

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 43 full time professors (as of December 2013), 15 professional staff members, 1026 undergraduate students, 358 graduate students and 20 post-doctoral fellows. At present, it offers four distinct CEAB-accredited undergraduate degree programs, a PhD and a Master's 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 2013, ECE members published a combined total of 183 refereed journal papers (up almost 24% from last year) and 270 refereed conference papers, for an impressive average production of 10.5 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 funding to a research team that is large by any standards (on average, each tenured or tenure track professor supervises 8.3 graduate students).

Research
productivity: 10.5
papers per
professor in 2013

ECE professors continue to obtain impressive levels of competitive research funding. In 2013 a total of \$11.3M of new operating and infrastructure funding was awarded (a level very similar to the \$11.6M of new funding reported for the previous year). It is particularly noteworthy that funding from the provincial FRQNT agency increased by more than 60% (arising from many successful FQNRT team grant applications). On average each ECE professor brought in around \$200,000 in new operating funding and \$65,000 in infrastructure funding.

The table below gives a more detailed breakdown of sources and types of funding, all amounts pertaining to calendar year 2013 installments. Note that all industrial contracts fall under the “Other Sources” category, and that the “Internal funds”

¹ A full list of publications is available at : <http://www.mcgill.ca/ece/about/publications>

category comprises start-up grants and James McGill Professor/William Dawson Scholar research awards.

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

Source	Operating Grants	Infrastructure	Grand Total ²
NSERC	\$2,587,362	\$615,408	\$3,202,770
FRQNT	\$1,227,619		\$1,227,619
CFI	\$261,000	\$4,738,696	\$4,999,696
CRC	\$175,000		\$175,000
Internal funds	\$70,532	\$4,950	\$75,482
Other Sources	\$1,533,586	\$78,953	\$1,612,539
Grand Total	\$5,855,099	\$83,900	\$11,293,106

The new research funding also included more than \$1M 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.

Industry connection:
\$1 M in new industrial contracts in 2013

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 358 individuals, of which 224 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.

The department faculty is highly research intensive, with an average of 5.2 PhD students per full time tenured or tenure track faculty member (this is number significantly higher than any of our Canadian competitors based on available data). The

Research intensity: 5.2 PhD students per professor

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

graduate student population is very much international, with roughly 53% coming to McGill on a student visa. In 2013, 41 MEng (out of which 4 in the non-thesis option) and 34 PhD students graduated from ECE graduate programs.

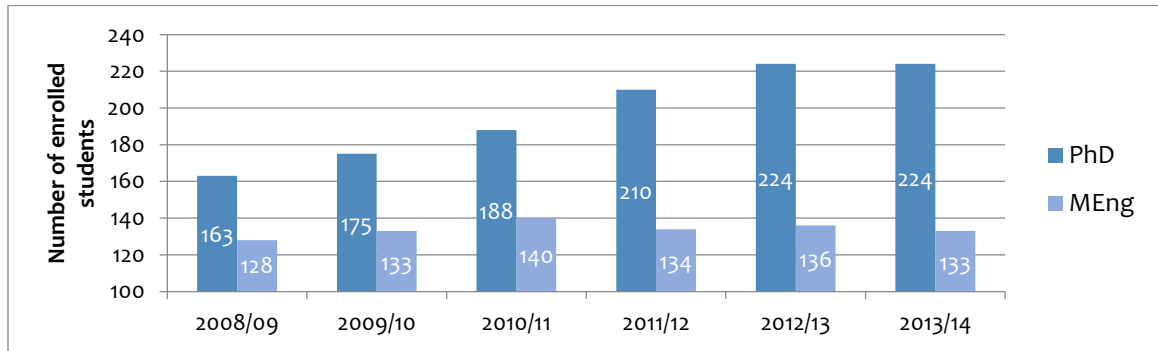


Figure 1: Enrolment trends in ECE's graduate program (Master's thesis and non-thesis options are lumped under "MEng").

An MEng non-thesis telecommunications concentration is currently being piloted 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. The first series of such internships will take place in the summer of 2014.

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 1023 enrolled students, all four programs are successful and continue to be attractive to a large population. There was a very significant increase in admissions to ECE programs. New admissions grew from 217 in 2012/13 to 290 this year, a growth of 33%, resulting in a 10% increase in total enrollment. In 2013, a cohort of 157 students graduated from ECE undergraduate programs.

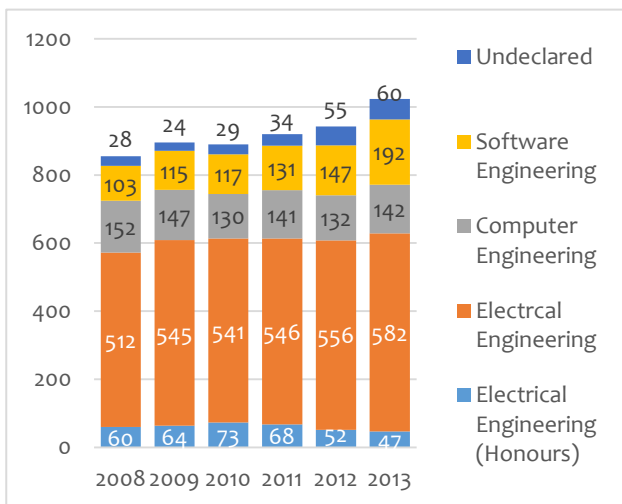


Figure 2: Undergraduate enrolment trends within the department's 4 programs. "Undeclared" students are those who have not picked their final program yet.

A major review of the undergraduate curriculum was started in 2012, with a formal set of revisions being developed in 2013 for adoption in 2014.

33% increase in new enrollment, with significant growth in 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 increase in Cegep admissions this year. The department recognizes that it must still undertake further effort to increase the percentage of female undergraduate students (who currently represent 15% of the total undergraduate body) and is developing an improved recruitment strategy for female students.

INVOLVEMENT IN THE COMMUNITY

ECE faculty members remain strongly involved in the scientific community, where a lot of them have developed a strong international visibility and reputation. In 2013, ECE members have participated in the Technical Program Committees of more than 70 international conferences, and in the organizing committee of 13 international conferences. ECE professors are active in more than 37 committees of scholarly societies or advisory boards. They collectively occupy 12 positions on editorial boards of international scholarly journals.

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 July 2013 Professor Andrew Kirk returned to the department as Chair, having interrupted his term to serve as Interim Dean of the Faculty of Engineering in October 2011. During that time Professor Fabrice Labeau served very ably as Acting Chair of the department.

In August 2013, the department welcomed Dr Gunter Mussbacher as an Assistant Professor. Professor Mussbacher joined us from the University of Ottawa where he was undertaking postdoctoral research. He also completed his PhD thesis in computer science at the University of Ottawa, where he developed the Aspect-oriented User Requirements Notation (AoURN), a framework that enables goal-oriented, scenario-based, and aspect-oriented modeling in a unified way. Professor Mussbacher brings much needed strength to our rapidly growing Software Engineering program.

December 2013 saw the retirement, after many years' service at McGill, of our Administrative Assistant Debbie Davies. The department is very grateful to Debbie for all of her efforts on our behalf. We were then pleased to welcome Carolyn Curiale as our new Administrative Assistant.

HONOURS, AWARDS AND PRIZES

We only list here a few rolled up numbers and highlights of the numerous awards garnered by ECE members in 2013.

Professor David Plant was awarded a Killam Research Fellowship, one of just six nationally and only the third professor from the Faculty of Engineering at McGill to receive this award since they were inaugurated in 1968.

Professor Benoit Boulet and PhD student Ahmad Haidar received the William and Rhea Seath Award in Engineering Innovation from the Faculty of Engineering for his research on an external artificial pancreas.

Professors Peter Caines and Tho Le-Ngoc were recipients of the Queen Elizabeth the 2nd Jubilee Medal for services to Canada.

Professor Michael Rabbat received the Principal's Prize for Excellence in Teaching at the level of Assistant Professor

ECE researchers attracted in 2013 6 best paper awards at international conferences as well as one best journal paper award.

6 best paper awards in 2013

(URL of publications :

<http://www.mcgill.ca/ece/department/publications/w.mcgill.ca/ece/department/publications/>)

HIGHLIGHTED PUBLICATIONS:

COOPERSTOCK, JEREMY R.:

Cirio, G*.; Marchal, M.; Lécuyer, A.; and Cooperstock, “Vibrotactile Rendering of Splashing Fluids,” J. R. Transactions on Haptics, 6(1):117-122. 2013. (Selected as a "best paper" from the journal for 2013 for presentation at a special session of the IEEE Haptics Symposium.)

CHAMPAGNE, BENOIT:

S. Yousefi (Ph.D.), B. Champagne and X.-W. Chang, “An improved extended Kalman filter for localization of a mobile node with NLOS anchors,” in Proc. 9th Int. Conf. on Wireless and Mobile Communications, Nice, France, July 2013, pp. 25-30. (Best Paper Award)

GIANNACOPOULOS, DENNIS:

A. Akbarzadeh-Sharbat* and D. Giannacopoulos. (2013). Convolution-free modeling of dispersive media in the time- domain finite-element solution of the vector wave equation. Proceedings of the 19th Conference on the Computation of Electromagnetic Fields, 2 pages, Budapest, Hungary, June 30-July 4, 2013. Best Student Paper Award (1st place out of 540 papers).

MEYER, BRETT:

Mojing Liu, Jonah Caplan, Georgi Z. Kostadinov, Brett H. Meyer, “Workload Effects on Execution Fingerprinting for Low-cost Safety-Critical Systems, ” Semiconductor Research Corporation TECHCON 2013, September 2013. (best paper in session)

ZENG, HAIBO:

Haibo Zeng and Marco Di Natale. Using Max-Plus Algebra to Improve the Analysis of Non-Cyclic Task Models. In Proceedings of the 25th Euromicro Conference on Real-Time Systems (ECRTS), Paris, France, July 9-12, 2013. (Best Papers Award)

ZILIC, ZELJKO:

J. Tong, M. Boule and Z. Zilic, “Mu-GSIM: A Mutation Testing Simulator on GPUs”, Proceedings of Asia Symposium on Quality Electronic Design (ASQED), pp. 302-311, Aug. 2013. Best Paper Award.