each program continued to give regular feedback on teaching, course content, and quality of instruction in undergraduate courses. This feedback is then used in the continual improvement process to consider subsequent changes in courses.

1.2.2 Strengthen co-op education and external engagement

- Co-op student placement opportunities were expanded in Stipendiary Experiential Learning semesters (research / community service) and entrepreneurial placements through the Memorial Centre of Entrepreneurship (MCE).

- Fry Family Foundation funding was secured by the Associate Dean, Undergraduate Studies, and Development Officer, for community service learning semesters in 12-week work terms.

- Funding for several new co-op education initiatives was secured by the Co-op Education Director, including support for student interviewers to conduct ENGI 200W mock interviews, and Employability Skills Training for international students.

- New internship opportunities for graduate students are under development to enhance their learning experience and practical skill development, particularly for students in course-based Master's programs.

- Funding for a MITACS program was secured for graduate students to complete summer internship programs at universities in Brazil, Australia and Norway.

1.2.3 Improve teaching and learning environment

- A new Iron Pin event was launched by the Associate Dean, Undergraduate Studies, for First Year engineering students. The ceremony formally welcomes students into the engineering community and encourages them to think about the values that are fundamental to the profession: responsibility to the common good, public safety and the environment; honour and trustworthiness; and inclusivity and respectfulness.

- Student support services for technical communications were expanded for First Year student advising and mentorship in the Cahill Engineering One Student Success Centre.

- The Office of the Associate Dean, Graduate Studies, continued to support graduate students in their development of TA skills through training sessions, as well as professional development seminars.

- A teaching seminar series was made accessible to faculty and graduate students, including TSEP, entrepreneurship, Thesis Boot Camp, and Career / Professional Development, in partnership with the School of Graduate Studies.

- FEAS secured 10 placements for NSERC USRA students over the past year to work with professors on research projects. FEAS contributed $2,700 per NSERC URSA student towards support of the students in these work terms.

- A Living and Learning Community was created for first year engineering students to be co-located together in the same floor(s) of residences. This is creating a closer sense of community among students to improve peer support and student retention.

- A new software system, Navigate, was introduced by Student Life and successfully used in FEAS to support student success by providing key information to advisors like majors and streams; course information; performance in courses which are critical to their major; and other data related to student success.

- Several student teams participated in the IEEE Xtreme 24 Hour Programming Competition. Among the 20 students who participated, there was a Term 6 team (8th and 17th out of 66 teams from Canada), Term 3 team (36th, 40th, 43th, and 46th) and MASCE graduate student team (38th).

- Engineers from the community gave invited lectures in various courses, e.g., Daniel Martin (2010 Civil Engineering graduate; Supervisor of water treatment facility), and Linda Fitzpatrick (Public Works - Waste and Recycling) in ENGI 4717, Applied Environmental Science and Engineering (Prof. Bing Chen).

- Resourcing data was compared with other engineering schools in Canada. Figure 2 illustrates that Memorial Engineering students continue to be supported above the average on a per student basis, as a result of the engineering expansion strategic initiative, but the support, per undergraduate student, dropped in the past year.

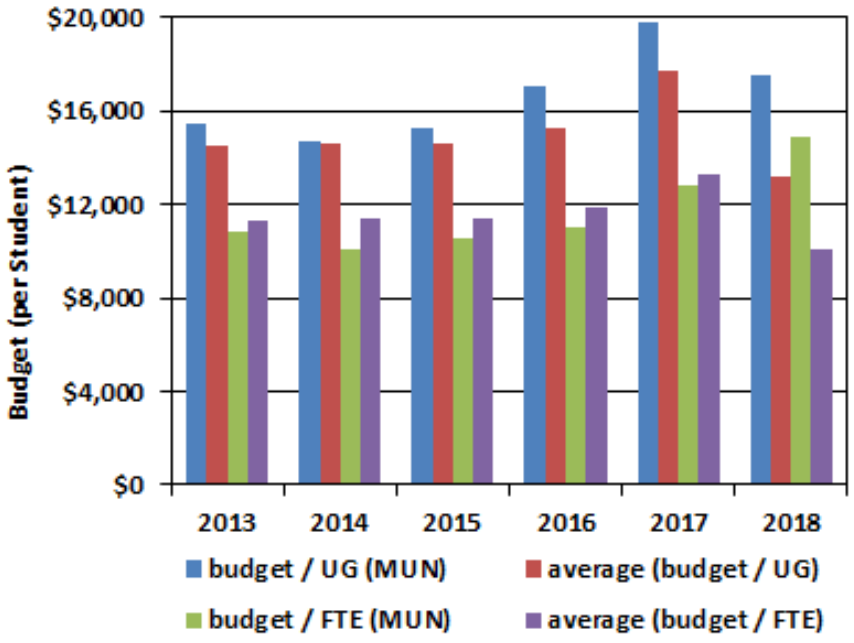

Figure 2: Operating budgets and resource allocations for undergraduate and total full-time equivalent (undergraduate and graduate) students [2, 3]

- The new Biomedical Engineering stream for the Classes of 2019 and 2020 has been successful with 20 or more students in each cohort opting for that path. Going forward, the program aims to have a blended Electrical / Computer / Mechanical Engineering cohort taking the stream together.

- FEAS students and alumni had successful competition results over the past year, e.g., 2019 national CEC and regional AEC Design Competitions (2nd in Communications, 2nd in Consulting); 2018 MCE Mel Woodward Cup Challenge (2nd, 3rd in 2018); 2019 Paradigm Hyperloop (8th in World, 3rd in North America, 1st in Canada); Great Northern Concrete Toboggan Race (GNCTR), among others

- Recent graduates were named Top 30 Under 30 by Atlantic Business Magazine and have achieved remarkable success of their startup companies - Brett Vokey, founder of BreathSuite (Class of 2019); Adam Keating ('17) and Jeremy Andrews ('17), co-founders of CoLab Software; and Zachary Green ('16), co-founder of Mysa.

- Process Engineering students started a new student chapter (Newfoundland and Labrador) of the Canadian Society of Chemical Engineering.

1.2.4 Develop a continuous improvement process

- Comprehensive new processes of learning outcomes, graduate attributes and continual improvement were developed by each of the departments. This involved the development of curriculum maps, indicators and learning outcomes that link what students are taught to their expected competencies and attributes upon graduation.

- A systematic review process continues to be used within departments to update labs / facilities, course content and delivery methods on a regular basis. Feedback from lab technologists is sought in each department to bring forward any lab related areas of improvement.

- Mechanisms were provided for feedback from graduate students on student supervision by faculty members in partnership with the School of Graduate Studies. All graduating students are encouraged to fill out an exit survey on their experiences.

3.2 Increasing Research Capacity

Very good progress was also made over the past year on the strategic plan goals of increasing research capacity and intensiveness, as described in the following selected examples.

Goal 2.1: Attract, Retain and Support Research Activities

2.1.1 Increase our research capacity

- A new grant entitled “Oil Spill Reconnaissance and Delineation through Autonomous Underwater Vehicle Technology” was secured in the amount of $1.38 million, 2018-2022. The PI is Dr. Neil Bose and partners are Fisheries and Oceans Canada, US EPA, NOAA, Woods Hole Oceanographic Institution, University of Tasmania, CSIRO and Dalhousie University.

- A CFI grant, Development of Autonomous Marine Observation Systems (DAMOS), was secured, totaling approximately $13 million, led by the ONAE Department with partners, CFI, Government of NL, and Dalhousie University.

- A new project entitled "Prediction of Propeller-induced Noise and Hull Vibration”, $960K, was secured in May 2019. The Co-PIs are Dr. Shameem Islam (NRC) and Dr. Lorenzo Moro. The partners are Transport Canada, National Research Council - Ocean, Coastal and River Engineering Research Centre, and Government of NL.

- The ABS Harsh Environment Research Program (HERP), led by David Molyneux, was renewed for three years, 2018 - 2021, with funding of $350K. The partners are ABS, Government of NL, and MITACS.

2.1.2 Recruit / retain top graduate students and increase funding for fellowships

- In efforts to recruit more top undergraduate students from Memorial to continue onto graduate studies, the students are encouraged to apply to a fast-track option during their final year.

- For international recruitment of graduate students, the ADGS Office and departmental staff attended national conferences to promote graduate programs. Partnerships with 24 recruiting agents internationally were secured to recruit for course-based programs.

- Enrollments exceeded 780 graduate students in the Fall 2019, up from 635 last Fall. FEAS actively recruited from top institutions in Vietnam, Ghana, Ethiopia, Brazil, India, and China.

- The ADGS Office worked closely in partnership with the School of Graduate Studies and the Internationalization Office on strategic recruitment initiatives to strengthen international partnerships, including missions to Africa and India.

2.1.3 Increase number of faculty holding NSERC grants and diversify funding sources

- As part of a recently adopted review process for NSERC and other proposals, applicants had several levels of internal reviews starting from the ERO office to experienced peers within the department (expert and non-expert panel) followed by policy compliance reviews by the ERO office.

- ERO worked with faculty members in developing and reviewing proposals to various funding agencies, including but not limited to, NSERC, CIHR, SSHRC, CFI, NFRF, ACOA and TCII.

- The success rate for the past year's applications was 77% for NSERC Discovery Grants and 29% for RTI Grants. These success rates are above the national average (2019 DG early career researchers 56%; established researchers 71%; 2019 RTI success rate 21%) and an improvement over previous years.

- Mechanical Engineering had 100% success with all Discovery Grant applications awarded in 2015, 2016, 2017, and 2018. A new RTI award was secured in 2019 (Prof. M. Al-Janaideh), the second in three years.

2.1.4 Develop quantitative measures of research capacity and recognize research achievements

- ERO established SciVal and other accounts to track and analyze publications, citations and impacts of research outputs in FEAS.

- Memorial's ranking for engineering programs improved over the past three years with respect to the Times Higher Education review of overall, teaching, industry income and research categories (see Table 2).

Indicator	**Overall**			**Teaching**			**Industry Income**			**Research**		
Year	**2020**	**2019**	**2018**	**2020**	**2019**	**2018**	**2020**	**2019**	**2018**	**2020**	**2019**	**2018**
Civil Engineering	14	15	21	9	20	21	1	3	4	11	17	17
Mechanical	14	15	21	15	21	21	1	3	4	11	17	17
Electrical	14	16	22	16	22	22	1	4	5	12	18	18

(a)

Indicator	**Overall**			**Teaching**			**Industry Income**			**Research**		
Year	**2020**	**2019**	**2018**	**2020**	**2019**	**2018**	**2020**	**2019**	**2018**	**2020**	**2019**	**2018**
Civil Engineering	5	5	7	3	6	4	1	1	2	2	4	4
Mechanical	5	5	7	3	7	6	1	1	2	2	4	4
Electrical	5	6	8	4	8	7	1	2	3	3	4	5

(b)

Table 2: Times Higher Education ranking of (a) all 45 engineering schools in Canada; and (b) within Memorial University's category of Canada's 15 comprehensive universities (universities having a significant amount of research activity and a wide range of programs at the undergraduate and graduate level, including professional degrees)

- The average number of citations to research articles per engineering professor per year continues to rise significantly from year to year, according to Google Scholar (see Figure 3).

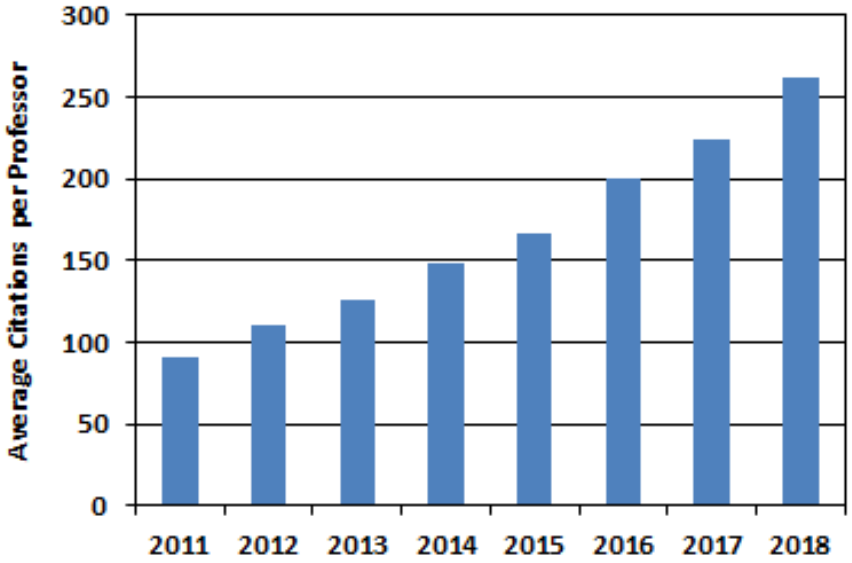

Figure 3: Average number of citations to research articles per engineering professor per year

- ERO completed a comprehensive review of the University ranking methods used for ARWU, Times and QS global ranking systems as well as for Maclean's national rankings in efforts to raise the Faculty's ranking on a global stage.

Goal 2.2: Support Research Excellence and Focus on Areas of Strategic Importance

2.2.1 Align FEAS's research capacity with areas of strategic importance

- New cross-disciplinary research programs were launched with other faculties / schools. For example, Dr. Kelly Hawboldt submitted several proposals in partnership with faculty members in Chemistry, Biology and MI. Dr. Andrew Vardy submitted a CFI application with the Faculty of Music. Dr. Steve Czarnuch submitted several CIHR and SSHRC applications in partnership with the Faculty of Humanities and Social Sciences. Dr. Lorenzo Moro is leading an OFI project with faculty members across three faculties (HSS, Business, Grenfell and MI).

- The 4th International Symposium on Safety and Integrity Management of Operations in Harsh Environments (led by Prof. Faisal Khan) was successfully hosted by C-RISE in St. John's. Many industrial partners and students attended and presented papers.

- Major research grants were secured by a team including Drs. Bing Chen, Helen Zhang, Tahir Hussain, Neil Bose (Engineering) and Uta Passow (Ocean Sciences) totaling $5.5 million, from DFO MPRI funds, in 6 research initiatives that are developing methods to respond to oil spills in Canadian marine environments.

- Dr. Joe Daraio secured NRCan funds for sustainable infrastructure through targeted climate adaptation training for professionals in Newfoundland and Labrador.

- An NSERC CRD project on Operational Capabilities of Low and Non-Ice Class Vessels in Ice, totaling $1.16 million, was secured by Dr. Bruce Quinton, in partnership with Vard Marine, DRDC, ABS, Memorial, Government of NL and NSERC.

2.2.2 Provide adequate space for research and ensure labs are well maintained and equipped

- A Harsh Environment Research Facility (HERF), totaling $16M, led by Dr. Yuri Muzychka, was secured with a large team of co-investigators and partners including the Canada Foundation for Innovation (CFI), Husky Energy, ACOA, and Government of NL. Memorial University is also contributing additionally through the construction of a high-bay lab expansion of the SJ Carew Building.

2.2.3 Improve administrative support and effectiveness of researchers' time.

- ERO worked with the Technology Transfer and Commercialization Office (TTCO) to assist and support researchers who submitted patent disclosures.

- ERO streamlined processes and worked with research account officers and the School of Graduate Studies to ensure that graduate students are paid more promptly.

- The introduction of Memorial's new researcher portal was successfully implemented and has changed the way in which grants and contracts are processed within the University. After an initial startup period, faculty members are now finding it easier to navigate through the portal and submit applications.

- ERO has continued to work with RGCS and the Office of the VPR to expedite grant applications / contracts and improve the account opening procedure. The turnaround time for receiving institutional approval has decreased over the past year.

- ERO (co-)hosted numerous seminar and information sessions to facilitate research funding applications (e.g., NSERC DG and RTI information sessions).

2.2.4 Enhance the research culture in FEAS

- ERO organized “lunch and learn” sessions on various research topic areas, including sessions in partnership with TTCO to bring awareness to services offered to researchers who intend to commercialize their research outcomes.

- ERO hosted sessions to showcase research within the Faculty, as well as invited guests external to Memorial (e.g., Dr. Norman Zhou from the University of Waterloo and Dr. Celso P. Pesce from the University of Sao Paulo, Brazil), to introduce graduate students to external research activities and discover new research approaches.

- ERO in partnership with the School of Graduate Studies hosted an Annual Research Day to showcase the research of graduate students and faculty members to the university and general public. There were over 47 poster presentations this year.

- Grant Facilitation Officers (GFOs) worked with their counterparts in other faculties / schools to promote interdisciplinary partnerships. When a project requires resources outside the scope of any faculty, the GFOs reach out to each other to determine if the resources are available within their respective faculties. Subsequently where such resources exist, ERO links the researcher together to form natural synergies.

- New inter-disciplinary research groups were formed over the past year. For example, Dr. Brian Veitch is collaborating with the School of Pharmacy to investigate health related research. Dr. Al Janaideh partnered with a faculty member in Earth Sciences (Dr. Alison Malcolm) to secure an NSERC RTI grant.

Goal 2.3: Expand Engagement with Partners

- Faculty engagement increased with industry and government partners through collaborative partnerships and outreach projects. For example, the PEOPLE Network (led by Dr. Bing Chen) includes 15 Canadian and 13 overseas institutions and more than 50 partners worldwide.

- The Faculty’s oil spill research team partnered with numerous organizations in Canada’s Ocean Protection Plan Multi-Partner Research Initiative (MPRI), including DFO/CCG, ECCC, TC, NRCan and over 10 industrial partners (ExxonMobil, Suncor, Shell, Chevron, Husky Energy, ECRC, SL Ross, among others).

- Examples of other faculty partnerships with outside organizations include Profs. Noori Saady (agriculture; with Department of Fisheries and Land Resources); Steve Bruneau, Amgad Hussein and Assem Hassan (ice-induced wear of concrete structures; with Kvaerner); Carlos Bazan (with start-up companies in Genesis and their clients such as Canadian Life Science, Chrom4, and 908 Devices); and Kevin Pope and Greg Naterer (Canadian Nuclear Laboratories).

- Departmental advisory committees were formed in each of the departments including members from industry, government agencies and other organizations. Committee members advised the department on program activities and continual improvement including graduate attributes in the accreditation process.

- OERC (Ocean Engineering Research Centre) facilitated a new partnership of a Karluk Collaboration Space at NRC. Several collaborative projects were initiated and adjunct professors were appointed at NRC.

- ONAE continued its leadership of a national network, CISMaRT – Canadian Network for Innovative Shipbuilding, Marine Research and Training – led by Prof. Wei Qiu. In partnership with Transport Canada and NRC, CISMaRT hosted a national workshop on autonomous surface ships on November 27 – 28, 2019, in Quebec City.

- The ONAE Department signed a partnership agreement with the Department of Naval Architecture, Chalmers University, Sweden, for Master's student exchanges.

3.3 Expanding Partnerships

Numerous activities of external engagement, outreach and partnerships with industry, high schools and other organizations, have been pursued over the past year.

Goal 3.1: Expand Partnerships that Contribute to Research

3.1.1 Expand partnerships within the Faculty, across the University and other universities

- Over the past year, there has been several new interdisciplinary partnerships with other faculties / schools as new synergies are formed in calls for proposals (e.g., graduate student co-supervisors among Engineering, Ocean Sciences, Earth Sciences, Chemistry, Medicine, Pharmacy and Medicine).

- Cross-appointed researchers from C-CORE have collaborated with faculty members on MITACS projects to promote joint co-supervision of PhD and Master's students.

- Faculty members collaborated with researchers at a number of other institutions. For example, the NSERC CREATE program led by Dr. Bing Chen involves collaborations with UBC, University of Manitoba, McGill University, Queen's University and multiple industrial partners. Dr. Ting Zou was a co-applicant on an NSERC CREATE program with Ontario Tech University. Dr. Heather Peng was a co-applicant of an NSERC CREATE application with Dalhousie University and UNB.

- Faculty members were encouraged to take sabbatical leaves away from Memorial. Examples are Profs. Bipul Hawlader (2018) and Cynthia Coles (2019).

- Professors expanded research partnerships abroad during sabbatical leaves, e.g., Dr. Yan Zhang (University of South China, Hengyang, China), Dr. Lesley James (University of New South Wales, Australia), among others.

3.1.2 Increase collaboration with industry and government agencies

- As mentioned earlier, a new MUN-NRC Karluk Space Initiative was launched including several collaborative projects, for example, a project on simulation of marine oil spills in ice-covered water by Drs. Bing Chen, Rocky Taylor, Helen Zhang, and Vandad Talimi (C-CORE). Four graduate students will be conducting oil spill research at NRC.

- NRC collaborations have grown over the past year. NRC is one of the major partners of the PEOPLE Network and CREATE Program, which involves 166 members from 15 Canadian and 13 overseas institutions and more than 50 partners worldwide.

- Professors contributed actively in professional societies, e.g., Dr. Octavia Dobre (IEEE ComSoc Board of Governors member, IEEE ComSoc Awards Committee), Dr. Cheng Li (Chair, IEEE ComSoc Ad Hoc and Sensor Networks Technical Committee, IEEE ComSoc Globecom / ICC Technical Content Committee, and General Chair of ICON'19 and WINCOM'19 conferences).

- Profs. Syed Imtiaz and Salim Ahmed are collaborating with NRC on a project entitled "Development and Performance Evaluation of Technologies for Greater Autonomy of Ships and Offshore Platforms".

Goal 3.2: Expand Partnerships that Contribute and Strengthen our Programs

3.2.1 Engage in collaborative degrees and student exchange with institutions

- Student exchange programs were continued in partnership with UArctic, CUP-B, UPC, UNIS (Svalbard, Norway), WHU, UPES, Amity and ICEN.

- Visiting students and scholars from national / international partner institutions were supported over the past year, particularly those with sponsorship programs, e.g., Vietnam (VIED), China (CSC), Iraq (Iraqi MOHE), Mexico (CONACYT), Brazil (SWB), Indonesia, Norway, Finland, Malaysia, Germany, Nigeria, Ethiopia and Ghana.

- Joint programs were developed and expanded with existing and new partners abroad. Current partnership agreements were continued with UPC, CUPB, IITM, RMU, ZJUT and UMAT. Joint programs were created for new graduate programs (MSSRE and MESE) with UPC and DMU in China.

- The Faculty hosted a workshop on Technological Stewardship in conjunction with the Engineering Change Lab (a national initiative to address systematic challenges in engineering education which are holding back the profession's full potential).

3.2.2 Expand co-op education and internship opportunities

- Many students held international student exchanges on co-op research work terms over the past year. Over 30 co-op placements were secured in India on research work terms.

- Faculty members hosted work term positions as research assistants. Students were encouraged to consider the potential of the position leading to graduate studies. Special funding support was provided for "critical path" students.

Goal 3.3: Improve Engineering and FEAS Profiles in the Community

3.3.1 Participate and increase community outreach activities

- The Memorial Engineering Outreach (MEO) Office was active over the past year with community outreach activities including workshops, camps, and school visits. Direct connections were made to thousands of potential future students.

- Actua funding was renewed for continuation of youth outreach programs. Outreach activities were held in Labrador. Three camps were help in parallel during the summer.

- In addition to the Faculty's camps, school visits, enrichment groups, and smaller tours, the Faculty also held larger Public Engagement Initiatives over the past year with the following attendance: Annual Open House (March) – 260; PEGNL Bridge Day – 175; PEGNL Family Event – 250; Science Odyssey – 250; Science Literacy Week Fair – 200; and Science Literacy Science Race – 100.

- The Faculty hosted public educational events through the Speaking of Engineering lecture series, and participated in high school fairs. It also participated in a "Science Rendezvous" for STEM youth outreach and hosted various student groups such as Girl Guides.

- A second successful Co-op Director's Award event was held at Clovelly. Next steps are underway to consider transcript notations in the academic calendar for these awards.

3.3.2 Participate in provincial curriculum development

- Initiatives were pursued to increase the awareness and visibility of engineering in the high school system. Support for CodeNL initiatives was provided by the Faculty.

- A CS/CE (Computer Science / Computer Engineering) Working Group was formed to increase computer literacy in high schools. Teacher training events were held over the past year, as well as teacher professional development. Outreach to school events connected with thousands of students.

3.3.3 Inform, direct or develop public policy

- Professors held leadership positions in national and international engineering societies, e.g., Canadian Association on Water Quality (CAWQ) – Prof. Bing Chen (VP Atlantic), Helen Zhang (Atlantic Regional Director), Associate Editor, Canadian Journal of Civil Engineering – Helen Zhang; Canadian Water Resource Journal – Bing Chen; and Canadian Geotechnical Journal – Bipul Hawlader.

- Faculty members contributed in significant ways to public policy development over the past year. Prof. Joe Daraio's research on climate change impacts on infrastructure appeared on "The National" and locally on "Here and Now". Profs. Ken Snelgrove and Joe Daraio participated on a CBC radio show regarding climate change.

- Profs. Bing Chen, Helen Zhang, and Tahir Husain, through Canada's Ocean Protection Plan, helped to shape Canadian policy and practice in marine oil spill response. The PEOPLE Network facilitated new regulations on emerging contaminants in oceans.

- Professors Husain, Chen, Bruneau, Daraio, Hossain, and Bazan have worked with NL communities, municipalities and governments (St. John's, Bay Bulls, Baie Verte, Pouch Cove, communities in Baie Verte peninsula) on infrastructure, water safety / treatment, road and highway projects.

- Faculty members engaged actively in professional societies, including Profs. Joe Daraio (PEGNL, Building Climate Resilience project, funded by NRCan), and Canadian Society for Civil Engineering (CSCE) – Profs. Bing Chen (VP International), Helen Zhang (NL Section Chair), Joe Daraio (NL Section), Leonard Lye (EC member).

3.3.4 Enhance alumni and industry connections

- Reunion 2018 was held successfully on October 12, 2018, with celebrations for the classes of 1983, 1988, 1993, 1998, 2003 and 2008. Many alumni attended and reconnected with the Faculty and former classmates.

- The 50th Engineering anniversary celebration was held on August 9, 2019, at the Signal Hill Campus, including Hilary Dawson (1st female BEng graduate) and Dr. Roberta Bondar as an invited guest speaker.

- A 50th anniversary video was created. Over 280 alumni and friends attended the 50th Anniversary. Revenues through sponsorships and registration fees exceeded costs (surplus to be redirected to a 50th anniversary monument project). Over 120 attended the 50th Anniversary Open House on the following day.

- A community outreach committee of EASAC (Engineering and Applied Science Advisory Committee), chaired by Carol Bartlett, was formed to enhance recruitment, industry connections and community involvement.

- The Faculty invited PEGNL staff members to speak to graduating classes, as well as graduate students, on the importance and process of professional licensure.

3.4 Fostering a Distinguished Workplace

Continued solid progress was achieved over the past year towards the Vision 2020 goals and action items for a distinguished workplace.

Goal 4.1: Promote Workplace Excellence

4.1.1 Recognition of excellence in the workplace

- Outstanding co-op students were honoured at the annual Co-op Director's Awards event. Amanda Whelan (Civil Class of 2019) was recognized in a close-up profile by the World Association of Cooperative Education. Memorial Engineering was the flagbearer at the 2019 WACE Conference in Cincinnati, OH.

- Best Paper Awards at international conferences were received by Profs. Octavia Dobre (IEEE International Communications Conference, Shanghai, China, and IEEE Wireless Communications and Networking Conference, Marrakesh, Morocco) and Cheng Li (International Conference on Ad Hoc Networks, Cairns, Australia).

- Profs. R. Venkatesan and Leonard Lye received the honour of Professor Emeritus at the Fall 2019 convocation.

- Prof. Ray Gosine was named a Fellow of Canadian Institute for Advanced Research (CIFAR), International Research Program.

- Prof. Glyn George was appointed as the Public Representative and Voting Member, Council of the College of Registered Nurses of Newfoundland and Labrador (CRNNL), 2018 – 2021. He also received an Honorary Membership of PEGNL.

- Distinguished achievements of faculty members and students were promoted widely through media stories.

- Several faculty members received national and international awards, e.g., Dr. Cheng Li (Technical Achievement Award, IEEE Communications Software Technical Committee, Citation: Achievements in Wireless Networking and Modelling), Dr. Octavia Dobre (Inspiring Member of the Year Award, Honorable Mention, IEEE Women in Engineering), among others.

- CFI prominently featured a Mechanical Engineering PhD student, Marjan Boroojerdi, working on Ice Mechanics research, in a video and other promotional materials across Canada, including posters at the Ottawa international airport.

4.1.2 Regularize an informal mentorship system

- Senior faculty members supported junior colleagues through mentorship, co-supervision of graduate students and participation in established research groups.

- Best practices for teaching were regularly shared and discussed at Department meetings.

- The ADGS office facilitated career development workshops and networking events for graduate students.

- A new initiative was launched to provide an inclusive welcoming environment for new faculty and staff members, by pairing up senior – junior members, faculty – students, and faculty / students – professionals.

- ERO created a new research mentorship program. The goal is to form teams of established researchers and early career researchers. This includes joint applications to large research projects and linkages of researchers with industry partners who have an established partnership with Memorial. Another aspect of the mentorship program will be guidance from senior experienced professors on how to manage large complex projects.

4.1.3 Provide opportunities for professional and personal development

- Staff members attended professional development and training sessions in the following areas: Banner HR; Excel Fund; Fixed Asset; Supply Chain Management; Public Procurement Act; MUN Purchasing; Digital and Social Media - Content Creator;; Building & Maximizing Workplace; Relationships; Charitable Giving Seminar; Art of Asking; Blackbaud System (new alumni database); and Fundraising Professionals Day.

- Conferences attended by staff members included: CAUBO; DelCon Conference; and NAGAP 2019 Conference.

Goal 4.2: Promote Diversity, Equity and Inclusion

4.2.1 Raise the percentage of female students in engineering

- The ADGS office, in collaboration of EGSS, offered Engineering-Diversity and Student Success seminars to enhance student experiences and ease new student transition.

- Female undergraduate enrollment decreased slightly overall in 2018 but increased to 28% in 2019 (Class of 2023) – see Figure 4.

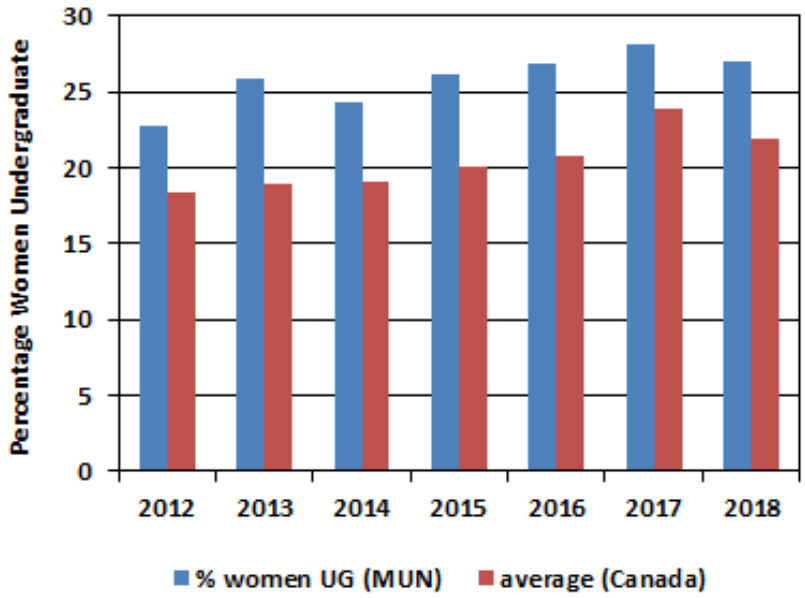

Figure 4: Percentage of female undergraduate students in engineering [2]

- The Memorial Engineering Outreach (MEO) office expanded its outreach activities to youth in under-represented groups and prospective female students (e.g., Girl Quest, Go ENG Girl, Go CODE Girl, Girl Guides).

- The Cahill Engineering One Student Success Centre hired female and international students as tutors, mentors and SI (supplemental instruction) leaders to increase the diversity of role models for students.

4.2.2 Increase the number of female faculty members

- An Action Plan to increase faculty and student diversity was endorsed at Faculty Council including four subcommittees working on the engineering image on campus; admissions and curriculum; graduate students and faculty diversity. The committees reported regularly on their activities at Faculty Council.

- Future job ads for faculty positions are now checked through the following website – http://gender-decoder.katmatfield.com/ (checks whether a job advertisement has any subtle linguistic gender-coding that has a discouraging effect).

- At a department meeting and/or startup meeting of each search committee, the Department Head / Dean facilitates a discussion on the Faculty's "30 by 30" initiative including the objective of increasing the number of female faculty members.

- HR has developed and given presentations to search committees on "Employment Equity and Diversity in Academic Hires" for gender balance in hiring, including online learning modules. An HR representative has attended and given a video and facilitated discussion at the start of each search process with the committee, and/or department meeting.

- A review of the NSERC awards database for PDF's was completed to see what contact information can be extracted about female PDF's in engineering so as to potentially contact them for available faculty position openings.

4.2.3 Support Memorial's indigenization strategy and TRC calls to action

- New fellowships were established to increase under-represented groups in graduate studies including women and Indigenous students.

- The Aboriginal student admissions practice in Engineering was continued with the reserved seats program over the past year.

- Through MEO (Memorial Engineering Outreach), a MUN Engineering outreach team traveled to Labrador to deliver STEM programs in North West River, Sheshatshiu, Postville, Rigolet and Nain. The team travelled to a new community every other week and brought supplies to run an exciting and inspiring camp program in Indigenous communities.

- Indigenous related case studies are being developed for engineering courses, including but not limited to, ENGI 3101 / 8152 (Engineering Professionalism) and ENGI 8104 (Critical Thinking about Technology, Science and Engineering).

Goal 4.3: Provide Adequate Physical Work Space for Employees and FEAS Activities

4.3.1 Provide adequate space for faculty, staff, students and researchers

- A comprehensive space plan was developed through collegial consultation with faculty and staff members for vacated spaces in the SJ Carew Building after the ECE department moves to the new CSF building next year.

- In the space plan, there is increased space to support informal student learning, design studios for project teamwork, student teams and research labs.

- Increased space on the mezzanine of the Fluids Laboratory was made available for student groups. The door that currently encompasses EN 1035D is being moved back to EN 1035C so that students on the mezzanine can access it for meetings.

- The Faculty obtained new 3rd floor space in the Bruneau Centre for Research and Innovation for Process Engineering. IIC 3011 became shared space for MOGE students while IIC 3041 is shared space for MSRE students. IIC 3003B became an active student learning area and IIC 3030 is now a meeting room.

4.3.2 Provide state-of-the-art teaching and research laboratory facilities

- The high-bay lab expansion of the SJ Carew Building was formally approved as a $24 construction project to begin in 2020. It will accommodate a large ice mechanics facility, sliding load apparatus, and icing wind tunnel as part of a CFI project, Harsh Environment Research Facility, led by Dr. Yuri Muzychka.

- IIC 1024 was renovated as a Process Engineering junior computer lab. It will be a dual-purpose room used both as a classroom and lab. The lab will have a new audio / visual system. Computers will have wide screen monitors with screen splitting. Instructor materials can be shared with students on the screen and vice versa.

- IIC 3022/25/33/34 were converted to graduate student computer labs.

Goal 4.4: Promote a Safe, Healthy and Respectful Work Environment

4.4.1 Promote a safety culture and safe environment

- Additional hazard / risk registries have been developed for teaching and research labs under the guidance of EHS.

- Workshops on issues related to safety were organized and presented. The Faculty continuously promoted safety in the workplace.

- Staff members participated in the following safety training courses:

  - Crane Training;
  - Forklift Training;
  - Strain Gauge Training;
  - First Aid / CPR;
  - Emergency Response session for all staff;

- Active Intruder Video;
- Emergency Response training for floor wardens; and
- OH&S Committee Re-certification Training.

- The Building OH&S Committee was active and met quarterly to discuss workplace safety issue.

4.4.2 Promote work / life balance, diversity and respectful work environment

- The 13th Annual Staff Retreat was held on October 15, 2019, with attendance of 45 staff members. Topics presented included: Emergency response; Active Intruder Video; Ergonomics – adding movement in your day; and Team Building Exercises.

- The Faculty held a number of social events to build camaraderie, including an annual Year in Review meeting with award presentations, and Academic Year Faculty & Staff Kick-off meeting.

- The Faculty Social Club events included birthday celebrations, Free Coffee Fridays, and at least 12 themed events throughout the year.

- The Social Club recognized milestone events of members and made monetary contributions towards collections for non-membership milestones.

4 Acknowledgements

The input and contributions to this progress report from Department Heads (Profs. Bing Chen, Cheng Li, Yuri Muzychka, Wei Qiu, Syed Imtiaz), Associate Deans (Profs. Dennis Peters, Faisal Khan, Helen Zhang), Director of Engineering Co-operative Education (Anil Raheja), and Senior Administrative Officer (Barb Elliott) are gratefully acknowledged.

5 References

1) Vision 2020, Strategic Plan of the Faculty of Engineering and Applied Science, Memorial University, St. John's NL, July 3, 2013.
2) Resources Survey of Engineers Canada, National Council of Deans of Engineering and Applied Science, 2018.
3) Fact Books, Centre for Institutional Analysis and Planning, Memorial University, St. John's NL, 2009 – 2019.