

ANNUAL REPORT

Department of
Electrical and Computer Engineering

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Submitted by:

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Chair

The Department of Electrical and Computer Engineering consists of 42 full time professors and 1 professor shared 50% with another Faculty (as of December 2017; two professors retired in 2017), 19 professional staff members, 1176 undergraduate students, 325 graduate students and 34 post-doctoral fellows. At present, it offers four distinct CEAB-accredited undergraduate degree programs, a PhD and a Masters program. The Department currently hosts the headquarters of the NSERC funded Strategic Research Network called Healthcare Support through Information Technology Enhancements (hSITE) and the FRQNT-funded STARaCom (Systèmes, technologies et applications en radiofréquence et communications). A provincially funded center for telecommunications research, STARaCom replaces SYTACOM and is comprised of 52 professors from eight universities under the direction of Professor David Plant. The Intelligent Systems group is part of the Center for Intelligent Machines – an interdisciplinary centre involving researchers from the Department as well Mechanical Engineering and Computer Science.

RESEARCH AND PUBLICATIONS

In 2017, ECE members published a combined total of 365 refereed journal and conference papers along with 96 additional publications, for an impressive average production of 8.7 refereed papers per tenured or tenure track professor per year¹. It must be noted that, in several sub-disciplines of Electrical and Computer Engineering, conference publications are a privileged means of fast dissemination, and are sometimes as well-regarded as journal publications.

Most of those publications are done in collaboration with supervised graduate students, and professors in ECE maintain a level of funding that allows them to provide adequate support to a research team that is large by any standards (on average, each tenured or tenure track professor supervises 7.7 graduate students).

Research
productivity: 8.7
refereed papers per
professor in 2017

ECE professors continue to obtain impressive levels of competitive research funding. In 2017 a total of \$9.1 M of new operating and infrastructure funding was awarded. On average each ECE professor brought in around \$216,000 in new operating funding and \$35,900 in new infrastructure funding. These amounts have been consistent over the past few years; an indication of the quality of the research in this increasingly-competitive funding climate.

Table 1 gives a more detailed breakdown of sources and types of funding, all amounts pertaining to calendar year 2017 installments. Note that all industrial contracts fall under the “Other Sources” category, and that the “Internal funds” category comprises mainly start-up grants and James McGill Professor/William Dawson Scholar research awards.

¹ For a full list of publications, please go to <http://www.mcgill.ca/ece/department/publications>

Table 1: Breakdown of new research funding for 2017, by type and source.

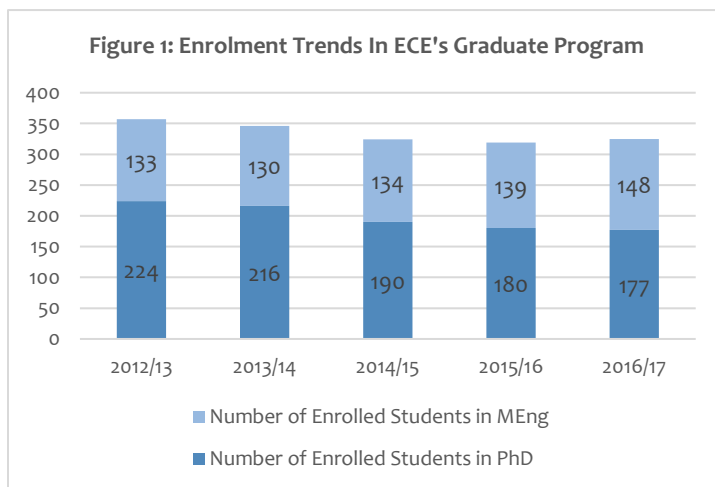
| Source | Operating Grants | Infrastructure | Grand Total ² |
|--------------------|--------------------|--------------------|--------------------------|
| NSERC | \$5,237,386 | \$264,834 | \$5,502,219 |
| FRQNT | \$813,872 | \$39,250 | \$853,122 |
| CFI | \$2,975 | \$1,150,434 | \$1,153,409 |
| CRC | \$158,333 | 0 | \$158,333 |
| Internal funds | \$243,377 | 0 | \$243,377 |
| Other Sources | \$1,580,887 | \$56,106 | \$1,636,993 |
| Grand Total | \$8,036,830 | \$1,510,624 | \$9,547,454 |

Over \$1.2M of the research funding came via new contracts with a wide range of domestic and international companies. Many other industry collaborations are supported through leveraged funding from NSERC. This includes three NSERC Industrial Research Chairs and a Hydro Québec Nano scholar, co-sponsored by partners Bell Canada and Hydro-Québec.

TEACHING AND LEARNING

GRADUATE PROGRAMS

ECE has very strong graduate programs. At the graduate level, two Master’s degree options, in addition to a Ph.D. program, are offered.



ECE’s graduate student population is made up of 325 individuals, of whom 177 are enrolled in the department’s PhD program. The chart below shows graduate enrolment trends over the last 5 years. According to available data, ECE operates one of the largest PhD programs in the university and has the highest PhD/faculty ratio of any comparable

department in Canada.

The department faculty is highly research intensive, with an average of 4.2 PhD students per full time tenured or tenure track faculty member. Last year, 36 students graduated with their PhD, while 41

Research intensity:
4.2 PhD students per professor

² Funding data is derived from annual reports submitted by academic staff in the department.

MEng students (out of which 12 were in the non-thesis option) also graduated from ECE graduate programs.

During the past academic year the department invested significant effort in planning and proposing a new course-based version of the Masters in Electrical Engineering program. This is intended to retain the M.Eng. designation while the thesis-option Master's program will be designated as an MSc. At time of writing the program proposals have been accepted by the university and we are now waiting for governmental approval.

UNDERGRADUATE PROGRAMS

ECE offers four distinct programs at the undergraduate level, all accredited by the Canadian Engineering Accreditation Board (CEAB), namely the B.Eng. in Electrical Engineering, the B.Eng. in Computer Engineering, the B.S.E. in Software Engineering and the B.Eng. in Honours Electrical Engineering. With a total of 1176 enrolled students, all four programs are successful and continue to be attractive to a large population. There is a very steady and significant increase in admissions to ECE programs. New admissions continue

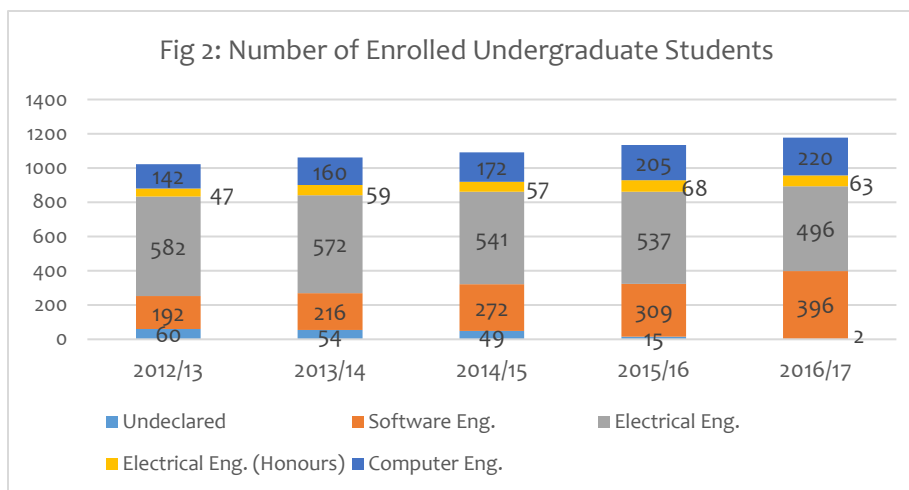


Figure 1: Undergraduate enrolment trends within the department's 4 programs. "Undeclared" students are those who have not picked their final program yet.

to grow, with a result that since 2010/2011 (at 920 students) there is a 27.8% increase in total enrollment. In 2017, a cohort of 179 students graduated from ECE undergraduate programs.

This year the department proposed that the Software Engineering program should be transformed into a Co-op Program. This has also been approved by the university and is also awaiting government approval, for debut in 2019 is well underway; final approval is anticipated before long. The demand by companies for interns in this field is strong, and consultation with our students has confirmed that this would be a welcome and popular program

37% of new enrollment is from CEGEP admissions

For several years the department has sought to increase enrollment in students from local CEGEPs and in 2013 it engaged in a major effort to encourage qualified CEGEP applicants to accept our offer of admission. This action has resulted in a significant percentage of CEGEP admissions again this year. The department recognizes that it must still undertake further effort to increase the

percentage of female undergraduate students (who currently represent 22.2% of the total undergraduate body). While this percentage has increased by approximately 6.6% over the last five years, more must be done and the department is continuously working on improving recruitment strategies for female students.

INVOLVEMENT IN THE COMMUNITY

ECE faculty members remain strongly involved in the scientific community, where many of them have developed a strong international visibility and reputation. In 2017, ECE members participated in more than one hundred conference organizing committees, editorial boards and other groups in their professional field, and played a leadership role in more than 30 of those. Of particular note: Professor Tal Arbel is Co-Chair of the NSERC Evaluation Group for Discovery Grant applications in Computer Science; Professor Francois Bouffard is Technical Program Committee Chair for the IEEE Power and Energy Society; Professor Warren Gross served as General Co-Chair for four different IEEE conferences in 2017 and Publications Chair for a fifth; Professor Fabrice Labeau will be General Chair of the IEEE Electric Power and Energy Conference in 2019 and also the IEEE International Conference on Image Processing in 2021; Professor David Plant is Vice-President (Technical Affairs) of the IEEE Photonics Society; Professor Michael Rabbat is the Co-organizer and Co-Chair of the IEEE Global SIP symposium on Graph Signal Processing.

It must be pointed out that ECE administrative and support staff are also heavily involved in the University community, through participation in change management committees and project steering committees.

The connections that ECE establishes with the community are on several fronts: well-established collaborations with the Department of Physics or the School of Computer Science at McGill (through e.g., the McGill Institute for Advanced Materials – MIAM – and the Center for intelligent Machines – CIM); individual research collaborations with the Quebec and Canadian community, through active participation in Quebec *Regroupements Stratégiques* CREER, ResMiQ, RQMP (including representation on their boards) and hosting of *Regroupement Stratégique* SYTACom; and funded international research projects.

Involvement in more than 100 conference and / or organizing committees.

MILESTONES

Six Associate Professors were promoted to Professor in 2017. These were Professors Arbel, Coates, Cooperstock, Labeau, Rochette and Zilic. In addition Prof. Brett Meyer was promoted from Assistant to Associate Professor. Three new Associate Chairs were named; these were Professor Gross (Academic Affairs), Bouffard (Undergraduate Programs) and Liboiron-Ladouceur (Graduate Programs). Prof. Lawrence Chen was appointed to serve as

the first Academic Lead of the eLATE (enhancing learning and teaching in Engineering) initiative. Prof. Chen will work in collaboration with academic staff and the Pedagogical Coordinator towards meeting the initiative's objectives, bringing the perspective of a faculty member. Two professors retired last year (Professor Jon Webb and Professor Martin Levine) and we also noted with great sadness the passing of Professors Emeritus Eric Adler (on November 6th 2017) and Clifford Champness (March 12th 2018). Both had played a very significant role in the development of the department and will be greatly missed.

HONOURS, AWARDS, PRIZES AND RECOGNITION

We only list here a few rolled up numbers and highlights of the numerous awards and recognitions garnered by ECE members in 2017.

Professor David Plant received the 2017 IEEE Photonics Society Engineering Achievement Award, given to recognize an exceptional engineering contribution, which has had a significant impact on the development of laser or electro-optic technology or the commercial application of technology within the past 10 years.

Professor Geza Joos was renewed as a CRC Chair, Tier 1 for 7 years.

Professor Derek Nowrouzezahrai was named as the NSERC/Ubisoft Industrial Research Chair in Believable Virtual Character Experiences.

Jonathan Bouchard, McGill PhD student and his supervisor Professor James Clark were awarded a best paper prize at the IC3D 2017 Conference in December 2017 for a paper entitled "Half-Occluded Regions: The Key to Detecting a Diverse Array of Defects in S3D Imagery" and received the Lumiere Prize at the Conference Gala.

In June 2017, local start-up company Ora Sound launched the world's first graphene-based headphones. This is based on intellectual property in graphene developed by Professor Thomas Szkopek and his graduate students at McGill.

ECE SCHOLARLY WORKS FOR THE PERIOD JANUARY 1ST, 2017 TO DECEMBER 31ST, 2017

(URL of publications: <http://www.mcgill.ca/ece/department/publications>)