

# 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 41 full time professors and 1 professor shared 50% with another Faculty (as of December 2015), 19 professional staff members, 1091 undergraduate students, 324 graduate students and 37 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 of FRQNT-funded SYTACom (a provincially funded center for telecommunications research). 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 2015, ECE members published a combined total of 209 refereed journal papers and 230 refereed conference papers, for an impressive average production of 10.7 papers per tenured or tenure track professor per year<sup>1</sup>. 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 funding to a research team that is large by any standards (on average, each tenured or tenure track professor supervises 7.9 graduate students).

Research  
productivity: 10.7  
papers per  
professor in 2015

ECE professors continue to obtain impressive levels of competitive research funding. In 2015 a total of \$9.9 M of new operating and infrastructure funding was awarded. On average each ECE professor brought in around \$213,000 in new operating funding and \$30,000 in new infrastructure funding. While the infrastructure funding is lower than last year, the operating funding continues to grow; with an average increase of 6.5% per professor.

The table below gives a more detailed breakdown of sources and types of funding, all amounts pertaining to calendar year 2015 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.

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

Table 1: Breakdown of new research funding for 2013, by type and source.

Source	Operating Grants	Infrastructure	Grand Total <sup>2</sup>
NSERC	\$6,170,962	\$96,553	\$6,267,515.00
FRQNT	\$439,232	\$11,013	\$450,245.00
CFI	\$2,998	\$1,055,745	\$1,058,743.00
CRC	\$155,000	0	\$155,000.00
Internal funds	\$165,381	0	\$165,381.00
Other Sources	\$1,821,301	\$68,241	\$1,889,542.00
Grand Total	\$8,754,493.00	\$1,231,552.00	\$9,986,426.00

The new research funding also included almost \$600,000 in new contracts with a wide range of domestic and international companies. Many other industry collaborations are supported through leveraged funding from NSERC. This includes 4 currently active NSERC Industrial Research Chairs, 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 324 individuals, of which 190 are enrolled in the department's PhD program. The growth of the PhD program over the last few years is illustrated in the chart below, describing graduate enrolment trends over the last 5 years. According to available data, ECE operates the largest PhD program in the university.

The department faculty is highly research intensive, with an average of 4.6 PhD students per full time tenured or tenure track faculty member. Last year 44 students graduated with their Ph.D., an increase of almost 42% over the last two years. In 2015, 37 MEng (out of which 7 in the non-thesis option) and 44 Ph.D. students graduated from ECE graduate programs.

Research intensity: 4.6  
PhD students per  
professor

An MEng non-thesis telecommunications concentration was piloted in 2013 in collaboration with industry partners; students in this concentration are able to take advantage of specifically-designed industry internships, which constitutes a portion of their Masters research experience. For the 2015-2016 academic year, there were 15 students registered in this concentration.

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



Figure 1: Enrolment trends in ECE's graduate program (Master's thesis and non-thesis options are lumped under "MEng").

## 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 1091 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 grew from remained steady this year for the first time in three years, with a result that since 2010 there is a 22.5% increase in total enrollment. In 2015, a cohort of 202 students graduated from ECE undergraduate programs.

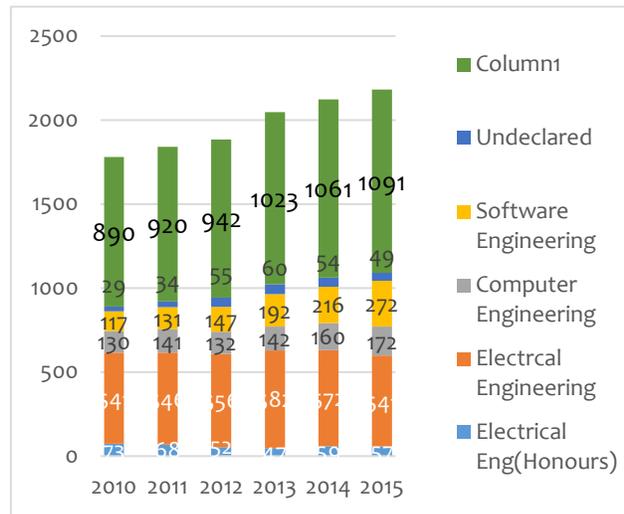


Figure 2: Undergraduate enrolment trends within the department's 4 programs. "Undeclared" students are those who have not picked their final program yet.

A major review of the undergraduate curriculum was started in 2012, with a formal set of revisions adopted in 2015 for introduction with the 2016 cohort.

34% 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 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 17.5% of the total undergraduate body). While this percentage has increased by approximately 2% over the last two years, more must be done and the department is developing an

improved recruitment strategy for female students. It is also heartening to note that the fraction of female students in our U0 and U1 cohort has increased by 35% over the last four years.

## 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 2015, ECE members participated in the technical program or organizing committees of more than 80 international conferences, including occupying major leadership roles in over 15 of these. ECE professors are active in more than 37 committees of scholarly societies, advisory boards and standards bodies and Chair 7 of these. They collectively occupy 10 positions on editorial boards of international scholarly journals. Of particular note: Professor Fabrice Labeau is President of the IEEE Vehicular Technology Society and Professor David Plant is Vice-President (Conferences) of the IEEE Photonics Society. ECE McGill professors Chair the local Montreal chapters of the IEEE Vehicular Technology Society, the IEEE Signal Processing Society and the IEEE Photonics Society.

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 with India, China, France, Sweden, Brazil and USA.

Involvement in more than  
70 conference  
committees and 10  
organizing committees

## MILESTONES

In August 2015 the department welcomed Professor Shane McIntosh as its newest member, filling an important role in the rapidly expanding Software Engineering program. Unfortunately, in 2015 two professors (Vamsy Chodavarapu and Richard Rose) left to continue their careers in the US. We also noted with great sadness the passing of Professor Emeritus Gerald Farnell at the Verdun General Hospital on April 30, 2015. While at McGill he served as Professor of Engineering Physics and Electrical Engineering, including terms as Chairman of the Electrical Engineering Department (from 1967 until 1972) and Dean of the Engineering Faculty (from 1974 until 1984).

## HONOURS, AWARDS AND PRIZES

We only list here a few rolled up numbers and highlights of the numerous awards garnered by ECE members in 2015.

Professor Aditya Mahajan was awarded the 2015 George Axelby Outstanding Paper Award from the IEEE Control Systems Society for the paper he co-authored entitled "Decentralized Stochastic Control with Partial History Sharing: A Common Information Approach". This award is seen as the highest recognition in the control systems field for young researchers.

Prof. Zetian Mi, received the International Symposium for Compound Semiconductors (ISCS) Young Scientist Award. Prof. Mi was given this award for his contributions to the development of quantum dot and nanowire based near-infrared, deep visible, and ultraviolet light sources.

Professor Thomas Szkopek investigations about the nature of black phosphorous were recognized by Quebec Science magazine as one of the top-ten science discoveries in Quebec in 2015.

Prof. François Bouffard was awarded a Technical Committee Distinguished Individual Service Award in recognition of his excellence in technical leadership and management in the area of power system economics and market operation.

Prof. Jeremy Cooperstock was selected as the first Gerald W. Farnell Teaching Scholar in the Faculty of Engineering for the 2015-2016 academic year.

Prof. Thomas Szkopek was awarded the Carrie M. Derick Award for Excellence in Graduate Teaching and Supervision.

ECE students also found a great deal of success. ECE undergraduate student Stéphanie Gerbeau was among seven students from across North America to be awarded the prestigious John W. Estey Outstanding IEEE Power and Energy Society Scholar awards. Dr. Md Golam Kibria, was recently recognized by the German Federal Ministry of Education and Research as one of the 26 Outstanding Young Scientists in the 2015 Green Talents Competition and ECE PhD graduate Dr. Zahra Karim-Aghaloo won the 2015 Doctoral Dissertation Award sponsored by the Canadian Image Processing and Pattern Recognition Society (CIPPRS)

**ECE SCHOLARLY WORKS FOR THE PERIOD JANUARY 1<sup>ST</sup>, 2015 TO DECEMBER 31<sup>ST</sup>, 2015**

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