Faculty of Engineering, including the Schools of Architecture and Urban Planning

Programs, Courses and University Regulations

2013-2014

This publication provides guidance to prospects, applicants, students, faculty and staff.

1 . McGill University reserves the right to mak

Publication Information

Published by

Enrolment Services
McGill University
3415 McTavish Street
Montreal, Quebec, H3A 0C8
Canada

McGill University reserves the right to make changes to the information contained in this publication - including correcting errors, altering fees, schedules of admission and credit requirements, and revising or cancelling particular courses or programs - without prior notification.

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1 About the Faculty of Engineering

The Faculty currently includes six engineering departments and two schools, and houses three institutes:

Departments
Bioengineering
Chemical Engineering
Civil Engineering and Applied Mechanics
Electrical and Computer Engineering
Mechanical Engineering
Mining and Materials Engineering

Schools
Architecture
Urban Planning

Institutes
Trottier Institute for Sustainability in Engineering and Design (TISED) (Website: *www.mcgill.ca/tised*)
McGill Institute for Advanced Materials (MIAM) (Website: *www.mcgill.ca/miam*) (established by the Faculties of Engineering and Science)
McGill Institute for Aerospace Engineering (MIAE) (Website: *www.mcgill.ca/miae*)

The Faculty serves approximately 3,010 undergraduate students and 1,150 graduate students in a wide v

Department of Mining and Materials Engineering

section 13.8.3: Department of Mining and Materials Engineering Faculty

section 13.8.4.3: Bachelor of Engineering (B.Eng.) - Materials Engineering CO-OP (148 credits)

section 13.8.5.3: Bachelor of Engineering (B.Eng.) - Mining Engineering CO-OP (150 credits)

School of Urban Planning

section 13.9.3: Undergraduate Courses in Urban Planning

Minor Programs

section 13.11.2.1: Bachelor of Engineering (B.Eng.) - Minor Biomedical Engineering (21 credits)

section 13.11.5.2: Bachelor of Engineering (B.Eng.) - Minor Computer Science (24 credits)

section 13.11.7.1: Bachelor of Engineering (B.Engg

Faculty website: *www.mcgill.ca/engineering*

The McGill Engineering Student Centre (Student Affairs Office, Career Centre, Peer Tutoring Services) and the Office of the Associate Dean (Undergraduate Education) are located at the following address:

3450 University Street
Montreal, Quebec H3A 0E8
Frank Dawson Adams Building, Suite 22

Telephone: 514-398-7257
McGill Engineering Student Centre website: *www.mcgill.ca/engineering/student*

6.2 Administrative Officers

Revision, August 2013. Start of revision.

Dean

James Nicell; B.A.Sc., M.A.Sc., Ph.D.(Windsor), P.Eng. (*James McGill Professor*)

Associate Deans

Lawrence Chen; B.Eng.(McG.), M.A.Sc., Ph.D.(Tor.), P.Eng. (*Academic Affairs*)

Mohamed A. Meguid; B.Sc.(Azhar, Cairo), M.Sc., Ph.D.(W. Ont.), P.Eng. (*Undergraduate Education*)

Showan Nazhat; B.Eng., M.Sc., Ph.D.(Lond.) (*Gerald Hatch Faculty Fellow*) (*Research and Graduate Education*)

Department Chairs

Sylvain Coloumbe; B.Sc., M.Sc.A.(Sher.), Ph.D.(McG.), ing. (*Chemical Engineering*)

Andrew Kirk; B.Sc.(Bristol), Ph.D.(Lond.) (*William Dawson Scholar*) (*Electrical and Computer Engineering*)

Arun Misra; B.Tech.(Indian IT, Kharagpur), Ph.D.(Br. Col.), P.Eng., F.A.A.S., A.F.A.I.A.A. (*Mechan, Ph.D.(McG.), ing. (*

Director, Engineering Student Centre

Judy Pharo

Revision, August 2013. End of revision.

10 Student Activities

The campus offers a wide variety of extracurricular activities for students. All are encouraged to participate. Many of these are organized within the Faculty

Minors
Management Minors: Minor in Finance, Minor in Management, Minor in Marketing, Minor in Operations Management
Materials Engineering
Mathematics
Mining Engineering
Musical Science and Technology
Physics
Software Engineering
Technological Entrepreneurship

12 Engineering Internship Program

Employers value experience. Internships (four, eight, twelv

13 Academic Programs

The programs and courses in the following sections have been approved for the 2013–2014 session as listed, but the Faculty reserves the right to introduce changes as may be deemed necessary or desirable.

13.1 General Engineering Program

The General Engineering Program (GEP) is offered in addition to the Faculty of Engineering's majors (Chemical, Civil, Computer, Electrical, Materials, Mechanical, Mining, and Software Engineering). The GEP permits students with strong mathematics, physics, and chemistry results in high school to pursue a common first-year curriculum without declaring a particular major program at the time of application. The GEP spans one academic year only (Year 0). Students then apply for placement and continue in an Engineering major program.

The GEP is not open to students with more than 6 transfer credits toward their engineering major (e.g., transfer credits from Advanced Placement (AP) exams or from courses taken at other universities).

Applicants who already know which major(s) they wish to study should apply directly for the major(s) rather than select the General Engineering Program option.

For more information about the General Engineering Program, see *www.mcgill.ca/engineering/degrees/general*.

13.1.1 Bachelor of Engineering (B.Eng.) - General Engineering - Undeclared (30 credits)

This is a 30-credit course of study for the first year of a Bachelor of Engineering degree for students who have not completed a Quebec CEGEP diploma. Upon successful completion of these requirements, students must apply for placement and continue in a B.Eng. or B.S.E. program.

Year 0 (Freshman) Courses

(30 credits)

CHEM 110	(4)	General Chemistry 1
CHEM 120	(4)	General Chemistry 2
FACC 100	(1)	Introduction to the Engineering Profession
MATH 133	(3)	Linear Algebra and Geometry
MATH 140	(3)	Calculus 1
MATH 141	(4)	Calculus 2
PHYS 131	(4)	Mechanics and Waves
PHYS 142	(4)	Electromagnetism and Optics

Note: FACC 100 (Introduction to the Engineering Profession) must be taken during the first year of study.

Humanities and Social Sciences, Management Studies, and Law

3 credits at the 200 level or higher from the following departments:

Anthropology (ANTH)

Economics (any 200- or 300-level course excluding ECON 227 and ECON 337)

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

Psychology (excluding PSYC 204 and PSYC 305, but including PSYC 100)

Religious Studies (RELG)

School of Social Work (SWRK)

Sociology (excluding SOCI 350)

OR one of the following:

ear 07mridC 305, b(4)

ARCH 528	(3)	History of Housing
BUSA 465*	(3)	Technological Entrepreneurship
ENVR 203	(3)	Knowledge, Ethics and Environment
ENVR 400	(3)	Environmental Thought
FACC 220	(3)	Law for Architects and Engineers
FACC 500	(3)	Technology Business Plan Design
FACC 501	(3)	Technology Business Plan Project
INDR 294*	(3)	Introduction to Labour-Management Relations
MATH 338	(3)	History and Philosophy of Mathematics
MGCR 222*	(3)	Introduction to Organizational Behaviour
MGCR 352*	(3)	Marketing Management 1
ORGB 321*	(3)	Leadership
ORGB 423*	(3)	Human Resources Management

* Note: Management courses have limited enrolment and registration dates. See Important Dates at: http://www.mcgill.ca/importantdates/.

Students who successfully complete one or more Science Placement Exams will obtain credit(s) for the equivalent(s), i.e., CHEM 110, CHEM 120, MATH 140, MATH 141, MATH 133, PHYS 131, PHYS 142. Please see http://www.mcgill.ca/students/exams/science for information on Science Placement Exams.

Language Courses

If you are not proficient in a certain language, 3 credits will be given for one 6-credit course at the 100 level or higher in that language. A maximum of 3 credits of language courses will be counted toward the B.Eng./B.S.E. Complementary Studies requirement.

However, 3 credits may be given for any language course at the 200 level or higher that has a sufficient cultural component. This course must be approved by the McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22).

13.2 School of Architecture

13.2.1 Location

Macdonald-Harrington Building, Room 201
815 Sherbrooke Street West
Montreal, Quebec H3A 0C2

Telephone: 514-398-6700
Fax: 514-398-7372
Website: *www.mcgill.ca/architecture*

13.2.2 About the School of Architecture

The School of Architecture at McGill University was founded in 1896. Our mission is to educate professionals who will contribute to the socio-economic and cultural development of Quebec, Canada and the broader global community through responsible participation in the process of the design, construction, and interpretation of the built environment.

The School offers the non-professional B.Sc.(Arch.) program, the M.Arch. (Professional) program, and post-professional research programs, including the M.Arch. (Post-professional) and Ph.D.

13.2.3 Architectural Certification in Canada

In Canada, all provincial/territorial associations/institutes/orders recommend a degree from an accredited professional degree program as a prerequisite for licensure. The Canadian

Master's degree programs may consist of a preprofessional undergraduate degree and a professional graduate degree, which, when earned sequentially, comprise an accredited professional education. However, the preprofessional degree is not, by itself, recognized as an accredited degree.

The M.Arch. (Professional) degree is accredited by the Canadian Architectural Certification Board (CACB), and is recognized as accredited by the National Council of Architectural Registration Boards (NCARB) in the United States.

13.2.4 Programs of Study

Students in the B.Sc.(Arch.) program who intend to proceed to the professional degree must satisfy certain minimum requirements. Students must:

- complete the B.Sc.(Arch.) degree, including the series of required and complementary courses stipulated for professional studies, with a minimum CGPA of 3.00;
- submit a portfolio of work executed in the sequence of six design studios, as well as samples of professional and personal work;
- complete the minimum period of relevant work experience according to the current Work Experience Guidelines (see *www.mcgill.ca/architecture/bboard/bscmai/workexperience*).

Further information on the M.Arch. (Professional) program and application procedures is available at *www.mcgill.ca/architecture*.

13.2.4.1 Student Exchanges

A limited number of qualified students may participate in an exchange with schools of architecture at other universities that have agreements with the McGill School of Architecture, for a maximum of one term in the second year of the B.Sc.(Arch.) program. These include the following: Università Iuav di Venezia (Venice, Italy); Fakultät für Raumplanung und Architektur, Technische Universität Wien (Vienna, Austria); Université Catholique de Louvain (Brussels, Belgium); École Nationale Supérieure d'architecture de Grenoble (Grenoble, France); École Nationale Supérieure d'architecture de Clermont-Ferrand (Clermont-Ferrand, France); Scuola di Architettura Civile Politecnico di Milano (Boviso) (Milan, Italy); The Royal Danish ri MiPdemyhe f1 0421 Tm(ersit)Tj/25.03m(

Professors

Vikram Bhatt; N.Dip.Arch.(Ahmedabad), M.Arch.(McG.), M.R.A.I.C.

Avi Friedman; B.Arch.(Technion), M.Arch.(McG.), Ph.D.(Montr.), O.A.Q., I.A.A.

Alberto Pérez-Gómez; Dipl.Eng.Arch.(Nat. Pol. Inst., Mexico), M.A., Ph.D.(Essex), M.R.A.I.C. (*Saidye Rosner Bronfman Professor of Architectural History*)

Associate Professors

Martin Bressani; B.Sc.(Arch.), B.Arch.(McG.), M.Sc.(Arch.)(MIT), D.E.A., Docteur (Paris-Sorbonne – Paris IV), O.A.Q.

Ricardo L. Castro; B.Arch.(Los Andes, Col.), M.Arch., M.A.(Ore.), F.R.A.I.C.

David Covo; B.Sc.(Arch.), B.Arch.(McG.), F.R.A.I.C., O.A.Q.

Michael Jemtrud; B.Sc., B.A., B.Arch.(Penn. St.), M.Arch.(McG.), M.R.A.I.C.

Nik Luka; B.A.A.(Ryerson), M.Arch.(Laval), Ph.D.(Tor.), M.C.I.P.

Robert Mellin; B.Arch., M.Sc.(Arch.)(Penn. St.), M.Arch.(McG.), M.Sc., Ph.D.(Penn.), M.R.A.I.C., N.A.A.

Assistant Professors

Aaron Sprecher; B.Arch.(Bezalel), M.Arch.(Calif.-LA)

Ipek Tureli; B.Arch.(Istanbul), Diploma (A.A.), Ph.D. (Calif., Berk.)

Adjunct Professors

Sinisha Brdar

Robert L. Claiborne

Howard Davies

Talia Dorsey

Julia Gersovitz

Phyllis Lambert

Maria Mingallon

Mark Poddubiuk

Pierina Saia

Conor Sampson

Course Lecturers

Manon Asselin

Morgan M. Carter

Jaime Coll

Nancy Dunton

Marc Hallé

Francisca Insulza

Andrew King

Judith Leclerc

Sevag Pogharian

Pieter Sijpkes

Katsuhiro Yamazaki

Visiting Critics and Guest Lecturers

Each year, visitors are involved in the teaching of certain courses as critics and lecturers. These visitors change from year to year. The following were visitors for 2012:

Visiting Critics and Guest Lecturers

Rami Abou-Khalil, Tanya Abramovitch, Gavin Affleck, Lionel Alcoloumbre, Thierry Beaudoin, Cédric Boulet, Louis Brillant, Michel Broz, Valérie Chartrand, Domenico Ciraci, Sergio Clavijo, Jerome Conraud, Anne Cormier, Dana Cupkova-Meyers, Claudine Deom, Paul Emmons, Miguel Escobar, Patrick Evans, Martin Frappier, Fabrizio Galanti, Fanis Gramenos, Hal Greenberg, André Habib, Bechara Helal, Jason Hughes, Hans Ibelings, Hal Ingberg, Marta Masferrer Juliol, Jan Kubanek, Daniel Lafond, Benoit-Simon Lagacé, Elsa Lam, Michel Langevin, David Leatherbarrow, Karl Lemieux, Mathieu Lemieux-Blanchard, Kevin Manaugh, Paula Meijerink, Patrick Morand, Franco Panzini, Louise Pelletier, Louis Pretty, Kevin Pratt, Michele Regina, Gilles Saucier, Paul Scriver, Malena Szlam, Inderbir Singh Riar, Chris Siefert, Robert Stanley, Bruno St-Jean, Tom Switzer, Georges Teyssot, David Theodore, Vladimir Topouzanov, Guy Villemure, Lilith Wyatt

Bac

ARCH 201	(6)	Communication, Behaviour and Architecture
ARCH 202	(6)	Architectural Graphics and Elements of Design
ARCH 221	(2)	Architectural Drawing
ARCH 240	(3)	Organization of Materials in Buildings
ARCH 241	(3)	Architectural Structures
ARCH 250	(3)	Architectural History 1
ARCH 251	(3)	Architectural History 2
ARCH 303	(6)	Design and Construction 1
ARCH 304	(6)	Design and Construction 2
ARCH 325	(2)	Architectural Sketching
ARCH 342	(3)	Digital Representation
ARCH 354	(3)	Architectural History 3
ARCH 355	(3)	Architectural History 4
ARCH 3.5r42ho.6 l521.2 Tm(20.52 521. 240		Landscape

ARCH 535	(3)	History of Architecture in Canada
ARCH 536	(3)	Heritage Conservation
ARCH 540	(3)	Selected Topics in Architecture 1
		Selected Topics in

Associate Professor

Yu (Brandon) Xia; B.Sc.(Peking), Ph.D.(Stan.)

CHEE 200	(3)	Chemical Engineering Principles 1
CHEE 204	(3)	Chemical Engineering Principles 2
CHEE 220	(3)	Chemical Engineering Thermodynamics
CHEE 231	(3)	Data Analysis and Design of Experiments
CHEE 291	(4)	Instrumentation and Measurement 1
CHEE 310	(3)	Physical Chemistry for Engineers
CHEE 314	(3)	Fluid Mechanics
CHEE 315	(3)	Heat and Mass Transfer
CHEE 351	(3)	Separation Processes
CHEE 360	(1)	Technical Paper
CHEE 370	(3)	Elements of Biotechnology
CHEE 380	(3)	Materials Science
CHEE 390	(3)	Computational Methods in Chemical Engineering
CHEE 400	(3)	Principles of Energy Conversion
CHEE 401	(3)	Energy Systems Engineering
CHEE 423	(3)	Chemical Reaction Engineering
CHEE 440	(3)	Process Modelling
CHEE 453	(4)	Process Design
CHEE 455	(3)	Process Control
CHEE 456	(2)	Design Project 1
CHEE 457	(5)	Design Project 2
CHEE 474	(3)	Biochemical Engineering
CHEE 484	(3)	Materials Engineering
CHEE 491	(4)	Instrumentation and Measurement 2

Technical Complementaries

9 credits

The purpose of this requirement is to provide students with an area of specialization within the broad field of chemical engineering. Alternatively, some students use the technical complementaries to increase the breadth of their chemical engineering training.

At least two courses (5-7 credits) must be chosen from the list below. The remaining course(s) (2-4 credits) may be taken from other suitable undergraduate courses in the Faculty of Engineering, with departmental permission.

BIOT 505*	(3)	Selected Topics in Biotechnology
CHEE 363**	(2)	Projects Chemical Engineering 1
CHEE 438	(3)	Engineering Principles in Pulp and Paper Processes
CHEE 494**	(3)	Research Project and Seminar 1
CHEE 495**	(4)	Research Project and Seminar 2
CHEE 496**	(3)	Environmental Research Project
CHEE 510	(3)	Advanced Separation Processes
CHEE 515+	(3)	Material Surfaces: A Biomimetic Approach
CHEE 521+	(3)	Nanomaterials and the Aquatic Environment
CHEE 541	(3)	Electrochemical Engineering
CHEE 543	(3)	Plasma Engineering
CHEE 561	(3)	Introduction to Soft Tissue Biophysics

CHEE 562	(3)	Engineering Principles in Physiological Systems
CHEE 563+	(3)	Biofluids and Cardiovascular Mechanics
CHEE 571	(3)	Small Computer Applications: Chemical Engineering
CHEE 582	(3)	Polymer Science & Engineering
CHEE 584	(3)	Polymer Processing
CHEE 585	(3)	Foundations of Soft Matter
CHEE 587	(3)	Chemical Processing: Electronics Industry
CHEE 591	(3)	Environmental Bioremediation
CHEE 592+	(3)	Industrial Air Pollution Control
CHEE 593+	(3)	Industrial Water Pollution Control
CHEE 594	(3)	Biocolloids in Environmental Systems
CHEE 595	(3)	Energy Recovery, Use, & Impact
CIVE 430+	(3)	Water Treatment and Pollution Control
CIVE 521+	(3)	Nanomaterials and the Aquatic Environment
MECH 534+	(3)	Air Pollution Engineering
MECH 563+	(3)	Biofluids and Cardiovascular Mechanics
MIME 515+	(3)	Material Surfaces: A Biomimetic Approach

* BIOT 505 can only be chosen by students taking the Minor in Biotechnology.

** Students may choose only one project course: CHEE 363, CHEE 495, or CHEE 496.

+ Students may choose only one course in each of the following sets:

- CHEE 515 or MIME 515
- CHEE 521 or CIVE 521
- CHEE 563 or MECH 563
- CHEE 592 or MECH 534
- CHEE 593 or CIVE 430

Complementary Studies

6 credits (9 credits for students from Quebec CEGEPs)

Group A - Impact of Technology on Society

3 credits from the following:

ANTH 212	(3)	Anthropology of Development
BTEC 502	(3)	Biotechnology Ethics and Society
CIVE 469	(3)	Infrastructure and Society
ECON 225	(3)	Economics of the Environment
ECON 347	(3)	Economics of Climate Change
ENVR 201	(3)	Society, Environment and Sustainability
GEOG 200	(3)	Geographical Perspectives: World Environmental Problems
GEOG 203	(3)	Environmental Systems
GEOG 205	(3)	Global Change: Past, Present and Future
GEOG 302	(3)	Environmental Management 1
MECH 526	(3)	Manufacturing and the Environment
MGPO 440*	(3)	Strategies for Sustainability
MIME 308	(3)	Social Impact of Technology

PHIL 343	(3)	Biomedical Ethics
RELG 270	(3)	Religious Ethics and the Environment
SOCI 235	(3)	Technology and Society
SOCI 312	(3)	Sociology of Work and Industry
URBP 201	(3)	Planning the 21st Century City

* Note: Management courses have limited enrolment and registration dates. See Important Dates at http://www.mcgill.ca/importantdates.

Group B - Humanities and Social Sciences, Management Studies and Law

3 credits (6 credits for students from Quebec CEGEPs) at the 200 level or higher from the following departments:

Anthropology (ANTH)

Economics (any 200- or 300-level course excluding ECON 227 and ECON 337)

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

Psychology (excluding PSYC 204 and PSYC 305, but including PSYC 100)

Religious Studies (RELG)

School of Social Work (SWRK)

Sociology (excluding SOCI 350)

OR one of the following:

ARCH 528	(3)	History of Housing
BUSA 465*	(3)	Technological Entrepreneurship
ENVR 203	(3)	Knowledge, Ethics and Environment
ENVR 400	(3)	Environmental Thought
FACC 220	(3)	Law for Architects and Engineers
FACC 500	(3)	Technology Business Plan Design
FACC 501	(3)	Technology Business Plan Project
INDR 294*	(3)	Introduction to Labour-Management Relations
MATH 338	(3)	History and Philosophy of Mathematics
MGCR 222*	(3)	Introduction to Organizational Behaviour
MGCR 352*	(3)	Marketing Management 1
ORGB 321*	(3)	Leadership
ORGB 423*	(3)	Human Resources Management

* Note: Management courses have limited enrolment and registration dates. See Important Dates at http://www.mcgill.ca/importantdates.

Language Courses

If you are not proficient in a certain language no more than 3 credits will be given for one 6-credit course at the 100 level or higher in that language. A maximum of 3 credits of language courses will be counted toward the Complementary Studies requirement.

However, 3-6 credits may be given for language courses at the 200 level or higher that have a sufficient cultural component. These courses must be approved by the McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22).

Revision, June 2013. End of revision.

More about the B.Eng.RELG6ea1dision0 1 9602.4mtrec0.52treision.

courses in biochemistry and microbiology. The food, beverage, and pharmaceutical industries are large industries in the Montreal area and these courses are relevant to these industries and to the new high-technology applications of biotechnology.

The third area in which there is a sequence of courses is Pollution Control. The Department of

Adjunct Professors

Paul Rodrigue

Sandro Scola

William Taylor

Marc Villeneuve

Jan Vrana

13.5.5 Bachelor of Engineering (B.Eng.) - Civil Engineering (139 credits)

Program credit weight: 139 credits

Program credit weight for Quebec CEGEP students: 110 credits

The Civil Engineering program is comprehensive in providing the fundamentals in mechanics and engineering associated with the diverse fields of the profession, in offering choices of specialization, and in fully reflecting the advances in science, mathematics, engineering, and computing that have transformed all fields of engineering in recent years. The resulting knowledge and training enables graduates to not only enter the profession thoroughly well prepared, but also to adapt to further change.

The required courses ensure a sound scientific and analytical basis for professional studies through courses in solid mechanics, fluid mechanics, soil mechanics, environmental engineering, water resources management, structural analysis, systems analysis, and mathematics. Fundamental concepts are applied to various fields of practice in both required and complementary courses.

By a suitable choice of complementary courses, students can attain advanced levels of technical knowledge in the specialized areas mentioned above. Alternatively, students may choose to develop their interests in a more general way by combining complementary courses within the Department with several from other departments or faculties.

Required Year 0 (Freshman) Courses

29 credits

Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credit for these Year 0 (Freshman) courses and enter a 110-credit program.

For information on transfer credit for French Baccalaureate, International Baccalaureate exams, Advanced Placement exams, Advanced Levels, and Science Placement Exams, see http://www.mcgill.ca/engineering/student/sao/newstudents/ and select your term of admission.

CHEM 110	(4)	General Chemistry 1
CHEM 120	(4)	General Chemistry 2
MATH 133	(3)	Linear Algebra and Geometry
MATH 140	(3)	Calculus 1
MATH 141	(4)	Calculus 2
PHYS 131	(4)	Mechanics and Waves
PHYS 142	(4)	Electromagnetism and Optics

AND 3 credits selected from the approved list of courses in Humanities and Social Sciences, Management Studies, and Law

MATH 263	(3)	Ordinary Differential Equations for Engineers
MATH 264	(3)	Advanced Calculus for Engineers
MECH 261	(2)	Measurement Laboratory
MECH 289	(3)	Design Graphics

* Note: FACC 100 (Introduction to the Engineering Profession) must be taken during the first year of study.

Required Civil Engineering Courses

61 credits

CIVE 202	(4)	Construction Materials
CIVE 205	(3)	Statics
CIVE 206	(3)	Dynamics
CIVE 207	(4)	Solid Mechanics
CIVE 208	(3)	Civil Engineering System Analysis
CIVE 210	(2)	Surveying
CIVE 225	(4)	Environmental Engineering
CIVE 290	(3)	Thermodynamics and Heat Transfer
CIVE 302	(3)	Probabilistic Systems
CIVE 311	(4)	Geotechnical Mechanics
CIVE 317	(3)	Structural Engineering 1
CIVE 318	(3)	Structural Engineering 2
CIVE 319	(3)	Transportation Engineering
CIVE 320	(4)	Numerical Methods
CIVE 323	(3)	Hydrology and Water Resources
CIVE 324	(3)	Sustainable Project Management
CIVE 327	(4)	Fluid Mechanics and Hydraulics
CIVE 418	(4)	Design Project
CIVE 432	(1)	Technical Paper

Complementary Courses

21 credits

List A - Design Technical Complementaries

6-15 credits from the following:

CIVE 416	(3)	Geotechnical Engineering
CIVE 421	(3)	Municipal Systems
CIVE 428	(3)	Water Resources and Hydraulic Engineering
CIVE 430	(3)	Water Treatment and Pollution Control
CIVE 440	(3)	Traffic Engineering and Simulation
CIVE 462	(3)	Design of Steel Structures
CIVE 463	(3)	Design of Concrete Structures

CHEE 521*	(3)	Nanomaterials and the Aquatic Environment
CIVE 433	(3)	Urban Planning
CIVE 446	(3)	Construction Engineering
CIVE 451	(3)	Geoenvironmental Engineering
CIVE 460	(3)	Matrix Structural Analysis
CIVE 470	(3)	Undergraduate Research Project
CIVE 512	(3)	Advanced Civil Engineering Materials
CIVE 514	(3)	Structural Mechanics
CIVE 520	(3)	Groundwater Hydrology
CIVE 521*	(3)	Nanomaterials and the Aquatic Environment
CIVE 527	(3)	Renovation and Preservation: Infrastructure
CIVE 540	(3)	Urban Transportation Planning
CIVE 542	(3)	Transportation Network Analysis
CIVE 546	(3)	Selected Topics in Civil Engineering 1
CIVE 550	(3)	Water Resources Management
CIVE 551	(3)	Environmental Transport Processes
CIVE 555	(3)	Environmental Data Analysis
CIVE 558	(3)	Biomolecular Techniques for Environmental Engineering
CIVE 560	(3)	Transportation Safety and Design
CIVE 561	(3)	Urban Activity, Air Pollution, and Health
CIVE 572	(3)	Computational Hydraulics
CIVE 573	(3)	Hydraulic Structures
CIVE 574	(3)	Fluid Mechanics of Water Pollution
		Riverecular

MGPO 440*	(3)	Strategies for Sustainability
MIME 308	(3)	Social Impact of Technology
PHIL 343	(3)	Biomedical Ethics
RELG 270	(3)	Religious Ethics and the Environment
SOCI 235	(3)	Technology and Society
SOCI 312	(3)	Sociology of Work and Industry
URBP 201	(3)	Planning the 21st Century City

* Note: Management courses have limited enrolment and registration dates. See Important Dates at http://www.mcgill.ca/importantdates.

Group B - Humanities and Social Sciences, Management Studies, and Law

3 credits at the 200 level or higher from the following departments:

Anthropology (ANTH)

Economics (any 200- or 300-level course excluding ECON 227 and ECON 337)

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

Psychology (excluding PSYC 204 and PSYC 305, but including PSYC 100)

Religious Studies (RELG)

School of Social Work (SWRK)

Sociology (excluding SOCI 350)

OR one of the following:

ARCH 528	(3)	History of Housing
BUSA 465*	(3)	Technological Entrepreneurship
ENVR 203	(3)	Knowledge, Ethics and Environment
ENVR 400	(3)	Environmental Thought
FACC 220	(3)	Law for Architects and Engineers
FACC 500	(3)	Technology Business Plan Design
FACC 501	(3)	Technology Business Plan Project
INDR 294*	(3)	Introduction to Labour-Management Relations
MATH 338	(3)	History and Philosophy of Mathematics
MGCR 222*	(3)	Introduction to Organizational Behaviour
MGCR 352*	(3)	Marketing Management 1
ORGB 321*	(3)	Leadership
ORGB 423*	(3)	Human Resources Management

* Note: Management courses have limited enrolment and registration dates. See Important Dates at http://www.mcgill.ca/importantdates.

Language Courses

If you are not proficient in a certain language, no more than 3 credits will be given for one 6-credit course at the 100 level or higher in that language. A maximum of 3 credits of language courses will be counted toward the Complementary Studies requirement.

However, 3-6 credits may be given for language courses at the 200 level or higher that have a sufficient cultural component. These courses must be approved by the McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22).

13.6 Department of Electrical and Computer Engineering

13.6.1 Location

Department of Electrical and Computer Engineering
Undergraduate Programs Office
Lorne Trottier Building, Room 2060
3630 University Street
Montreal, Quebec H3A 0C6

Telephone: 514-398-3943
Fax: 514-398-4653
Website: *www.mcgill.ca/ece*

13.6.2 About the Department of Electrical and Computer Engineering

Revision, August 2013. Start of revision.

The Department of Electrical and Computer Engineering offers undergraduate degree programs in Electrical Engineering, Electrical Engineering (Honours), Computer Engineering, and Software Engineering. All programs pro

Emeritus Professors

Nicholas C. Rumin; B.Eng., M.Sc., Ph.D.(McG.), Eng.

Professors

Peter E. Caines; B.A.(Oxf.), D.I.C., Ph.D.(Lond.), F.R.S.C., F.I.E.E.E., F.C.I.A.R. (*James McGill Professor*) (*Macdonald Professor*)

Benoit Champagne; B.Eng., M.Eng.(Montr.), Ph.D.(Tor.)

Lawrence Chen; B.Eng.(McG.), M.A.Sc., Ph.D.(Tor.), *Associate Dean, Academic*

Assistant Professors

Odile Liboiron-Ladouceur; M.Sc., Ph.D.(Col.)

Aditya Mahajan; B.Tech.(Indian IT), M.S., Ph.D.(Mich.)

Brett Meyer; Ph.D.(Carn. Mellon)

Michael Rabbat; B.S.(Ill.), M.S.(Texas), Ph.D.(Wisc.)

Haibo Zeng, Ph.D.(Calif., Berk.)

Associate Members

Gregory Dudek; B.Sc.(Qu.), M.Sc., Ph.D.(Tor.)

Alan C. Evans; M.Sc.(Surrey), Ph.D.(Leeds)

William R. Funnell; M.Eng., Ph.D.(McG.)

Henrietta L. Galiana; M.Eng., Ph.D.(McG.)

Jean Gotman; M.E.(Dart.), Ph.D.(McG.)

David Juncker; Ph.D.(Neuchatel)

Robert E. Kearney; M.Eng., Ph.D.(McG.)

Nathaniel J. Quitoriano; B.S.(Calif.), Ph.D.(MIT)

Adjunct Professors

Rhys Allan Adams

Robert Diraddo

Danny Grant

Cedric Guss

Vincent Hayward

Ricardo Izquierdo

Cheng K. Jen

Innocent Kamwa

George K

This program gives students a broad understanding of the key principles that are responsible for the extraordinary advances in the technology of computers, micro-electronics, automation and robotics, telecommunications, and power systems. These areas are critical to the development of our industries and, more generally, to our economy. A graduate of this program is exposed to all basic elements of electrical engineering and can function in any of our client industries. This breadth is what distinguishes an engineer from, say, a computer scientist or physicist.

In addition to technical complementary courses, students in the Electrical Engineering program take general complementary courses in social sciences, administrative studies, and humanities. These courses allow students to develop specific interests in areas such as psychology, economics, management, or political science.

Required Year 0 (Freshman) Courses

29 credits

Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credit for these Year 0 (Freshman) courses and enter a 109- to 110-credit program.

For information on transfer credit for French Baccalaureate, International Baccalaureate exams, Advanced Placement exams, Advanced Levels, and Science Placement Exams, see http://www.mcgill.ca/engineering/student/sao/newstudents/ and select your term of admission.

CHEM 110	(4)	General Chemistry 1
CHEM 120	(4)	General Chemistry 2
MATH 133	(3)	Linear Algebra and Geometry
MATH 140	(3)	Calculus 1
MATH 141	(4)	Calculus 2
PHYS 131	(4)	Mechanics and Waves
PHYS 142	(4)	Electromagnetism and Optics

AND 3 credits selected from the approved list of courses in Humanities and Social Sciences, Management Studies, and Law, listed below under Complementary Studies (Group B)

* Note: FACC 100 (Introduction to the Engineering Profession) must be taken during the first year of study.

Required Non-Departmental Courses

35 credits

CCOM 206	(3)	Communication in Engineering
CIVE 281	(3)	Analytical Mechanics
COMP 202	(3)	Foundations of Programming
FACC 100*	(1)	Introduction to the Engineering Profession
FACC 300	(3)	Engineering Economy
FACC 400	(1)	Engineering Professional Practice
MATH 262	(3)	Intermediate Calculus
MATH 263	(3)	Ordinary Differential Equations for Engineers
MATH 264	(3)	Advanced Calculus for Engineers
MATH 270	(3)	Applied Linear Algebra
MATH 381	(3)	Complex Variables and Transforms
MIME 262	(3)	Properties of Materials in Electrical Engineering
PHYS 271	(3)	Introduction to Quantum Physics

* Note: FACC 100 (Introduction to the Engineering Profession) must be taken during the first year of study.

Required Electrical Engineering Courses

57 credits

ECSE 200	(3)	Electric Circuits 1
ECSE 210	(3)	Electric Circuits 2
ECSE 211	(3)	Design Principles and Methods

ECSE 460*	(3)	Appareillage électrique (Electrical Power Equipment)
ECSE 462	(3)	Electromechanical Energy Conversion
ECSE 464	(3)	Power Systems Analysis 1
ECSE 465	(3)	Power Electronic Systems
ECSE 467*	(3)	Comportement des réseaux électriques
ECSE 468*	(3)	Electricité industrielle (Industrial Power Systems)
ECSE 469*	(3)	Protection des réseaux électriques

* Courses taught in French.

Laboratory Complementaries

2-3 credits from the following:

ECSE 426	(3)	Microprocessor Systems
ECSE 431	(3)	Introduction to VLSI CAD
		Mixed-Signal Test T

MIME 308	(3)	Social Impact of Technology
PHIL 343	(3)	Biomedical Ethics
RELG 270	(3)	Religious Ethics and the Environment
SOCI 235	(3)	Technology and Society
SOCI 312	(3)	Sociology of Work and Industry
URBP 201	(3)	Planning the 21st Century City

*Note: Management courses have limited enrolment and registration dates. See Important Dates at http://www.mcgill.ca/importantdates.

Group B - Humanities and Social Sciences, Management Studies, and Law

3 credits at the 200 level or higher from the following departments:

Anthropology (ANTH)

Economics (any 200- or 300-level course excluding ECON 227 and ECON 337)

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

Psychology (excluding PSYC 204 and PSYC 305, but including PSYC 100)

Religious Studies (RELG)

School of Social Work (SWRK)

Sociology (ePolOR one Soc follo

Note: This program is open to students in the regular Electrical Engineering program only.

Here are some benefits of the concentration:

ECSE 221	(3)	Introduction to Computer Engineering
ECSE 291	(2)	Electrical Measurements Laboratory
ECSE 303	(3)	Signals and Systems 1
ECSE 304	(3)	Signals and Systems 2
ECSE 305	(3)	Probability and Random Signals 1
ECSE 322	(3)	Computer Engineering
ECSE 323	(5)	Digital System Design
ECSE 330	(3)	Introduction to Electronics
ECSE 334	(3)	Introduction to Microelectronics
ECSE 351	(3)	Electromagnetic Fields
ECSE 352	(3)	Electromagnetic Waves
ECSE 361	(3)	Power Engineering
ECSE 434	(2)	Microelectronics Laboratory
ECSE 498	(3)	Honours Thesis 1
ECSE 499	(3)	Honours Thesis 2
ECSE 543	(3)	Numerical Methods in Electrical Engineering

Complementary Courses

17-18 credits

Technical Complementaries

9 credits chosen from 500-level ECSE courses OR 6 credits chosen from 500-level ECSE courses and 3 credits chosen from the following list of 400-level courses (no more than one 400-level course can be chosen as a technical complementary):

ECSE 425	(3)	Computer Organization and Architecture
ECSE 427	(3)	Operating Systems
ECSE 451	(3)	EM Transmission and Radiation

Laboratory Complementaries

2-3 credits from the following:

ECSE 426	(3)	Microprocessor Systems
ECSE 431	(3)	Introduction to VLSI CAD
ECSE 435	(3)	Mixed-Signal Test Techniques
ECSE 436	(3)	Signal Processing Hardware
ECSE 450	(3)	Electromagnetic Compatibility
ECSE 485	(2)	IC Fabrication Laboratory
ECSE 486	(2)	Power Laboratory
ECSE 487	(2)	Computer Architecture Laboratory
ECSE 488	(2)	High Frequency Laboratory
ECSE 489	(2)	Telecommunication Network Laboratory
ECSE 490	(2)	Digital Signal Processing Laboratory
ECSE 491	(2)	Communication Systems Laboratory
ECSE 492	(2)	Optical Communications Laboratory
ECSE 493	(2)	Control and Robotics Laboratory

Complementary Studies

6 credits

Group A - Impact of Technology on Society

3 credits from the following:

ANTH 212	(3)	Anthropology of Development
BTEC 502	(3)	Biotechnology Ethics and Society
CIVE 469	(3)	Infrastructure and Society
ECON 225	(3)	Economics of the Environment
ECON 347	(3)	Economics of Climate Change
ENVR 201	(3)	Society, Environment and Sustainability
GEOG 200	(3)	Geographical Perspectives: World Environmental Problems
GEOG 203	(3)	Environmental Systems
GEOG 205	(3)	Global Change: Past, Present and Future
GEOG 302	(3)	Environmental Management 1
MECH 526	(3)	Manufacturing and the Environment
MGPO 440*	(3)	Strategies for Sustainability
MIME 308	(3)	Social Impact of Technology
PHIL 343	(3)	Biomedical Ethics
RELG 270	(3)	Religious Ethics and the Environment
SOCI 235	(3)	Technology and Society
SOCI 312	(3)	Sociology of Work and Industry
URBP 201	(3)	Planning the 21st Century City

* Note: Management courses have limited enrolment and registration dates. See Important Dates at http://www.mcgill.ca/importantdates.

Group B - Humanities and Social Sciences, Management Studies, and Law

3 credits at the 200 level or higher from the following departments:

Anthropology (ANTH

Economics (any 200- or 300-level course excluding ECON 227 and ECON 337)

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

Psychology (excluding PSYC 204 and PSYC 305, but including PSYC 100)

Religious Studies (RELG)

School of Social Work (SWRK)

Sociology (excluding SOCI 350)

OR one of the following:

ARCH 528	(3)	History of Housing
BUSA 465*	(3)	Technological Entrepreneurship
ENVR 203	(3)	Knowledge, Ethics and Environment
ENVR 400	(3)	Environmental Thought
FACC 220	(3)	Law for Architects and Engineers
FACC 500	(3)	Technology Business Plan Design
FACC 501	(3)	Technology Business Plan Project

INDR 294*	(3)	Introduction to Labour-Management Relations
MATH 338	(3)	History and Philosophy of Mathematics
MGCR 222*	(3)	Introduction to Organizational Behaviour
MGCR 352*	(3)	Marketing Management 1
ORGB 321*	(3)	Leadership
ORGB 423*	(3)	Human Resources Management

* Note: Management courses have limited enrolment and registration dates. See Important Dates at http://www

COMP 251	(3)	Algorithms and Data Structures
FACC 100*	(1)	Introduction to the Engineering Profession
FACC 300	(3)	Engineering Economy
		Engineering Professional Practice

Earth System Science (ESYS)

Physics (PHYS)

Technical Complementaries

9 credits from the following:

500-level ECSE courses are restricted to students with a minimum CGPA of 3.0 and B+ or better in prerequisite courses.

COMP 424	(3)	Artificial Intelligence
ECSE 404	(3)	Control Systems
ECSE 411	(3)	Communications Systems 1
ECSE 412	(3)	Discrete Time Signal Processing
ECSE 420	(3)	Parallel Computing
ECSE 421	(3)	Embedded Systems
ECSE 422	(3)	Fault Tolerant Computing
ECSE 424	(3)	Human-Computer Interaction
ECSE 428	(3)	Software Engineering Practice
ECSE 429	(3)	Software Validation
ECSE 431	(3)	Introduction to VLSI CAD
ECSE 436	(3)	Signal Processing Hardware
ECSE 443	(3)	Introduction to Numerical Methods in Electrical Engineering
ECSE 450	(3)	Electromagnetic Compatibility
ECSE 530	(3)	Logic Synthesis
ECSE 532	(3)	Computer Graphics
ECSE 537	(3)	Advanced Digital Integrated Circuits
ECSE 548	(3)	Introduction to VLSI Systems

Laboratory Complementaries

2-3 credits from the following:

ECSE 434	(2)	Microelectronics Laboratory
ECSE 436	(3)	Signal Processing Hardware
ECSE 487	(2)	Computer Architecture Laboratory
ECSE 489	(2)	Telecommunication Network Laboratory
ECSE 490	(2)	Digital Signal Processing Laboratory
ECSE 491	(2)	Communication Systems Laboratory
ECSE 493	(2)	Control and Robotics Laboratory

Complementary Studies

6 credits

Group A - Impact of Technology on Society

3 credits from the following:

ANTH 212	(3)	Anthropology of Development
BTEC 502	(3)	Biotechnology Ethics and Society
CIVE 469	(3)	Infrastructure and Society
ECON 225	(3)	Economics of the Environment

ECON 347	(3)	Economics of Climate Change
ENVR 201	(3)	Society, Environment and Sustainability
GEOG 200	(3)	Geographical Perspectives: World Environmental Problems
GEOG 203	(3)	Environmental Systems
GEOG 205	(3)	Global Change: Past, Present and Future
GEOG 302	(3)	Environmental Management 1
MECH 526	(3)	Manufacturing and the Environment
MGPO 440*	(3)	Strategies for Sustainability
MIME 308	(3)	Social Impact of Technology
PHIL 343	(3)	Biomedical Ethics
RELG 270	(3)	Religious Ethics and the Environment
SOCI 235	(3)	Technology and Society
SOCI 312	(3)	Sociology of Work and Industry
URBP 201	(3)	Planning the 21st Century City

* Note: Management courses have limited enrolment and registration dates. See Important Dates at http://www.mcgill.ca/importantdates.

Group B - Humanities and Social Sciences, Management Studies, and Law

3 credits at the 200-level or higher from the following departments:

Anthropology (ANTH)

Economics (any 200- or 300-level course excluding ECON 227 and ECON 337)

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

Psychology (excluding PSYC 204 and PSYC 305, but including PSYC 100)

Religious Studies (RELG)

School of Social Work (SWRK)

Sociology (excluding SOCI 350)

OR one of the following:

ARCH 528	(3)	History of Housing
BUSA 465*	(3)	Technological Entrepreneurship
ENVR 203	(3)	Knowledge, Ethics and Environment
ENVR 400	(3)	Environmental Thought
FACC 220	(3)	Law for Architects and Engineers
FACC 500	(3)	Technology Business Plan Design
FACC 501	(3)	Technology Business Plan Project
INDR 294*	(3)	Introduction to Labour-Management Relations
MATH 338	(3)	History and Philosophy of Mathematics
MGCR 222*	(3)	Introduction to Organizational Behaviour
MGCR 352*	(3)	Marketing Management 1
ORGB 321*	(3)	Leadership
ORGB 423*	(3)	Human Resources Management

* Note: Management courses have limited enrolment and registration dates. See Important Dates at http://www.mcgill.ca/importantdates.

Language Courses

If you are not proficient in a certain language, no more than 3 credits will be given for one 6-credit course at the 100- level or higher in that language. A maximum of 3 credits of language courses will be counted toward the Complementary Studies requirement.

However, 3-6 credits may be given for language courses at the 200- level or higher that have a sufficient cultural component. These courses must be approved by the McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22).

13.6.7 Bachelor of Software Engineering (B.S.E.) - Software Engineering (137 credits)

Program credit weight: 137-144 credits

Program credit weight for CEGEP students: 114-115 credits

Program credit weight for out-of-province students: 137-140 credits

This program offers students the opportunity to focus their studies on the skills needed to design and develop complex software systems. This emerging field of engineering is a major component of the growing Information Technology (IT) sector of the economy, in which the demand for qualified personnel continues to outstrip supply. Graduates of this program will have a solid foundation for careers in the software industry.

In addition to technical complementary courses, students take general complementary courses in social sciences, management studies, and humanities. These courses allow students to develop specific interests in areas such as psychology, economics, management, or political science.

Required Year 0 (Freshman) Courses

29 credits

Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credit for these Year 0 (Freshman) courses and enter a 112- to 115-credit program.

For information on transfer credit for French Baccalaureate, International Baccalaureate exams, Advanced Placement exams, Advanced Levels, and Science Placement Exams, see http://www.mcgill.ca/engineering/student/sao/newstudents/ and select your term of admission.

CHEM 110	(4)	General Chemistry 1
CHEM 120	(4)	General Chemistry 2
MATH 133	(3)	Linear Algebra and Geometry
MATH 140	(3)	Calculus 1
MATH 141	(4)	Calculus 2
PHYS 131	(4)	Mechanics and Waves
PHYS 142	(4)	Electromagnetism and Optics

AND 3 credits selected from the approved list of courses in Humanities and Social Sciences, Management Studies, and Law, listed below under Complementary Studies (Group B)

Note: FACC 100 (Introduction to the Engineering Profession) must be taken during the first year of study.

Required Courses

76 credits

COMP 202	(3)	Foundations of Programming
COMP 206	(3)	Introduction to Software Systems
COMP 250	(3)	Introduction to Computer Science
COMP 251	(3)	Algorithms and Data Structures
COMP 302	(3)	Programming Languages and Paradigms
COMP 360	(3)	Algorithm Design
COMP 421	(3)	Database Systems
ECSE 211	(3)	Design Principles and Methods
ECSE 221	(3)	Introduction to Computer Engineering
ECSE 321	(3)	Introduction to Software Engineering
ECSE 322	(3)	Computer Engineering
ECSE 323	(5)	Digital System Design
ECSE 414	(3)	Introduction to Telecommunication Networks

ECSE 420	(3)	Parallel Computing
ECSE 427	(3)	Operating Systems
ECSE 428	(3)	Software Engineering Practice
ECSE 429	(3)	Software Validation
ECSE 456	(3)	ECSE Design Project 1
ECSE 457	(3)	ECSE Design Project 2
FACC 100*	(1)	Introduction to the Engineering Profession
FACC 400	(1)	Engineering Professional Practice
MATH 262	(3)	Intermediate Calculus
MATH 263	(3)	Ordinary Differential Equations for Engineers
MATH 264	(3)	Advanced Calculus for Engineers
MATH 270	(3)	Applied Linear Algebra
MATH 363	(3)	Discrete Mathematics

* Note: FACC 100 (Introduction to the Engineering Profession) must be taken during the first year of study.

Engineering Breadth Required Courses

20 credits

CCOM 206	(3)	Communication in Engineering
ECSE 200	(3)	Electric Circuits 1
ECSE 210	(3)	Electric Circuits 2
ECSE 291	(2)	Electrical Measurements Laboratory
ECSE 305	(3)	Probability and Random Signals 1
ECSE 306	(3)	Fundamentals of Signals and Systems
FACC 300	(3)	Engineering Economy

PHIL 343	(3)	Biomedical Ethics
RELG 270	(3)	Religious Ethics and the Environment
SOCI 235	(3)	Technology and Society
SOCI 312	(3)	Sociology of Work and Industry
URBP 201	(3)	Planning the 21st Century City

* Note: Management courses have limited enrolment and registration dates. See Important Dates at http://www.mcgill.ca/importantdates.

Group B - Humanities and Social Sciences, Management Studies, and Law

3 credits at the 200 level or higher from the following departments:

Anthropology (ANTH)

Economics (any 200- or 300-level course excluding ECON 227 and ECON 337)

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

Psychology (excluding PSYC 204 and PSYC 305, but including PSYC 100)

Religious Studies (RELG)

School of Social Work (SWRK)

Sociology (excluding SOCI 350)

OR one of the following:

ARCH 528	(3)	History of Housing
BUSA 465*	(3)	Technological Entrepreneurship
ENVR 203	(3)	Knowledge, Ethics and Environment
ENVR 400	(3)	Environmental Thought
FACC 220	(3)	Law for Architects and Engineers
FACC 500	(3)	Technology Business Plan Design
FACC 501	(3)	Technology Business Plan Project
INDR 294*	(3)	Introduction to Labour-Management Relations
MATH 338	(3)	History and Philosophy of Mathematics
MGCR 222*	(3)	Introduction to Organizational Behaviour
	(3)	Marketing Management 1

817 Sherbrooke Street West
Montreal, Quebec H3A 0C3

Telephone: 514-398-6296
Fax: 514-398-7365
Website: *www.mcgill.ca/mecheng*

13.7.2 About the Department of Mechanical Engineering

Mechanical engineers are traditionally concerned with the conception, design, implementation, and operation of mechanical systems. Typical fields of work are aerospace, energy, manufacturing, machinery, and transportation. Because of the very broad nature of the discipline, there is usually a high demand for mechanical engineers.

Many mechanical engineers follow other career paths. Graduate studies are useful for the specialists working in research establishments, consulting firms, or in corporate research and development.

To prepare the mechanical engineer for a wide range of career possibilities, there is a heavy emphasis in our curriculum on the fundamental analytical disciplines. This is balanced by a sequence of experimental and design engineering courses, which include practice in design, manufacturing, and experimentation. In these courses, students learn how to apply their analytical groundwork to the solution of practical problems.

Concentrations in Aeronautical Engineering, Mechatronics*, and Design are available for students in either the regular or Honours program who wish to specialize in these areas.

While the program is demanding, there is time for many extracurricular activities. Students are active in such professional societies as CASI (Canadian Aeronautics and Space Institute), SAE (Society of Automotive Engineers), and ASME (American Society of Mechanical Engineers), and in various campus organizations.

Relations between faculty and students are extremely close. Social functions, at which students and professors meet to exchange views and get to know each other better, are organized frequently.

Note: * The Mechatronics Concentration will not be offered until further notice.

13.7.3 Department of Mechanical Engineering Faculty

Revision, August 2013. Start of revision.

Chair

Arun K. Misra

Emeritus Professors

Abdul M. Ahmed; B.Sc.(Dhaka), M.Eng., Ph.D.(McG.), Eng. (*Thomas W oq 12eme fundamental .929 317.772 0 1c B.Sc.(Dhaka), t/ e(Emeritus Pr)Tj1 0 0u1(ugust 20*

Professors

Wagdi G. Habashi; B.Eng., M.Eng.(McG.), Ph.D.(C'nell), ing., C.Q., F.R.S.C., F.C.A.E., F.A.I.A.A., F.A.S.M.E. (*NSERC-J. Armand Bombardier-Bell-Helicopter-CAE Industrial Research Chair*)

George Haller; M.S.(Budapest Tech.), Ph.D.(Calif. Tech.) (*Faculty of Engineering Distinguished Professor*)

Pascal Hubert; B.Eng., M.Sc.(École Poly., Montr.), Ph.D.(Br. Col.), ing. (*William Dawson Scholar*), *Aerospace Program Coordinator*

John H.S. Lee; B.Eng.(McG.), M.Sc.(MIT), Ph.D.(McG.), ing., F.R.S.C., F.C.A.E.

Arun K. Misra; B.Tech.(IIT, Kharagpur), Ph.D.(Br. Col.), P.Eng., F.A.A.S., F.A.I.A.A., F.C.A.E. (*Thomas Workman Professor of Mechanical Engineering*)

Luc Mongeau; B.Sc., M.Sc.(École Poly., Montr.), Ph.D.(Penn. St.), ing., A.S.A., S.A.E., A.S.M.E., A.I.A.A. (*Tier 1 Canada Research Chair*), *Graduate Program Director*

Meyer Nahon; B.Sc.(Qu.), M.Sc.(Tor.), Ph.D.(McG.), ing., A.F.A.I.A.A.

Associate Professors

Francois Barthelat; M.Sc.(Roch.), Ph.D.(N'western), ing.

Jeffrey M. Bergthorson; B.Sc.(Manit.), M.Sc., Ph.D.(Calif. Tech.), P.Eng.

Luca Cortelezzi; M.Sc., Ph.D.(Calif. Tech.)

David L. Frost; B.A.Sc.(Br. Col.), M.S., Ph.D.(Calif. Tech.), P.Eng.

Andrew J. Higgins; B.Sc.(Ill.), M.S., Ph.D.(Wash.)

Michael Kokkolaras; Dipl. Aerospace Eng.(Tech. Univ. Munich), Ph.D.(Rice)

Jozsef Kövecses; M.Sc.(U. Miskolc), Ph.D.(Hung. Acad. Sci.), ing.

Tim Lee; M.S.(Port. St.), Ph.D.(Idaho)

Larry B. Lessard; B.Eng.(McG.), M.Sc., Ph.D.(Stan.), ing., *Undergraduate Program Director*

Rosaire Mongrain; B.Sc., M.Sc.(Montr.), Ph.D.(École Poly., Montr.), ing. (*William Dawson Scholar*)

Laurent Mydlarski; B.A.Sc.(Wat.), Ph.D.(C'nell), ing.

Siva Nadarajah; B.Sc.(Math), B.Sc.(Aero.Eng.)(Kansas), M.Sc., Ph.D.(Stan.), *Director, Graduate Admissions and Scholarships*

Damiano Pasini; M.Sc.(Pavia), Ph.D.(Brist.), ing.

Peter Radziszewski; B.A.Sc.(Br. Col.), M.Sc., Ph.D.(Laval), ing.

Course Lecturers
Josef Slanik
Dino Zorbas

Revision, August 2013. End of revision.

13.7.4 Bachelor of Engineering (B.Eng.) - Mechanical Engineering (142 credits)

Program credit weight: 142-148 credits

Program credit weight for CEGEP students: 119 credits

Program credit weight for out-of-province students: 142 credits

To prepare the mechanical engineer for a wide range of career possibilities, there is a heavy emphasis in our curriculum on the fundamental analytical disciplines. This is balanced by a sequence of experimental and design engineering courses which include practice in design, manufacturing, and experimentation. In these courses, students learn how to apply their analytical groundwork to the solution of practical problems.

Special interests are satisfied by selecting appropriate complementary courses from among those offered with a specific subject concentration, such as management, industrial engineering, computer science, controls and robotics, bio-engineering, aeronautics, combustion, systems engineering, etc.

Required Year 0 (Freshman) Courses

29 credits

Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credit for these Year 0 (Freshman) courses and enter a 118-credit program.

For information on transfer credit for French Baccalaureate, International Baccalaureate exams, Advanced Placement exams, Advanced Le

* Note: FACC 100 (Introduction to the Engineering Profession) must be taken during the first year of study.

Required Mechanical Engineering Courses

MECH 544	(3)	Processing of Composite Materials
MECH 553	(3)	Design and Manufacture of Microdevices
MECH 557	(3)	Mechatronic Design
MECH 563*	(3)	Biofluids and Cardiovascular Mechanics
MECH 565	(3)	Fluid Flow and Heat Transfer Equipment
MECH 573	(3)	Mechanics of Robotic Systems
MECH 577	(3)	Optimum Design
MECH 593	(3)	Design Theory and Methodology

* Students select either CHEE 563 or MECH 563.

3 credits chosen from courses at the 300 level or higher (approved by the Department) in the Faculty of Engineering (including MECH courses) or from courses in the Faculty of Science, including MATH courses.

Complementary Studies

6 credits

Group A - Impact of Technology on Society

3 credits from the following:

ANTH 212	(3)	Anthropology of Development
BTEC 502	(3)	Biotechnology Ethics and Society
CIVE 469	(3)	Infrastructure and Society
ECON 225	(3)	Economics of the Environment
ECON 347	(3)	Economics of Climate Change
ENVR 201	(3)	Society, Environment and Sustainability
GEOG 200	(3)	Geographical Perspectives: World Environmental Problems
GEOG 203	(3)	Environmental Systems
GEOG 205	(3)	Global Change: Past, Present and Future
GEOG 302	(3)	Environmental Management 1
MECH 526	(3)	Manufacturing and the Environment
MGPO 440*	(3)	Strategies for Sustainability
MIME 308	(3)	Social Impact of Technology
PHIL 343	(3)	Biomedical Ethics
RELG 270	(3)	Religious Ethics and the Environment
SOCI 235	(3)	Technology and Society
SOCI 312	(3)	Sociology of Work and Industry
URBP 201	(3)	Planning the 21st Century City

* Note: Management courses have limited enrolment and registration dates. See Important Dates at http://www.mcgill.ca/importantdates.

Group B - Humanities 1 311.62ll15N1ences,

Religious Studies (RELG)

School of Social Work (SWRK)

Sociology (excluding SOCI 350)

OR one of the following:

ARCH 528	(3)	History of Housing
BUSA 465*	(3)	Technological Entrepreneurship
ENVR 203	(3)	Knowledge, Ethics and Environment
ENVR 400	(3)	Environmental Thought
FACC 220	(3)	Law for Architects and Engineers
FACC 500	(3)	Technology Business Plan Design
FACC 501	(3)	Technology Business Plan Project
INDR 294*	(3)	Introduction to Labour-Management Relations
MATH 338	(3)	History and Philosophy of Mathematics
MGCR 222*	(3)	Introduction to Organizational Behaviour
MGCR 352*	(3)	Marketing Management 1
ORGB 321*	(3)	Leadership
ORGB 423*	(3)	Human Resources Management

* Note: Management courses have limited enrolment and registration dates. See Important Dates at http://www.mcgill.ca/importantdates.

Language Courses

If you are not proficient in a certain language, no more than 3 credits will be given for one 6-credit course at the 100 level or higher in that language. A maximum of 3 credits of language courses will be counted toward the Complementary Studies requirement.

However, 3-6 credits may be given for language courses at the 200 level or higher that have a sufficient cultural component. These courses must be approved by the McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22).

Elective Courses

0-6 credits

Students from Quebec CEGEPs must take 6 credits of courses at the 200 level or higher from the following faculties/schools:

Desautels Faculty of Management

Faculty of Agricultural and Environmental Sciences

Faculty of Arts

Faculty of Engineering

Faculty of Religious Studies

Faculty of Science

Schulich School of Music

Typical Program of Study

Students entering the program from Quebec CEGEPs follow a different curriculum from those entering from outside the province. Students will be advised by the Department as to which courses they should select from the course lists above.

For a detailed curriculum, please see http://www.mcgill.ca/mecheng/undergrad/curriculum.

For all minors and concentrations, students should complete a Course Authorization Form, available from the McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22) or from the Undergraduate Program Coordinator, indicating their intention to take the minor or concentration.

13.7.5 Bachelor of Engineering (B.Eng.) - Honours Mechanical Engineering (142 credits)

Program credit weight: 142-148 credits

Program credit weight for CEGEP students: 119 credits

Program credit weight for out-of-province students: 142 credits

To prepare the mechanical engineer for a wide range of career possibilities, there is a heavy emphasis in our curriculum on the fundamental analytical disciplines. This is balanced by a sequence of experimental and design Engineering courses, which include practice in design, manufacturing, and experimentation. In these courses, students learn how to apply their analytical groundwork to the solution of practical problems.

The Honours program is particularly suitable for those with a high aptitude in mathematics and physics and gives a thorough grounding in the basic engineering sciences.

Special interests are satisfied by selecting appropriate complementary courses from among those offered with a specific subject concentration, such as management, industrial engineering, computer science, controls and robotics, bio-engineering, aeronautics, combustion, systems engineering, etc.

Required Year 0 (Freshman) Courses

29 credits

Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credit for these Year 0 (Freshman) courses and enter a 119-credit program.

For information on transfer credit for French Baccalaureate, International Baccalaureate exams, Advanced Placement exams, Advanced Levels, and Science Placement Exams, see http://www.mcgill.ca/engineering/student/sao/newstudents and select your term of admission.

(4) General Chemistry 1

MECH 290	(3)	Design Graphics for Mechanical Engineering
MECH 292	(3)	Conceptual Design
MECH 309	(3)	Numerical Methods in Mechanical Engineering
MECH 321	(3)	Mechanics of Deformable Solids
MECH 331	(3)	Fluid Mechanics 1
MECH 341	(3)	Thermodynamics 2
MECH 346	(3)	Heat Transfer
MECH 360	(3)	Principles of Manufacturing
MECH 362	(2)	Mechanical Laboratory 1
MECH 383	(3)	Applied Electronics and Instrumentation
MECH 403D1	(3)	Thesis (Honours)
MECH 403D2	(3)	Thesis (Honours)
MECH 404	(3)	Honours Thesis 2
MECH 419	(4)	Advanced Mechanics of Systems
MECH 430	(3)	Fluid Mechanics 2
MECH 494	(3)	Honours Design Project

Technical Complementary Courses

18 credits

3 credits from the following, chosen with the approval of either the thesis supervisor or the coordinator of the Honours program, when a thesis supervisor has not yet been secured:

MATH 327	(3)	Matrix Numerical Analysis
MATH 381	(3)	Complex Variables and Transforms
MATH 417	(3)	Mathematical Programming

6 credits from the following:

MECH 513	(3)	Control Systems
MECH 546	(3)	Finite Element Methods in Solid Mechanics
MECH 562	(3)	Advanced Fluid Mechanics
MECH 577*	(3)	Optimum Design
MECH 578	(3)	Advanced Thermodynamics
MECH 579*	(3)	Multidisciplinary Design Optimization

* Note: Students select either MECH 577 or MECH 579

6 credits at the 300 level or higher, chosen from Mechanical Engineering courses (subject code MECH). One of these two courses (3 credits) must be from the following list:

CHEE 563*	(3)	Biofluids and Cardiovascular Mechanics
MECH 497	(3)	Value Engineering
MECH 498	(3)	Interdisciplinary Design Project 1
MECH 499	(3)	Interdisciplinary Design Project 2
MECH 513	(3)	Control Systems
		Discrete Manuf

MECH 532	(3)	Aircraft Performance, Stability and Control
MECH 535	(3)	Turbomachinery and Propulsion
MECH 536	(3)	Aircraft Structures
MECH 541	(3)	Kinematic Synthesis
MECH 543	(3)	Design with Composite Materials
MECH 544	(3)	Processing of Composite Materials
MECH 553	(3)	Design and Manufacture of Microdevices
MECH 557	(3)	Mechatronic Design
MECH 563*	(3)	Biofluids and Cardiovascular Mechanics
MECH 565	(3)	Fluid Flow and Heat Transfer Equipment
MECH 573	(3)	Mechanics of Robotic Systems
MECH 577*	(3)	Optimum Design
MECH 593	(3)	Design Theory and Methodology

*Students choose either CHEE 563 or MECH 563

3 credits chosen from courses at the 300-level or higher (approved by the Department) in the Faculty of Engineering (including MECH courses) or from MIME 260 or from courses at the 300 level or higher in the Faculty of Science, including MATH courses.

Complementary Studies

6 credits

Group A - Impact of Technology on Society

3 credits from the following:

ANTH 212	(3)	Anthropology of Development
BTEC 502	(3)	Biotechnology Ethics and Society
CIVE 469	(3)	Infrastructure and Society
ECON 225	(3)	Economics of the Environment
ECON 347	(3)	Economics of Climate Change
ENVR 201	(3)	Society, Environment and Sustainability
GEOG 200	(3)	Geographical Perspectives: World Environmental Problems
GEOG 203	(3)	Environmental Systems
GEOG 205	(3)	Global Change: Past, Present and Future
GEOG 302	(3)	Environmental Management 1
MECH 526	(3)	Manufacturing and the Environment
MGPO 440*	(3)	Strategies for Sustainability
MIME 308	(3)	Social Impact of Technology
PHIL 343	(3)	Biomedical Ethics
RELG 270	(3)	Religious Ethics and the Environment
SOCI 235	(3)	Technology and Society
SOCI 312	(3)	Sociology of Work and Industry
URBP 201	(3)	Planning the 21st Century City

* Note: Management courses have limited enrolment and registration dates. See Important Dates at http://www.mcgill.ca/importantdates.

Group B: Humanities and Social Sciences, Management Studies and Law

3 credits at the 200 level or higher from the following departments:

Anthropology (ANTH)

Economics (any 200- or 300-level course excluding ECON 227 and ECON 337)

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

Psychology (excluding PSYC 204 and PSYC 305, but including PSYC 100)

For all minors and concentrations, students should complete a Course Authorization Form, available from the McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22) or from the Undergraduate Program Coordinator, indicating their intention to take the minor or concentration.

13.7.6 Bachelor of Engineering (B.Eng.) - Mechanical Engineering - Aeronautical Engineering (15 credits)

Students in this concentration take five courses in the area of Aeronautical Engineering. All courses must be passed with a grade of C or better.

Students should discuss their course selection with their adviser and complete a Course Authorization Form, available from the the McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22) or from the Undergraduate Program Coordinator, indicating their intention to take the concentration.

Required Courses

6 credits

MECH 532	(3)	Aircraft Performance, Stability and Control
MECH 533	(3)	Subsonic Aerodynamics

Complementary Courses

9 credits

3-6 credits from the following:

MECH 535	(3)	Turbomachinery and Propulsion
MECH 536	(3)	Aircraft Structures

3-6 credits from the following:

MECH 537	(3)	High-Speed Aerodynamics
MECH 538	(3)	Unsteady Aerodynamics
MECH 539	(3)	Computational Aerodynamics
MECH 565	(3)	Fluid Flow and Heat Transfer Equipment
MECH 566	(3)	Fluid-Structure Interactions

13.7.7 Bachelor of Engineering (B.Eng.) - Honours Mechanical Engineering - Aeronautical Engineering (15 credits)

Students in this concentration take five courses in the area of aeronautical engineering. All courses must be passed with a grade of C or better.

Students should discuss their course selection with their adviser and complete a Course Authorization Form, available from thethe McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22) or from the Undergraduate Program Coordinator, indicating their intention to take the concentration.

Required Courses

6 credits

MECH 532	(3)	Aircraft Performance, Stability and Control
MECH 533	(3)	Subsonic Aerodynamics

Complementary Courses

9 credits

3-6 credits from the following:

MECH 535	(3)	Turbomachinery and Propulsion
MECH 536	(3)	Aircraft Structures

3-6 credits from the following:

MECH 537	(3)	High-Speed Aerodynamics
MECH 538	(3)	Unsteady Aerodynamics
MECH 539	(3)	Computational Aerodynamics
MECH 565	(3)	Fluid Flow and Heat Transfer Equipment
MECH 566	(3)	Fluid-Structure Interactions

13.7.8 Bachelor of Engineering (B.Eng.) - Mechanical Engineering - Design (15 credits)

Students in this concentration take five courses in the area of design, including the completion of an interdisciplinary project.

Students should complete a Course Authorization Form, available from the McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22) or from the Undergraduate Program Coordinator, indicating their intention to take the concentration.

Total concentration credit weight: 15-16 credits

Required Courses

6 credits

MECH 498	(3)	Interdisciplinary Design Project 1
MECH 499	(3)	Interdisciplinary Design Project 2

Complementary Courses

9-10 credits from the following:

ARCH 515	(3)	Sustainable Design
CHEE 453	(4)	Process Design
MECH 497	(3)	Value Engineering
MECH 526	(3)	Manufacturing and the Environment
MECH 528	(3)	Product Design
MECH 530	(3)	Mechanics of Composite Materials
MECH 541	(3)	Kinematic Synthesis
MECH 543	(3)	Design with Composite Materials
MECH 557	(3)	Mechatronic Design
MECH 565	(3)	Fluid Flow and Heat Transfer Equipment
MECH 576	(3)	Geometry in Mechanics
MECH 577	(3)	Optimum Design
MECH 579	(3)	Multidisciplinary Design Optimization
MECH 593	(3)	Design Theory and Methodology

13.7.9 Bachelor of Engineering (B.Eng.) - Honours Mechanical Engineering - Design (15 credits)

Students in this concentration take five courses in the area of design, including the completion of an interdisciplinary project.

Students should complete a Course Authorization Form, available from the McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22) or from the Undergraduate Program Coordinator, indicating their intention to take the concentration.

Total concentration credit weight: 15-16 credits

Required Courses

6 credits

MECH 498	(3)	Interdisciplinary Design Project 1
MECH 499	(3)	Interdisciplinary Design Project 2

Complementary Courses

9-10 credits from the following:

ARCH 515	(3)	Sustainable Design
CHEE 453	(4)	Process Design
MECH 497	(3)	Value Engineering
MECH 526	(3)	Manufacturing and the Environment
MECH 528	(3)	Product Design
MECH 530	(3)	Mechanics of Composite Materials
MECH 541	(3)	Kinematic Synthesis
MECH 543	(3)	Design with Composite Materials
MECH 557	(3)	Mechatronic Design
MECH 565	(3)	Fluid Flow and Heat Transfer Equipment
MECH 576	(3)	Geometry in Mechanics
MECH 577	(3)	Optimum Design
MECH 579	(3)	Multidisciplinary Design Optimization
MECH 593	(3)	Design Theory and Methodology

13.7.10 Bachelor of Engineering (B.Eng.) - Mechanical Engineering - Mechatronics (18 credits)

Not offered until further notice.

Students in this concentration take six courses in the area of control, robotics, and/or CAD/CAM.

Students should complete a Course Authorization Form, available fromthe McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22) or from the Undergraduate Program Coordinator, indicating their intention to take the concentration.

Required Courses

12 credits

MECH 513	(3)	Control Systems
MECH 554	(3)	Microprocessors for Mechanical Systems
MECH 557	(3)	Mechatronic Design
MECH 572	(3)	Introduction to Robotics

Complementary Courses

6 credits from the following:

MECH 528	(3)	Product Design
MECH 541	(3)	Kinematic Synthesis
MECH 573	(3)	Mechanics of Robotic Systems
MECH 576	(3)	Geometry in Mechanics

13.7.11 Bachelor of Engineering (B.Eng.) - Honours Mechanical Engineering - Mechatronics (18 credits)

Not offered until further notice.

Students in this concentration take six courses in the area of control, robotics, and/or CAD/CAM.

Students should complete a Course Authorization Form, available from the Student Affairs Office (Engineering Student Centre) or from the Undergraduate Program Coordinator, indicating their intention to take the concentration.

Required Courses

12 credits

MECH 513	(3)	Control Systems
MECH 554	(3)	Microprocessors for Mechanical Systems
MECH 557	(3)	Mechatronic Design
MECH 572	(3)	Introduction to Robotics

Complementary Courses

6 credits from the following:

MECH 528	(3)	Product Design
MECH 541	(3)	Kinematic Synthesis
MECH 573	(3)	Mechanics of Robotic Systems
		Geometry in Mechanics

13.8.2.1 Scholarships

The Department offers renewable Entrance Scholarships every year. A substantial number of other scholarships and bursaries are also awarded by the Department as well as by the Canadian Mineral Industry Education Foundation.

13.8.3 Department of Mining and Materials Engineering Faculty

Revision, August 2013. Start of revision.

Chair

Stephen Yue

Associate Chair, Student Affairs

Mathieu Brochu

Associate Chair, Research

James A. Finch

Associate Chair, Graduate Studies

George P. Demopoulos

Emeritus Professors

John E. Gruzleski; B.Sc., M.Sc.(Qu.), Ph.D.(Tor.), Eng., F.C.I.M., F.A.S.M. (*Gerald G. Hatch Emeritus Professor*)

John J. Jonas; B.Eng.(McG.), Ph.D.(Camb.), Eng., F.A.S.M., F.R.S.C. (*Henry Birks Emeritus Professor*)

Gordon W. Smith; B.Eng., M.Eng., Ph.D.(McG.), Eng.

Professors

George P. Demopoulos; Dipl.Eng.(NTU Athens), M.Sc., Ph.D.(McG.), Eng., F.C.I.M. (*Gerald Hatch Faculty Fellow*) (*on leave 2013–2014*)

Roussos Dimitrakopoulos; B.Sc.(Thessaloniki), M.Sc.(Alta.), Ph.D.(École Poly., Montr.) (*Canada Research Chair I*)

James A. Finch; B.Sc.(Birm.), M.Eng., Ph.D.(McG.), Eng., F.C.I.M., F.R.S.C. (*Gerald G. Hatch Professor*)

Raynald Gauvin; B.Ing., Ph.D.(Montr.), Eng.

Roderick I.L. Guthrie; B.Sc., Ph.D.(Lond.), D.I.C., A.R.S.M., Eng., F.C.I.M., R.R.S.C. (*William C. Macdonald Professor*)

Faramarz (Ferri) P. Hassani; Ph.D.(Nott.), C.Eng.(U.K. Reg.) (*George Boyd Webster Professor*)

Hani S. Mitri; B.Sc.(Cairo), M.Eng., Ph.D.(McM.), Eng.

Stephen Yue; B.Sc., Ph.D.(Leeds) (*James McGill Professor*) (*Lorne Trottier Chair in Aerospace Engineering*)

Associate Professors

Mathieu Brochu; B.Eng.(Laval), Ph.D.(McG.) (*Canada Research Chair II*)

Richard Chromik; B.Sc.(Penn. St.), M.Sc., Ph.D.(SUNY)

Mainul Hasan; B.Eng.(Dhaka), M.Sc.(Dhahran), Ph.D.(McG.)

Mustafa Kumral; B.Eng.(Hacettepe), M.Eng.(Cukurova), Ph.D.(Leeds)

Frank Mucciardi; B.Eng., M.Eng., Ph.D.(McG.), Eng.

Showan Nazhat; B.Eng., M.Sc., Ph.D.(Lond.) (*Gerald Hatch Faculty Fellow*), *Associate Dean, Research and Graduate Education*

Mihriban Pekguleryuz; B.Eng., M.Eng.(Flor.), Ph.D.(McG.)

Assistant Professors

Kirk Bevan; Ph.D.(Purd.)

Marta Cerruti; B.Sc., Ph.D., Laurea in Chemistry (Torino)

In-Ho Jung; B.Sc.(POSTECH), Ph.D.(École Poly., Montr.) (*Gerald Hatch Faculty Fellow*) (*William Dawson Scholar*)

Jun Song; Ph.D., M.Sc.(Princ.)

Assistant Professors

Nathaniel Quitoriano; B.Sc.(Calif., Berk.), Ph.D.(MIT)

Kristian Waters; M.Sc., M.Eng.(Manc.), Ph.D.(Birm.)

Faculty Lecturer

Florence Paray; B.Eng.(CSP), M.Eng., Ph.D.(McG.)

Course Lecturer

Bruno Benedetto

Adjunct Professors

Mostafa Benzaazoua

Marc Bétournay

Martin Bureau

Robin A.L. Drew

Daryoush Emadi

Elhachmi Essadiqi

Carlton Fuerst

Mory Ghomshei

Bryn Harris

Ahmad Hemami

Wynand J. Kleingeld

Eric Lifshin

Arun Mujumdar

Jan Nessett

Joe Stachulak

Karim Zaghib

Co-op Program Liaison Officers

Teresa Barrett (Mining)

Genevieve Snider (Materials)

Revision, August 2013. End of revision.

13.8.4 About Materials Engineering

13.8.4.1 Materials Engineering (Co-op)

The Materials Engineering degree is a cooperative program leading to a B.Eng. and includes formal industrial work periods. It is built on a strong background of mathematics, basic sciences, computer skills and applications, and specific engineering and design courses to provide up-to-date training in materials engineering. Students take core courses covering processing, fabrication, applications, and performance of materials, namely metals, ceramics, polymers, and composites. The program is fully accredited by the Canadian Engineering Accreditation Board (CEAB) and is designed to offer students exceptional training for employment in the field. The core courses are supplemented by complementary courses, which provide a diverse selection of specialties for the graduating engineer. The course structure is reinforced with laboratory exercises. Graduates find employment in a wide range of industries, including the resource and manufacturing sectors. Students in the Co-op program benefit from practical learning experience gained from work-term employment in meaningful engineering jobs, as well as non-tangible learning experiences arising from the responsibilities required to obtain and successfully complete the work terms.

Regarding the Co-op program fees, an amount of $200 will be billed during ten consecutive terms for a total amount of $2,000 before graduation. These fees cover expenses directly related to the operation of the Co-op program. Students must register for each of their industrial training courses within the university registration period for returning students or late fees will apply. Before registering for any work term course, students must contact the Materials Co-op Liaison Officer for approval.

13.8.4.2 Student Advising

Students entering this program must plan their schedule of studies in consultation with one of the departmental advisers. Appointments may be obtained by contacting the Administrative and Student Affairs Coordinator.

13.8.4.3 Bachelor of Engineering (B.Eng.) - Materials Engineering CO-OP (148 credits)

Revision, June 2013. Start of revision.

Program credit weight: 148 credits

Program credit weight for CEGEP students: 119 credits

In addition to regular courses and laboratories, the B.Eng. Materials Engineering curriculum includes seminars, colloquia, and student projects reinforced by field trips to industrial operations.

Students entering this program must plan their schedule of studies in consultation with a departmental adviser.

Required Year 0 (Freshman) Courses

29 credits

Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credit for these Year 0 (Freshman) courses and enter a 119-credit program.

For information on transfer credit for French Baccalaureate, International Baccalaureate exams, Advanced Placement exams, Advanced Lev

68 credits

ECSE 461*	(3)	Electric Machinery
MIME 209	(3)	Mathematical Applications
MIME 212	(3)	Engineering Thermodynamics
MIME 250	(3)	Introduction to Extractive Metallurgy
MIME 261	(3)	Structure of Materials
MIME 280	(2)	Industrial Training 1
MIME 311	(3)	Modelling and Automatic Control
MIME 317	(3)	Analytical and Characterization Techniques
MIME 341	(3)	Introduction to Mineral Processing
MIME 345	(3)	Applications of Polymers
MIME 350	(3)	Extractive Metallurgical Engineering
MIME 352	(3)	Hydrochemical Processing
MIME 356	(4)	Heat, Mass and Fluid Flow
MIME 360	(3)	Phase Transformations: Solids
MIME 362	(3)	Mechanical Properties
MIME 380	(2)	Industrial Training 2
MIME 442	(3)	Analysis, Modelling and Optimization in Mineral Processing
MIME 452	(4)	Process and Materials Design
MIME 455	(3)	Advanced Process Engineering
MIME 456	(3)	Steelmaking and Steel Processing
MIME 465	(3)	Metallic and Ceramic Powders Processing
MIME 467	(3)	Electronic Properties of Materials
MIME 480	(2)	Industrial Training 3

Complementary Courses

18 credits

Technical Complementaries

12 credits

9-12 credits from the following:

CHEE 515*	(3)	Material Surfaces: A Biomimetic Approach
CIVE 512	(3)	Advanced Civil Engineering Materials
MECH 530	(3)	Mechanics of Composite Materials
MIME 410	(3)	Research Project
MIME 470	(3)	Engineering Biomaterials
MIME 512	(3)	Corrosion and Degradation of Materials
MIME 515*	(3)	Material Surfaces: A Biomimetic Approach
MIME 542	(3)	Transmission Electron Microscopy
MIME 544	(3)	Analysis: Mineral Processing Systems 1
MIME 545	(3)	Analysis: Mineral Processing Systems 2
MIME 551	(3)	Electrochemical Processing
MIME 556	(3)	Sustainable Materials Processing

MIME 558	(3)	Engineering Nanomaterials
MIME 559	(3)	Aluminum Physical Metallurgy
MIME 560	(3)	Joining Processes
MIME 561	(3)	Advanced Materials Design
MIME 563	(3)	Hot Deformation of Metals
MIME 565	(3)	Aerospace Metallic-Materials and Manufacturing Processes
MIME 568	(3)	Topics in Advanced Materials
MIME 569	(3)	Electron Beam Analysis of Materials
MIME 570	(3)	Micro- and Nano-Fabrication Fundamentals
MIME 571	(3)	Surface Engineering
MIME 572	(3)	Computational Thermodynamics
MIME 573	(3)	Computational Materials Design

* Students choose either CHEE 515 or MIME 515

0-3 credits from the following:

BMDE 504	(3)	Biomaterials and Bioperformance
CHEM 574	(3)	Introductory Polymer Chemistry
CHEM 585	(3)	Colloid Chemistry
PHYS 558	(3)	Solid State Physics

Complementary Studies

6 credits

Group A - Impact of Technology on Society

3 credits from the following:

ANTH 212	(3)	Anthropology of Development
BTEC 502	(3)	Biotechnology Ethics and Society
CIVE 469	(3)	Infrastructure and Society
ECON 225	(3)	Economics of the Environment
ECON 347	(3)	Economics of Climate Change
ENVR 201	(3)	Society, Environment and Sustainability
GEOG 200	(3)	Geographical Perspectives: World Environmental Problems
GEOG 203	(3)	Environmental Systems
GEOG 205	(3)	Global Change: Past, Present and Future
GEOG 302	(3)	Environmental Management 1
MECH 526	(3)	Manufacturing and the Environment
MGPO 440*	(3)	Strategies for Sustainability
MIME 308	(3)	Social Impact of Technology
PHIL 343	(3)	Biomedical Ethics
RELG 270	(3)	Religious Ethics and the Environment
SOCI 235	(3)	Technology and Society
SOCI 312	(3)	Sociology of Work and Industry

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* Management courses have limited enrolment and registration dates. See Important Dates at http://www.mcgill.ca/importantdates.

Group B - Humanities and Social Sciences, Management Studies, and Law

3 credits at the 200 level or higher from the following departments:

Anthropology (ANTH)

Economics (any 200- or 300-level course excluding ECON 227 and ECON 337)

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

Psychology (excluding PSYC 204 and PSYC 305, but including PSYC 100)

Religious Studies (RELG)

School of Social Work (SWRK)

Sociology (excluding SOCI 350)

OR one of the following:

ARCH 528	(3)	History of Housing
BUSA 465*	(3)	Technological Entrepreneurship
ENVR 203	(3)	Knowledge, Ethics and Environment
ENVR 400	(3)	Environmental Thought
FACC 220	(3)	Law for Architects and Engineers
FACC 500	(3)	Technology Business Plan Design
FACC 501	(3)	Technology Business Plan Project
INDR 294*	(3)	Introduction to Labour-Management Relations
MATH 338	(3)	History and Philosophy of Mathematics
MGCR 222*	(3)	Introduction to Organizational Behaviour
MGCR 352*	(3)	Marketing Management 1
ORGB 321*	(3)	Leadership

Students must register for each work term (MIME 290, MIME 291, MIME 392, MIME 494) and pay associated fees by the Course Change (add/drop) registration deadline or else late fees will apply. Before registering for any work term course, students must contact the Mining Co-op Liaison Officer for approval.

13.8.5.2 Student Advising

Students entering this program must plan their schedule of studies in consultation with one of the departmental advisers: Professor Ferri Hassani or Professor Hani Mitri.

13.8.5.3 Bachelor of Engineering (B.Eng.) - Mining Engineering CO-OP (150 credits)

Revision, June 2013. Start of revision.

Program credit weight: 150-152 credits

Program credit weight for CEGEP students: 121-123 credits

In addition to regular courses and laboratories, the curriculum of the B.Eng. Mining Engineering Co-op program includes seminars, colloquia, and student projects reinforced by field trips to industrial operations.

Students entering this program must plan their schedule of studies in consultation with a departmental adviser.

Required Year 0 (Freshman) Courses

29 credits

Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credit for these Year 0 (Freshman) courses and enter a 121- to 123-credit program.

For information on transfer credit for French Baccalaureate, International Baccalaureate exams, Advanced Placement exams, Advanced Levels, and Science Placement Exams, see http://www.mcgill.ca/engineering/student/sao/newstudents and select your term of admission.

CHEM 110	(4)	General Chemistry 1
CHEM 120	(4)	General Chemistry 2
MATH 133	(3)	Linear Algebra and Geometry
MATH 140	(3)	Calculus 1
MATH 141	(4)	Calculus 2
PHYS 131	(4)	Mechanics and Waves
PHYS 142	(4)	Electromagnetism and Optics

AND 3 credits selected from the approved list of courses in Humanities and Social Sciences, Management Studies, and Law, listed below under Complementary Studies (Group B)

Note: FACC 100 (Introduction to the Engineering Profession) must be taken during the first year of study.

Required Non-Departmental Courses

34 credits

CCOM 206	(3)	Communication in Engineering
CIVE 205	(3)	Statics
CIVE 207	(4)	Solid Mechanics
COMP 208	(3)	Computers in Engineering
EPSC 221	(3)	General Geology
EPSC 225	(1)	Properties of Minerals
FACC 100*	(1)	Introduction to the Engineering Profession
FACC 300	(3)	Engineering Economy
FACC 400	(1)	Engineering Professional Practice
MATH 262	(3)	Intermediate Calculus
MATH 263	(3)	Ordinary Differential Equations for Engineers
MATH 264	(3)	Advanced Calculus for Engineers
MECH 289	(3)	Design Graphics

* Note: FACC 100 (Introduction to the Engineering Profession) must be taken during the first year of study.

Required Mining Engineering Courses

62 credits

ECSE 461	(3)	Electric Machinery
MIME 200	(3)	Introduction to the Minerals Industry
MIME 203	(2)	Mine Surveying
MIME 209	(3)	Mathematical Applications
MIME 260	(3)	Materials Science and Engineering
MIME 290	(2)	Industrial Work Period 1
MIME 291	(2)	Industrial Work Period 2
MIME 322	(3)	Rock Fragmentation
MIME 323	(3)	Rock and Soil Mass Characterization
MIME 325	(3)	Mineral Industry Economics
MIME 333	(3)	Materials Handling
MIME 340	(3)	Applied Fluid Dynamics
MIME 341	(3)	Introduction to Mineral Processing
MIME 392	(2)	Industrial Work Period 3
MI41 333	(3)	Str 0 0iTj1 0 0 68.l5949 453.221 Tgctri(MiPlan Minitak)Tj1 0 0 02.358949 453.221 TWtak

MI41 209 (3)

MI4E6325 MiDesignock aFeasibilityiSt stral j(Eling)Tj1 0 0 1 165.839 504.861 T(6(3)

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CIVE 311	(4)	Geotechnical Mechanics
MIME 329	(2)	Mining Geology
MIME 421	(3)	Rock Mechanics

Technical Complementaries

8-9 credits

Courses can be chosen from the following or from any other approved technical courses in Engineering, Management, or Science.

Note: Not all courses are given annually; see the "Courses" section of this publication to know if a course is offered.

MIME 320	(3)	Extraction of Energy Resources
MIME 350	(3)	Extractive Metallurgical Engineering
MIME 442	(3)	Analysis, Modelling and Optimization in Mineral Processing
MIME 484	(3)	Mining Project
MIME 494	(2)	Industrial Work Period 4
MIME 520	(3)	Stability of Rock Slopes
MIME 521	(3)	Stability of Underground Openings
MIME 526	(3)	Mineral Economics
MIME 527	(3)	Selected Topics in Mineral Resource Engineering
MIME 544	(3)	Analysis: Mineral Processing Systems 1
MIME 545	(3)	Analysis: Mineral Processing Systems 2
MIME 588	(3)	Reliability Analysis: Mining Systems
MPMC 320*	(3)	CAO et informatique pour les mines

* Mining course taken at École Polytechnique

Complementary Studies

6 credits

Group A - Impact of Technology on Society

3 credits from the following:

ANTH 212	(3)	Anthropology of Development
BTEC 502	(3)	Biotechnology Ethics and Society
CIVE 469	(3)	Infrastructure and Society
ECON 225	(3)	Economics of the Environment
ECON 347	(3)	Economics of Climate Change
ENVR 201	(3)	Society, Environment and Sustainability
GEOG 200	(3)	Geographical Perspectives: World Environmental Problems
GEOG 203	(3)	Environmental Systems
GEOG 205	(3)	Global Change: Past, Present and Future
GEOG 302	(3)	Environmental Management 1
MECH 526	(3)	Manufacturing and the Environment
MGPO 440*	(3)	Strategies for Sustainability
MIME 308	(3)	Social Impact of Technology
PHIL 343	(3)	Biomedical Ethics
RELG 270	(3)	Religious Ethics and the Environment

SOCI 235	(3)	Technology and Society
SOCI 312	(3)	Sociology of Work and Industry
URBP 201	(3)	Planning the 21st Century City

* Note: Management courses have limited enrolment and registration dates. See Important Dates at http://www.mcgill.ca/importantdates.

Group B - Humanities and Social Sciences, Management Studies, and Law

3 credits at the 200 level or higher from the following departments:

Anthropology (ANTH)

Economics (any 200- or 300-level course excluding ECON 227 and ECON 337)

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

Psychology (excluding PSYC 204 and PSYC 305, but including PSYC 100)

Religious Studies (RELG)

School of Social Work (SWRK)

Sociology (excluding SOCI 350)

OR one of the following:

ARCH 528	(3)	History of Housing
BUSA 465*	(3)	Technological Entrepreneurship
ENVR 203	(3)	Knowledge, Ethics and Environment
ENVR 400	(3)	Environmental Thought
FACC 220	(3)	Law for Architects and Engineers
FACC 500	(3)	Technology Business Plan Design
FACC 501	(3)	Technology Business Plan Project
INDR 294*	(3)	Introduction to Labour-Management Relations
MATH 338	(3)	History and Philosophy of Mathematics
MGCR 222*	(3)	Introduction to Organizational Behaviour
MGCR 352*	(3)	Marketing Management 1
ORGB 321*	(3)	Leadership
ORGB 423*	(3)	Human Resources Management

* Note: Management courses have limited enrolment and registration dates. See Important Dates at http://www.mcgill.ca/importantdates.

Language Courses

If you are not proficient in a certain language, no more than 3 credits will be given for one 6-credit course at the 100 level in that language.

Montreal, Quebec H3A 0C2

Telephone: 514-398-4075
Fax: 514-398-8376
Email: *admissions.planning@mcgill.ca*
Website: *www.mcgill.ca/urbanplanning*

13.9.2 About the School of Urban Planning

Urban planning can be described as the collective management of urban development. It is concerned with the welfare of communities, control of the use of land, design of the built environment, including transportation and communication networks, and protection and enhancement of the natural environment. It is at once a technical and a political process that brings together actors from the public, private, and community spheres. Planners participate in that process in a variety of ways, as designers and analysts, advocates and mediators, facilitating the search for equitable and efficient solutions to problems of urban change and development.

Modern urban planning developed into a profession largely as a response to the appalling sanitary, social, and economic conditions of rapidly developing industrial cities. Initially, the disciplines of architecture, landscape architecture, civil engineering, and public health provided the nucleus of concerned professionals; beautification schemes and infrastructure works marked the early stages of public intervention in the 19th century. Architects, engineers, and public health specialists were joined by economists, sociologists, lawyers, and geographers as the complexities of the city's problems came to be more fully understood and public pressure mounted for their solution. Contemporary urban and regional planning techniques for survey, analysis, design, and implementation developed from an interdisciplinary synthesis of these various fields. This multidisciplinarity is still a hallmark of planning practice and of planning education.

McGill was the first university in Canada to offer a planning degree, starting in 1947. The School of Urban Planning itself was established as an independent unit in 1972. Today, it brings together students from various fields (such as those mentioned above) and different parts of the world in a professional master's program and an *ad hoc* Ph.D. program. Key features of the work done at the school are the use of real-world projects for learning, a focus on policy-relevant research, and strong engagement with the community, both in Canada and abroad.

The School has a long track record of research, capacity-building and consulting in developing regions as well as in Montreal and other Canadian cities. Faculty and students collaborate actively with members of other McGill departments, notably Architecture, Geography, Civil Engineering, and Law, and with colleagues at other institutions in Canada and abroad. Alumni of the School work as planners and designers at various levels of government, in non-profit organizations, and with private consulting firms. Their expertise ranges from urban design to transportation planning, from housing policy to computer modelling. They devote their efforts in increasing numbers to environmental planning and sustainable development.

The objective of the School is to enable young urban planners to exercise leadership in the public, private, and community sectors. Training is provided at the postgraduate level. The main degree offered is the Master of Urban Planning (M.U.P.). Many specializations are possible within the program; one of them, in Transportation Planning, is formally recognized as a concentration. M.U.P. students in the core program may also opt to spend a semester in Barbados as part of the Barbados Field Study Semester, which focuses on global environmental issues. Details concerning each of these concentrations can be found at *www.mcgill.ca/urbanplanning/programs/mup-transportation-planning* (see also *www.trams/mup-tr*

Undergraduate Courses in Urban Planning

Revision, August 2013. Start of revision.

CIVE 433	(3)	Urban Planning

Revision, August 2013. End of revision.

URBP 201	(3)	Planning the 21st Century City
URBP 501	(2)	Principles and Practice 1
URBP 504	(3)	Planning for Active Transportation
URBP 505	(3)	Geographic Information Systems

Guest Lecturers
Suzanne Doucet
Paul LeCavalier
Denis Lévesque
James McGregor
Pierre Morissette
Larry Sherman
Martin Wexler

13.10 Faculty of Engineering Related Programs

13.10.1 Bioresource Engineering

The Faculty of Engineering cooperates with the Faculty of Agricultural and Environmental Sciences in providing courses of instruction for a curriculum in agricultural and biosystems engineering to meet requirements for a professional degree awarded in the Faculty of Agricultural and Environmental Sciences. For details, refer to the B.Eng.(Bioresource) program requirements in *Programs, Courses and University Regulations > Faculties & Schools > Faculty of Agricultural and Environmental Sciences* .

Some of the courses offered by the Department of Bioresource Engineering (subject code BREE) may be of interest to students in the Faculty of Engineering.

The Department of Bioresource Engineering is located in the Faculty of Agricultural and Environmental Sciences on the Macdonald campus:

Department of Bioresource Engineering
Macdonald-Stewart Building, Room MS1-027
21,111 Lakeshore Road
Sainte-Anne-de-Bellevue, Quebec H9X 3V9
Telephone: 514-398-7773
Fax: 514-398-8387
Website: *www.mcgill.ca/bioeng*

13.10.2 Department of Biomedical Engineering

Lyman Duff Medical Sciences Building
3775 University Street
Montreal, Quebec H3A 2B4
Telephone: 514-398-6736
Website: *www.bmed.mcgill.ca*

Some of the courses offered by the Department of Biomedical Engineering (subject code BMDE) may be of interest to Engineering students, and may be approved as complementary courses. The Faculty of Engineering also offers a Minor in Biomedical Engineering; for more information, see *section 13.11.2.1: Bachelor of Engineering (B.Eng.) - Minor Biomedical Engineering (21 credits).*

13.11 Minor Programs

This section includes general information concerning minors that are designed for students in the Faculty of Engineering.

Minors are coherent sequences of courses taken in addition to the courses required for the B.Eng., B.S.E., or B.Sc.(Arch.) degree. Minors normally consist of 18–24 credits, allowing 9–12 credits of overlap with the degree program. The real credit cost to the student is typically 9–15 credits, representing one term beyond the B.Eng., B.S.E., or B.Sc.(Arch.) degree program. All courses in a minor must be passed with a grade of C or better.

Engineering students choose from a considerable variety of complementary courses under the categories of technical and complementary studies. Students should refer to their department for information concerning selection of complementary courses, and should see their department adviser. Departments also publish information regarding the choice of courses in this publication and in separate documents.

Note: Students are also permitted to register for minor concentrations offered by departments in the Faculty of Arts. Students must obtain approval from both the department in the Faculty of Arts and from the McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22), before registering in one of these minors.

Minor Programs:

Minor program credit weight: 21-25 credits

The Biomedical Engineering Minor allows access to courses in basic life sciences and is intended to expose students to the interdisciplinary tools used in biomedicine.

To complete this Minor, students must obtain a grade of C or better in all approved courses and satisfy the requirements of both the major program and the Minor.

Students considering this Minor should contact the Minor Advisers listed above.

Complementary Introductory Courses in Life Sciences

3-7 credits

One or two courses from the following list (equivalents can be approved):

ANAT 212	(3)	Molecular Mechanisms of Cell Function
BIOC 212	(3)	Molecular Mechanisms of Cell Function
BIOL 200	(3)	Molecular Biology
BIOL 201	(3)	Cell Biology and Metabolism
CHEM 212	(4)	Introductory Organic Chemistry 1
		Mammalian Physiology 1

COMP 462	(3)	Computational Biology Methods
COMP 526	(3)	Probabilistic Reasoning and AI

* Students choose either ANAT 365 or BIOC 458

Revision, June 2013. End of revision.

Biomaterials, Biosensors,

MIMM 413	(3)	Parasitology
MIMM 465	(3)	Bacterial Pathogenesis
MIMM 466	(3)	Viral Pathogenesis

Molecular Biology (Biology)

BIOL 300	(3)	Molecular Biology of the Gene
BIOL 314	(3)	Molecular Biology of Oncogenes
BIOL 520	(3)	Gene Activity in Development
BIOL 524	(3)	Topics in Molecular Biology
BIOL 551	(3)	Principles of Cellular Control

Molecular Biology (Biochemistry)

BIOC 311	(3)	Metabolic Biochemistry
BIOC 312	(3)	Biochemistry of Macromolecules
BIOC 450	(3)	Protein Structure and Function
BIOC 454	(3)	Nucleic Acids
PSYT 455	(3)	Neurochemistry

Physiology

EXMD 401	(3)	Physiology and Biochemistry Endocrine Systems
EXMD 502	(3)	Advanced Endocrinology 01
EXMD 503	(3)	Advanced Endocrinology 02
PHAR 562	(3)	General Pharmacology 1
PHAR 563	(3)	General Pharmacology 2
PHGY 517	(3)	Artificial Internal Organs
PHGY 518	(3)	Artificial Cells

Pollution

Note: Engineering students may not use these courses to count toward the Environmental Engineering Minor.

CIVE 225	(4)	Environmental Engineering
CIVE 430	(3)	Water Treatment and Pollution Control

13.11.4 Chemistry Minor

The Departments of Chemistry and Chemical Engineering offer this Chemistry Minor, of particular interest to Chemical Engineering students, and a Chemical Engineering Minor, of interest to Chemistry students; see *Programs, Courses and University Regulations > Faculties & Schools > Faculty of Science > Undergraduate > Academic Programs > Chemistry* (available at *www.mcgill.ca/study*). Students taking the Chemistry Minor complete 10 credits of required courses in physical and organic chemistry, and choose an additional 15 credits of complementary courses from the areas of inorganic, analytical, organic, and physical chemistry.

Minor Adviser: Dr. Samuel Sewall (Director of Undergraduate Studies, Chemistry)

For more information about the Chemical Engineering Minor, see Prof. David Cooper (Chemical Engineering).

13.11.4.1 Bachelor of Engineering (B.Eng.) - Minor Chemistry (25 credits)

Minor Adviser (program coordinator): Dr. Samuel Sewall (Director of Undergraduate Studies, Chemistry)

Program credit weight: 25 credits

Minor Adviser: Students interested in this Minor should see Liette Chin, Undergraduate Program Coordinator (School of Computer Science, Lorne

ECSE 221 (3) Introduction to Computer Engineering

Revision, June 2013. Start of revision.

MGCR 211	(3)	Introduction to Financial Accounting
MGCR 341	(3)	Finance 1

Complementary Courses

3-4 credits (4 credits from List A OR 3 credits from List B)

List A - Building Structures

4 credits from the following:

ARCH 447	(2)	Lighting
ARCH 451	(2)	Building Regulations and Safety
ARCH 554	(2)	Mechanical Services
CIVE 492	(2)	Structures

OR

List B - Heavy Construction

3 credits from the following:

MIME 322	(3)	Rock Fragmentation
MIME 333	(3)	Materials Handling

Construction-Related Complementary Courses

6 credits from the following:

BUSA 462	(3)	Management of New Enterprises
CIVE 446	(3)	Construction Engineering
CIVE 527	(3)	Renovation and Preservation: Infrastructure
ECSE 461	(3)	Electric Machinery
FINE 445	(3)	Real Estate Finance
MIME 520	(3)	Stability of Rock Slopes
MIME 521	(3)	Stability of Underground Openings
MPMC 321*	(3)	Mécanique des roches et contrôle des terrains

* Course offered in French at École Polytechnique in Montreal

13.11.7 Economics Minor

Engineering students who want to complete a minor in Economics are required to complete the following program rather than one of the minor concentrations offered by the Department of Economics in *Programs, Courses and University Regulations > Faculties & Schools > Faculty of Arts > Undergraduate > Academic Programs > Economics* (available at *www.mcgill.ca/study*), unless they have obtained permission from the Faculty of Engineering.

Minor Adviser: Faculty Student Adviser in the McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22)

Bachelor of Engineering (B.Eng.) - Minor Economics (18 credits)

Required Courses

9 credits

ECON 209*	(3)	Macroeconomic Analysis and Applications
ECON 230D1**	(3)	Microeconomic Theory
ECON 230D2**	(3)	Microeconomic Theory

* This requirement is w

ECON 525	(3)	Project Analysis
ECON 546	(3)	Game Theory

Note: Mining Engineering students are permitted to include (MIME 526) Mineral Economics among the Complementary Courses.

Revision, June 2013. End of revision.

13.11.8 Minor in Environment

Environmental studies focus on the interactions between humans and their natural and technological environments. Environmental problems are complex, and their satisfactory solutions require the synthesis of social, scientific, and institutional knowledge.

The Minor in Environment is offered and administered by the McGill School of Environment (MSE).

Since the program comprises a total of 18 credits for the Minor, additional credits beyond those needed for the B.Eng. degree are required. Students wishing to complete the Minor should prepare a program and have it approved by both their regular Engineering departmental adviser and the MSE Adviser. For program details, see *Programs, Courses and University Regulations > Faculties & Schools > McGill School of Environment > Undergraduate > : Minor in Environment*.

Note: Engineering students interested in this Minor must submit a completed Course Authorization Form to the McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22).

Minor Adviser: Students interested in this Minor should contact Kathy Roulet, MSE Program Adviser (email: *kathy.roulet@mcgill.ca*; telephone: 514-398-4306).

13.11.9 Environmental Engineering Minor

The Environmental Engineering Minor is offered for students in Engineering and in the Department of Bioresource Engineering wishing to pursue studies in this area. Students completing this Minor take an introductory course in environmental engineering, bio-environmental engineering, or environmental aspects of technology, then choose from a wide variety of complementary courses within and outside the Faculty of Engineering on environmental topics. Students may choose to participate in the Barbados Field Study Semester (BFSS) or in the Barbados Interdisciplinary Tropical Studies (BITS) field semester and have the field study courses count toward this Minor.

The Environmental Engineering Minor is administered by the Department of Civil Engineering and Applied Mechanics.

Minor Adviser: Prof. R. Gehr, Macdonald Engineering Building, Room 569E

For more information on the Barbados Field Study Semester, see *www.mcgill.ca/bfss*.

For more information on the Barbados Interdisciplinary Tropical Studies field semester, see *www.mcgill.ca/bits*.

For more information on environmental studies in the Faculty of Engineering, see *www.mcgill.ca/enveng*.

13.11.9.1 Bachelor of Engineering (B.Eng.) - Minor Environmental Engineering (21 credits)

Minor Adviser: Prof. R. Gehr, Macdonald Engineering Building, Room 569E

Minor program credit weight: 21-22 credits

The Environmental Engineering Minor is administered by the Department of Civil Engineering and Applied Mechanics and is offered for all students in Engineering (including B.S.E. students) and in the Department of Bioresource Engineering wishing to pursue studies in this area.

A maximum of 12 credits of coursework in the student's major may double-count with the Minor.

To complete the Minor in Environmental Engineering, students must obtain a grade of C or better in all approved courses in the Minor, and satisfy the requirements of both the Minor and their major program.

Note: Not all courses listed are offered every year

Courses offered at the Downtown campus:

ARCH 377	(3)	Energy, Environment and Buildings
ARCH 515	(3)	Sustainable Design
CHEE 351	(3)	Separation Processes
CHEE 370	(3)	Elements of Biotechnology
CHEE 496	(3)	Environmental Research Project
CHEE 591	(3)	Environmental Bioremediation
CHEE 592	(3)	Industrial Air Pollution Control
CHEE 593	(3)	Industrial Water Pollution Control
CIVE 225	(4)	Environmental Engineering
CIVE 323**	(3)	Hydrology and Water Resources
CIVE 421	(3)	Municipal Systems
CIVE 428	(3)	Water Resources and Hydraulic Engineering
CIVE 430	(3)	Water Treatment and Pollution Control
CIVE 451	(3)	Geoenvironmental Engineering
CIVE 550	(3)	Water Resources Management
CIVE 555	(3)	Environmental Data Analysis
CIVE 572	(3)	Computational Hydraulics
CIVE 573	(3)	Hydraulic Structures
CIVE 574	(3)	Fluid Mechanics of Water Pollution
CIVE 577	(3)	River Engineering
CIVE 584	(3)	Groundwater Engineering
MECH 447	(3)	Combustion
MECH 526	(3)	Manufacturing and the Environment
MECH 534	(3)	Air Pollution Engineering
MECH 535	(3)	Turbomachinery and Propulsion
MIME 422	(3)	Mine Ventilation
MIME 512	(3)	Corrosion and Degradation of Materials
MPMC 328	(3)	Environnement et gestion des rejets miniers
URBP 506	(3)	Environmental Policy and Planning

** Not open to students who have passed BREE 217.

Non-Engineering Course List

Courses offered at the Macdonald campus:

LSCI 230+	(3)	Introductory Microbiology
MICR 331+	(3)	Microbial Ecology
MICR 341	(3)	Mechanisms of Pathogenicity
RELG 270	(3)	Religious Ethics and the Environment
SOIL 210++	(3)	Principles of Soil Science
SOIL 331	(3)	Soil Physics
WILD 375	(3)	Issues: Environmental Sciences
WILD 415	(2)	Conservation Law

WOOD 420	(3)	Environmental Issues: Forestry

+ Not open to students who have passed CHEE 370.

++ Not part of the Minor for Agricultural Engineering students.

Courses offered at the Downtown campus:

ANTH 206	(3)	Environment and Culture
BIOL 205	(3)	Biology of Organisms
BIOL 432	(3)	Limnology
CMPL 580	(3)	Environment and the Law
ECON 225	(3)	Economics of the Environment
ECON 326	(3)	Ecological Economics
ECON 347	(3)	Economics of Climate Change
EPSC 549	(3)	Hydrogeology
GEOG 200	(3)	Geographical Perspectives: World Environmental Problems
GEOG 201	(3)	Introductory Geo-Information Science
GEOG 203	(3)	Environmental Systems
GEOG 205	(3)	Global Change: Past, Present and Future
GEOG 302	(3)	Environmental Management 1
GEOG 308	(3)	Principles of Remote Sensing
GEOG 321	(3)	Climatic Environments
GEOG 404	(3)	Environmental Management 2
MIMM 211	(3)	Introductory Microbiology

Required Courses (9 credits)

FINE 342	(3)	Finance 2
FINE 441	(3)	Investment Management
MGCR 341*	(3)	Finance 1

Complementary Courses (9 credits)

9 credits selected from:

FINE 442	(3)	Capital Markets and Institutions
FINE 443	(3)	Applied Corporate Finance
FINE 445	(3)	Real Estate Finance
FINE 448	(3)	Financial Derivatives
FINE 449	(3)	Market Risk Models
FINE 451	(3)	Fixed Income Analysis
FINE 480	(3)	Global Investments
FINE 482	(3)	International Finance 1
FINE 492	(3)	International Finance 2
		Applied In(3)

Applied In(3)

MGCR 352	(3)	Marketing Management 1
MGCR 382	(3)	International Business
MGCR 472*	(3)	Operations Management

Category C

6 credits selected from:

3-6 credits from any 300- or 400-level Management courses for which prerequisites have been met.

0-3 credits may be from a specifically designated course by the student's home faculty.

* Prerequisite: MGCR 271, Business Statistics, or another equivalent Statistics course approved by the Program Adviser.

** 3 credits of statistics: Students who have taken an equivalent Statistics course in another faculty may not count those credits towards the Minor; an additional 3-credit complementary course must be chosen from the course list above.

*** Students who have taken an equivalent Economics course in another faculty may not count those credits toward the Minor; an additional 3-credit complementary course must be chosen from the course list above.

Note: Students should select their Statistics course only after consulting the "Course Overlap" section in the Faculty of Arts, the "Course Overlap" section in the Faculty of Science, and the "Course Overlap" section in the Desautels Faculty of Management to avoid overlapping Statistics courses.

13.11.10.3 Minor Marketing (For Non-Management Students) (18 credits)

The Minor Marketing consists of 18 credits of Management courses and is currently offered to non-Management students in the Faculties of Arts, Engineering, Science, and the Schulich School of Music.

This Minor is designed to provide students with an understanding of the fundamental concepts in marketing and a framework for applying marketing in a decision-making context. Students will be introduced to the basic concepts in marketing. The use of marketing theory and concepts for decision making will be covered. Marketing research methods for marketing decisions is introduced. Subsequently, students will be able to specialize by choosing from the list of complementary courses.

Required Courses (9 credits)

MGCR 352	(3)	Marketing Management 1
MRKT 354	(3)	Marketing Management 2
MRKT 451	(3)	Marketing Research

Complementary Courses (9 credits)

3 credits selected from:

MGCR 271*	(3)	Business Statistics

6 credits selected from:

MRKT 357	(3)	Marketing Planning 1
MRKT 365	(3)	New Products
MRKT 438	(3)	Brand Management
MRKT 452	(3)	Consumer Behaviour
MRKT 453	(3)	Advertising Management
MRKT 455	(3)	Sales Management
MRKT 459	(3)	Retail Management
MRKT 483	(3)	International Marketing Management

or other appropriate 300- or 400-level MRKT courses with the approval of the Program Adviser.

* Students who have taken an equivalent Statistics course in another faculty may not count those credits toward the Minor; an additional 3-credit complementary course must be chosen from the course list above.

Note: Students should select their Statistics course only after consulting the "Course Overlap" section in the Faculty of Arts, the "Course Overlap" section in the Faculty of Science, and the "Course Overlap" section in the Desautels Faculty of Management to avoid overlapping Statistics courses.

13.11.10.4 Minor Operations Management (For Non-Management Students) (18 credits)

Mentors: Please consult the Bachelor of Commerce website at: http://www.mcgill.ca/desautels/programs/bcom/academics/courseinfo

The Minor Operations Management consists of 18 credits of Management courses and is currently offered to non-Management students in the Faculties of Arts, Engineering, Science, and Agricultural & Environmental Sciences.

It provides non-Management students with the opportunity to pursue a career that involves decision making at the operational level. Graduates will be able to find employment in consulting, manufacturing, supply chain, distribution, retail operations, healthcare management and environmental management for profit and non-profit corporations. This Minor has been designed to provide students with an understanding of the key concepts in operations management theory and practice.

Required Courses (6 credits)

MGCR 472	(3)	Operations Management
MGSC 373	(3)	Operations Research 1

Complementary Courses (12 credits)

3 credits selected from:

MGCR 271*	(3)	Business Statistics

9 credits selected from:

MGSC 372	(3)	Advanced Business Statistics
MGSC 402	(3)	Operations Strategy
MGSC 403	(3)	Introduction to Logistics Management
MGSC 405	(3)	Quality Management
MGSC 415	(3)	Supplier Management
MGSC 431	(3)	Operations Analysis
MGSC 479	(3)	Applied Optimization
MGSC 575	(3)	Applied Time Series Analysis Managerial Forecasting
MGSC 578	(3)	Simulation of Management Systems

or other appropriate 300- or 400-level MGSC courses with the approval of the Program Adviser.

* 3 credits of Statistics: Students who have taken an equivalent Statistics course in another faculty may not count those credits toward the Minor; an additional 3-credit complementary course must be chosen from the course list above.

Note: Students should select their Statistics course only after consulting the "Course Overlap" section in the Faculty of Arts, the "Course Overlap" section in the Faculty of Science, and the "Course Overlap" section in the Desautels Faculty of Management to avoid overlapping Statistics courses.

13.11.11 Materials Engineering Minor

Students taking the Materials Engineering Minor complete 15 credits of required courses in materials science, materials engineering, electronic properties of materials, metallic and ceramic powders processing, and applications of polymers, and choose three complementary courses in other areas related to materials engineering.

Minor Adviser: Prof. M. Brochu (Minor Coordinator), Wong Building, Room 2640

13.11.11.1 Bachelor of Engineering (B.Eng.) - Minor Materials Engineering (24 credits)

Revision, June 2013. Start of revision.

Minor Adviser: Prof. M. Brochu (Minor Coordinator), Wong Building, Room 2640

Engineering students may obtain a Materials Engineering Minor by completing 24 credits chosen from the required and complementary courses listed below. By a careful selection of complementary courses, Engineering students may obtain this Minor with a minimum of 15 additional credits.

Required Courses

15 credits

CHEE 380*	(3)	Materials Science
CHEE 484	(3)	Materials Engineering
MIME 260*	(3)	Materials Science and Engineering
MIME 345	(3)	Applications of Polymers
MIME 465	(3)	Metallic and Ceramic Powders Processing
MIME 467	(3)	Electronic Properties of Materials

* Students choose either CHEE 380 or MIME 260.

Complementary Courses

9 credits from the following:

CHEE 587	(3)	Chemical Processing: Electronics Industry
ECSE 545	(3)	Microelectronics Technology
MECH 530	(3)	Mechanics of Composite Materials
MIME 360	(3)	Phase Transformations: Solids
MIME 512	(3)	Corrosion and Degradation of Materials
MIME 560	(3)	Joining Processes
MIME 561	(3)	Advanced Materials Design
MIME 563	(3)	Hot Deformation of Metals
MIME 569	(3)	Electron Beam Analysis of Materials

Revision, June 2013. End of revision.

13.11.12 Mathematics Minor

Students in the Minor in Mathematics for Engineering students complete 18 credits of Mathematics courses (subject code MATH), not including Mathematics courses that are required in their Engineering program (or equivalent courses), and choose 6 credits from other Mathematics-related courses.

Minor Adviser: Faculty Student Adviser in the McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22) AND an adviser designated by the Department of Mathematics and Statistics, normally beginning in Year 2 (please consult the Department of Mathematics and Statistics for this adviser). Course selection for this Minor must be done in conjunction with the Minor advisers.

13.11.12.1 Bachelor of Engineering (B.Eng.) - Minor Mathematics (24 credits)

Minor Adviser: Faculty Student Adviser in the McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22) AND an adviser designated by the Department of Mathematics and Statistics, normally beginning in the U2 year (please consult the Department of Mathematics and Statistics for this adviser). Selection of courses must be done in conjunction with the Minor advisers.

Note: The Mathematics Minor is open to all students in the Faculty of Engineering (B.Eng., B.S.E., and B.Sc.(Arch.)).

Engineering students must obtain a grade of C or better in courses approved for this Minor.

Course Selection

At least 18 credits must be chosen from the Mathematics and Statistics courses approved for the Mathematics Major or Honours program, or from the following courses:

MATH 249	(3)	Honours Complex Variables
MATH 363	(3)	Discrete Mathematics
MATH 381	(3)	Complex Variables and Transforms

The remaining credits may be chosen from mathematically-

MATH 247	(3)	Honours Applied Linear Algebra
MATH 248	(3)	Honours Advanced Calculus
MATH 262	(3)	Intermediate Calculus
MATH 263	(3)	Ordinary Differential Equations for Engineers
MATH 264	(3)	Advanced Calculus for Engineers
MATH 270	(3)	Applied Linear Algebra
MATH 271	(3)	Linear Algebra and Partial Differential Equations
MATH 314	(3)	Advanced Calculus
MATH 315	(3)	Ordinary Differential Equations
MATH 319	(3)	Introduction to Partial Differential Equations
MATH 325	(3)	Honours Ordinary Differential Equations

13.11.13 Mining Engineering Minor

Students taking the Mining Engineering Minor complete 12 credits of required courses in mining engineering, including an introduction to the minerals industry, courses in mining science and technology, rock fragmentation and materials handling, and an industrial work term. Students choose 12 credits from

12 credits

COMP 250	(3)	Introduction to Computer Science
ECSE 221	(3)	Introduction to Computer Engineering
ECSE 321	(3)	Introduction to Software Engineering
ECSE 428	(3)	Software Engineering Practice

Complementary Courses

12 credits from the following:

Engineering Courses

6-12 credits from the following:

CHEE 571	(3)	Small Computer Applications: Chemical Engineering
CIVE 460	(3)	Matrix Structural Analysis
CIVE 550	(3)	Water Resources Management
CIVE 572	(3)	Computational Hydraulics
ECSE 322	(3)	Computer Engineering
ECSE 420	(3)	Parallel Computing
ECSE 421	(3)	Embedded Systems
ECSE 422	(3)	Fault Tolerant Computing
ECSE 424	(3)	Human-Computer Interaction
ECSE 427	(3)	Operating Systems
ECSE 429	(3)	Software Validation
ECSE 526	(3)	Artificial Intelligence
ECSE 532	(3)	Computer Graphics
MECH 524	(3)	Computer Integrated Manufacturing
MECH 539	(3)	Computational Aerodynamics
MECH 576	(3)	Geometry in Mechanics

Computer Science Courses

0-6 credits from the following (no more than 6 credits will count toward the Minor):

COMP 302	(3)	Programming Languages and Paradigms
COMP 421	(3)	Database Systems
COMP 424	(3)	Artificial Intelligence
COMP 527	(3)	Logic and Computation

13.11.17 Technological Entrepreneurship Minor

This Minor is offered jointly by the Faculties of Engineering and Management. It will appeal to those students who have a concept, process, or product idea in mind and who want to explore the opportunity of commercializing it. It will also be of interest to students who have a general interest in entrepreneurship and intend to pursue a career in small- and medium-sized high-technology/engineering companies.

Students taking the Minor choose 18 credits from courses in technological entrepreneurship (entrepreneurship, marketing management, organization policy, marketing of technology, leadership, and human resources management). Students can also choose to take business plan design and project courses, which give students an opportunity to design a business plan and develop a technology or engineering project.

Minor Adviser: Faculty Student Adviser in the McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22)

13.11.17.1 Bachelor of Engineering (B.Eng.) - Minor Technological Entrepreneurship (18 credits)

Minor Adviser: Faculty Student Adviser in the McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22).

This Minor is offered jointly by the Faculties of Engineering and Management. It will appeal to those students who ha