71.30 DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

Faculty

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STANLEY J. KUBINA, PhD *McG.*

Professors Emeriti
J. CHARLES GIGUÈRE, PhD *N.S.T.C.*
EUGENE I. PLOTKIN, PhD *Leningrad*
OTTO SCHWELB, PhD *McG.*

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AMIR G. AGHDAM, PhD *Tor.* , PEng
OTMANE AIT MOHAMED, PhD *H.P.N.*, Ing
AISHY AMER, PhD *Québ.*, Ing
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NAWWAF N. KHARMA, PhD *Lond.*, PEng
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RABIN RAUT, PhD *C'dia.*, Ing
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ABDELWAHAB HAMOU-LHADJ, PhD *Ott.*
SHAH JAHINUZZAMAN, PhD *Wat.*
M. ZAHANGIR KABIR, PhD *Sask.*, EIT
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ZHENGUO LU, PhD *Zhongshan*
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SIAMAK TAFAZOLI, PhD *C'dia.*
OLIVIER TOUSIGNANT, PhD *Montr.*

For the complete list of faculty members, please consult the Department website.

Location

Sir George Williams Campus
Engineering, Computer Science and Visual Arts Complex, Room: EV 005.139
514-848-2424 ext. 3100

Department Objectives

Electrical Engineering is concerned primarily with energy and information, their conversion and transmission in the most efficient and reliable manner. This vast field of endeavour includes many specialties and Electrical Engineers may be involved in one or more of these throughout their careers. A partial list includes: electronics, integrated circuit design, very large scale integrated (VLSI) circuit design, layout and testing, controls, robotics, system simulation, telecommunications, signal processing, computer hardware design, software design, power devices, power and control systems, electromechanical systems, microelectromechanical devices, electromagnetics, antennas, wave guides, lasers, and optoelectronics.

Computer Engineering is the driving force of the information revolution and its transformation of society. Over the course of their careers, computer engineers will be called upon to meet a number of challenges, most of which cannot be imagined today. A partial list of current specialties includes: computer architecture, digital electronics, digital circuits, very large scale integrated (VLSI) circuit design, layout and testing, digital circuit testing and reliability, software design, software engineering, digital communication and computer networks.

The four-year programs consist of the Engineering Core, taken by all engineering students, program cores and electives. The Electrical Engineering Core provides a solid introduction to all aspects of the discipline, to programming methodology and to the design of large software systems. Technical electives are scheduled to enable students to register for sets of related technical courses. Current sets of electives include: Communications and Signal Processing, Computer Systems, Electronics and VLSI, Power and Control Systems, and Waves and Electromagnetics. The Computer Engineering Core provides a thorough grounding in all aspects of computer hardware and software. Technical electives allow students to acquire further knowledge in various aspects of hardware or software. A mandatory final-year design project gives students in both programs the opportunity to apply the knowledge they have acquired to the design and testing of a working prototype.

Six Quebec universities have joined together with Hydro-Québec to create the Institute for Electrical Power Engineering whose primary mission is to meet the anticipated shortfall in this area. Students accepted by the Institute are expected to complete six courses offered by participating universities. Some of these courses are offered in English and others in French. Students register for courses at their home universities.

71.30.1 Course Requirements (BEng in Electrical Engineering)

The program in Electrical Engineering consists of the Engineering Core, the Electrical Engineering Core, and one of two options as set out below. The normal length of the program is 120 credits.

Engineering Core (30.5 credits)
See §71.20.5.

Electrical Engineering Core		*Credits*
COEN 231	Introduction to Discrete Mathematics	3.00
COEN 243	Programming Methodology I	3.00
COEN 244	Programming Methodology II	3.00
COEN 311	Computer Organization and Software	3.50
COEN 312	Digital Systems Design I	3.50
ELEC 251	Fundamentals of Applied Electromagnetics	3.00
ELEC 264	Signals and Systems I	3.00
ELEC 311	Electronics I	4.00
ELEC 321	Introduction to Semiconductor Materials and Devices	3.50
ELEC 331	Fundamentals of Electrical Power Engineering	3.50
ELEC 351	Electromagnetic Waves and Guiding Structures	3.00
ELEC 363	Fundamentals of Telecommunications Systems	3.50
ELEC 364	Signals and Systems II	3.00
ELEC 365	Complex Variables and Partial Differential Equations	3.00
ELEC 370	Modelling and Analysis of Physical Systems	3.50
ELEC 372	Fundamentals of Control Systems	3.50
ELEC 390	Electrical Engineering Team Design Project	3.00
ELEC 490	Capstone Electrical Engineering Design Project	4.00
		59.50

Telecommunications Option		*Credits*
ELEC 462	Digital Communications	3.50
ELEC 463	Telecommunication Networks	3.00
	Minimum number of elective credits chosen from list below	23.50
		30.00

COEN 320	Introduction to Real-Time Systems	3.00
COEN 346	Operating Systems	4.00
COEN 352	Data Structures and Algorithms	3.00
ELEC 425	Optical Devices for High-Speed Communications	3.50
ELEC 442	Digital Signal Processing	3.50
ELEC 453	Microwave Engineering	3.50
ELEC 456	Antennas	3.50

ELEC 457	Design of Wireless RF Systems	3.00
ELEC 464	Wireless Communications	3.00
ELEC 465	Networks Security and Management	3.50
ELEC 466	Introduction to Optical Communication Systems	3.50
ELEC 472	Advanced Telecommunication Networks	3.50
ELEC 498	Topics in Electrical Engineering	3.00
ENGR 411	Special Technical Report	1.00

Electronics/Systems Option* *Credits*

COEN 315	Digital Electronics	3.50
ELEC 312	Electronics II	4.00
ELEC 442	Digital Signal Processing	3.50
	Minimum number of elective credits chosen from lists below	19.00
		30.00

*Note: Students accepted by the Institute for Electrical Power Engineering are expected to complete five courses as required by the Institute, and offered by participating universities, from among: ELEC 430, 431, 432, 433, 434, 435, 436, 438. Some of these courses are offered in French. Students register for courses at their home universities. Students accepted by the Institute must complete a minimum of 120 credits in total.

Electronics/Systems Electives
Courses are listed in groups to facilitate course selection.

		Credits
ELEC 498	Topics in Electrical Engineering	3.00
ENGR 411	Special Technical Report	1.00

A. Communications and Signal Processing *Credits*

ELEC 441	Modern Analog Filter Design	3.50
ELEC 462	Digital Communications	3.50
ELEC 463	Telecommunication Networks	3.00
ELEC 464	Wireless Communications	3.00
ELEC 465	Networks Security and Management	3.50
ELEC 472	Advanced Telecommunication Networks	3.50

B. Computer Systems *Credits*

COEN 313	Digital Systems Design II	3.50
COEN 316	Computer Architecture and Design	3.00
COEN 317	Microprocessor Systems	4.00
COEN 320	Introduction to Real-Time Systems	3.00
COEN 345	Software Testing and Validation	4.00
COEN 346	Operating Systems	4.00
COEN 352	Data Structures and Algorithms	3.00
COEN 421	Embedded Systems and Software Design	4.00
COEN 432	Applied Genetic and Evolutionary Systems	3.00
SOEN 341	Software Process	3.00
SOEN 342	Software Requirements and Specifications	3.00
SOEN 343	Software Architecture and Design I	3.00

C. Electronics/VLSI *Credits*

COEN 451	VLSI Circuit Design	4.00
ELEC 421	Solid State Devices	3.50
ELEC 422	Design of Integrated Circuit Components	3.50
ELEC 423	Introduction to Analog VLSI	4.00
ELEC 424	VLSI Process Technology	3.50
ELEC 425	Optical Devices for High-Speed Communications	3.50

D. Power and Control Systems *Credits*

ELEC 430	Electrical Power Equipment*	3.50
ELEC 431	Electrical Power Systems	3.50
ELEC 432	Control of Electrical Power Conversion Systems*	3.50

ELEC 433	Power Electronics	3.50
ELEC 434	Behaviour of Power Systems*	3.50
ELEC 435	Electromechanical Energy Conversion Systems	3.50
ELEC 436	Protection of Power Systems*	3.50
ELEC 438	Industrial Electrical Systems*	3.50
ELEC 439	Hybrid Electric Vehicle Power System Design and Control	3.00
ELEC 481	Linear Systems	3.50
ELEC 482	System Optimization	3.50
ELEC 483	Real-Time Computer Control Systems	3.50
ENGR 245	Mechanical Analysis	3.00
ENGR 472	Robot Manipulators	3.50

*Note: ELEC 430, 432, 434, 436, and 438 are usually offered in the French language.

E. Waves and Electromagnetics *Credits*

ELEC 451	Computer-Aided Modelling and Design of Circuits	4.00
ELEC 453	Microwave Engineering	3.50
ELEC 455	Acoustics	3.00
ELEC 456	Antennas	3.50
ELEC 457	Design of Wireless RF Systems	3.00
ELEC 458	Techniques in Electromagnetic Compatibility	3.00

71.30.2 Course Requirements (BEng in Computer Engineering)

The program in Computer Engineering consists of the Engineering Core, the Computer Engineering Core, and one of the two options as set out below. The normal length of the program is 120 credits.

Engineering Core: (30.5 credits)
See §71.20.5.

Computer Engineering Core *Credits*

COEN 231	Introduction to Discrete Mathematics	3.00
COEN 243	Programming Methodology I	3.00
COEN 244	Programming Methodology II	3.00
COEN 311	Computer Organization and Software	3.50
COEN 312	Digital Systems Design I	3.50
COEN 317	Microprocessor Systems	4.00
COEN 346	Operating Systems	4.00
COEN 352	Data Structures and Algorithms	3.00
COEN 390	Computer Engineering Team Design Project	3.00
COEN 490	Capstone Computer Engineering Design Project	4.00
ELEC 264	Signals and Systems I	3.00
ELEC 311	Electronics I	4.00
ELEC 321	Introduction to Semiconductor Materials and Devices	3.50
ELEC 353	Transmission Line Circuits and Electromagnetic Waves	3.00
ELEC 364	Signals and Systems II	3.00
ELEC 370	Modelling and Analysis of Physical Systems	3.50
ELEC 372	Fundamentals of Control Systems	3.50
		57.50

System Hardware Option *Credits*

COEN 313	Digital Systems Design II	3.50
COEN 315	Digital Electronics	3.50
COEN 316	Computer Architecture and Design	3.00
COEN 451	VLSI Circuit Design	4.00
	Electives chosen from the list below	18.00
		32.00

System Hardware Electives *Credits*

COEN 320	Introduction to Real-Time Systems	3.00
COEN 345	Software Testing and Validation	4.00
COEN 421	Embedded Systems and Software Design	4.00
COEN 432	Applied Genetic and Evolutionary Systems	3.00

COEN 445	Communication Networks and Protocols	4.00
COEN 498	Topics in Computer Engineering	3.00
COMP 371	Computer Graphics	4.00
COMP 426	Multicore Programming	4.00
ELEC 312	Electronics II	4.00
ELEC 363	Fundamentals of Telecommunication Systems	3.50
ELEC 423	Introduction to Analog VLSI	4.00
ELEC 442	Digital Signal Processing	3.50
ELEC 451	Computer-Aided Modelling and Design of Circuits	4.00
ELEC 462	Digital Communications	3.50
ELEC 465	Networks Security and Management	3.50
ELEC 472	Advanced Telecommunication Networks	3.50
ELEC 481	Linear Systems	3.50
ENGR 245	Mechanical Analysis	3.00
ENGR 411	Special Technical Report	1.00
ENGR 472	Robot Manipulators	3.50
SOEN 341	Software Process	3.00
SOEN 342	Software Requirements and Specifications	3.00
SOEN 343	Software Architecture and Design I	3.00
SOEN 344	Software Architecture and Design II	3.00

System Software Option *Credits*

COEN 320	Introduction to Real-Time Systems	3.00
COEN 345	Software Testing and Validation	4.00
COEN 421	Embedded Systems and Software Design	4.00
COEN 445	Communication Networks and Protocols	4.00
SOEN 341	Software Process	3.00
	Electives chosen from the list below	14.00
		32.00

System Software Electives *Credits*

COEN 313	Digital Systems Design II	3.50
COEN 315	Digital Electronics	3.50
COEN 316	Computer Architecture and Design	3.00
COEN 432	Applied Genetic and Evolutionary Systems	3.00
COEN 498	Topics in Computer Engineering	3.00
COMP 335	Introduction to Theoretical Computer Science	3.00
COMP 353	Databases	4.00
COMP 371	Computer Graphics	4.00
COMP 426	Multicore Programming	4.00
COMP 442	Compiler Design	4.00
COMP 451	Database Design	4.00
COMP 465	Design and Analysis of Algorithms	3.00
COMP 472	Artificial Intelligence	4.00
COMP 474	Intelligent Systems	4.00
ELEC 363	Fundamentals of Telecommunication Systems	3.50
ELEC 442	Digital Signal Processing	3.50
ELEC 465	Networks Security and Management	3.50
ELEC 472	Advanced Telecommunication Networks	3.50
ELEC 481	Linear Systems	3.50
ENGR 245	Mechanical Analysis	3.00
ENGR 411	Special Technical Report	1.00
ENGR 472	Robot Manipulators	3.50
SOEN 342	Software Requirements and Specifications	3.00
SOEN 343	Software Architecture and Design I	3.00
SOEN 344	Software Architecture and Design II	3.00
SOEN 357	User Interface Design	3.00
SOEN 431	Formal Methods	3.00
SOEN 448	Management of Evolving Systems	3.00
SOEN 449	Component Engineering	3.00