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

Programs, Courses and University Regulations

2010-2011

The publication is produced in electronic form and the most recent version is the official university publication. Archival copies are available at www.mcgill.ca/courses.

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

1. McGill University reserves the right to make changes to the information contained in this online publication - including correcting errors, altering fees, schedules of admission, and credit requirements, and revising or cancelling particular courses or programs- without prior notice.
2. In the interpretation of academic regulations, the Senate is the final authority.
3. Students are responsible for informing themselves of the University's procedures, policies and regulations, and the specific requirements associated with the degree, diploma, or certificate sought.
4. All students registered at McGill University are considered to have agreed to act in accordance with the University procedures, policies and regulations.
5. Although advice is readily available on request, the responsibility of selecting the appropriate courses for graduation must ultimately rest with the student.
6. Not all courses are offered every year and changes can be made after publication. Always check the Minerva Class Schedule link at https://banweb.mcgill.ca/mcgp/bwckschd.p_disp_dyn_sched for the most up-to-date information on whether a course is offered.
7. The academic publication year begins at the start of the Fall semester and extends through to the end of the Winter semester of any given year. Students who begin study at any point within this period are governed by the regulations in the publication which came into effect at the start of the Fall semester.
8. Notwithstanding any other provision of the publication, it is expressly understood by all students that McGill University accepts no responsibility to provide any course of instruction, program or class, residential or other services including the normal range of academic, residential and/or other services in circumstances of utility interruptions, fire, flood, strikes, work stoppages, labour disputes, war, insurrection, the operation of law or acts of God or any other cause (whether similar or dissimilar to those enumerated) which reasonably prevent their provision.

Note: throughout this publication, "you" refers to students newly admitted, readmitted or returning to McGill.

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1 About the Faculty of Engineering

The Faculty currently includes five engineering departments and two schools:

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

The Schools
Architecture
Urban Planning

The Faculty serves approximately 2,740 undergraduate students and 1,060 graduate students in a wide variety of academic programs.

Undergraduate programs leading to professional bachelor's degrees are offered in all engineering departments. These programs are designed to qualify graduates for immediate employment in a wide range of industries and for membership in the appropriate professional bodies. Additionally, a non-professional undergraduate degree is offered in the School of Architecture for those who plan to work in related fields not requiring professional qualification.

The curricula are structured to provide suitable preparation for those who plan to continue their education in postgraduate studies either at McGill or elsewhere. The professional degrees in Architecture and Urban Planning are offered at the master's level and are described in the *Graduate and Postdoctoral Studies Calendar* found at *www.mcgill.ca/students/courses/calendars*.

The academic programs are divided into required and complementary sections. The required courses emphasize those basic principles which permit graduates to keep abreast of progress in technology throughout their careers. Exposure to current technology is provided by the wide variety of complementary courses which allow students to pursue in depth a particular interest. For program details, refer to *section 12: Academic Programs*.

The Engineering Internship Program provides engineering students with the opportunity to participate in four-, eight-, twelve- or sixteen-month paid work experiences. Details can be found at *www.mcgill.ca/careers4engineers/students/internship*. In addition, co-op programs are offered in Mining Engineering and in Materials Engineering.

Postgraduate programs leading to master's and doctoral degrees are offered in all sectors of the Faculty. Numerous areas of specialization are available in each of the departments and schools. All postgraduate programs, including the professional degree programs in Architecture and in Urban Planning, are described in the *Graduate and Postdoctoral Studies Calendar* found at *www.mcgill.ca/students/courses/calendars*.

2 History of the Faculty

The Faculty of Engineering began in 1871 as the Department of Practical and Applied Science in the Faculty of Arts with degree programs in Civil Engineering and Surveying, Mining Engineering and Assaying, and Practical Chemistry. Diploma courses had been offered from 1859, and by 1871 the staff and enrolments had increased sufficiently to justify the creation of the Department. Continued growth led to the formation of the Faculty of Applied Science in 1878. By 1910 there were ten degree programs offered, including Architecture and Railroad Engineering. Subsequent changes in the overall pattern of the University led to the creation of the Faculty of Engineering in 1931 with a departmental structure very similar to that which exists at present.

3 Faculty of Engineering Facilities

3.1 Schulich Library of Science and Engineering

Second largest of the thirteen branches of the McGill Library, the Schulich Library of Science and Engineering provides resources and services to support the research and teaching programs in engineering and in the physical sciences. The Library holds more than 260,000 books, journals and other materials covering the spectrum of engineering and the physical sciences. There is also an extensive collection of online resources, with thousands of electronic journals, e-books and databases. Other branch libraries will be of interest to students in the Faculty of Engineering: Blackader-Lauterman Library of Architecture and

Art, Life Sciences Library, Macdonald Campus Library, Walter Hitschfeld Geographic Information Centre, Edward Rosenthall Mathematics and Statistics Library, and the Howard Ross Management Library.

The Schulich Library of Science and Engineering has over 100 networked computer workstations and the entire building is a McGill wireless zone. You may choose to work in the quiet or group study areas, and there are copy and print facilities on site. The Library provides support for users with disabilities, including wheelchair access and an adaptive workstation. The Library also offers a range of tours and workshops designed to help users effectively find, assess and use information.

Visit the website, phone or email us to learn more about the Library's services, collections and facilities. We look forward to seeing you in the Library.

Website: *www.mcgill.ca/library/library-using/branches/schulich*
Telephone: 514-398-4769
Email: *schulich.library@mcgill.ca*

3.2 Engineering Microcomputing Facility

In addition to the services provided by McGill's Information Technology Services, the Faculty, in conjunction with its departments and schools, maintains specialized computing and information resources in support of teaching and research. These vary from desktop computers distributed throughout the Engineering complex to very high performance scientific workstations found in the research laboratories. Each unit organizes and maintains facilities that are designed around specific roles, e.g., CAD/CAM, microelectronic design, software engineering, circuit simulation, process control, polymers, structural mechanics, metal processing, etc., in addition to systems dedicated to administrative support.

The role of the Faculty is to provide access to computing resources on a 24-hour basis and to provide services that are not covered by individual units. Further information is available at *www.mcgill.ca/emf*.

4 Revisions – Faculty of Engineering

Architecture

section 12.2.7: Bachelor of Science (B.Sc.) (Architecture) - Architecture (126 credits)

Chemical Engineering

section 12.3.6: Bachelor of Engineering (B.Eng.) - Chemical Engineering (112 credits)

Civil Engineering and Applied Mechanics

section 12.4.5: Bachelor of Engineering (B.Eng.) - Civil Engineering (110 credits)

Electrical and Computer Engineering

section 12.5.4: Bachelor of Engineering (B.Eng.) - Electrical Engineering (109 credits)

section 12.5.5: Bachelor of Engineering (B.Eng.) - Honours Electrical Engineering (109 credits)

section 12.5.6: Bachelor of Engineering (B.Eng.) - Computer Engineering (110 credits)

section 12.5.7: Bachelor of Software Engineering (B.S.E.) - Software Engineering (106 credits)

Mechanical Engineering

section 12.6.4: Bachelor of Engineering (B.Eng.) - Mechanical Engineering (112 credits)

section 12.6.5: Bachelor of Engineering (B.Eng.) - Honours Mechanical Engineering (112 credits)

Mining and Materials Engineering

section 12.7.4: Bachelor of Engineering (B.Eng.) - Materials Engineering CO-OP (118 credits)

section 12.7.5: Bachelor of Engineering (B.Eng.) - Mining Engineering CO-OP (120 credits)

Minor Programs

section 12.10.4.1: Bachelor of Engineering (B.Eng.) - Minor Chemistry (25 credits)

Minor Programs

section 12.10.14.1: Bachelor of Engineering (B.Eng.) - Minor Physics (18 credits)

section 12.10.16.1: Bachelor of Engineering (B.Eng.) - Minor Software Engineering (24 credits)

5 About the the Faculty of Engineering (Undergraduate)

Welcome to the Faculty of Engineering section of the Undergraduate Calendar.

The mission of the Faculty of Engineering is to contribute to the advancement of learning and to the socio-economic development of Quebec and Canada, through teaching and research activities at the highest international standards of quality.

Goals:

- To prepare graduates for productive professional careers through the provision of accredited bachelor's programs.
- To train students through focused professional programs to attain the forefront of their fields.
- To perform research and other scholarly activities which achieve international recognition.
- To ensure that technological innovations developed through research are transferred to industry.
- To provide a stimulating environment for teaching, learning and research.

In this section you will find up-to-date information about the Faculty and about the undergraduate programs and courses it offers. For information about graduate studies in the Faculty of Engineering, see the *Graduate and Postdoctoral Studies Calendar* at *www.mcgill.ca/students/courses/calendars*.

You will find information on the following topics (and others):

- *section 1: About the Faculty of Engineering* (including a brief history of the Faculty)
- *: Schulich Library of Science and Engineering*
- *: Engineering Microcomputing Facility (EMF)*
- *section 6: Degrees and Requirements for Professional Registration*
- *section 11: Engineering Internship Program* (EIP)
- *section 9: Student Activities*
- Undergraduate *Programs* and *Courses*
- *section 12.10: Minor Programs* for students in the Faculty of Engineering
- *University Regulations and General Information* (watch for sections and notes that are specific to the Faculty of Engineering)

5.1 Location

Macdonald Engineering Building
817 Sherbrooke Street West
Montreal, Quebec H3A 2K6
Canada

Telephone: 514-398-7257
Faculty website: *www.mcgill.ca/engineering*

The Student Affairs Office and the Offices of the Associate Dean, Student Affairs and Associate Dean, Academic are located within the Engineering Student Centre, at:

3450 University Street
Montreal, Quebec H3A 2A7
Frank Dawson Adams Building, Suite 22

5.2 Administrative Officers

Christophe Pierre; Ph.D.(Duke), M.Sc.(Prin.), B.Eng.(École Centrale, Paris) (*Canada Research Chair*)	**Dean**
James Clark; B.A.Sc., Ph.D.(Br. Col.)	**Associate Dean (Academic)**

Subhasis Ghoshal; B.C.E.(Jadavpur), M.S.(Missouri), Ph.D.(Carn. Mell) (*William Dawson Scholar*)	**Associate Dean (Student Affairs)**
Andrew Kirk; B.Sc.(Brist.), Ph.D.(Lond.) (*William Dawson Scholar*)	**Associate Dean (Research and Graduate Education)**
Luc Mongeau; B.Sc., M.Sc.(École Poly., Montr.), Ph.D.(Penn. St.) (*Canada Research Chair*)	**Associate Dean (Academic Affairs)**
Michael Jemtrud; B.A., B.Sc., B.Arch.(Penn. St.), M.Arch.(McG.), M.R.A.I.C.	**Director, School of Architecture**
Dimitrios Berk; B.Sc.(Bosphorus), M.E.Sc.(W. Ont.), Ph.D.(Calg.), P.Eng.	**Chair, Department of Chemical Engineering**
Van Thanh Van Nguyen; B.Mech.Eng.(Vietnam), M.Civil Eng.(Thailand), Ph.D.(École Poly., Montr.), P.Eng.	**Chair, Department of Civil Engineering and Applied Mechanics**
David V. Plant; M.S., Ph.D.(Brown), F.O.S.A. (*James McGill Professor*)	**Chair, Department of Electrical and Computer Engineering**
George Haller; M.Sc.(Univ. Budapest), Ph.D.(Cal. Tech.) (*Faculty of Engineering Distinguished Professor*)	**Chair, Department of Mechanical Engineering**
Steve Yue; B.Sc., Ph.D.(Leeds)	**Chair, Department of Mining and Materials Engineering**
David F. Brown; B.A.(Bishop's), M.U.P.(McG.), Ph.D.(Sheff.)	**Director, School of Urban Planning**
Colin Rogers; B.A.Sc., M.A.Sc.(Wat.), Ph.D.(Syd.), P.Eng.	**Secretary of Faculty**
Christine Tutt	**Director of Administration**
Debbie Morzajew	**Manager, EMF**
Jonathan Rousham	**Facilities Manager**
Susanne Baumann-Moroy	**Human Resource Adviser**
Enza De Martinis	**Financial Officer**
Judy Pharo	**Associate Director, Engineering Student Centre**

6 Degrees and Requirements for Professional Registration

Non-Professional

Bachelor of Science (Architecture)

The first professional degree in architecture is the Master of Architecture (Professional). Further information can be found in the *Graduate and Postdoctoral Studies Calendar* at *www.mcgill.ca/students/courses/calendars*.

Professional

Bachelor of Engineering

Bachelor of Engineering (Honours)

Bachelor of Software Engineering

The B.Eng. and B.S.E. programs are accredited by the Canadian Engineering Accreditation Board (CEAB) of Engineers Canada and fulfil the academic requirements for admission to the provincial engineering professional organizations. Engineers Canada has also negotiated agreements with engineering organizations in other countries to grant Canadian licensed engineers the same privileges accorded to professional engineers in those countries. For more information, visit the Engineers Canada website at *www.engineerscanada.ca*. All students are expected to seek professional registration after graduation.

To become a professional engineer in Canada, a graduate must pass an examination on legal aspects and on the principles of professional practice, and acquire two to four years of engineering experience, depending on the province. Only persons duly registered may use the title "engineer" and perform the professional activities reserved for engineers by provincial laws and regulations.

In Quebec, the professional engineering body is the *Ordre des ingénieurs du Québec* (OIQ). In order to better prepare new graduates for the practice of their profession, McGill organizes seminars in cooperation with the OIQ on various aspects of the profession. The OIQ also has a student section. As soon as you have accumulated 60 credits in a B.Eng. or B.S.E. program, you can join the student section of the OIQ. Registration is free. For more information, visit the OIQ website at *www.oiq.qc.ca*.

7 Admission Requirements

The Faculty of Engineering offers programs leading to the degrees of B.Eng., B.S.E. and B.Sc.(Arch.). Enrolment in Engineering programs is limited.

For detailed information on admissions requirements, see the *Undergraduate Admissions Guide 2010-11* at *www.mcgill.ca/applying*.

8 Student Progress

The length of the B.Eng., B.S.E. and B.Sc.(Arch.) programs vary depending on your program and basis of admission. You can find the curriculum for your program on the website of your department/school. See *www.mcgill.ca/engineering/departments* for links to department/school websites.

You must successfully complete the B.Eng., B.S.E., or B.Sc.(Arch.) programs within six years of entry. Candidates admitted to a lengthened program, or to a shortened program because of advanced standing, or who are participating in a work term or in the Engineering Internship Program (EIP), will have a correspondingly greater or lesser period in which to complete their program.

Extensions may be granted by the Committee on Standing in cases of serious medical problems or where other similarly uncontrollable factors have affected your progress.

9 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 under the auspices of the Engineering Undergraduate Society (EUS) or the Architectural Student Association (ASA). Both of these organizations publish handbooks describing their operations and the activities of various Faculty clubs and societies. All undergraduate students automatically become members of the EUS or the ASA, as appropriate.

10 Degrees and Programs Offered

Engineering Internship Program

Co-op Programs

Materials Engineering (B.Eng.)

Mining Engineering (B.Eng.)

General Engineering Program

General Engineering - Undeclared major (freshman year)

Major Programs

Architecture (B.Sc.)

Chemical Engineering (B.Eng.)

Civil Engineering (B.Eng.)

Computer Engineering (B.Eng.)

Electrical Engineering (B.Eng.)

Mechanical Engineering (B.Eng.)

Software Engineering (B.S.E.)

Honours Programs
Electrical Engineering (B.Eng.)
Mechanical Engineering (B.Eng.)

Minors
Arts
Biomedical Engineering
Biotechnology
Chemistry
Computer Science
Construction Engineering and Management
Economics
Environmental Engineering
Environment
Management Minors: Minor in Finance, Minor in Management, Minor in Marketing, Minor in Operations Management
Materials Engineering
Mathematics
Mining Engineering
Physics
Technological Entrepreneurship
Software Engineering

11 Engineering Internship Program

Employers value experience. Internships (four, eight, twelve or sixteen months) allow you to gain professional work experience during the course of your undergraduate studies while earning a salary within the average range for entry-level professional positions. Other benefits include the following:

- improved employment prospects upon graduation, often at a higher starting salary;
- the opportunity to explore career options prior to graduation;
- the opportunity to develop communication skills and to acquire a business perspective that cannot be learned in school.

An internship may begin in January, May or September. Employers choose the most suitable students for their organization through an application and interview process. While employed by the participating companies, you work on assignments related to your field of study. Internships will be recognized on your transcript as one or more non-credit courses entitled "Industrial Practicum." Successful completion of an internship of eight or more months qualifies you to graduate with the Internship Program designation on your transcript.

11.1 Student Eligibility

To participate in the Engineering Internship Program, you must

- have a CGPA of 2.00 or higher;
- be in good financial standing with the University;
- obtain approval from the Engineering Career Centre before registering for or starting your internship;
- be registered full-time in your program before and after your internship;
- remain a degree candidate while on internship;
- return to complete your undergraduate degree at McGill, with a minimum of 15 credits remaining in your program after your internship (i.e., you are not allowed to complete your degree during your internship).

Internship students will receive an automatic extension for the completion of their studies.

International students are eligible (a few restrictions may apply).

For more information, see *www.mcgill.ca/careers4engineers* or send an email to *careers4engineers@mcgill.ca*.

Important Information:

- While on internship, you are expected to complete any deferrals you may have been granted, regardless of the location of the internship. If you do not write a deferred exam as scheduled, you will receive a final grade of J. The J grade will calculate as a failure in both TGPA and CGPA.
- International students must ensure that their health coverage remains in force during their internship.
- During your time as an intern, you are not considered to be in full-time status. Your government loans will become due and payable within the prescribed grace period (usually six months).
- If you officially accept an internship position but subsequently decline the position, you will no longer be eligible for the Engineering Internship Program.

12 Academic Programs

The programs and courses in the following pages have been approved for the 2010-11 session as listed, but the Faculty reserves the right to introduce changes as may be deemed necessary or desirable.

12.1 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), following which students enter into an engineering major program.

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

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

This is a 30-31 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 transfer into a B.Eng. or B.S.E. program.

Year 0 (Freshman) Courses

(30-31 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

* Students may take MATH 139 (Calculus) (4 credits) instead of MATH 140, but only with permission from the Department of Mathematics and Statistics.

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 208, ECON 217, 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 350	(3)	The Material Culture of Canada
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
MATH 352	(1)	Problem Seminar
MGCR 222*	(3)	Introduction to Organizational Behaviour
MRKT 360*	(3)	Marketing of Technology
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/student-records/exam/placement for information on Science Placement Exams.

12.2 School of Architecture

12.2.1 Location

Macdonald-Harrington Building, Room 201
815 Sherbrooke Street West
Montreal, Quebec H3A 2K6

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

12.2.2 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.

12.2.3 Architectural Certification in Canada

In Canada, all provincial associations recommend a degree from an accredited professional degree program as a prerequisite for licensure. The Canadian Architectural Certification Board (CACB), which is the sole agency authorized to accredit Canadian professional degree programs in architecture, recognizes

two types of accredited degrees: the Bachelor of Architecture and the Master of Architecture. A program may be granted a five-year, three-year, or two-year term of accreditation, depending on its degree of conformance with established educational standards.

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.

Since all provincial associations in Canada recommend any applicant for licensure to have graduated from a CACB-accredited program, obtaining such a degree is an essential aspect of preparing for the professional practice of architecture. While graduation from a CACB-accredited program does not assure registration, the accrediting process is intended to verify that each accredited program substantially meets those standards that, as a whole, comprise an appropriate education for an architect.

12.2.4 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*.

12.2.4.1 Student Exchanges

A limited number of qualified students may participate in an exchange with schools of architecture at other universities which 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); Institut Supérieur d'Architecture, Saint-Luc Bruxelles (Brussels, Belgium); École Nationale Supérieure d'architecture de Grenoble (Grenoble, France); École Nationale Supérieure d'architecture de Clermont-Ferrand (Clermont-Ferrand, France); Facoltà di Architettura Civile Politecnico di Milano (Boviso) (Milan, Italy); The Royal Danish Academy of Fine Arts, School of Architecture (Copenhagen, Denmark).

12.2.5 Ancillary Academic Facilities

Laboratories and Workshops

Architectural Workshops - David Speller, Technician

Communications Laboratory, including Photo Lab - Carrie Henzie, Media Technician

Computers in Architecture Laboratories - Professor Aaron Sprecher

Library

Blackader-Lauterman Library of Architecture and Art, located in the Redpath Library - Marilyn Berger

Collections

Visual Resources Collection, including slides, film, video and other materials - Dr. Annmarie Adams

The John Bland Canadian Architecture Collection, housed in the Blackader-Lauterman Library - Ann Marie Holland, Preservations Librarian

Orson Wheeler Architectural Model Collection - Professor Pieter Sijpkes

Materials Resource Centre - Dr. Avi Friedman

12.2.6 School of Architecture Faculty

Director

Michael Jemtrud

Emeritus Professors

Derek Drummond; B.Arch.(McG.), F.R.A.I.C., O.A.A. (*William C. Macdonald Emeritus Professor of Architecture*)

Radoslav Zuk; B.Arch.(McG.), M.Arch.(MIT), D.Sc.(Ukr. Acad. Art), F.R.A.I.C., F.R.S.A., F.A.R.C., O.A.Q., O.A.A.

Professors

Annmarie Adams; B.A.(McG.), M.Arch., Ph.D.(Calif., Berk.), M.R.A.I.C. (*William C. Macdonald Professor of Architecture*)

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.(Nat.Pol.Inst., Mexico), M.A., Ph.D.(Essex) (*Saidye Rosner Bronfman Professor of Architectural History*)

Adrian Sheppard; B.Arch.(McG.), M.Arch.(Yale), F.R.A.I.C., O.A.Q., A.A.P.P.Q.

Associate Professors

Martin Bressani; B.Sc.(Arch.), B.Arch.(McG.), M.Sc.Arch., Diplômes des Études approfondies, Docteur de l'Université de Paris-Sorbonne(Paris IV)

Ricardo L. Castro; B.Arch.(Los Andes), M.Arch., M.A.(Art History)(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.)

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.

Pieter Sijpkes; B.Sc.(Arch.), B.Arch.(McG.)

Assistant Professors

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

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

Adjunct Professors

Robert Claiborne

Howard Davies

François Émond

Julia Gersovitz

Phyllis Lambert

Joanna Nash

Mark Poddubiuk

Conor Sampson

Jozef Zorko

Planetary Society Visiting Professor in Architecture

Torben Berns

Course Lecturers

Tom Balaban

Sinisha Brdar

Nancy Dunton

Leila Marie Farah

Jean-François Fortin

Andrew King

Andrea MacElwee

Sybil McKenna

Suresh Perera

Carlos Rueda

Course Lecturers

Pierina Saia

Senior Critic

Dan Hanganu

Visiting Critics and 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 2009:

Diego Agudelo, Manon Asselin, Neeraj Bhatia, Mark Brightman, Mark Boutin, Randall Cohen, Youki Cropas, Jason Crow, Dana Cupkova, Nathalie Dionne, Tom Egli, Denis Fortune, Eric Gauthier, Ben Gianni, Nathan Godlovitch, Peter Gossage, Cynthia Hammond,Shelley Hornstein, Hal Ingberg, Richard Klopp, Vuk Krcmar-Grkavac, Anick La Bissionniere, Matt Litvak, Marianne McKenna, Vouli Mamfredis, Shawn Moscowitz, Katsu Muramoto, Mark Poddubiuk, Julie Podmore, Wendy Pollard, Kevin Pratt, Inderbir Riar, Owen Rose, Zubin Singh, Jan Vrana, Katsuhiro Yamazaki

12.2.7 Bachelor of Science (B.Sc.) (Architecture) - Architecture (126 credits)

Revision, Fall 2010. Start of revision.

McGill's professional program in Architecture is divided into two parts. The first part is an eight-term design-based program (six-term program for students entering with the Quebec Diploma of Collegial Studies in Pure and Applied Science or the equivalent) leading to a non-professional degree, Bachelor of Science (Architecture). Applicants whose background includes a university degree in an area not related to architecture should apply to the B.Sc.(Arch.) program. For detailed information about admission procedures and requirements, please see the Undergraduate Admissions Guide at http://www.mcgill.ca/applying.

The second part, for students with the McGill B.Sc.(Arch.) degree or equivalent non-professional undergraduate architecture degree, is either a three-term (fall/winter/summer) or a two-year program leading to the Master of Architecture (Professional) degree. There are two options for the completion of M.Arch. (Professional) program: Design Studio (45 credits) and Design Studio-Directed Research (60 credits). 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 U.S.

For more information on program structure and courses, visit the School of Architecture website at http://www.mcgill.ca/architecture.

Required Year 0 (Freshman) Courses

26 credits

Generally, students admitted to the Architecture program from Quebec CEGEPs are granted transfer credit for the Year 0 (Freshman) courses and enter a 100-credit (six-term) 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

Required Non-Departmental Courses

15 credits

Note: Candidates intending not to proceed to the M.Arch. (Professional) degree may substitute other courses of equal total credit weight for any course with an asterisk (*) in the list below.

CIVE 284	(4)	Structural Engineering Basics
CIVE 385*	(3)	Structural Steel and Timber Design
CIVE 388*	(3)	Foundation and Concrete Design

CIVE 492*	(2)	Structures
FACC 220	(3)	Law for Architects and Engineers

Required Architectural Courses

70 credits

ARCH 201	(6)	Communication, Behaviour and Architecture
ARCH 202	(6)	Architectural Graphics and Elements of Design
ARCH 217	(1)	Freehand Drawing 1
ARCH 218	(1)	Freehand Drawing 2
ARCH 240	(3)	Organization of Materials in Buildings
ARCH 241	(3)	Architectural Structures
ARCH 242	(2)	Digital Representation
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 321	(1)	Freehand Drawing 3
ARCH 322	(1)	Freehand Drawing 4
ARCH 324	(1)	Sketching School
ARCH 354	(3)	Architectural History 3
ARCH 355	(3)	Architectural History 4
ARCH 375	(2)	Landscape
ARCH 377	(3)	Energy, Environment and Buildings
ARCH 405	(6)	Design and Construction 3
ARCH 406	(6)	Design and Construction 4
ARCH 447	(2)	Lighting
ARCH 451	(2)	Building Regulations and Safety

Complementary Courses

9 credits from the following:

ARCH 318	(3)	Design Sketching
ARCH 319	(3)	The Camera and Perception
ARCH 352	(3)	Art and Theory of House Design
ARCH 363	(2)	Structure, Organization and Form
ARCH 378	(3)	Site Usage
ARCH 379	(3)	Summer Course Abroad
ARCH 383	(3)	Geometry and Architecture
ARCH 461	(1)	Freehand Drawing and Sketching
ARCH 471	(2)	Computer-Aided Building Design
ARCH 490	(2)	Selected Topics in Design
ARCH 512	(3)	Architectural Modelling
ARCH 514	(4)	Community Design Workshop

ARCH 515	(3)	Sustainable Design
ARCH 517	(3)	Sustainable Residential Development
ARCH 520	(3)	Montreal: Urban Morphology
ARCH 521	(3)	Structure of Cities
ARCH 522	(3)	History of Domestic Architecture in Quebec
ARCH 523	(3)	Significant Texts and Buildings
ARCH 524	(3)	Critical Design Strategies
ARCH 525	(3)	Seminar on Analysis and Theory
ARCH 526	(3)	Philosophy of Structure
ARCH 527	(3)	Civic Design
ARCH 528	(3)	History of Housing
ARCH 529	(3)	Housing Theory
ARCH 531	(3)	Architectural Intentions Vitruvius - Renaissance
ARCH 532	(3)	Origins of Modern Architecture
ARCH 533	(3)	New Approaches to Architectural History
ARCH 534	(3)	Architectural Archives
ARCH 535	(3)	History of Architecture in Canada
ARCH 536	(3)	Heritage Conservation
ARCH 540	(3)	Selected Topics in Architecture 1
ARCH 541	(3)	Selected Topics in Architecture 2
ARCH 554	(2)	Mechanical Services
ARCH 555	(2)	Environmental Acoustics
ARCH 564	(3)	Design for Development
ARCH 566	(3)	Cultural Landscapes Seminar
OCC1 442	(2)	Environments for the Disabled

Electives

6 credits of elective courses outside the School of Architecture must be completed, subject to approval by the student adviser.

Revision, Fall 2010. End of revision.

12.3 Department of Chemical Engineering

12.3.1 Location

M.H. Wong Building, Room 3060
3610 University Street
Montreal, Quebec H3A 2B2

Telephone: 514-398-4494
Fax: 514-398-6678
Website: *www.mcgill.ca/chemeng*

12.3.2 About the Department of Chemical Engineering

The central purpose of engineering is to pursue solutions to technological problems in order to satisfy the needs and desires of society. Chemical engineers are trained to solve the kinds of problems that are typically found in the "chemical process industries", which include the chemical manufacturing, plastics,

water treatment, pulp and paper, petroleum refining, ceramics, and paint industries as well as substantial portions of the food processing, textile, nuclear energy, biochemical, biomedical and pharmaceutical industries. The technological problems and opportunities in these industries are often closely linked to social, economic and environmental concerns. For this reason, practitioners of chemical engineering often deal with these questions when they are working in management, pollution abatement, product development, marketing and equipment design.

By means of complementary courses, students can also obtain further depth in technical areas and breadth in non-technical subjects. Some students elect to complete a minor in biotechnology, management, materials engineering, computer science, environmental engineering or chemistry.

The solution to many environmental problems requires an understanding of technological principles. A chemical engineering degree provides an ideal background. In addition to relevant material learned in the core program, a selection of environmental complementary courses and minor programs is available. The involvement of many chemical engineering staff members in environmental research provides the opportunity for undergraduate students to carry out research projects in this area.

The curriculum also provides the preparation necessary to undertake postgraduate studies leading to the M.Eng. or Ph.D. degrees in chemical engineering. Students completing this curriculum acquire a broad, balanced education in the natural sciences with the accent on application. Thus, for those who do not continue in chemical engineering, it provides an exceptionally balanced education in applied science. For others, it will form the basis of an educational program that may continue with a variety of studies such as business administration, medicine or law. Versatility is, then, one of the most valuable characteristics of the graduate of the chemical engineering program.

12.3.3 Academic Program

The Chemical Engineering Program comprises 140-141 credits (111 credits for those who completed the Quebec CEGEP program in Pure and Applied Sciences). Certain students who take advantage of summer session courses can complete the program in three calendar years.

In some cases students from university science disciplines have sufficient credits to complete the requirements for the B.Eng. (Chemical) program in two years. Those concerned should discuss this with their adviser.

Students must obtain a grade of C or better in all core courses. For the Department of Chemical Engineering, core courses include all required courses (departmental and non-departmental) as well as complementary courses (departmental).

12.3.4 Canadian Society for Chemical Engineering

The Chemical Engineering Student Society has for many years been affiliated both with the CSChE (Canadian Society for Chemical Engineering) and with the AIChE (American Institute of Chemical Engineers). For a nominal fee students receive Canadian Chemical News, a monthly publication, and the AlChE Student Members Bulletin as well as other privileges of student membership in the two societies. The student chapter also organizes a series of local social, educational and sporting events. For example, recent events have included student-professor banquets and Christmas parties, dances, speakers, broomball games and joint meetings with the Montreal Section of the CSChE. The latter gives students a chance to mix with practising chemical engineers.

12.3.5 Department of Chemical Engineering Faculty

Chair

Dimitrios Berk

Emeritus Professors

John M. Dealy; B.S.(Kansas), M.S.E., Ph.D.(Mich.), Eng.

Musa R. Kamal; B.S.(Ill.), M.S., Ph.D.(Carn. Mell), Eng.

Juan H. Vera; B.Mat.(Chile), Ing.Quim.(U.T.E.), M.S.(Calif., Berk.), Dr.Ing.(Santa Maria), Ing.

Professors

David G. Cooper; B.Sc., Ph.D.(Tor.)

Richard J. Munz; B.A.Sc., M.A.Sc.(Wat.), Ph.D.(McG.), Eng.

Alejandro D. Rey; B.Ch.Eng.(CCNY), Ph.D.(Calif., Berk.) (*James McGill Professor*)

Associate Professors

Dimitrios Berk; B.Sc.(Bosphorus), M.E.Sc.(W. Ont.), Ph.D.(Calg.), P.Eng.

Sylvain Coulombe; B.Sc., M.Sc.A.(Sher.), Ph.D.(McG.), Ing.

Reghan James Hill; B.Eng., Ph.D.(C'nell)

Richard L. Leask; B.A.Sc., M.A.Sc.(Wat.), Ph.D.(Tor.), P.Eng.

Milan Maric; B.Sc., B.Eng. & Mgmt(McM.), Ph.D.(Minn.), P.Eng.

Jean-Luc Meunier; Dipl.Ing., EPFL(Lausanne), M.Sc., Ph.D., INRS(Varennes), Ing.

Associate Professors

Sasha Omanovic; Dipl.Ing., Ph.D.(Zagreb), P.Eng.

Thomas Quinn; B.Sc.(Qu.), S.M., Ph.D.(MIT)

Phillip Servio; B.Sc., Ph.D.(Minn.)

Assistant Professors

Elizabeth Jones; B.A.Sc.(Wat.), M.S., Ph.D.(Cal. Tech.)

Nathalie Tufenkji; B.Eng.(McG.), M.Sc., Ph.D.(Yale)

Viviane Yargeau; B.Eng., M.Sc.A., Ph.D.(Sher.), Ing.

Post-Retirement

W.J. Murray Douglas; B.Sc.(Qu.), M.S.E., Ph.D.(Mich.)

PAPRICAN Adjunct Professor

George J. Kubes; B.Eng., M.Eng.(Prague), Ph.D.(Bratislava)

Adjunct Professors

T. Addona

P. Bisaillon

M. Davidovsky

M. Fokas

D.J. McKeagan

B. McNicoll

A. De Mori

M. Perrier

B.E. Sarkis

J. Simandl

B. Théorét

R.C. Urquhart

12.3.6 Bachelor of Engineering (B.Eng.) - Chemical Engineering (112 credits)

Revision, Fall 2010. Start of revision.

The discipline of chemical engineering is distinctive in being based equally on physics, mathematics and chemistry. Application of these three fundamental sciences is basic to a quantitative understanding of the process industries. Those with an interest in the fourth major science, biology, will find several courses in the chemical engineering curriculum which integrate aspects of the biological sciences relevant to process industries such as food processing, fermentation, biomedical and water pollution control. Courses on the technical operations and economics of the process industries are added to this foundation. The core curriculum concludes with process design courses taught by practising design engineers. Problem-solving, experimenting, planning and communication skills are emphasized in courses throughout the core curriculum.

Certain students who take advantage of summer session courses can complete the departmental program in three calendar years.

In some cases students from university science disciplines have sufficient credits to complete the requirements for the B.Eng. (Chemical) program in two years. Those concerned should discuss this with their adviser.

Students must obtain a grade of C or better in all core courses. For the Department of Chemical Engineering, core courses include all required courses (departmental and non-departmental) as well as complementary courses (departmental).

Note to CEGEP students

If you have successfully completed a course at CEGEP that is equivalent to CHEM 212 or CHEM 234, you may request exemption for either or both courses. However, you must replace each course with another university-level course of an equal number of credits or more – McGill courses beginning with subject codes ATOC, BIOL, CHEM, EPSC, ESYS, PHYS are acceptable substitutes.

Total program credit weight 112-115 credits.

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.

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/credit 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).

Required Non-Departmental Courses

24 credits

CHEM 212	(4)	Introductory Organic Chemistry 1
CHEM 234	(3)	Topics in Organic Chemistry
COMP 208	(3)	Computers in Engineering
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
MIME 310	(3)	Engineering Economy

Required Chemical Engineering Courses

73 credits

CHEE 200	(4)	Introduction to Chemical Engineering
CHEE 204	(3)	Chemical Manufacturing Processes
CHEE 220	(3)	Chemical Engineering Thermodynamics
CHEE 291	(4)	Instrumental Measurement Laboratory
CHEE 310	(3)	Physical Chemistry for Engineers
CHEE 314	(4)	Fluid Mechanics
CHEE 315	(4)	Heat and Mass Transfer
CHEE 340	(3)	Process Modelling
CHEE 351	(3)	Separation Processes
CHEE 360	(1)	Technical Paper 1
CHEE 370	(3)	Elements of Biotechnology
CHEE 380	(3)	Materials Science
CHEE 392	(4)	Project Laboratory 1

CHEE 393	(5)	Project Laboratory 2
CHEE 423	(4)	Chemical Reaction Engineering
CHEE 453	(4)	Process Design
CHEE 455	(4)	Process Control
CHEE 456	(2)	Design Project 1
CHEE 457	(5)	Design Project 2
CHEE 462	(1)	Technical Paper 2
CHEE 474	(3)	Biochemical Engineering
CHEE 484	(3)	Materials Engineering

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

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

CHEE 494 or CHEE 495 or CHEE 496

CHEE 563 or MECH 563

CHEE 592 or MECH 534

CHEE 593 or CIVE 430

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 452	(3)	Particulate Systems
CHEE 458	(3)	Computer Applications
CHEE 464	(2)	Projects Chemical Engineering 2
CHEE 487	(3)	Chemical Processing: Electronics Industry
CHEE 494*	(3)	Research Project and Seminar 1
CHEE 495*	(4)	Research Project and Seminar 2
CHEE 496*	(3)	Environmental Research Project
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 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
MECH 534*	(3)	Air Pollution Engineering
MECH 563*	(3)	Biofluids and Cardiovascular Mechanics

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

Complementary Studies

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
CHEE 430	(3)	Technology Impact Assessment
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

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 208, ECON 217, 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, 3 credits will be given for one 6-credit course in that language.

However, 3 credits may be given for any language course that has a sufficient cultural component. You must have this course approved by a faculty adviser.

Revision, Fall 2010. End of revision.

12.3.6.1 More about the B.Eng. Degree in Chemical Engineering

Courses CHEE 582 and CHEE 584 comprise a Polymeric Materials sequence. Additional courses in this area are available in the Chemistry Department (e.g., CHEM 455) or at the graduate level (CHEE 681 to CHEE 684). The Department has considerable expertise in the polymer area.

Courses CHEE 370 and CHEE 474 make up a sequence in Biochemical Engineering-Biotechnology. Students interested in this area may take additional courses, particularly those offered by the Department of Food Science and Agricultural Chemistry, Faculty of Agricultural and Environmental Sciences, and 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 offers three courses in this area: CHEE 591, CHEE 592, and CHEE 593. As some water pollution control problems are solved by microbial processes, course CHEE 474 is also relevant to the pollution control area. Additional courses in this area are listed under *Bachelor of Engineering (B.Eng.) - Minor Environmental Engineering (22 credits), section 12.10.8: Environmental Engineering Minor*.

A Minor in Biotechnology is also offered in the Faculties of Engineering and of Science with emphasis on molecular biology and chemical engineering processes. A full description of the program appears under *section 12.10.3: Biotechnology Minor*.

Note that many of the technical complementaries are offered only in alternate years. Students should, therefore, plan their complementaries as far ahead as possible. With the approval of the instructor and academic adviser, students may take graduate (500-level) CHEE courses as technical complementaries.

12.4 Department of Civil Engineering and Applied Mechanics

12.4.1 Location

Macdonald Engineering Building, Room 492
817 Sherbrooke Street West
Montreal, Quebec H3A 2K6

Telephone: 514-398-6860
Fax: 514-398-7361
Website: *www.mcgill.ca/civil*

12.4.2 About the Department of Civil Engineering and Applied Mechanics

Civil engineers have traditionally applied scientific and engineering knowledge to the task of providing the built environment, from its conception and planning to its design, construction, maintenance and rehabilitation. Examples include buildings, bridges, roads, railways, dams, and facilities for water supply and treatment, and waste disposal. With the aging and deterioration of an already vast infrastructure, its maintenance and rehabilitation has become

an increasingly important role of the civil engineering profession. Also, with worldwide concern about the detrimental impact of human activities on the environment, civil engineers are now in the forefront of developing and providing the means for both prevention and remediation of many aspects of environmental pollution.

Students who wish to extend their knowledge in certain areas beyond the range that the program complementary courses allow can also take a Minor program. Minors are available in fields such as Arts, Economics, Management, Environmental Engineering, and Construction Engineering and Management. These require additional credits to be taken from a specified list of topics relating to the chosen field. Further information on the various Minor programs may be found in *section 12.10: Minor Programs*. Details of how the Minors can be accommodated within the Civil Engineering program will be made available at the time of preregistration counselling.

12.4.3 Academic Programs

Considerable freedom exists for students to influence the nature of the program of study which they follow in the Department of Civil Engineering and Applied Mechanics. A variety of advanced complementary courses is offered in five main groupings: Environmental Engineering, Geotechnical and Geoenvironmental Engineering, Water Resources and Hydraulic Engineering, Structural Engineering, and Transportation Engineering.

Guidance on the sequence in which required core courses should be taken is provided for students in the form of a sample program which covers the entire period of study. The technical complementary courses selected, usually in the last two terms of the program, will depend upon the student's interests. All students must meet with their adviser each term to confirm the courses for which they are registered.

Courses taken in Term 3 or later will depend on a student's interests and ability. Information and advice concerning different possibilities are made available in the Department prior to registration. All programs require the approval of a staff adviser. Programs for students transferring into the Department with advanced standing will be dependent upon the academic credit previously achieved, and such a program will be established only after consultation with a staff adviser.

12.4.4 Department of Civil Engineering and Applied Mechanics Faculty

Chair

Van-Thanh-Van Nguyen

Emeritus Professors

Philip J. Harris; B.Sc.(Manit.), M.Eng., Ph.D.(McG.), F.E.I.C., F.C.S.C.E., Eng.

M. Saeed Mirza; B.Eng.(Karachi), M.Eng., Ph.D.(McG.), F.A.C.I., F.E.I.C., F.C.S.C.E., Hon. F.I.E.P., Eng.

Richard G. Redwood; B.Sc.(Eng.)(Brist.), M.A.Sc.(Tor.), Ph.D.(Brist.), F.C.S.C.E., F.I.Struct.Eng., Eng.

Stuart B. Savage; B.Eng.(McG.), M.S.Eng.(Cal. Tech.), Ph.D.(McG.), F.R.S.C.

Professors

Vincent H. Chu; B.S.Eng.(Taiwan), M.A.Sc.(Tor.), Ph.D.(MIT), Eng.

Denis Mitchell; B.A.Sc., M.A.Sc., Ph.D.(Tor.), F.A.C.I., F.C.A.E., F.C.S.C.E., Eng. (*James McGill Professor*)

Van-Thanh-Van Nguyen; B.M.E.(Vietnam), M.C.E.(A.I.T.), D.A.Sc.(Montr.), Eng.

James Nicell; B.A.Sc., M.A.Sc., Ph.D.(Windsor), P.Eng. (*William Dawson Scholar*)

A. Patrick S. Selvadurai; M.S.(Stan.), Ph.D., D.Sc.(Nott.), F.E.I.C., F.I.M.A., F.C.S.C.E., P.Eng. (*William Scott Professor of Civil Engineering, James McGill Professor*)

Suresh C. Shrivastava; B.Sc.(Eng.)(Vikram), M.C.E.(Del.), Sc.D.(Col.), Eng.

Associate Professors

Luc E. Chouinard; B.Ing., M.Ing.(Montr.), B.C.L.(McG.), Sc.D.(MIT), Eng.

Susan J. Gaskin; B.Sc.(Qu.), Ph.D.(Cant.), P.Eng., Graduate Program Director

Ronald Gehr; B.Sc.(Eng.)(Rand), M.A.Sc., Ph.D.(Tor.), P.Eng.

Subhasis Ghoshal; B.C.E.(Jadavpur), M.S.(Missouri), Ph.D.(Carn. Mell), P.Eng., Associate Dean (*William Dawson Scholar*)

Ghyslaine McClure; B.Ing.(Montr.), S.M.C.E.(MIT), Ph.D.(Montr.), Eng.

Colin Rogers; B.A.Sc., M.A.Sc.(Wat.), Ph.D.(Syd.), P.Eng.

Yixin Shao; B.S., M.S.(Tongji), Ph.D.(N'western), P.Eng., Undergraduate Program Director

Assistant Professors

Andrew J. Boyd; B.Sc.Eng.(New Br.), M.A.Sc.(Tor.), Ph.D.(Br. Col.), P.Eng., F.A.C.I.

Dominic Frigon; B.Sc.(Agr.Sci.), M.Sc.(McG.), Ph.D.(Env.Sci.)(Ill.)

Mohamed Abdel-Meguid; B.Sc.(Cairo, Azhar), M.Sc., Ph.D.(W. Ont.), P.Eng.

Luis Miranda-Moreno; B.Sc., M.Eng.(Mexico), M.Sc., Ph.D.(Wat.)

Adjunct Professors

Sofia Babarutsi

Richard Edwards

John Hadjinicolaou

Jalal Hawari

Konrad Jones

Angela Keane

Zoubir Lounis

Pierre Lundahl

Patrick Maillard

Charles Manatakos

Thanh Son Nguyen

Paul Rodrigue

Sandro Scola

William Taylor

Marc Villeneuve

Jan Vrana

12.4.5 Bachelor of Engineering (B.Eng.) - Civil Engineering (110 credits)

Revision, Fall 2010. Start of revision.

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.

Required Non-Departmental Courses

28 credits

CCOM 206	(3)	Communication in Engineering
COMP 208	(3)	Computers in Engineering
EPSC 221	(3)	General Geology
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
MECH 261	(2)	Measurement Laboratory
MECH 289	(3)	Design Graphics
MIME 310	(3)	Engineering Economy

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)	Construction Project Management
CIVE 327	(4)	Fluid Mechanics and Hydraulics
CIVE 418	(4)	Design Project
CIVE 432	(1)	Technical Paper

Complementary Courses

21 credits consisting of:

Technical Complementary Courses

15 credits from List A and List B

Complementary Studies

6 credits from Group A and Group B

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 462	(3)	Design of Steel Structures
CIVE 463	(3)	Design of Concrete Structures

List B - General Technical Complementaries

0-9 credits from the following, or from other suitable undergraduate or 500-level courses:

CIVE 433	(3)	Urban Planning
CIVE 440	(3)	Traffic Engineering
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 527	(3)	Renovation and Preservation: Infrastructure
CIVE 540	(3)	Urban Transportation Planning
CIVE 550	(3)	Water Resources Management
CIVE 551	(3)	Environmental Transport Processes
CIVE 553	(3)	Stream Pollution and Control
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
CIVE 587	(3)	Pavement Design

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
CHEE 430	(3)	Technology Impact Assessment

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

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 208, ECON 217, 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, 3 credits will be given for one 6-credit course in that language.

However, 3 credits may be given for any language course that has a sufficient cultural component. You must have this course approved by a faculty adviser.

Revision, Fall 2010. End of revision.

12.5 Department of Electrical and Computer Engineering

12.5.1 Location

Department of Electrical and Computer Engineering
Undergraduate Programs Office
Lorne Trottier Building, Room 2060
3630 University Street
Montreal, Quebec H3A 2B2

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

12.5.2 About the Department of Electrical and Computer Engineering

The Department of Electrical and Computer Engineering offers undergraduate degree programs in Electrical Engineering, Electrical Engineering (Honours), Computer Engineering, and Software Engineering. All programs provide students with a strong background in mathematics, basic sciences, engineering science, engineering design and complementary studies, in conformity with the requirements of the Canadian Engineering Accreditation Board (CEAB).

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

12.5.3 Department of Electrical and Computer Engineering Faculty

Chair

David V. Plant

Associate Chair, Operations

Benoit Boulet

Associate Chair, Undergraduate Studies

Jonathan P. Webb

Associate Chair, Graduate Studies

Mark Coates

Emeritus Professors

Eric L. Adler; B.Sc.(Lond.), M.A.Sc.(Tor.), Ph.D.(McG.), F.I.E.E.E., Eng.

Pierre R. Bélanger; B.Eng.(McG.), S.M., Ph.D.(MIT), F.I.E.E.E., Eng.

Maier L. Blostein; B.Eng., M.Eng.(McG.), Ph.D.(Ill.), F.I.E.E.E., Eng.

Clifford H. Champness; M.Sc.(Lond.), Ph.D.(McG.)

Gerry W. Farnell; B.A.Sc.(Tor.), S.M.(MIT), Ph.D.(McG.), F.I.E.E.E., Eng.

Lorne Mason; B.Eng., Ph.D.(Sask.)

Tomas J.F. Pavlasek; B.Eng., M.Eng., Ph.D.(McG.), Eng.

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*)

James Clark; B.A.Sc., Ph.D.(Br. Col.), *Associate Dean, Academic*

Frank Ferrie; B.Eng., Ph.D.(McG.)

Francisco D. Galiana; B.Eng.(McG.), S.M., Ph.D.(MIT), F.I.E.E.E., Eng.

Vincent Hayward; Dip.Ing.(ENSM, Nantes), Doc.Ing.(Orsay), Eng.

Geza Joos; B.Sc.(C'dia), M.Eng., Ph.D.(McG.) (*CRC Chair*)

Peter Kabal; B.A.Sc., M.A.Sc., Ph.D.(Tor.)

Tho Le-Ngoc; M.Eng.(McG.), Ph.D.(Ott.), F.I.E.E.E.

Harry Leib; B.Sc.(Technion), Ph.D.(Tor.)

Martin D. Levine; B.Eng., M.Eng.(McG.), Ph.D.(Lond.), F.C.I.A.R., F.I.E.E.E., Eng.

David A. Lowther; B.Sc.(Lond.), Ph.D.(C.N.A.A.), F.C.A.E., Eng. (*James McGill Professor*)

Boon-Teck Ooi; B.E.(Adel.), S.M.(MIT), Ph.D.(McG.), Eng.

David V. Plant; M.S., Ph.D.(Brown), P.Eng., F.I.E.E.E., F.O.S.A., F.C.A.E. (*James McGill Professor*)

Gordon Roberts; B.A.Sc.(Wat.), M.A.Sc., Ph.D.(Tor.), Eng., F.I.E.E.E. (*James McGill Professor*)

Jonathan Webb; B.A., Ph.D.(Cant.)

Associate Professors

Ramesh Abhari; M.A.Sc.(Tehran), Ph.D.(Tor.)

Tal Arbel; M.Eng., Ph.D.(McG.)

Jan Bajcsy; B.Sc.(Harv.), M.Eng., Ph.D.(Prin.)

Benoit Boulet; B.Sc.(Laval), M.Eng.(McG.), Ph.D.(Tor.) (*William Dawson Scholar*)

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

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

Mark Coates; B.Eng.(Adel.), Ph.D.(Camb.)

Jeremy R. Cooperstock; B.Ap.Sc.(Br. Col.), M.Sc., Ph.D.(Tor.)

Mourad El-Gamal; B.Sc.(Cairo), M.Sc.(Nashville), Ph.D.(McG.) (*William Dawson Scholar*)

Dennis Giannacopoulos; M.Eng., Ph.D.(McG.)

Warren Gross; B.A.Sc.(Wat.), M.A.Sc., Ph.D.(Tor.)

Roni Khazaka; M.Eng., Ph.D.(Car.)

Andrew Kirk; B.Sc.(Brist.), Ph.D.(Lond.), *Associate Dean, Research and Graduate Education* (*William Dawson Scholar*)

Fabrice Labeau; M.S., Ph.D.(Louvain)

Shie Mannor; B.A., B.Sc., Ph.D.(Haifa)

Steve McFee; B.Eng., Ph.D.(McG.)

Hannah Michalska; B.Sc., M.Sc.(Warsaw), Ph.D.(Lond.)

Milica Popovich; B.Sc.(Colo.), M.Sc., Ph.D.(N'western)

Ioannis Psaromiligkos; B.Sc.(Patras), M.Sc., Ph.D.(Buffalo)

Richard Rose; B.Sc., M.S.(Ill.), Ph.D.(GIT)

Ishiang Shih; M.Eng., Ph.D.(McG.)

Zeljko Zilic; B.Eng.(Zagreb), M.Sc., Ph.D.(Tor.)

Assistant Professors

Vamsy Chodavarapu; B.Eng.(India), M.S., Ph.D.(NYU)

Anas Hamoui; M.Eng.(McG.), Ph.D.(Tor.)

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

Zetian Mi; B.A.Sc.(China), M.Sc.(Iowa), Ph.D.(Mich.)

Sam Musallam; B.Sc., M.Sc., Ph.D.(Tor.)

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

Martin Rochette; B.A., M.Eng., Ph.D.(Laval)

Thomas Szkopek; B.A.Sc., M.A.Sc.(Tor.), Ph.D.(Calif.-LA)

Mai Vu; M.S., Ph.D.(Stan.)

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.)

Xue Liu; B.S., M.Eng.(Tsinghua), Ph.D.(Ill.)

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

Adjunct Professors

Ray Bartnikas

Eric Boisvert

Charalambos Charalambous

Robert DiRaddo

Danny Grant

Cedric Guss

Cheng K. Jen

Irene Leszkowicz

Miguel Marin

Douglas O'Shaughnessy

Katarzyna Radecka

Farouk Rizk

Anthony Rodolakis

Robert Sabourin

Leszek Szczecinski

Kenneth D. Wagner

12.5.4 Bachelor of Engineering (B.Eng.) - Electrical Engineering (109 credits)

Revision, Fall 2010. Start of revision.

The 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.

Total program credit weight: 109-110 credits.

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.

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).

Required Non-Departmental Courses

35 credits

CCOM 206	(3)	Communication in Engineering
CIVE 281	(3)	Analytical Mechanics
COMP 202	(3)	Introduction to Computing 1
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 381	(3)	Complex Variables and Transforms
MIME 262	(3)	Properties of Materials in Electrical Engineering
MIME 310	(3)	Engineering Economy
PHYS 271	(3)	Introduction to Quantum Physics

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 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 443	(3)	Introduction to Numerical Methods in Electrical Engineering
ECSE 456	(3)	ECSE Design Project 1
ECSE 457	(3)	ECSE Design Project 2

Complementary Courses

17-18 credits

Technical Complementaries

9 credits from the following:

ECSE 404	(3)	Control Systems
ECSE 405	(3)	Antennas
ECSE 411	(3)	Communications Systems 1
ECSE 412	(3)	Discrete Time Signal Processing
ECSE 413	(3)	Communications Systems 2
ECSE 414	(3)	Introduction to Telecommunication Networks
ECSE 420	(3)	Parallel Computing
ECSE 421	(3)	Embedded Systems
ECSE 422	(3)	Fault Tolerant Computing
ECSE 423	(3)	Fundamentals of Photonics
ECSE 424	(3)	Human-Computer Interaction
ECSE 425	(3)	Computer Organization and Architecture
ECSE 426	(3)	Microprocessor Systems
ECSE 427	(3)	Operating Systems
ECSE 430	(3)	Photonic Devices and Systems
ECSE 431	(3)	Introduction to VLSI CAD
ECSE 432	(3)	Physical Basis: Transistor Devices
ECSE 435	(3)	Mixed-Signal Test Techniques
ECSE 436	(3)	Signal Processing Hardware
ECSE 450	(3)	Electromagnetic Compatibility
ECSE 451	(3)	EM Transmission and Radiation
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
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 from Group A and Group B

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
CHEE 430	(3)	Technology Impact Assessment
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

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 208, ECON 217, 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, 3 credits will be given for one 6-credit course in that language.

However, 3 credits may be given for any language course that has a sufficient cultural component. You must have this course approved by a faculty adviser.

Enhanced Power Concentration

(Students following this program must complete 15 credits of technical complementary courses.)

The Institute for Electrical Power Engineering was recently established as a province-wide centre for electrical power engineering education. It is funded by industry, mostly Hydro-Québec, and provides a comprehensive program and state-of-the-art laboratory facilities, and a point of contact between industry and universities involved in power engineering.

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

Here are some benefits of the concentration:

- a complete and up-to-date final-year program in electrical power engineering, with industry-sponsored and supported courses

- access to industry-sponsored projects, internships and new employment opportunities

ELIGIBILITY CRITERIA

To be considered in September 2010, the applicant must

- be registered in the B.Eng. program (regular Electrical Engineering);

- have a cumulative GPA of at least 2.70

- have completed or be registered in ECSE 361 (Power Engineering);

- be able to complete the degree requirements by Spring 2011;

- agree to follow the curriculum requirements set out below.

SELECTION CRITERIA

The number of students selected, expected to be between five and ten, will be the subject of a specific agreement between the University and the Institute. Selection criteria to the Institute will be based on CGPA and on the curriculum vitae. The selection process for the scholarship may involve an interview with the committee presided by Hydro-Québec. There is a possibility of an internship with Hydro-Québec.

CURRICULUM REQUIREMENTS FOR SELECTED STUDENTS

Generally, unless the University has authorized specific substitutions, students must complete the degree requirements set out this Calendar with the following specifications:

Technical Complementaries and Laboratories (15 credits)

All students must take (or have taken) five courses from the following:

Required Courses

9 credits

ECSE 462	(3)	Electromechanical Energy Conversion
ECSE 464	(3)	Power Systems Analysis 1
ECSE 465	(3)	Power Electronic Systems

Students must also complete ECSE 474 and 475 (Electrical Engineering Design Projects 1 and 2) on a practical project in power engineering, preferably at the Institute or with a company sponsoring the Institute.

Complementary Courses

6 credits from the following:

ECSE 404	(3)	Control Systems
ECSE 460*	(3)	Appareillage électrique (Electrical Power Equipment)
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.

Note: ECSE 460, ECSE 464 (Fall semester), ECSE 465, ECSE 467, ECSE 468 and ECSE 469 are courses sponsored by the Institute and taught at École Polytechnique de Montréal.

Revision, Fall 2010. End of revision.

12.5.5 Bachelor of Engineering (B.Eng.) - Honours Electrical Engineering (109 credits)

Revision, Fall 2010. Start of revision.

This program is designed for students who wish to pursue postgraduate work and look to a career in advanced research and development. The technical complementaries are selected from graduate courses, facilitating the transition to postgraduate studies. Students in this curriculum benefit from smaller classes and have more contact with professorial staff and graduate students. However, the program is quite demanding.

Total program credit weight: 109-110 credits.

Entry into the Electrical Engineering Honours Program

The Honours program is a limited enrolment program and entry is highly competitive. There is no direct entry to the Honours program in the first year. Students may enter the Honours program in the following ways:

- Students from CEGEP will be admitted, on the basis of their grades, at the start of the third term.

- Students from outside Quebec will be admitted, on the basis of their grades, at the start of the fifth term.

To remain in the Honours program and to be awarded the Honours degree, a student must have completed at least 14 credits in each term since entering Electrical and Computer Engineering, except for the final two terms of their degree, and maintained a CGPA of at least 3.30 since entering Electrical and Computer Engineering. In either of their final two full terms (i.e., Fall and Winter, or Winter and Fall) students may drop below 14 credits, provided the combined load for the two terms is at least 16 credits. For more information, please contact the Departmental office at 514-398-3943.

Required Year 0 (Freshman) Courses

29 credits

Note: Students in the Honours Electrical Engineering program complete the Year 0 (Freshman) courses before entering the Honours program, as explained above.

Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credit for these Year 0 (Freshman) courses.

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).

Required Non-Departmental Courses

35 credits

CCOM 206	(3)	Communication in Engineering
CIVE 281	(3)	Analytical Mechanics
COMP 202	(3)	Introduction to Computing 1
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 381	(3)	Complex Variables and Transforms
MIME 262	(3)	Properties of Materials in Electrical Engineering
MIME 310	(3)	Engineering Economy
PHYS 271	(3)	Introduction to Quantum Physics

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 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 from Group A and Group B

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
CHEE 430	(3)	Technology Impact Assessment
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

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 208, ECON 217, 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, 3 credits will be given for one 6-credit course in that language.

However, 3 credits may be given for any language course that has a sufficient cultural component. You must have this course approved by a faculty adviser.

Revision, Fall 2010. End of revision.

12.5.6 Bachelor of Engineering (B.Eng.) - Computer Engineering (110 credits)

Revision, Fall 2010. Start of revision.

The Computer Engineering program provides students with greater depth and breadth of knowledge in the hardware and software aspects of computers. Students are exposed to both theoretical and practical issues of both hardware and software in well-equipped laboratories. Although the program is designed to meet the growing demands by industry for engineers with a strong background in modern computer technology, it also provides the underlying depth for graduate studies in all fields of Computer Engineering.

In addition to technical complementary courses, students in the program 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.

Total program credit weight: 110-114 credits.

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.

For information on transfer credit for French Baccalaureate, International Baccalaureate exams, Advanced Placement exams, Advanced Levels and Science Placement Exams, see

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 Administrative Studies and Law, listed below under Complementary Studies (Group B).

Required Non-Departmental Courses

35 credits

CCOM 206	(3)	Communication in Engineering
CIVE 281	(3)	Analytical Mechanics
COMP 202	(3)	Introduction to Computing 1
COMP 250	(3)	Introduction to Computer Science

COMP 251	(3)	Data Structures and Algorithms
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
MIME 310	(3)	Engineering Economy

Required Computer Engineering Courses

58 credits

ECSE 200	(3)	Electric Circuits 1
ECSE 210	(3)	Electric Circuits 2
ECSE 211	(3)	Design Principles and Methods
ECSE 221	(3)	Introduction to Computer Engineering
ECSE 291	(2)	Electrical Measurements Laboratory
ECSE 305	(3)	Probability and Random Signals 1
ECSE 306	(3)	Fundamentals of Signals and Systems
ECSE 321	(3)	Introduction to Software Engineering
ECSE 322	(3)	Computer Engineering
ECSE 323	(5)	Digital System Design
ECSE 330	(3)	Introduction to Electronics
ECSE 334	(3)	Introduction to Microelectronics
ECSE 353	(3)	Electromagnetic Fields and Waves
ECSE 414	(3)	Introduction to Telecommunication Networks
ECSE 425	(3)	Computer Organization and Architecture
ECSE 426	(3)	Microprocessor Systems
ECSE 427	(3)	Operating Systems
ECSE 456	(3)	ECSE Design Project 1
ECSE 457	(3)	ECSE Design Project 2

Complementary Courses

17-21 credits

Basic Science Complementary Courses (for CEGEP students only)

0-3 credits

Students from CEGEP are required to complete one 3-credit course at the 200-level or higher, chosen from the following science departments, approved by the Undergraduate Programs Office in the Department of Electrical and Computer Engineering:

Atmospheric and Oceanic Sciences (ATOC)

Biology (BIOL)

Chemistry (CHEM)

Earth and Planetary Sciences (EPSC)

Earth System Science (ESYS)

Physics (PHYS)

Technical Complementaries

9 credits from List A and List B

The course chosen from List A is meant to enhance the body of knowledge; the courses chosen from List B are to provide breadth.

LIST A

3 credits from the following:

ECSE 424	(3)	Human-Computer Interaction
ECSE 428	(3)	Software Engineering Practice
ECSE 431	(3)	Introduction to VLSI CAD

LIST B

6 credits from the following:

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 429	(3)	Software Validation
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 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 from Group A and Group B

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
CHEE 430	(3)	Technology Impact Assessment
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

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 208, ECON 217, 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, 3 credits will be given for one 6-credit course in that language.

However, 3 credits may be given for any language course that has a sufficient cultural component. You must have this course approved by a faculty adviser.

Revision, Fall 2010. End of revision.

12.5.7 Bachelor of Software Engineering (B.S.E.) - Software Engineering (106 credits)

Revision, Fall 2010. Start of revision.

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.

Total program credit weight: 106-115 credits.

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.

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).

Required Courses

68 credits

COMP 202	(3)	Introduction to Computing 1
COMP 206	(3)	Introduction to Software Systems
COMP 250	(3)	Introduction to Computer Science
COMP 251	(3)	Data Structures and Algorithms
COMP 302	(3)	Programming Languages and Paradigms
COMP 360	(3)	Algorithm Design Techniques
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 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

Engineering Breadth Required Courses

23 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
ECSE 330	(3)	Introduction to Electronics
MIME 310	(3)	Engineering Economy

Complementary Courses

15-24 credits

Basic Science Complementary Courses (for CEGEP students only)

0-6 credits

Students from CEGEP are required to complete two 3-credit courses at the 200-level or higher, chosen from the following science departments, approved by the Undergraduate Programs Office in the Department of Electrical and Computer Engineering:

Atmospheric and Oceanic Sciences (ATOC)

Biology (BIOL)

Chemistry (CHEM)

Earth and Planetary Sciences (EPSC)

Earth System Science (ESYS)

Physics (PHYS)

Technical Complementaries

9-12 credits

Not all courses listed are offered in a given year. See the course listing at http://www.mcgill.ca/students/courses/calendars/search to know when a course is offered.

List A

3-4 credits from the following:

COMP 330	(3)	Theoretical Aspects: Computer Science
COMP 350	(3)	Numerical Computing
COMP 409	(3)	Concurrent Programming
COMP 424	(3)	Artificial Intelligence
COMP 520	(4)	Compiler Design
COMP 535*	(3)	Computer Networks 1
COMP 557**	(3)	Fundamentals of Computer Graphics
COMP 566	(3)	Discrete Optimization 1
COMP 575	(3)	Fundamentals of Distributed Algorithms
ECSE 404	(3)	Control Systems
ECSE 413	(3)	Communications Systems 2
ECSE 414*	(3)	Introduction to Telecommunication Networks
ECSE 421	(3)	Embedded Systems
ECSE 422	(3)	Fault Tolerant Computing
ECSE 504	(3)	Sampled Data Control
ECSE 529	(3)	Computer and Biological Vision
ECSE 532**	(3)	Computer Graphics

*Students choose either COMP 535 or ECSE 414.

**Students choose either COMP 557 or ECSE 532.

List B

6-8 credits from the following:

ECSE 323	(5)	Digital System Design
ECSE 411	(3)	Communications Systems 1
ECSE 412	(3)	Discrete Time Signal Processing
ECSE 424	(3)	Human-Computer Interaction
ECSE 425	(3)	Computer Organization and Architecture
ECSE 426	(3)	Microprocessor Systems
ECSE 530	(3)	Logic Synthesis

Complementary Studies

6 credits

3 credits selected from the Impact of Technology on Society course list below.

3 credits selected from the Humanities and Social Sciences, Management Studies and Law course lists below.

Note: Out-of-province (high school) students completing the basic science requirements for students entering outside Quebec need an additional 3 credits of pre-engineering Humanities and Social Sciences (HSS) courses. Please contact the Faculty of Engineering for information.

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
CHEE 430	(3)	Technology Impact Assessment
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

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

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

Anthropology (ANTH)

Economics (any 200- or 300-level course excluding ECON 208, ECON 217, 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, 3 credits will be given for one 6-credit course in that language.

However, 3 credits may be given for any language course that has a sufficient cultural component. You must have this course approved by a faculty adviser.

Revision, Fall 2010. End of revision.

12.6 Department of Mechanical Engineering

12.6.1 Location

Macdonald Engineering Building, Room 270
817 Sherbrooke Street West
Montreal, Quebec H3A 2K6

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

12.6.2 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.

12.6.3 Department of Mechanical Engineering Faculty

Chair

George Haller

Emeritus Professors

Abdul M. Ahmed; B.Sc.(Dhaka), M.Eng., Ph.D.(McG.), Eng. (*Thomas Workman Emeritus Professor of Mechanical Engineering*)

Romuald Knystautas; B.Eng., M.Eng., Ph.D.(McG.), Eng.

Michael P. Pa doussis; B.Eng.(McG.), Ph.D.(Camb.), Eng., F.I.Mech.E., F.A.S.M.E., F.A.A.M., F.C.S.M.E., F.R.S.C., F.C.A.E. (*Thomas Workman Emeritus Professor of Mechanical Engineering*)

Stuart J. Price; B.Sc., Ph.D.(Brist.), P.Eng.

Post-Retirement

Lucjan Kops; B.Eng., M.Eng., D.Sc.Eng.(Krakow Tech.), Eng., F.C.I.R.P., F.A.S.M.E., F.C.S.M.E., M.S.M.E.

Professors

Marco Amabili; B.Eng.(Ancona), Ph.D.(Bologna) (*Tier 1 Canada Research Chair*)

Jorge Angeles; B.Eng., M.Eng.(UNAM Mexico), Ph.D.(Stan.), Eng., F.A.S.M.E., F.C.S.M.E., F.R.S.C. (*James McGill Professor*)

Bantwal R. Baliga; B.Tech.(IIT, Kanpur), M.Sc.(Case West.), Ph.D.(Minn.)

Professors

Eliot Fried; A.B.(Calif., Berk.), M.S., Ph.D.(Cal. Tech.) (*Tier 1 Canada Research Chair*)

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

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

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

Dan Mateescu; M.Eng.(Univ-Poli. Bucharest), Ph.D.(Rom. Acad. Sci.), Doctor Honoris Causa(Univ-Poli.Bucharest), F.C.A.S.I., A.F.A.I.A.A., Erskine Fellow(Cant.)

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

Luc Mongeau; B.S.M.E., M.S.(École Poly., Montr.), Ph.D.(Penn. St.) (*Tier 1 Canada Research Chair*), *Associate Dean, Academic Affairs, Director, Graduate Admissions and Scholarships*

Christophe Pierre; B.Eng.(École Centrale, Paris), M.Sc.(Prin.), Ph.D.(Duke) (*Tier 1 Canada Research Chair*), *Dean, Faculty of Engineering*

Associate Professors

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

David L. Frost; B.A.Sc.(Br. Col.), M.S., Ph.D.(Cal. Tech.), P.Eng., *Graduate Program Director*

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

Pascal Hubert; B.Eng., M.Sc.(École Poly., Montr.), Ph.D.(Br. Col.), P.Eng. (*Canada Research Chair*), *Aerospace Program Coordinator*

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

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

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

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

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

Siva Nadarajah; B.Sc.(Math), B.Sc.(Aero.Eng.)(Kansas), M.Sc., Ph.D.(Stan.)

Meyer Nahon; B.Sc.(Qu.), M.Sc.(Tor.), Ph.D.(McG.), P.Eng., *Associate Dean, Graduate and Postdoctoral Studies*

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

Inna Sharf; B.A.Sc., Ph.D.(Tor.), P.Eng.

Vince Thomson; B.Sc.(Windsor), Ph.D.(McM.) (*Werner Graupe Professor of Manufacturing Automation*)

Evgeny V. Timofeev; M.Sc., Ph.D.(STU, St. Peters.), Eng., A.F.A.I.A.A.

Srikar T. Vengallatore; B.Tech.(BHU), Ph.D.(MIT) (*Canada Research Chair*) *Associate Chair*

Paul J. Zsombor-Murray; B.Eng., M.Eng., Ph.D.(McG.), Eng., F.C.S.M.E.

Assistant Professors

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

Jeffrey M. Bergthorson; B.Sc.(Man.), M.Sc., Ph.D.(Cal. Tech.), P.Eng.

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

Laboratory Superintendents

A. Micozzi

G. Savard

G. Tewfik

Adjunct Professors/Course Lecturers

H. Attia

A. Segall

Adjunct Professors/Course Lecturers

R. Sumner

D. Zorbas

12.6.4 Bachelor of Engineering (B.Eng.) - Mechanical Engineering (112 credits)

Revision, Fall 2010. Start of revision.

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.

Total program credit weight: 112-118 credits.

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.

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).

Required Non-Departmental Courses

33 credits

CCOM 206	(3)	Communication in Engineering
CIVE 207	(4)	Solid Mechanics
COMP 208	(3)	Computers in Engineering
ECSE 461	(3)	Electric Machinery
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 271	(3)	Linear Algebra and Partial Differential Equations
MIME 260	(3)	Materials Science and Engineering
MIME 310	(3)	Engineering Economy

Required Mechanical Engineering Courses

64 credits

MECH 201	(2)	Introduction to Mechanical Engineering
MECH 210	(2)	Mechanics 1
MECH 220	(4)	Mechanics 2
MECH 240	(3)	Thermodynamics 1
MECH 260	(2)	Machine Tool Laboratory
MECH 262	(3)	Statistics and Measurement Laboratory
MECH 289	(3)	Design Graphics
MECH 292	(3)	Conceptual Design
MECH 309	(3)	Numerical Methods in Mechanical Engineering
MECH 314	(3)	Dynamics of Mechanisms
MECH 315	(4)	Mechanics 3
MECH 321	(3)	Mechanics of Deformable Solids
MECH 331	(3)	Fluid Mechanics 1
MECH 341	(3)	Thermodynamics 2
MECH 346	(3)	Heat Transfer
MECH 362	(2)	Mechanical Laboratory 1
MECH 383	(3)	Applied Electronics and Instrumentation
MECH 393	(3)	Machine Element Design
MECH 412	(3)	Dynamics of Systems
MECH 430	(3)	Fluid Mechanics 2
MECH 463D1	(3)	Mechanical Engineering Project
MECH 463D2	(3)	Mechanical Engineering Project

Complementary Courses

15 credits

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 513	(3)	Control Systems
MECH 528	(3)	Product Design
MECH 529	(3)	Discrete Manufacturing Systems
MECH 530	(3)	Mechanics of Composite Materials
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 554	(3)	Microprocessors for Mechanical Systems
MECH 557	(3)	Mechatronic Design
MECH 563*	(3)	Biofluids and Cardiovascular Mechanics
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
CHEE 430	(3)	Technology Impact Assessment
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

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 208, ECON 217, 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, 3 credits will be given for one 6-credit course in that language.

However, 3 credits may be given for any language course that has a sufficient cultural component. You must have this course approved by a faculty adviser.

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 CEGEP follow a different curriculum than those entering from out of 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 Student Affairs Office (Engineering Student Center) or from the Undergraduate Program Secretary, indicating their intention to take the minor or the concentration.

Revision, Fall 2010. End of revision.

12.6.5 Bachelor of Engineering (B.Eng.) - Honours Mechanical Engineering (112 credits)

Revision, Fall 2010. Start of revision.

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.

Total program credit weight: 112-118 credits.

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.

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).

Required Non-Departmental Courses

27 credits

CCOM 206	(3)	Communication in Engineering
CIVE 207	(4)	Solid Mechanics
COMP 208	(3)	Computers in Engineering
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 271	(3)	Linear Algebra and Partial Differential Equations
MIME 310	(3)	Engineering Economy

Required Mechanical Engineering Courses

61 credits

MECH 201	(2)	Introduction to Mechanical Engineering
MECH 210	(2)	Mechanics 1
MECH 220	(4)	Mechanics 2
MECH 240	(3)	Thermodynamics 1
MECH 260	(2)	Machine Tool Laboratory
MECH 262	(3)	Statistics and Measurement Laboratory
MECH 289	(3)	Design Graphics
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 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

Complementary Courses

24 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 546	(3)	Finite Element Methods in Solid Mechanics
MECH 562	(3)	Advanced Fluid Mechanics
MECH 578	(3)	Advanced Thermodynamics

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 513	(3)	Control Systems
MECH 528	(3)	Product Design
MECH 529	(3)	Discrete Manufacturing Systems
MECH 530	(3)	Mechanics of Composite Materials
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 554	(3)	Microprocessors for Mechanical Systems
MECH 557	(3)	Mechatronic Design
MECH 563*	(3)	Biofluids and Cardiovascular Mechanics
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
CHEE 430	(3)	Technology Impact Assessment
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

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 208, ECON 217, 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.

Elective Courses

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

Language Courses

If you are not proficient in a certain language, 3 credits will be given for one 6-credit course in that language. However, 3 credits may be given for any language course that has a sufficient cultural component. You must have this course approved by a faculty adviser.

Typical Program of Study

Students entering the program from CEGEP follow a different curriculum than those entering from out of province. Students will be advised by the Department as to which courses they should select from the course lists above.

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

For all minors and concentrations, students should complete a Course Authorization Form, available from the Student Affairs Office (Engineering Student Center) or from the Undergraduate Program Secretary, indicating their intention to take the minor or concentration.

Revision, Fall 2010. End of revision.

12.6.6 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 Student Affairs Office (Engineering Student Center) or from the Undergraduate Program Secretary, 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 chosen from the lists below

3-6 credits from the following:

MECH 535	(3)	Turbomachinery and Propulsion

MECH 536	(3)	Aircraft Structures

3-6 credits from the following:

MECH 531	(3)	Aeroelasticity
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

12.6.7 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 the Student Affairs Office (Engineering Student Center) or from the Undergraduate Program Secretary, 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 chosen from the lists below

3-6 credits from the following:

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

3-6 credits from the following:

MECH 531	(3)	Aeroelasticity
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

12.6.8 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 Student Affairs Office (Engineering Student Center) or from the Undergraduate Program Secretary, 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 554	(3)	Microprocessors for Mechanical Systems
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

12.6.9 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 Student Affairs Office (Engineering Student Center) or from the Undergraduate Program Secretary, 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 554	(3)	Microprocessors for Mechanical Systems
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

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

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 Center) or from the Undergraduate Program Secretary, 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

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

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 Center) or from the Undergraduate Program Secretary, 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

12.7 Department of Mining and Materials Engineering

12.7.1 Location

General Office:
Wong Building, Room 2140
3610 University Street
Montreal, Quebec H3A 2B2

Website: *www.mcgill.ca/minmat*

Materials

Wong Building, Room 2140
3610 University Street
Montreal, Quebec H3A 2B2
Telephone: 514-398-1040
Fax: 514-398-4492
Email: *coordinator.minmat@mcgill.ca*

Mining

Frank Dawson Adams Building, Room 125
3450 University Street
Montreal, Quebec H3A 2A7
Telephone: 514-398-2215
Fax: 514-398-7099
Email: *admin.mining@mcgill.ca*

12.7.2 About the Department of Mining and Materials Engineering

The Department of Mining and Materials Engineering offers programs leading to the Bachelor of Engineering degree in Materials Engineering or Mining Engineering. In addition to regular courses and laboratories, the curriculum includes seminars, colloquia and student projects reinforced by field trips to industrial operations.

For more information, refer to:

section 12.7.3.1: Mining Engineering (CO-OP)
section 12.7.3.2: Materials Engineering (CO-OP)

12.7.2.1 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.

12.7.3 Department of Mining and Materials Engineering Faculty

Chair

Stephen Yue

Associate Chair, Student Affairs

Frank Mucciardi

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. (*Gerald G. Hatch Emeritus Professor*)

John J. Jonas; B.Eng.(McG.), Ph.D.(Camb.), Eng. (*Henry Birks Emeritus Professor*)

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

William M. Williams; B.Sc., M.Sc.(Brist.), Ph.D.(Tor.), Eng. (*Henry Birks Emeritus Professor*)

Post-Retirement

Michel L. Bilodeau; B.A.Sc.(Montr.), M.Sc.App., Ph.D.(McG.), Eng.

Professors

George P. Demopoulos; Dipl. Eng.(NTU Athens), M.Sc., Ph.D.(McG.), Eng.

Roussos Dimitrakopoulos; B.Sc., M.Sc.(Alta.), Ph.D.(École Poly., Montr.)

James A. Finch; B.Sc.(Birm.), M.Eng., Ph.D.(McG.), Eng. (*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. (*William C. Macdonald Professor*)

Faramarz (Ferri) P. Hassani; Ph.D.(Nott.), (*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*)

Associate Professors

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

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

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

Assistant Professors

Mathieu Brochu; B.Eng.(Laval), Ph.D.(McG.)

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

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

In-Ho Jung; B.Sc.(South Korea), Ph.D.(École Poly., Montr.)

Showan Nazhat; B.Eng., M.Sc., Ph.D.(Lond.)

Nathaniel Quitoriano; B.Sc.(Calif.), 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 Lecturers

Raad Jassim

Angelina Mehta

John Mossop

Course Lecturers

Jan Nesset

Adjunct Professors

Mostafa Benzaazoua

Marc Betournay

Martin Bureau

Robin A.L. Drew

Daryoush Emadi

Elhachmi Essadiqi

Carlton Fuerst

Bryn Harris

Ahmad Hemami

Wynand Kleingeld

Eric Lifshin

Joe Stachulak

Serge Vézina

Co-op Program Liaison Officer

Genevieve Snider (Materials)

Mining Program Manager

Angelina Mehta

12.7.3.1 About Materials Engineering

12.7.3.1.1 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 and pay the associated fees by the Minerva Course Change (drop/add) deadlines or late fees will apply. Before registering for any work term course, students must contact the Materials Co-op Liaison Officer for approval.

12.7.3.1.2 Student Advising

Students entering this program must plan their schedule of studies in consultation with the departmental adviser, Prof. Richard Chromik.

12.7.3.2 About Mining Engineering

12.7.3.2.1 Mining Engineering (Co-op)

McGill is proud to be the host of the oldest mining engineering program in Canada, which started in 1871. The program is known for the excellence of its courses as well as the training it provides in mining technology, mineral economics and mine design. The minerals industry is currently going through an expansion phase that has never been seen before. This is highly beneficial to both our graduate and undergraduate students. Tremendous career opportunities are available in Canada and around the world. There have been rapid technical developments in recent years, presenting a challenge to the creative student with a strong interest in engineering and a taste for innovative solutions.

The Department offers a co-operative program leading to the accredited B.Eng. degree in Mining Engineering. It includes four paid industrial work terms. The Co-op program is offered in collaboration with the mining engineering program at École Polytechnique in Montreal. Students registered at McGill are required to take a series of mining courses at École Polytechnique in the latter part of the program. These courses are designated in the course outline under the Subject Code MPMC.

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 Program Manager for approval.

12.7.3.2.2 Student Advising

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

12.7.4 Bachelor of Engineering (B.Eng.) - Materials Engineering CO-OP (118 credits)

Revision, Fall 2010. Start of revision.

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 the departmental adviser.

Total program credit weight: 118-119 credits.

Required Year 0 (Freshman) Courses

30 credits

Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credit for these Year 0 (Freshman) courses (except FACC 100).

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).

Required Non-Departmental Courses

29 credits

CCOM 206	(3)	Communication in Engineering
CHEM 233	(3)	Topics in Physical Chemistry
CIVE 205	(3)	Statics
CIVE 207	(4)	Solid Mechanics
COMP 208	(3)	Computers in Engineering
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
MECH 289	(3)	Design Graphics

Required Materials Engineering Courses

70-71 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 310	(3)	Engineering Economy
MIME 311	(3)	Modelling and Automatic Control
MIME 317	(3)	Analytical and Characterization Techniques
MIME 337*	(2)	Electrotechnology
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 367	(3)	Electronic Properties of Materials
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 480	(2)	Industrial Training 3

*Students select either ECSE 461 or MIME 337.

Complementary Courses

18 credits

Technical Complementaries

12 credits of Technical Complementaries

9-12 credits from the following:

CIVE 512	(3)	Advanced Civil Engineering Materials
MECH 530	(3)	Mechanics of Composite Materials
MIME 410	(3)	Research Project
MIME 457	(3)	Light Metals Extraction and Processing
MIME 470	(3)	Engineering Biomaterials
MIME 512	(3)	Corrosion and Degradation of Materials
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 552	(3)	Environmental Controls in Metallurgical Plants
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 564	(3)	X-Ray Diffraction Analysis of Materials
MIME 565	(3)	Aerospace Metallic-Materials and Manufacturing Processes
MIME 566	(3)	Texture, Structure & Properties of Polycrystalline Materials
MIME 568	(3)	Topics in Advanced Materials
MIME 569	(3)	Electron Beam Analysis of Materials
MIME 571	(3)	Surface Engineering
MIME 572	(3)	Computational Thermodynamics

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 from Group A and Group B

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
CHEE 430	(3)	Technology Impact Assessment
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

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 208, ECON 217, 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

*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, 3 credits will be given for one 6-credit course in that language.

However, 3 credits may be given for any language course that has a sufficient cultural component. You must have this course approved by a faculty adviser.

Revision, Fall 2010. End of revision.

12.7.5 Bachelor of Engineering (B.Eng.) - Mining Engineering CO-OP (120 credits)

Revision, Fall 2010. Start of revision.

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.

Total program credit weight: 120-122 credits.

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.

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).

Required Non-Departmental Courses

31 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 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

Required Mining Engineering Courses

72-73 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 310	(3)	Engineering Economy
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 337*	(2)	Electrotechnology
MIME 340	(3)	Applied Fluid Dynamics
MIME 341	(3)	Introduction to Mineral Processing
MIME 392	(2)	Industrial Work Period 3
MIME 419	(3)	Surface Mining

MIME 420	(3)	Feasibility Study
MIME 422	(3)	Mine Ventilation
MIME 426	(3)	Development and Services
MIME 484	(3)	Mining Project
MPMC 321**	(3)	Mécanique des roches et contrôle des terrains
MPMC 326**	(3)	Recherche opérationnelle I
MPMC 328**	(3)	Environnement et gestion des rejets miniers
MPMC 329**	(2)	Géologie minière
MPMC 330**	(3)	Géotechnique minière
MPMC 421**	(3)	Exploitation en souterrain

*Students select either MIME 337 or ECSE 461.

**Mining courses taken at École Polytechnique

Complementary Courses

11-12 credits of departmental complementary courses, selected from Stream A or Stream B, as described below.

Stream A

11 credits

MIME 494	(2)	Industrial Work Period 4

and 9 credits from the Technical Complementaries list below

OR

Stream B

6 credits

MIME 350	(3)	Extractive Metallurgical Engineering
MIME 544	(3)	Analysis: Mineral Processing Systems 1

and 6 credits from the Technical Complementaries list below

Technical Complementaries

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 course listing or Class Schedule at http://www.mcgill.ca/students/courses/calendars to know when a course is offered.

MIME 320	(3)	Extraction of Energy Resources
MIME 442	(3)	Analysis, Modelling and Optimization in Mineral Processing
MIME 513	(3)	Mine Planning Optimization Under Uncertainty
MIME 520	(3)	Stability of Rock Slopes
MIME 521	(3)	Stability of Underground Openings
MIME 525	(3)	Stochastic Orebody Modelling
MIME 526	(3)	Mineral Economics
MIME 527	(3)	Selected Topics in Mineral Resource Engineering
MIME 528	(3)	Mining Automation
MIME 544	(3)	Analysis: Mineral Processing Systems 1
MIME 545	(3)	Analysis: Mineral Processing Systems 2
MPMC 320	(3)	CAO et informatique pour les mines

MPMC 327	(3)	Hydrogéologie appliquée

* Mining courses 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
CHEE 430	(3)	Technology Impact Assessment
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

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 208, ECON 217, 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, 3 credits will be given for one 6-credit course in that language.

However, 3 credits may be given for any language course that has a sufficient cultural component. You must have this course approved by a faculty adviser.

Revision, Fall 2010. End of revision.

12.8 School of Urban Planning

12.8.1 Location

Macdonald-Harrington Building, Room 400
815 Sherbrooke Street West
Montreal, Quebec H3A 2K6

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

12.8.2 About the School of Urban Planning

Modern urban planning developed into a profession in the early decades of the 20th century, 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, as did the practice of urban design.

Today, 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 which 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 growth and development.

McGill University was the first institution in Canada to offer a full-time planning program. An interdisciplinary program was established in 1947, in which students combined a master's degree in Urban Planning with one in a related field. An autonomous program was established in 1972. It became the School of Urban Planning in 1976, a unit within the Faculty of Engineering. It has strong links with the School of Architecture, which is housed in the same building.

Students come to the School from diverse backgrounds, the physical sciences, the traditional professions, such as architecture and engineering, and the social sciences. 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 historic preservation to transportation planning, from housing development to computer imaging. They devote their efforts in increasing numbers to environmental planning and sustainable development.

The School is a partner in the Montreal Interuniversity Group "Urbanization and Development", a consortium recognized by CIDA as a Centre of Excellence, which is devoted to the study of urban problems and the formulation of policies in developing regions. 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.

The objective of the School is to produce qualified professional urban planners for the public and the private sectors. Training is provided at the postgraduate level; the degree offered is the Master of Urban Planning (M.U.P.). There are two formal specializations available: in Urban Design and in Transportation Planning. All M.U.P. students 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 may be seen at *www.mcgill.ca/urbandesign*, *www.tram.mcgill.ca* and *www.mcgill.ca/bfss* respectively.

Upon completion of the two-year program of studies, graduates are expected to have acquired basic planning skills, a broad understanding of urban issues, and specialized knowledge in a field of their own choice.

The program of study offered by the School is fully recognized by the *Ordre des Urbanistes du Québec* (O.U.Q.) and the Canadian Institute of Planners (C.I.P.). Graduates may become full members of the O.U.Q. and other provincial planning associations by completing their respective internship and examination requirements. Similar requirements must be met for admission to the American Institute of Certified Planners (A.I.C.P.) and other such organizations.

For details of the M.U.P. admission requirements and curriculum, consult the *Graduate and Postdoctoral Studies Calendar*, available at *www.mcgill.ca/students/courses/calendars*.

12.8.3 Undergraduate Courses in Urban Planning

The following courses taught by faculty in the School of Urban Planning are open to undergraduate students:

ARCH 520	(3)	Montreal: Urban Morphology
ARCH 521	(3)	Structure of Cities
ARCH 550	(3)	Urban Planning and Development
URBP 201	(3)	Planning the 21st Century City
URBP 501	(2)	Principles and Practice 1
URBP 505	(3)	Geographic Information Systems
URBP 506	(3)	Environmental Policy and Planning
URBP 507	(3)	Planning and Infrastructure
URBP 519	(6)	Sustainable Development Plans
URBP 520	(3)	Globalization: Planning and Change
URBP 530	(3)	Urban Environmental Planning

12.8.4 School of Urban Planning Faculty

Director

David F. Brown

Emerita Professor

Jane Matthews-Glenn; B.A., LL.B.(Qu.), D. en droit(Stras.)

Associate Professors

Madhav G. Badami; B.Tech., M.S.(IIT, Madras), M.E.Des.(Calg.), Ph.D.(Br. Col.) (*joint appoint. with McGill School of Environment*)

Lisa Bornstein; B.Sc.(Calif., Berk.), M.R.P.(C'nell), Ph.D.(Calif., Berk.)

David F. Brown; B.A.(Bishop's), M.U.P.(McG.), Ph.D.(Sheff.)

Raphaël Fischler; B.Eng.(V. Tech. Eindhoven), M.S. Arch.S., M.C.P.(MIT), Ph.D.(Calif., Berk.)

Assistant Professors

Ahmed Elgeneidy; B.S., M.S.(Alexandria), Ph.D.(Port. St.)

Nik Luka; B.A.(Ryerson), M.Arch.(Laval), Ph.D.(Tor.) (*joint appoint. with Architecture*)

Instructors

Heather Braiden; B.E.S.(Wat.), M.L.Arch.(Tor.)

Instructors

Marc-André Lechasseur; LL.B.(Sher.), LL.M.(Montr.)

Alain Trudeau; B.Sc.(UQAM), M.U.P.(McG.)

Adjunct Professors

David Farley; B.Arch.(McG.), M.Arch., M.C.P.(Harv.)

Mario Polèse; B.A.(CUNY), M.A., Ph.D.(Penn.)

Ray Tomalty; B.A., M.P.A..(Qu.), Ph.D.(Wat.)

Guest Lecturers

Daniel Hodder

Andrew Hoffmann

Paul Le Cavalier

Brenda Lee

Eric Peissel

Richard Sheamur

Larry Sherman

Alain Trudeau

Martin Wexler

Joshua Wolfe

12.9 Faculty of Engineering Related Programs

12.9.1 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 of the curriculum, see *Faculty of Agricultural and Environmental Sciences > : Bachelor of Engineering (Bioresource) (B.Eng.(Bioresource)) - Major Bioresource Engineering (113 credits)*.

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
Room MS1-027, Macdonald Stewart Building
21,111 Lakeshore Road
Ste. Anne de Bellevue, Quebec H9X 3V9
Tel: 514-398-7773
Fax: 514-398-8387

12.9.2 Department of Biomedical Engineering

Lyman Duff Medical Sciences Building
3775 University Street
Montreal, Quebec H3A 2B4
Telephone: 514-398-8278

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 12.10.2: Biomedical Engineering Minor*.

12.10 Minor Programs

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 to 24 credits, allowing 9 to 12 credits of overlap with the degree program. The real credit cost to the student is typically 9 to 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 complementary course selections. Departments also publish information regarding the choice of courses in this publication and in separate documents. Students should also consult their course advisers.

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

Note: Students are also permitted to register for Minor Concentrations offered by departments in the Faculty of Arts. Students should seek approval from both the specific department in the Faculty of Arts and the Faculty of Engineering Student Affairs Office, Engineering Student Centre, Frank Dawson Adams, Suite 22, before embarking on one of these minors.

Minor Programs

12.10.1 Arts Minor

The Arts Minor is open to B.Sc.(Arch.), B.Eng. and B.S.E. students. In this minor, students choose courses from two areas of concentration in the Faculty of Arts, approved by a faculty adviser in the Student Affairs Office, Engineering Student Centre, or by the Senior Faculty Adviser in the Faculty of Arts. B.Eng. and B.S.E. students may count some of their Complementary Studies courses toward this Minor, as described in the Arts Minor.

12.10.1.1 Bachelor of Engineering (B.Eng.) - Minor Arts (24 credits)

B.Sc.(Arch.), B.Eng. and B.S.E. students may obtain the Arts Minor as part of their B.Eng., B.S.E or B.Sc.(Arch.) degree by satisfying the 24-credit requirement described below.

Students must select courses for this minor in consultation with an adviser in the Student Affairs Office, Engineering Student Centre, or Donald Sedgwick, Senior Faculty Adviser, Faculty of Arts.

All courses in the Minor must be passed with a grade of C or better.

Requirements

Students must complete 24 credits as follows:

a) At least two areas of concentration from within the Faculty of Arts must be chosen, with a minimum of 6 credits in any one area.

b) At least 12 credits must be at the 300-level or higher.

In general, B.Eng. and B.S.E. students may use courses from the Complementary Studies lists (Group A and Group B) in their program that are offered by the Faculty of Arts to satisfy some of these requirements. No more than 9 credits of these courses can be credited toward the Arts minor.

12.10.2 Biomedical Engineering Minor

Biomedical engineering can be defined as the application of engineering principles to medicine and the life sciences. Students in the Biomedical Engineering Minor take courses in life sciences (anatomy, biology, chemistry and physiology) and choose courses from area(s) within the field of biomedicine (artificial cells and organs; bioinformatics, genomics and proteomics; biomaterials, biosensors and nanotechnology; biomechanics and prosthetics; medical physics and imaging; and neural systems and biosignal processing).

12.10.2.1 Bachelor of Engineering (B.Eng.) - Minor Biomedical Engineering (21 credits)

Note: open to all students in the Faculty of Engineering (including B.S.E. students).

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 Prof. R. Leask (Room 4120, Wong Building) or Prof. R. Mongrain (Room 369, Macdonald Engineering Building).

Total minor credit weight: 21-25 credits.

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
PHGY 201	(3)	Human Physiology: Control Systems
PHGY 202	(3)	Human Physiology: Body Functions
PHGY 209	(3)	Mammalian Physiology 1
PHGY 210	(3)	Mammalian Physiology 2

Specialization Courses

12 credits from the following:

Students must select 6 credits from courses outside their department and at least one BMDE course. These BMDE courses are best taken near the end of the program, when prerequisites are satisfied.

Artificial Cells and Organs

BMDE 505	(3)	Cell and Tissue Engineering
PHGY 311	(3)	Channels, Synapses & Hormones
PHGY 312	(3)	Respiratory, Renal, & Cardiovascular Physiology
PHGY 313	(3)	Blood, Gastrointestinal, & Immune Systems Physiology
PHGY 517	(3)	Artificial Internal Organs
PHGY 518	(3)	Artificial Cells

Bioinformatics, Genomics and Proteomics

ANAT 365*	(3)	Cellular Trafficking
ANAT 458	(3)	Membranes and Cellular Signaling

BIOC 311	(3)	Metabolic Biochemistry
BIOC 312	(3)	Biochemistry of Macromolecules
BIOC 458*	(3)	Membranes and Cellular Signaling
BMDE 506	(3)	Molecular Biology Techniques
COMP 302	(3)	Programming Languages and Paradigms
COMP 360	(3)	Algorithm Design Techniques
COMP 421	(3)	Database Systems
COMP 424	(3)	Artificial Intelligence
COMP 462	(3)	Computational Biology Methods
COMP 526	(3)	Probabilistic Reasoning and AI

*Students select either ANAT 365 or BIOC 458.

Biomaterials, Biosensors and Nanotechnology

BMDE 504	(3)	Biomaterials and Bioperformance
BMDE 505	(3)	Cell and Tissue Engineering
CHEE 380	(3)	Materials Science
ECSE 424	(3)	Human-Computer Interaction
MECH 553	(3)	Design and Manufacture of Microdevices
MIME 360	(3)	Phase Transformations: Solids
MIME 362	(3)	Mechanical Properties
PHYS 534	(3)	Nanoscience and Nanotechnology

Biomechanics and Prosthetics

BMDE 503	(3)	Biomedical Instrumentation
CHEE 563*	(3)	Biofluids and Cardiovascular Mechanics
MECH 315	(4)	Mechanics 3
MECH 321	(3)	Mechanics of Deformable Solids
MECH 530	(3)	Mechanics of Composite Materials
MECH 561	(3)	Biomechanics of Musculoskeletal Systems
MECH 563*	(3)	Biofluids and Cardiovascular Mechanics
MIME 360	(3)	Phase Transformations: Solids
MIME 362	(3)	Mechanical Properties

*Students select either CHEE 563 or MECH 563.

Medical Physics and Imaging

BMDE 519	(3)	Biomedical Signals and Systems
COMP 302	(3)	Programming Languages and Paradigms
COMP 360	(3)	Algorithm Design Techniques
COMP 423	(3)	Data Compression
COMP 424	(3)	Artificial Intelligence
COMP 558	(3)	Fundamentals of Computer Vision
ECSE 303	(3)	Signals and Systems 1

ECSE 304	(3)	Signals and Systems 2
ECSE 412	(3)	Discrete Time Signal Processing
PHYS 557	(3)	Nuclear Physics

Neural Systems and Biosignal Processing

BMDE 501	(3)	Selected Topics in Biomedical Engineering
BMDE 502	(3)	BME Modelling and Identification
BMDE 503	(3)	Biomedical Instrumentation
BMDE 519	(3)	Biomedical Signals and Systems
ECSE 526	(3)	Artificial Intelligence
PHYS 413	(3)	Physical Basis of Physiology

Complementary Courses

0-6 credits

Up to 6 credits in the B.Eng., B.S.E. or B.Sc.(Arch.) program can also be credited to the Minor, with the permission of the departmental adviser and approval of the Minor adviser. In particular, courses at the 200-level or higher that are prerequisites for certain specialization courses would be eligible, with permission of the Minor adviser. By careful selection of complementary courses, the Minor can be satisfied with 9 additional credits in the undergraduate program or a maximum of 12 credits overlap with the degree program.

12.10.3 Biotechnology Minor

Biotechnology can be defined as the science of understanding, selecting and promoting useful organisms and specific gene products for therapeutic purposes. It requires a broad comprehension of biology and engineering and detailed knowledge of at least one basic subject such as molecular genetics, protein chemistry, microbiology, or chemical engineering.

The Minor in Biotechnology, offered by the Faculties of Engineering and of Science, emphasizes an area relevant to biotechnology that is complementary to the student's main program. It is designed specifically for Chemical Engineering students; other Engineering students interested in taking this Minor should contact the Program Supervisor, Dr. Hugh Bennett (see below for contact information).

Students who are interested in this Minor should inform their academic adviser and the Program Supervisor in Year 1 and at the time of registration in Year 2. With the agreement of their academic adviser, students should submit their course list to the Program Supervisor, who will certify that the proposed program conforms to the requirements for the Minor.

The Biotechnology Minor is administered by the Faculty of Engineering Student Affairs Office, Engineering Student Centre, and by the Faculty of Science by Dr. Hugh Bennett, Program Supervisor.

Dr. Hugh Bennett
Sheldon Biotechnology Centre
3773 University Street
Montreal, Quebec H3A 2B4
Tel: 512-398-8083
Email: *hugh.bennett@mcgill.ca*

12.10.3.1 Bachelor of Engineering (B.Eng.) - Minor Biotechnology (for Engineering Students) (24 credits)

This minor is offered by the Faculties of Engineering and of Science for students who wish to take biotechnology courses that are complementary to their area. It has been designed specifically for Chemical Engineering students; other Engineering students who are interested in the Minor should contact the Minor Program Supervisor, Prof. Hugh Bennett (Sheldon Biotechnology Centre, Lyman Duff Building) or an adviser in the Student Affairs Office, Engineering Student Centre.

To obtain the Biotechnology Minor, students must complete 24 credits, 18 of which must be exclusively for the Minor. Approved substitutions must be made for any of the required courses which are part of the student's main program.

The Department of Chemical Engineering permits students taking this minor to complete BIOT 505 (Selected Topics in Biotechnology) as one of their technical complementary requirements. The total course credit required for the Chemical Engineering student is 15 credits beyond the 140-credit B.Eng. program.

Required Courses

12 credits

BIOT 505	(3)	Selected Topics in Biotechnology
CHEE 200	(4)	Introduction to Chemical Engineering
CHEE 204	(3)	Chemical Manufacturing Processes
CHEE 474	(3)	Biochemical Engineering

OR

Alternative Required Courses (for Chemical Engineering students)

A Chemical Engineering student may complete the Biotechnology Minor by taking the courses below plus one course from the list of complementary courses not including MIME 310.

BIOL 200	(3)	Molecular Biology
BIOL 201	(3)	Cell Biology and Metabolism
BIOL 202	(3)	Basic Genetics
BIOT 505	(3)	Selected Topics in Biotechnology
MIMM 211	(3)	Introductory Microbiology

Complementary Courses

12 credits selected from courses outside the department of the student's main program. Alternatively, or in addition, courses may be taken from the lists below. In this case, at least three courses must be taken from one area of concentration as grouped.

Biomedicine

ANAT 541	(3)	Cell and Molecular Biology of Aging
EXMD 504	(3)	Biology of Cancer
PATH 300	(3)	Human Disease

Chemistry

CHEM 382	(3)	Organic Chemistry: Natural Products
CHEM 502	(3)	Advanced Bio-Organic Chemistry
CHEM 552	(3)	Physical Organic Chemistry

General

MIME 310	(3)	Engineering Economy

Immunology

ANAT 261	(4)	Introduction to Dynamic Histology
BIOC 503	(3)	Immunochemistry
MIMM 314	(3)	Immunology
MIMM 414	(3)	Advanced Immunology
PHGY 513	(3)	Cellular Immunology

Management

Note: Engineering students may not use these courses to count toward a Management minor, nor toward the Complementary Studies requirement.

ECON 208	(3)	Microeconomic Analysis and Applications
MGCR 211	(3)	Introduction to Financial Accounting

MGCR 341	(3)	Finance 1
MGCR 352	(3)	Marketing Management 1
MGCR 472	(3)	Operations Management

Microbiology

MIMM 323	(3)	Microbial Physiology
MIMM 324	(3)	Fundamental Virology
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)	Molecular Biology: Cell Cycle

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
BIOC 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
CIVE 553	(3)	Stream Pollution and Control

12.10.4 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 (described under the *Faculty of Science > : Bachelor of Science (B.Sc.) - Minor Chemical Engineering (24 credits)*). 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.

Please consult the program coordinators for more information: Professor David Cooper (Chemical Engineering) and Dr. Gonzalo Cosa (Chemistry).

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

Revision, Fall 2010. Start of revision.

Please consult the program coordinator, Dr. Gonzalo Cosa, for more information about this minor.

A passing grade for courses within the Minor is a C.

Required Courses

10 credits

CHEE 310*	(3)	Physical Chemistry for Engineers
CHEM 212	(4)	Introductory Organic Chemistry 1
CHEM 233*	(3)	Topics in Physical Chemistry
CHEM 234**	(3)	Topics in Organic Chemistry

*Students select either CHEM 233 or CHEE 310

** or CEGEP equivalent

Complementary Courses

15 credits from the following lists, two courses of which must be laboratory courses (* indicates lab).

Note that CHEM 212 is a prerequisite for most of the courses listed below, and CHEM 223 (Introductory Physical Chemistry 1) and CHEM 243 (Introductory Physical Chemistry 2) or their equivalents are prerequisites for the physical chemistry courses. If students take CHEM 222 (Introductory Organic Chemistry 2), which includes a lab, instead of CHEM 234, they will receive credit for one of the two required laboratory courses, but they must complete a total of 25 credits in chemistry for the Minor.

Inorganic Chemistry

CHEM 281	(3)	Inorganic Chemistry 1
CHEM 371*	(2)	Inorganic Chemistry Laboratory
CHEM 381	(3)	Inorganic Chemistry 2
CHEM 591	(3)	Bioinorganic Chemistry

Analytical Chemistry

CHEM 287	(2)	Introductory Analytical Chemistry
CHEM 297*	(1)	Introductory Analytical Chemistry Laboratory
CHEM 367	(3)	Instrumental Analysis 1
CHEM 377	(3)	Instrumental Analysis 2

Organic Chemistry

CHEM 302	(3)	Introductory Organic Chemistry 3
CHEM 352	(3)	Structural Organic Chemistry
CHEM 362*	(2)	Advanced Organic Chemistry Laboratory
CHEM 382	(3)	Organic Chemistry: Natural Products

Physical Chemistry

CHEM 345	(3)	Molecular Properties and Structure 1
CHEM 355	(3)	Molecular Properties and Structure 2
CHEM 393*	(2)	Physical Chemistry Laboratory 2
CHEM 574	(3)	Introductory Polymer Chemistry

Revision, Fall 2010. End of revision.

12.10.5 Computer Science Courses and Minor Program

The School of Computer Science offers an extensive range of courses for Engineering students interested in computers. Engineering students may obtain a Computer Science Minor as part of their B.Eng., B.S.E. or B.Sc.(Arch.) degree by satisfying the 24-credit requirement from courses passed with a grade of C or better. For further information, please see the School of Computer Science website, *www.cs.mcgill.ca*.

12.10.5.1 Bachelor of Engineering (B.Eng.) - Minor Computer Science (24 credits)

Note: This minor is open to B.Eng., B.S.E. and B.Sc.(Arch.) students in Engineering.

Computer Science Courses

The School of Computer Science offers an extensive range of courses for Engineering students interested in computers. The course taken by students in most B.Eng. programs (COMP 208) and other courses included in the core of the various B.Eng. and B.S.E. programs are listed below.

See the course listing at ttp://www.mcgill.ca/students/courses/calendars/search for other courses offered by the School of Computer Sciences (subject code COMP).

COMP 202	(3)	Introduction to Computing 1
COMP 208	(3)	Computers in Engineering
COMP 250	(3)	Introduction to Computer Science
COMP 302	(3)	Programming Languages and Paradigms

Note: COMP 202 and COMP 208 (compulsory for some Engineering students) do not form part of the Minor in Computer Science.

B.Eng. - Minor Computer Science (24 credits)

Engineering students may obtain the Computer Science minor as part of their B.Eng., B.S.E. or B.Sc.(Arch.) degree by satisfying the 24-credit requirement from courses passed with a grade of C or better. In general, some complementary courses within B.Eng. and B.S.E. programs may be used to satisfy some of these requirements, but the minor will require at least 12 extra credits from Computer Science (COMP) courses beyond those needed for the B.Eng. or B.S.E. degree. Students should consult their departments about the use of complementaries, and credits that can be double counted.

Students should see the undergraduate secretary in the Lorne Trottier Building, Room 2060, to obtain the appropriate forms and to make an appointment to see the minor adviser for approval of their course selection. Forms must be approved before the end of the Course Change (drop/add) period of the student's final term.

For further information, please see the School of Computer Science website at http://www.cs.mcgill.ca.

Required Course

3 credits

COMP 206	(3)	Introduction to Software Systems

Complementary Courses

21 credits

3 credits from the following:

COMP 203	(3)	Introduction to Computing 2
COMP 250	(3)	Introduction to Computer Science

3 credits from the following:

COMP 302	(3)	Programming Languages and Paradigms
COMP 303	(3)	Software Development

3 credits from the following:

COMP 273	(3)	Introduction to Computer Systems
ECSE 221	(3)	Introduction to Computer Engineering

3 credits from the following:

COMP 350	(3)	Numerical Computing
MECH 309	(3)	Numerical Methods in Mechanical Engineering

0-3 credits from the following:

COMP 251	(3)	Data Structures and Algorithms

6-9 credits chosen from other computer science courses at the 300 level or higher.

Notes:

A. COMP 203 and COMP 250 are considered to be equivalent from a prerequisite point of view, and cannot both be taken for credit.

B. COMP 208 may be taken before COMP 250; however, it cannot be taken for credit in the same term or afterwards.

C. COMP 396 (Undergraduate Research Project) cannot be taken for credit towards this minor.

Courses that make considerable use of computing from other departments may also be selected, with the approval of the School of Computer Science. Students should consult with their advisers about counting specific courses.

12.10.6 Construction Engineering and Management Minor

Students taking the Minor in Construction Engineering and Management complete 15 credits of required courses in management and law. Students choose complementary courses from the areas of either building structures or heavy construction, and from other construction- and management-related courses.

For further information about this minor and course selection, contact Professor L. Chouinard at 514-398-6446, Room 488, Macdonald Engineering Building.

12.10.6.1 Bachelor of Engineering (B.Eng.) - Minor Construction Engineering and Management (24 credits)

Note: This minor is open to B.Eng., B.S.E. and B.Sc.(Arch.) students.

All courses in the minor program must be passed with a grade of C or better.

For further information, contact Professor L. Chouinard at 514-398-6446, Room 488, Macdonald Engineering Building.

Total minor credit weight: 24-25 credits.

Prerequisites

CIVE 208	(3)	Civil Engineering System Analysis
CIVE 302	(3)	Probabilistic Systems
COMP 208	(3)	Computers in Engineering
MIME 310	(3)	Engineering Economy

Required Courses: Management and Law

15 credits

CIVE 324	(3)	Construction Project Management
FACC 220	(3)	Law for Architects and Engineers

INDR 294	(3)	Introduction to Labour-Management Relations
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 Complementaries

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

12.10.7 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 the Faculty of Arts section of this publication, unless they have obtained permission from the Faculty of Engineering. Students should consult with a faculty adviser in the Student Affairs Office, Engineering Student Centre for advice on this minor.

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

This minor consists of 18 credits of required and complementary courses given in the Economics Department. In addition, it is presumed that all Engineering students will have a sufficient background in statistics. Engineering Economy, MIME 310, does not form part of this 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 the Faculty of Arts section of the Calendar, unless they have obtained permission from the Faculty of Engineering.

All courses in the minor program must be passed with a grade of C or better.

For more information see the Department of Economics, Room 443, Leacock Building.

Required Courses

9 credits

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

* This requirement is waived for students who choose ECON 330D1/ECON 330D2 from the list of complementaries. Students may not take both ECON 209 and ECON 330D1/ ECON 330D2.

** Students may, with consent of instructor, take ECON 250D1/ ECON 250D2 Introduction to Economic Theory: Honours, in place of ECON 230D1/ECON 230D2.

Complementary Courses

9 credits from:

ECON 225	(3)	Economics of the Environment
ECON 302D1	(3)	Money and Banking
ECON 302D2	(3)	Money and Banking
ECON 303	(3)	Canadian Economic Policy
ECON 305	(3)	Industrial Organization
ECON 306D1	(3)	Labour Economics and Institutions
ECON 306D2	(3)	Labour Economics and Institutions
ECON 308	(3)	Governmental Policy Towards Business
ECON 311	(3)	United States Economic Development
ECON 313	(3)	Economic Development 1
ECON 314	(3)	Economic Development 2
ECON 316	(3)	The Underground Economy
ECON 326	(3)	Ecological Economics
ECON 329	(3)	Economics of Confederation
ECON 330D1	(3)	Macroeconomic Theory
ECON 330D2	(3)	Macroeconomic Theory
ECON 331	(3)	Economic Development: Russia and USSR
ECON 335	(3)	The Japanese Economy
ECON 337	(3)	Introductory Econometrics 1
ECON 344	(3)	The International Economy 1830-1914
ECON 345	(3)	The International Economy since 1914
ECON 347	(3)	Economics of Climate Change
ECON 348	(3)	Urban Economics
ECON 404	(3)	Transportation
ECON 405	(3)	Natural Resource Economics
ECON 406	(3)	Topics in Economic Policy
ECON 408	(3)	Public Sector Economics 1
ECON 409	(3)	Public Sector Economics 2
ECON 411	(3)	Economic Development: A World Area
ECON 416	(3)	Topics in Economic Development 2
ECON 420	(3)	Topics in Economic Theory
ECON 423D1	(3)	International Trade and Finance
ECON 423D2	(3)	International Trade and Finance

ECON 426	(3)	Labour Economics
ECON 434	(3)	Current Economic Problems
ECON 440	(3)	Health Economics
ECON 447	(3)	Economics of Information and Uncertainty
ECON 468	(3)	Econometrics 1 - Honours
ECON 469	(3)	Econometrics 2 - Honours
ECON 525	(3)	Project Analysis
ECON 546	(3)	Game Theory

Note: Mining Engineering students will be permitted to include Mineral Economics (MIME 526) among these 18 credits.

12.10.8 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 Program is administered by the Department of Civil Engineering and Applied Mechanics. Further information may be obtained from Professor Gehr, Room 487, Macdonald Engineering Building.

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*.

12.10.8.1 Bachelor of Engineering (B.Eng.) - Minor Environmental Engineering (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.

Further information may be obtained from Professor Ronald Gehr, Room 487, Macdonald Engineering Building.

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. Students should see the course listing at http://www.mcgill.ca/students/courses/calendars/search to know when a course is offered.

Total minor credit weight: 21-22 credits.

Complementary Courses

21-22 credits

18 credits from Stream A, B or C below

and

One course from the following list:

BREE 327	(3)	Bio-Environmental Engineering
CHEE 230	(3)	Environmental Aspects of Technology
CIVE 225	(4)	Environmental Engineering

Stream A

15 credits* from the Engineering Course List and 3 credits from the Non-Engineering Course List below

*A minimum of 6 credits must be from outside the student's department. A maximum of 6 credits of research project courses may be counted toward this category, provided the project has sufficient environmental engineering content (project requires approval of project supervisor and coordinator of the Minor).

Stream B

15 credits of courses that make up the "Barbados Field Study Semester" below, provided the project for CIVE/AGRI/URBP 519 Sustainable Development Plans has sufficient environmental engineering content (project requires approval of the Coordinator of the Minor);

3 credits chosen from the Engineering Course List below, excluding CHEE 496.

Barbados Field Study Courses

Required Courses

6 credits

URBP 507	(3)	Planning and Infrastructure
URBP 520	(3)	Globalization: Planning and Change

Complementary Courses

9 credits

One of the following cross-listed courses:

AGRI 452	(3)	Water Resources in Barbados
CIVE 452	(3)	Water Resources in Barbados

and one of the following cross-listed project courses:

AGRI 519	(6)	Sustainable Development Plans
CIVE 519	(6)	Sustainable Development Plans
URBP 519	(6)	Sustainable Development Plans

Stream C

9 credits of courses specified from the "Barbados Interdisciplinary Tropical Studies (BITS)" field semester below, provided the project has sufficient environmental engineering content (project requires approval of the Coordinator of the Minor);

AEBI 425	(3)	Tropical Energy and Food
AEBI 427	(6)	Barbados Interdisciplinary Project

and 9 credits chosen from the Engineering Course List below, excluding CHEE 496.

Engineering Course List

Courses offered at the Macdonald campus:

BREE 217	(3)	Hydrology and Water Resources
BREE 322	(3)	Organic Waste Management
BREE 416	(3)	Engineering for Land Development
BREE 518	(3)	Bio-Treatment of Wastes

Courses offered at the downtown campus:

ARCH 377	(3)	Energy, Environment and Buildings
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

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
NRSC 437	(3)	Assessing Environmental Impact
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

Courses offered at the downtown campus:

ANTH 206	(3)	Environment and Culture
BIOL 205	(3)	Biology of Organisms
BIOL 432	(3)	Limnology
CHEM 307	(3)	Analytical Chemistry of Pollutants
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

12.10.9 Minor in Environment

Environmental studies involve the interactions between humans and their natural or technological environment. Environmental problems are frequently comprehensive and complex, and their satisfactory solutions require the synthesis of humanistic, scientific, and institutional knowledge.

The Minor in Environment is offered and administered by the McGill School of Environment (MSE). Inquiries should be directed to Ms. Kathy Roulet, MSE Program Adviser; email: *kathy.roulet@mcgill.ca*, or telephone: 514-398-4306.

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 receive the Minor should prepare a program and have it approved by both their regular Engineering adviser and the MSE adviser. For program details, see *McGill School of Environment > Minor in Environment*.

12.10.10 Minor Programs in Finance, Management, Marketing, and Operations Management

Prerequisite: None

Many engineers begin to assume management functions within a few years of graduation. They can, at this stage, take up the study of economics, behavioural science and other management subjects. Students wishing to include such studies in their undergraduate program can take suitable courses from Engineering and Management.

Courses are available, subject to timetable requirements, from the core program of the Desautels Faculty of Management. Some courses from the Management core program have considerable overlap with Engineering courses and thus are not available to Engineering students. Further information is available at *www.mcgill.ca/engineering/degrees/minors*.

A student embarking on a Minor must be prepared to take credits additional to their engineering program. Students may choose the required Complementary Studies (Humanities and Social Sciences, Management Studies and Law) course(s) (maximum of 6 credits) in his/her program so that they count toward both their engineering program and the Minors where applicable. More information about Complementary Studies is given in the B.Eng./B.S.E. program section.

Students considering this Minor should consult an adviser or the Faculty of Engineering Student Affairs Office, Engineering Student Centre, FDA 22.

Students must have a CGPA of 3.0 or better to be considered for this Minor.

Students planning to take any course with statistics as a prerequisite must have completed MGCR 271 (Business Statistics) or an equivalent course approved by the BCom Student Affairs Office.

Detailed information on this Minor can be found under *Desautels Faculty of Management > Minors for Non-Management Students*.

12.10.11 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.

For more information regarding this Minor, contact the minor coordinator, Prof. M. Brochu, Room 2640, Wong Building.

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

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.

For further information, please contact the coordinator, Prof. M. Brochu, Room 2640, Wong Building.

Required Courses

15 credits**

CHEE 380*	(3)	Materials Science
CHEE 484	(3)	Materials Engineering
MIME 260*	(3)	Materials Science and Engineering
MIME 367	(3)	Electronic Properties of Materials
MIME 465	(3)	Metallic and Ceramic Powders Processing

* Students choose either CHEE 380 or MIME 360.

**Note: Another 3-credit MIME course will be added to the Required Courses list for 2010-2011, pending University approval. Please see Prof. M. Brochu for more information.

Complementary Courses

9 credits from the following:

CHEE 487	(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 566	(3)	Texture, Structure & Properties of Polycrystalline Materials
MIME 569	(3)	Electron Beam Analysis of Materials

12.10.12 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.

In addition to an Engineering adviser, each student in the Minor must have an adviser designated by the Department of Mathematics and Statistics, normally beginning in Year 2. The selection of courses for the Minor is to be done in conjunction with the Minor adviser. Please consult the Department of Mathematics and Statistics for an adviser.

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

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

This minor for Engineering students requires satisfactory passes in 24 credits of approved courses in Mathematics.

In addition to an Engineering adviser, each student in the minor program must have an adviser designated by the Department of Mathematics and Statistics, normally beginning in their U2 year. The selection of courses is to be done in conjunction with the minor adviser. Please consult the Department of Mathematics and Statistics for an adviser.

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 allied courses.

The following courses cannot be used towards the Minor:

MATH 222	(3)	Calculus 3
MATH 223	(3)	Linear Algebra
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

12.10.13 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 mining-related courses within the departments of Mining and Materials Engineering, Mechanical Engineering, Civil Engineering, and Chemical Engineering.

One of the required courses is a work term for which enrolment may be limited. Interested students should contact the coordinator, Professor Hani Mitri, Room 121, Adams Building.

12.10.13.1 Bachelor of Engineering (B.Eng.) - Minor Mining Engineering (24 credits)

Students in Engineering may obtain the Mining Engineering Minor by completing 24 credits of required and complementary courses, as listed below.

One of the required courses is a work term for which enrolment may be limited. Interested students should contact the coordinator, Professor Hani Mitri, Room 121, Adams Building.

Required Courses

12 credits

MIME 200	(3)	Introduction to the Minerals Industry
MIME 291	(2)	Industrial Work Period 2
MIME 313	(1)	Mining Science and Technology Seminar
MIME 322	(3)	Rock Fragmentation
MIME 333	(3)	Materials Handling

Complementary Courses

12 credits selected from the following lists:

List A: Mining Engineering

6-12 credits from the following:

MIME 320	(3)	Extraction of Energy Resources
MIME 323	(3)	Rock and Soil Mass Characterization
MIME 325	(3)	Mineral Industry Economics
MIME 341	(3)	Introduction to Mineral Processing

MIME 419	(3)	Surface Mining
MIME 422	(3)	Mine Ventilation
MIME 426	(3)	Development and Services
MIME 520	(3)	Stability of Rock Slopes
MIME 521	(3)	Stability of Underground Openings
MIME 526	(3)	Mineral Economics

List B: Mechanical Engineering

0-6 credits from the following:

MECH 497	(3)	Value Engineering
MECH 554	(3)	Microprocessors for Mechanical Systems
MECH 557	(3)	Mechatronic Design
MECH 572	(3)	Introduction to Robotics
MECH 573	(3)	Mechanics of Robotic Systems
MECH 577	(3)	Optimum Design

List C: Civil Engineering

0-6 credits from the following:

CIVE 416	(3)	Geotechnical Engineering
CIVE 451	(3)	Geoenvironmental Engineering
CIVE 462	(3)	Design of Steel Structures
CIVE 463	(3)	Design of Concrete Structures
CIVE 527	(3)	Renovation and Preservation: Infrastructure

List D: Chemical Engineering

0-6 credits from the following:

CHEE 453	(4)	Process Design
CHEE 455	(4)	Process Control
CHEE 484	(3)	Materials Engineering

12.10.14 Physics Minor

Students in Honours Electrical Engineering taking the Physics Minor take 9 credits of required courses in thermal physics and honours quantum physics and choose three other physics courses (subject code PHYS).

Interested students should contact the Department of Physics concerning this Minor.

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

Revision, Fall 2010. Start of revision.

Students in Honours Electrical Engineering may obtain this minor as part of their B.Eng. degree by completing 18 credits of physics courses, as listed below.

Please consult the Department of Physics for an adviser.

Required Courses

9 credits

PHYS 253	(3)	Thermal Physics

PHYS 357*	(3)	Honours Quantum Physics 1
PHYS 457*	(3)	Honours Quantum Physics 2

* Students who take PHYS 357 and PHYS 457 can omit PHYS 271 from their normal Electrical Engineering program.

Complementary Courses

9 credits from the following:

PHYS 351	(3)	Honours Classical Mechanics 2
PHYS 362	(3)	Statistical Mechanics
PHYS 432	(3)	Physics of Fluids
PHYS 514	(3)	General Relativity
PHYS 551	(3)	Quantum Theory
PHYS 557	(3)	Nuclear Physics
PHYS 558	(3)	Solid State Physics
PHYS 559	(3)	Advanced Statistical Mechanics
PHYS 562	(3)	Electromagnetic Theory
PHYS 567	(3)	Particle Physics

Revision, Fall 2010. End of revision.

12.10.15 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 gives students an opportunity to design a business plan and develop a technology or engineering project.

Students considering this Minor should consult with a faculty adviser in the Student Affairs Office, Engineering Student Centre, Frank Dawson Adams, Suite 22.

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

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.

Engineering students (including B.Eng. and B.Sc.(Arch.) students) may obtain the Technological Entrepreneurship Minor by completing six courses (18 credits). B.Eng. and B.S.E. student may double-count up to two courses (6 credits) of Complementary Studies (Humanities and Social Sciences courses, Group B) toward the Minor.

Students considering this minor should consult with a faculty adviser in the Student Affairs Office, Engineering Student Centre, Frank Dawson Adams, Suite 22.

Complementary Courses

18 credits (six courses) from the following:

BUSA 465	(3)	Technological Entrepreneurship
FACC 500	(3)	Technology Business Plan Design
FACC 501	(3)	Technology Business Plan Project
MGCR 352	(3)	Marketing Management 1
MGCR 423	(3)	Organizational Policy
MRKT 360	(3)	Marketing of Technology
ORGB 321	(3)	Leadership

ORGB 423	(3)	Human Resources Management

12.10.16 Software Engineering Minor

This Minor will prepare an engineering student for a career in software engineering. It will provide a foundation in basic computer science, computer programming and software engineering practice.

Students considering this Minor should consult with a faculty adviser in the Student Affairs Office, Engineering Student Centre, Frank Dawson Adams, Suite 22.

12.10.16.1 Bachelor of Engineering (B.Eng.) - Minor Software Engineering (24 credits)

Revision, Fall 2010. Start of revision.

The Software Engineering Minor will prepare an engineering student for a career in software engineering. It will provide a foundation in basic computer science, computer programming and software engineering practice.

This minor consists of 24 credits (eight courses). Up to four courses (12 credits) may be double-counted for credit towards the B. Eng. degree in Electrical Engineering or Computer Engineering. Students in other programs may double-count up to three courses (9 credits).

Students considering the Minor Software Engineering should consult with a faculty adviser in the Student Affairs Office, Engineering Student Centre, Frank Dawson Adams, Suite 22.

Required Courses

9 credits

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

Complementary Courses

15 credits

3 credits from the following:

COMP 203	(3)	Introduction to Computing 2
COMP 250	(3)	Introduction to Computer Science

3-12 credits from the following engineering courses:

CHEE 458	(3)	Computer Applications
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 545	(3)	Advanced Stress Analysis
MECH 576	(3)	Geometry in Mechanics

0-6 credits from the following computer science courses (no more than 6 credits will count toward the minor):

COMP 302	(3)	Programming Languages and Paradigms
COMP 335	(3)	Software Engineering Methods
COMP 421	(3)	Database Systems
COMP 424	(3)	Artificial Intelligence
COMP 527	(3)	Logic and Computation

Revision, Fall 2010. End of revision.