



**Faculty of Engineering, including the Schools of  
Architecture and Urban Planning  
Programs, Courses and University Regulations  
2012-2013**



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**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, and houses three institutes:

### Departments

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

### Schools

Architecture  
Urban Planning

### Institutes

Institute for Sustainability in Engineering and Design (ISEAD)  
McGill Institute for Advanced Materials (MIAM) (Website: [www.mcgill.ca/miam](http://www.mcgill.ca/miam)) (established by the Faculties of Engineering and Science)  
McGill Institute for Aerospace Engineering (MIAE) (Website: [www.mcgill.ca/miae](http://www.mcgill.ca/miae))

The Faculty serves approximately 2,800 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 *Programs, Courses and University Regulations* for Graduate and Postdoctoral Studies found at [www.mcgill.ca/study](http://www.mcgill.ca/study).

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](http://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 *Programs, Courses and University Regulations* for Graduate and Postdoctoral Studies found at [www.mcgill.ca/study](http://www.mcgill.ca/study).

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## 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.

For a detailed history of the Faculty from 1811 to 2003, see [www.mcgill.ca/engineering/faculty/history](http://www.mcgill.ca/engineering/faculty/history).

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### 3 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](http://www.mcgill.ca/emf).

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### 4 Schulich Library of Science and Engineering

Second largest of the 13 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. The following 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 Hirschfeld Geographic Information Centre, Edward Rosenthal Mathematics and Statistics Library, and the Howard Ross Library of Management.

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](http://www.mcgill.ca/library/library-using/branches/schulich)

Telephone: 514-398-4769

Email: [schulich.library@mcgill.ca](mailto:schulich.library@mcgill.ca)

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### 5 About the Faculty of Engineering (Undergraduate)

Welcome to the undergraduate Faculty of Engineering section of the *Programs, Courses and University Regulations* publication.

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 *Programs, Courses and University Regulations* publication for Graduate and Postdoctoral Studies at [www.mcgill.ca/study](http://www.mcgill.ca/study).

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

- [section 1: About the Faculty of Engineering](#)
- [section 2: History of the Faculty](#)
- [section 3: Engineering Microcomputing Facility](#)
- [section 4: Schulich Library of Science and Engineering](#)
- [section 6: Degrees and Requirements for Professional Registration](#)
- [section 9: Student Activities](#)
- [section 11: Engineering Internship Program \(EIP\)](#)

- Undergraduate [Programs](#) and [Courses](#)
- [section 12.10: Minor Programs](#) for students in the Faculty of Engineering

For regulations that are specific to the Faculty of Engineering, see [Programs, Courses and University Regulations > University Regulations and Resources](#) and 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 0C3  
Canada

Telephone: 514-398-7250

Faculty website: [www.mcgill.ca/engineering](http://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 the following address:

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

Telephone: 514-398-7257

Student Affairs Office website: [www.mcgill.ca/engineering/student/sao](http://www.mcgill.ca/engineering/student/sao)

## 5.2 Administrative Officers

### Dean

Andrew G. Kirk; B.Sc.(Brist.), Ph.D.(Lond.) (*James McGill Professor*) (*Interim*)

### Associate Deans

Subhasis Ghoshal; B.C.E.(Jad.), M.S.(Missouri), Ph.D.(Carn. Mell), P.Eng. (*William Dawson Scholar*) (*Undergraduate Education*)

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

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

### Department Chairs

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

Van Thanh Van Nguyen; B.M.E.(Vietnam), M.C. Eng.(A.I.T.), D.A.Sc.(Montr.), Eng. (*Civil Engineering and Applied Mechanics*)

Fabrice Labeau; B.Eng., Ph.D.(Louvain), P.Eng. (*Electrical and Computer Engineering*) (*Interim*)

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

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

### Director, School of Architecture

Anmarie Adams; B.A.(McG.), M.Arch., Ph.D.(Calif., Berk.)

### Director, School of Urban Planning

Raphaël Fischler; B.Eng.(U. Tech. Eindhoven), M.Sc., M.C.P.(MIT), Ph.D.(Calif., Berk.)

### Secretary of Faculty

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

**Director of Administration**

Christine Tutt

**Manager, EMF**

Debbie Morzajew

**Facilities Manager (Acting)**

Debbie Morzajew

**Human Resources Adviser**

Susanne Baumann-Moroy

**Financial Officer**

Sonia Nardini

**Associate Director, Engineering Student Centre**

Judy Pharo

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## 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 Programs, Courses and University Regulations* publication at [www.mcgill.ca/study](http://www.mcgill.ca/study).

**Professional**

Bachelor of Engineering

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](http://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](http://www.oiq.qc.ca).

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## 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* at [www.mcgill.ca/applying](http://www.mcgill.ca/applying).

## 8 Student Progress

The length of the B.Eng., B.S.E., and B.Sc.(Arch.) programs varies depending on the 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](http://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.) program 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). EUS publishes a handbook describing their operations and the activities of various Faculty clubs and societies; you can also find these on their website (see below). All undergraduate students automatically become members of the EUS. Each department and school also has a student association.

For more information about EUS and links to department/school student association websites, visit the EUS website at [www.mcgilleus.ca](http://www.mcgilleus.ca).

For more information on extra-curricular activities and organizations, see [www.mcgill.ca/engineering/student/sao/life](http://www.mcgill.ca/engineering/student/sao/life).

For more information on student design teams and projects, see [www.mcgill.ca/engineering/student/sao/studentdesign](http://www.mcgill.ca/engineering/student/sao/studentdesign).

## 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.(Arch.))

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

Environment

Environmental Engineering

Management Minors: Minor in Finance, Minor in Management, Minor in Marketing, Minor in Operations Management

Materials Engineering

Mathematics

Mining Engineering

Physics

Software Engineering

Technological Entrepreneurship

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## 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.

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### 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](http://www.mcgill.ca/careers4engineers) or send an email to [careers4engineers@mcgill.ca](mailto: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.

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## 12 Academic Programs

The programs and courses in the following sections have been approved for the 2012–2013 session as listed, but the Faculty reserves the right to introduce changes as may be deemed necessary or desirable.

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### 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). Students then apply for placement and continue in an Engineering major program.

For more information about the General Engineering Program, see [www.mcgill.ca/engineering/degrees/general](http://www.mcgill.ca/engineering/degrees/general).

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

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

##### Year 0 (Freshman) Courses

(30 credits)

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

##### 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 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/>.

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/science> for information on Science Placement Exams.

### Language Courses

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

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

---

## 12.2 School of Architecture

### 12.2.1 Location

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

Telephone: 514-398-6700

Fax: 514-398-7372

Website: [www.mcgill.ca/architecture](http://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](http://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](http://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 that have agreements with the McGill School of Architecture, for a maximum of one term in the second year of the B.Sc.(Arch.) program. These include the following: Università Iuav di Venezia (Venice, Italy); Fakultät für Raumplanung und Architektur, Technische Universität Wien (Vienna, Austria); 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 – Jennifer Garland, Liaison Librarian

##### 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, Liaison Librarian

Orson Wheeler Architectural Model Collection – Professor Pieter Sijpkens

Materials Resource Centre – Dr. Avi Friedman

#### 12.2.6 School of Architecture Faculty

##### Director

Annmarie Adams

##### Emeritus Professors

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

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

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

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

### Associate Professors

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

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

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

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

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

### Assistant Professors

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)

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

### Adjunct Professors

Thomas Balaban

Sinisha Brdar

Howard Davies

Talia Dorsey

Julia Gersovitz

Phyllis Lambert

Maria Mingallon

Suresh Perera

Mark Poddubiuk

Conor Sampson

Jozef Zorko

### Course Lecturers

Torben Berns

Christina Contandriopoulos

Nancy Dunton

Eric Gauthier

Francisca Insulza

Ron Jelaco

Andrew King

Paula Meijeriuk

Sevag Pogharian

Enrique Ramos

Pierina Saia

Pieter Sijpkens

**Course Lecturers**

Michael Wen-Sen Su

**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 2011:

Senn Annis, Madhav Badami, Rami Bebawi, Louis Brilliant, Alberto Carli, Julian Chen, Lily Chi, Carlotta Daro, Trevor Davies, John Diodati, Ahmed El-Geneidy, Paul Emmons, Francois Emond, Maude Francoeur, Naomi Frangos, Vassilis Ganiatsas, Ziad Haddad, Cynthia Hammond, Hal Ingberg, Radu Juster, David Leatherbarrow, Lorraine Mercier, Sergio Morales, Cleo Paskal, Louise Pelletier, Marc-Antoine Primeau, Ron Proulx, Tudor Radulescu, Robert Stanley, Kassra Tavakoli, Vladimir Topouzanov, David Theodore, Henry Tsang

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

Program credit weight: 126 credit

Program credit weight for CEGEP students: 100 credits

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 the 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**

73 credits

|          |     |   |
|----------|-----|---|
| ARCH 201 | (6) | Communication, Behaviour and Architecture     |
| ARCH 202 | (6) | Architectural Graphics and Elements of Design |
| ARCH 221 | (2) | Architectural Drawing                         |
| ARCH 240 | (3) | Organization of Materials in Buildings        |
| ARCH 241 | (3) | Architectural Structures                      |
| ARCH 250 | (3) | Architectural History 1                       |
| ARCH 251 | (3) | Architectural History 2                       |
| ARCH 303 | (6) | Design and Construction 1                     |
| ARCH 304 | (6) | Design and Construction 2                     |
| ARCH 325 | (2) | Architectural Sketching                       |
| ARCH 342 | (3) | Digital Representation                        |
| ARCH 354 | (3) | Architectural History 3                       |
| ARCH 355 | (3) | Architectural History 4                       |
| ARCH 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               |
| ARCH 512 | (3) | Architectural Modelling                       |

**Complementary Courses**

6 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 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 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.

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## 12.3 Department of Chemical Engineering

### 12.3.1 Location

M.H. Wong Building, Room 3060  
3610 University Street  
Montreal, Quebec H3A 0C5

Telephone: 514-398-4494

Fax: 514-398-6678

Website: [www.mcgill.ca/chemeng](http://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, chemistry, or another minor (see [section 12.10: Minor Programs](#) for minors available to engineering students).

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 141 credits (115 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 *AIChE 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

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

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.

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

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

#### Professor

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'neil)

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.

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.)

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

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

**Assistant Professors**

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

P-Luc Girard-Lauriault; B.Sc.(Montr.), Ph.D.(École Poly., Montr.)

Jeff Gostick; B.Eng.(Ryerson), M.A.Sc., Ph.D.(Wat.)

Anne-Marie Kietzig; B.Eng.(T.U. Berlin), Ph.D.(Br. Col.)

**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

T. Alexakis

B. Alvarade

J. Anson

P. Bisaillon

R. Campeau

M. Davidovsky

M. Fokas

N. Peters

B.E. Sarkis

B. Théorét

R.C. Urquhart

L. Yerushalmi

**12.3.6 Bachelor of Engineering (B.Eng.) – Chemical Engineering (141 credits)**

Program credit weight: 141-144 credits

Program credit weight for CEGEP students: 115 crédits

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 fundamental science, biology, will find several courses in the chemical engineering curriculum that 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.

**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 115-credit program.

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

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

### 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                           |

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

### 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 course(s) (2-5 credits) may be taken from other suitable undergraduate courses in the Faculty of Engineering, with departmental permission.

|             |     |  |
|-------------|-----|--|
| BIOT 505*   | (3) | Selected Topics in Biotechnology                   |
| CHEE 363    | (2) | Projects Chemical Engineering 1                    |
| CHEE 438    | (3) | Engineering Principles in Pulp and Paper Processes |
| CHEE 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 510    | (3) | Advanced Separation Processes                      |
| CHEE 515+   | (3) | Material Surfaces: A Biomimetic Approach           |
| 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   |
| MIME 515+   | (3) | Material Surfaces: A Biomimetic Approach |

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

\*\* Students may choose only one project course: CHEE 494, CHEE 495, or CHEE 496.

\*\*\* Students choose either CHEE 563 or MECH 563.

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

- CHEE 515 or MIME 515

- CHEE 592 or MECH 534

- CHEE 593 or CIVE 430

### Complementary Studies

6 credits (9 credits for students from Quebec CEGEPs)

#### Group A - Impact of Technology on Society

3 credits from the following:

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

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

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

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

Anthropology (ANTH)

Economics (any 200- or 300-level course excluding ECON 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 no more than 3 credits will be given for one 6-credit course at the 100 level or higher in that language. A maximum of 3 credits of language courses will be counted toward the Complementary Studies requirement.

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

#### 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 in the [section 12.10.9: Environmental Engineering Minor](#).

A Minor in Biotechnology is also offered by the Faculties of Engineering and Science with emphasis on molecular biology and chemical engineering processes. A full description of the program appears in the [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.

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## 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 0C3

Telephone: 514-398-6860  
Fax: 514-398-7361  
Website: [www.mcgill.ca/civil](http://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 ageing 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. Minors are available in fields such as Arts, Economics, Management, Environmental Engineering, Construction Engineering and Management, and others. These require additional credits to be taken from a specified list of topics relating to the chosen field. Further information on the various minors may be found in [section 12.10: Minor Programs](#). Details of how 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

#### Associate Chair

Mohamed Abdel-Meguid

#### 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.

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.(Delhi), Sc.D.(Col.), Eng.

#### Associate Professors

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

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

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

**Associate Professors**

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

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

Ghyslaine McClure; B.Eng.(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.Sc., M.S.(Tongji), Ph.D.(N'western), P.Eng., F.A.C.I.; 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.

Naveen Eluru; B.Sc.(Indian IT), M.Sc., Ph.D.(Texas-Austin)

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

Tom Gleeson; B.Sc.(Vic., BC), M.Sc.(S. Fraser), Ph.D.(Qu.)

Marianne Hatzopoulou; B.Sc., M.Sc.(Beirut), Ph.D.(Tor.)

Dimitrios G. Lignos; B.Sc.(Nat. Tech., Athens), M.Sc., Ph.D.(Stan.)

Jinxia Liu; B.Eng., M.Eng.(Tianjin), M.Eng.(Rensselaer Poly.), Ph.D.(Purd.)

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 (139 credits)**

Program credit weight: 139 credits

Program credit weight for Quebec CEGEP students: 110 credits

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

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

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

**Required Year 0 (Freshman) Courses**

29 credits

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

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

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

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

**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                           |

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

**Required Civil Engineering Courses**

61 credits

|          |     |                                   |
|----------|-----|-----------------------------------|
| CIVE 202 | (4) | Construction Materials            |
| CIVE 205 | (3) | Statics                           |
| CIVE 206 | (3) | Dynamics                          |
| CIVE 207 | (4) | Solid Mechanics                   |
| CIVE 208 | (3) | Civil Engineering System Analysis |
| CIVE 210 | (2) | Surveying                         |
| CIVE 225 | (4) | Environmental Engineering         |
| CIVE 290 | (3) | Thermodynamics and Heat Transfer  |

|          |     |                                |
|----------|-----|--------------------------------|
| CIVE 302 | (3) | Probabilistic Systems          |
| CIVE 311 | (4) | Geotechnical Mechanics         |
| CIVE 317 | (3) | Structural Engineering 1       |
| CIVE 318 | (3) | Structural Engineering 2       |
| CIVE 319 | (3) | Transportation Engineering     |
| CIVE 320 | (4) | Numerical Methods              |
| CIVE 323 | (3) | Hydrology and Water Resources  |
| CIVE 324 | (3) | Sustainable Project Management |
| CIVE 327 | (4) | Fluid Mechanics and Hydraulics |
| CIVE 418 | (4) | Design Project                 |
| CIVE 432 | (1) | Technical Paper                |

### Complementary Courses

21 credits

#### List A - Design Technical Complementaries

6-15 credits from the following:

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

#### 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 446 | (3) | Construction Engineering                              |
| CIVE 451 | (3) | Geoenvironmental Engineering                          |
| CIVE 460 | (3) | Matrix Structural Analysis                            |
| CIVE 470 | (3) | Undergraduate Research Project                        |
| CIVE 512 | (3) | Advanced Civil Engineering Materials                  |
| CIVE 514 | (3) | Structural Mechanics                                  |
| CIVE 527 | (3) | Renovation and Preservation: Infrastructure           |
| CIVE 540 | (3) | Urban Transportation Planning                         |
| CIVE 546 | (3) | Selected Topics in Civil Engineering 1                |
| 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 558 | (3) | Biomolecular Techniques for Environmental Engineering |
| CIVE 560 | (3) | Transportation Safety and Design                      |

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

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

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

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

Anthropology (ANTH)

Economics (any 200- or 300-level course excluding ECON 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, no more than 3 credits will be given for one 6-credit course at the 100 level or higher in that language. A maximum of 3 credits of language courses will be counted toward the Complementary Studies requirement.

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

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## 12.5 Department of Electrical and Computer Engineering

### 12.5.1 Location

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

Telephone: 514-398-3943

Fax: 514-398-4653

Website: [www.mcgill.ca/ece](http://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

#### Interim Chair

Fabrice Labeau

**Associate Chair, Academic**

Roni Khazaka

**Associate Chair, Undergraduate Studies**

Jonathan P. Webb

**Associate Chair, Graduate Studies**

Mark Coates

**Associate Chair, Technical and Laboratory Services**

TBA

**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.

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

**Professors**

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

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

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

James Clark; B.A.Sc., Ph.D.(Br. Col.)

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

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

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

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

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

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 P. 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.(Princ.)

**Associate Professors**

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

Francois Bouffard; Ph.D.(McG.)  
 Vamsy Chodavarapu; B.Eng.(Osmania), M.S., Ph.D.(NYU)  
 Odile Liboiron-Ladouceur; M.Sc., Ph.D.(Col.)  
 Aditya Mahajan; B.Tech.(Indian IT), M.S., Ph.D.(Mich.)  
 Brett Meyer; Ph.D. (Carn. Mellon)  
 Zetian Mi; B.A.Sc.(Beijing), 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.(Wisc.)  
 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.)  
 Haibo Zeng, Ph.D. (Calif., Berk.)

**Associate Members**

Gregory Dudek; B.Sc.(Qu.), M.Sc., Ph.D.(Tor.)  
 Alan C. Evans; M.Sc.(Surrey), Ph.D.(Leeds)  
 William R. Funnell; M.Eng., Ph.D.(McG.)  
 Henrietta L. Galiana; M.Eng., Ph.D.(McG.)  
 Jean Gotman; M.E.(Dart.), Ph.D.(McG.)  
 David Juncker; Ph.D.(Neuchatel)  
 Robert E. Kearney; M.Eng., Ph.D.(McG.)  
 Xue Liu; B.S., M.Eng.(Tsinghua), Ph.D.(Ill.)  
 Nathaniel J. Quitoriano; B.S.(Calif.), Ph.D.(MIT)

**Adjunct Professors**

Ray Bartnikas

**Adjunct Professors**

Danny Grant  
 Cedric Guss  
 Ricardo Izquierdo  
 Cheng K. Jen  
 Innocent Kamwa  
 Irene Leszkowicz  
 Shie Mannor  
 Douglas O'Shaughnessy  
 Katarzyna Radecka  
 Anthony Rodolakis  
 Robert Sabourin  
 Joshua D. Schwartz  
 Leszek Szczecinski  
 Claude Thibeault  
 Kenneth D. Wagner

**12.5.4 Bachelor of Engineering (B.Eng.) - Electrical Engineering (138 credits)**

Program credit weight: 138-139 credits

Program credit weight for Quebec CEGEP students: 109-110 credits

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

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

**Required Year 0 (Freshman) Courses**

29 credits

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

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

<http://www.mcgill.ca/engineering/student/sao/newstudents/> and select your term of admission.

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

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

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

**Required Non-Departmental Courses**

35 credits

|           |     |   |
|-----------|-----|---|
| CCOM 206  | (3) | Communication in Engineering                      |
| CIVE 281  | (3) | Analytical Mechanics                              |
| COMP 202  | (3) | Foundations of Programming                        |
| FACC 100* | (1) | Introduction to the Engineering Profession        |
| FACC 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                   |

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

### Required Electrical Engineering Courses

57 credits

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

#### Group A - Impact of Technology on Society

3 credits from the following:

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

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

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

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

Anthropology (ANTH)

Economics (any 200- or 300-level course excluding ECON 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, no more than 3 credits will be given for one 6-credit course at the 100-level or higher in that language. A maximum of 3 credits of language courses will be counted toward the Complementary Studies requirement.

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

### 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 2011, the applicant must:

- be registered in the B.Eng. program (regular Electrical Engineering);
- have a cumulative GPA of at least 2.4
- have completed or be registered in ECSE 361 (Power Engineering);
- be able to complete the degree requirements by December 2012;
- 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 in this publication 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.

## 12.5.5 Bachelor of Engineering (B.Eng.) - Honours Electrical Engineering (138 credits)

Program credit weight: 138-139 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.

|          |     |                             |
|----------|-----|-----------------------------|
| 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 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 and enter a 109- to 100-credit program.

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

|          |     |                             |
|----------|-----|-----------------------------|
| CHEM 110 | (4) | General Chemistry 1         |
| CHEM 120 | (4) | General Chemistry 2         |
| MATH 133 | (3) | Linear Algebra and Geometry |
| MATH 140 | (3) | Calculus 1                  |

|          |     |                             |
|----------|-----|-----------------------------|
| MATH 141 | (4) | Calculus 2                  |
| PHYS 131 | (4) | Mechanics and Waves         |
| PHYS 142 | (4) | Electromagnetism and Optics |

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

**Required Non-Departmental Courses**

35 credits

|           |     |   |
|-----------|-----|---|
| CCOM 206  | (3) | Communication in Engineering                      |
| CIVE 281  | (3) | Analytical Mechanics                              |
| COMP 202  | (3) | Foundations of Programming                        |
| FACC 100* | (1) | Introduction to the Engineering Profession        |
| FACC 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                   |

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

**Required Electrical Engineering Courses**

57 credits

|          |     |                                      |
|----------|-----|--------------------------------------|
| ECSE 200 | (3) | Electric Circuits 1                  |
| ECSE 210 | (3) | Electric Circuits 2                  |
| ECSE 211 | (3) | Design Principles and Methods        |
| ECSE 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 chose from 500-level ECSE courses OR 6 credits chosen from 500-level ECSE courses and 3 credits chosen from the following list of 400-level courses (no more than one 400-level course can be chosen as a technical complementary):

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

#### Laboratory Complementaries

2-3 credits from the following:

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

### Complementary Studies

6 credits

#### Group A - Impact of Technology on Society

3 credits from the following:

ANTH 212 (3) Anthropology of Development  
 BTEC 502 (3) Biotechnology Ethics and Society  
 CIVE 469 (3) Infrastructure and Society  
 ECON 225 (3) Economics of the Environment  
 ECON 347 (3) Economics of Climate Change  
 ENVR 201 (3) Society, Environment and Sustainability  
 GEOG 200 (3) Geographical Perspectives: World Environmental Problems  
 GEOG 203 (3) Environmental Systems  
 GEOG 205 (3) Global Change: Past, Present and Future  
 GEOG 302 (3) Environmental Management 1

|           |     |                                      |
|-----------|-----|--------------------------------------|
| MECH 526  | (3) | Manufacturing and the Environment    |
| MGPO 440* | (3) | Strategies for Sustainability        |
| MIME 308  | (3) | Social Impact of Technology          |
| PHIL 343  | (3) | Biomedical Ethics                    |
| RELG 270  | (3) | Religious Ethics and the Environment |
| SOCI 235  | (3) | Technology and Society               |
| SOCI 312  | (3) | Sociology of Work and Industry       |
| URBP 201  | (3) | Planning the 21st Century City       |

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

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

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

Anthropology (ANTH)

Economics (any 200- or 300-level course excluding ECON 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 I                      |
| ORGB 321* | (3) | Leadership                                  |
| ORGB 423* | (3) | Human Resources Management                  |

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

**Language Courses**

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

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

**12.5.6 Bachelor of Engineering (B.Eng.) - Computer Engineering (139 credits)**

Program credit weight: 139-143 credits

Program credit weight for CEGEP students: 113-114 credits

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.

### 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 113- to 114-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 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) | Foundations of Programming                    |
| COMP 250  | (3) | Introduction to Computer Science              |
| COMP 251  | (3) | Algorithms and Data Structures                |
| 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                           |

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

### 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 the following:

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

|          |     |                                 |
|----------|-----|---------------------------------|
| COMP 424 | (3) | Artificial Intelligence         |
| ECSE 404 | (3) | Control Systems                 |
| ECSE 411 | (3) | Communications Systems 1        |
| ECSE 412 | (3) | Discrete Time Signal Processing |
| ECSE 420 | (3) | Parallel Computing              |
| ECSE 421 | (3) | Embedded Systems                |
| ECSE 422 | (3) | Fault Tolerant Computing        |
| ECSE 424 | (3) | Human-Computer Interaction      |
| ECSE 428 | (3) | Software Engineering Practice   |
| ECSE 429 | (3) | Software Validation             |

|          |     |   |
|----------|-----|---|
| ECSE 431 | (3) | Introduction to VLSI CAD                                    |
| ECSE 436 | (3) | Signal Processing Hardware                                  |
| ECSE 443 | (3) | Introduction to Numerical Methods in Electrical Engineering |
| ECSE 450 | (3) | Electromagnetic Compatibility                               |
| ECSE 530 | (3) | Logic Synthesis   |
| ECSE 532 | (3) | Computer Graphics   |
| ECSE 537 | (3) | Advanced Digital Integrated Circuits                        |
| ECSE 548 | (3) | Introduction to VLSI Systems                                |

### Laboratory Complementaries

2-3 credits from the following:

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

### Complementary Studies

6 credits

#### Group A - Impact of Technology on Society

3 credits from the following:

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

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

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

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

Anthropology (ANTH)

Economics (any 200- or 300-level course excluding ECON 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, no more than 3 credits will be given for one 6-credit course at the 100- level or higher in that language. A maximum of 3 credits of language courses will be counted toward the Complementary Studies requirement.

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

**12.5.7 Bachelor of Software Engineering (B.S.E.) - Software Engineering (135 credits)**

Program credit weight: 135-144 credits

Program credit weight for CEGEP students: 112-115 credits

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

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

**Required Year 0 (Freshman) Courses**

29 credits

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

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

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

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

### Required Courses

68 credits

|           |     |   |
|-----------|-----|---|
| COMP 202  | (3) | Foundations of Programming                    |
| COMP 206  | (3) | Introduction to Software Systems              |
| COMP 250  | (3) | Introduction to Computer Science              |
| COMP 251  | (3) | Algorithms and Data Structures                |
| COMP 302  | (3) | Programming Languages and Paradigms           |
| COMP 360  | (3) | Algorithm Design                              |
| COMP 421  | (3) | Database Systems                              |
| ECSE 211  | (3) | Design Principles and Methods                 |
| ECSE 221  | (3) | Introduction to Computer Engineering          |
| ECSE 321  | (3) | Introduction to Software Engineering          |
| ECSE 322  | (3) | Computer Engineering                          |
| ECSE 420  | (3) | Parallel Computing                            |
| ECSE 427  | (3) | Operating Systems                             |
| ECSE 428  | (3) | Software Engineering Practice                 |
| ECSE 429  | (3) | Software Validation                           |
| ECSE 456  | (3) | ECSE Design Project 1                         |
| ECSE 457  | (3) | ECSE Design Project 2                         |
| FACC 100* | (1) | Introduction to the Engineering Profession    |
| FACC 400  | (1) | Engineering Professional Practice             |
| MATH 262  | (3) | Intermediate Calculus                         |
| MATH 263  | (3) | Ordinary Differential Equations for Engineers |
| MATH 264  | (3) | Advanced Calculus for Engineers               |
| MATH 270  | (3) | Applied Linear Algebra                        |
| MATH 363  | (3) | Discrete Mathematics                          |

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

### Engineering Breadth Required Courses

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

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

Not all courses listed are offered in a given year. See the "Courses" section of this publication to know if a course is offered.

#### List A

6-12 credits from the following:

|           |     |  |
|-----------|-----|--|
| ECSE 323  | (5) | Digital System Design                      |
| ECSE 404  | (3) | Control Systems                            |
| 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 421  | (3) | Embedded Systems                           |
| ECSE 422  | (3) | Fault Tolerant Computing                   |
| ECSE 424  | (3) | Human-Computer Interaction                 |
| ECSE 425  | (3) | Computer Organization and Architecture     |
| ECSE 426  | (3) | Microprocessor Systems                     |
| ECSE 530  | (3) | Logic Synthesis                            |

#### List B

0-4 credits from the following:

|          |     |                       |
|----------|-----|-----------------------|
| COMP 330 | (3) | Theory of Computation |
| 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 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.

### Complementary Studies

6 credits

#### Group A - Impact of Technology on Society

3 credits from the following:

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

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

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

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

Anthropology (ANTH)

Economics (any 200- or 300-level course excluding 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 I                      |
| ORGB 321* | (3) | Leadership                                  |
| ORGB 423* | (3) | Human Resources Management                  |

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

### Language Courses

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

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

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## 12.6 Department of Mechanical Engineering

### 12.6.1 Location

Macdonald Engineering Building, Room 270

817 Sherbrooke Street West

Montreal, Quebec H3A 0C3

Telephone: 514-398-6296

Fax: 514-398-7365

Website: [www.mcgill.ca/mecheng](http://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.



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

### 12.6.3 Department of Mechanical Engineering Faculty

#### Chair

Arun K. Misra

#### 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.), Ing.

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

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.

Vince Thomson; B.Sc.(Windsor), Ph.D.(McM.)

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

#### Professors

Marco Amabili; M.Eng.(Ancona), Ph.D.(Bologna); F.A.S.M.E. (*Tier 1 Canada Research Chair*)

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

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

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

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

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

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

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

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

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

#### Associate Professors

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

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

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

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

**Associate Professors**

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

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

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

Rosaire Mongrain; B.Sc., M.Sc.(Montr.), Ph.D.(École Poly., Montr.), 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.) *Associate Dean, Academic Affairs, Director, Graduate Admissions and Scholarships*

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

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

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

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) (*Tier 2 Canada Research Chair*)

**Assistant Professors**

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

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

Mathias LeGrand; M.Sc.(École Centrale, Nantes); Ph.D.(École Centrale, Nantes)

**Faculty Workshop Manager**

Maurice Ouellet

**Adjunct Professors/Course Lecturers**

Helmi Attia

O.F. Bertrand

Farhang Daneshmand

Sudarshan Martins

Angelo Segall

George Vukovich

Dino Zorbas

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

Program credit weight: 142-148 credits

Program credit weight for CEGEP students: 119 credits

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

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

**Required Year 0 (Freshman) Courses**

29 credits

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

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

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

### Required Mechanical Engineering Courses

65 credits

|          |     |   |
|----------|-----|---|
| MECH 201 | (2) | Introduction to Mechanical Engineering      |
| MECH 210 | (2) | Mechanics 1                                 |
| MECH 220 | (4) | Mechanics 2                                 |
| MECH 240 | (3) | Thermodynamics 1                            |
| MECH 262 | (3) | Statistics and Measurement Laboratory       |
| MECH 290 | (3) | Design Graphics for Mechanical Engineering  |
| 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 360 | (3) | Principles of Manufacturing                 |

|            |     |   |
|------------|-----|---|
| 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 497  | (3) | Value Engineering                           |
| MECH 498  | (3) | Interdisciplinary Design Project 1          |
| MECH 499  | (3) | Interdisciplinary Design Project 2          |
| MECH 513  | (3) | Control Systems                             |
| 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 |
| CIVE 469 | (3) | Infrastructure and Society       |

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

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

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

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

Anthropology (ANTH)

Economics (any 200- or 300-level course excluding ECON 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, no more than 3 credits will be given for one 6-credit course at the 100 level or higher in that language. A maximum of 3 credits of language courses will be counted toward the Complementary Studies requirement.

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

### Elective Courses

0-6 credits

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

Desautels Faculty of Management

Faculty of Agricultural and Environmental Sciences

Faculty of Arts

Faculty of Engineering

Faculty of Religious Studies

Faculty of Science

Schulich School of Music

### Typical Program of Study

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

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

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

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

Program credit weight: 142-148 credits

Program credit weight for CEGEP students: 119 credits

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

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

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

### Required Year 0 (Freshman) Courses

29 credits

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

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

|          |     |                             |
|----------|-----|-----------------------------|
| 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                               |

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

### Required Mechanical Engineering Courses

62 credits

|            |     |   |
|------------|-----|---|
| MECH 201   | (2) | Introduction to Mechanical Engineering      |
| MECH 210   | (2) | Mechanics 1                                 |
| MECH 220   | (4) | Mechanics 2                                 |
| MECH 240   | (3) | Thermodynamics 1                            |
| MECH 262   | (3) | Statistics and Measurement Laboratory       |
| MECH 290   | (3) | Design Graphics for Mechanical Engineering  |
| MECH 292   | (3) | Conceptual Design                           |
| MECH 309   | (3) | Numerical Methods in Mechanical Engineering |
| MECH 321   | (3) | Mechanics of Deformable Solids              |
| MECH 331   | (3) | Fluid Mechanics 1                           |
| MECH 341   | (3) | Thermodynamics 2                            |
| MECH 346   | (3) | Heat Transfer                               |
| MECH 360   | (3) | Principles of Manufacturing                 |
| MECH 362   | (2) | Mechanical Laboratory 1                     |
| MECH 383   | (3) | Applied Electronics and Instrumentation     |
| MECH 403D1 | (3) | Thesis (Honours)                            |
| MECH 403D2 | (3) | Thesis (Honours)                            |
| MECH 404   | (3) | Honours Thesis 2                            |
| MECH 419   | (4) | Advanced Mechanics of Systems               |
| MECH 430   | (3) | Fluid Mechanics 2                           |
| MECH 494   | (3) | Honours Design Project                      |

### 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 513  | (3) | Control Systems                           |
| MECH 545* | (3) | Advanced Stress Analysis                  |
| MECH 546* | (3) | Finite Element Methods in Solid Mechanics |
| MECH 562  | (3) | Advanced Fluid Mechanics                  |
| MECH 578  | (3) | Advanced Thermodynamics                   |
| MECH 579  | (3) | Multidisciplinary Design Optimization     |

\* Note: Students select either MECH 545 or MECH 546

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

|           |     |   |
|-----------|-----|---|
| CHEE 563* | (3) | Biofluids and Cardiovascular Mechanics      |
| MECH 497  | (3) | Value Engineering                           |
| MECH 498  | (3) | Interdisciplinary Design Project 1          |
| MECH 499  | (3) | Interdisciplinary Design Project 2          |
| MECH 513  | (3) | Control Systems                             |
| 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                        |
| CIVE 469  | (3) | Infrastructure and Society                              |
| ECON 225  | (3) | Economics of the Environment                            |
| ECON 347  | (3) | Economics of Climate Change                             |
| ENVR 201  | (3) | Society, Environment and Sustainability                 |
| GEOG 200  | (3) | Geographical Perspectives: World Environmental Problems |
| GEOG 203  | (3) | Environmental Systems                                   |
| GEOG 205  | (3) | Global Change: Past, Present and Future                 |
| GEOG 302  | (3) | Environmental Management 1                              |
| MECH 526  | (3) | Manufacturing and the Environment                       |
| MGPO 440* | (3) | Strategies for Sustainability                           |
| MIME 308  | (3) | Social Impact of Technology                             |
| PHIL 343  | (3) | Biomedical Ethics                                       |
| RELG 270  | (3) | Religious Ethics and the Environment                    |
| SOCI 235  | (3) | Technology and Society                                  |
| SOCI 312  | (3) | Sociology of Work and Industry                          |
| URBP 201  | (3) | Planning the 21st Century City                          |

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

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

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

Anthropology (ANTH)

Economics (any 200- or 300-level course excluding ECON 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, no more than 3 credits will be given for one 6-credit course at the 100 level or higher in that language. A maximum of 3 credits of language courses will be counted toward the Complementary Studies requirement.

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

### Elective Courses

0-6 credits

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

Desautels Faculty of Management

Faculty of Agricultural and Environmental Sciences

Faculty of Arts

Faculty of Engineering

Faculty of Religious Studies

Faculty of Science

Schulich School of Music

### Typical Program of Study

Students entering the program from CEGEP follow a different curriculum from 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 Centre) or from the Undergraduate Program Coordinator, indicating their intention to take the minor or concentration.

## 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 Centre, Frank Dawson Adams Building, Room 22) or from the Undergraduate Program Coordinator, indicating their intention to take the concentration.

### Required Courses

6 credits

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

### Complementary Courses

9 credits

3-6 credits from the following:

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

3-6 credits from the following:

|          |     |                |
|----------|-----|----------------|
| MECH 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 Centre), Frank Dawson Adams Building, Room 22) or from the Undergraduate Program Coordinator, indicating their intention to take the concentration.

#### Required Courses

6 credits

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

#### Complementary Courses

9 credits

3-6 credits from the following:

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

3-6 credits from the following:

|          |     |  |
|----------|-----|--|
| MECH 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 Centre, Frank Dawson Adams Building, Room 22) or from the Undergraduate Program Coordinator, indicating their intention to take the concentration.

Total concentration credit weight: 15-16 credits

#### Required Courses

6 credits

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

#### Complementary Courses

9-10 credits from the following:

|          |     |                    |
|----------|-----|--------------------|
| ARCH 515 | (3) | Sustainable Design |
|----------|-----|--------------------|

|          |     |  |
|----------|-----|--|
| CHEE 453 | (4) | Process Design                         |
| MECH 497 | (3) | Value Engineering                      |
| MECH 526 | (3) | Manufacturing and the Environment      |
| MECH 528 | (3) | Product Design                         |
| MECH 530 | (3) | Mechanics of Composite Materials       |
| MECH 541 | (3) | Kinematic Synthesis                    |
| MECH 543 | (3) | Design with Composite Materials        |
| MECH 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 Centre, Frank Dawson Adams Building, Room 22) or from the Undergraduate Program Coordinator, indicating their intention to take the concentration.

Total concentration credit weight: 15-16 credits

#### Required Courses

6 credits

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

#### Complementary Courses

9-10 credits from the following:

|          |     |  |
|----------|-----|--|
| ARCH 515 | (3) | Sustainable Design                     |
| CHEE 453 | (4) | Process Design                         |
| MECH 497 | (3) | Value Engineering                      |
| MECH 526 | (3) | Manufacturing and the Environment      |
| MECH 528 | (3) | Product Design                         |
| MECH 530 | (3) | Mechanics of Composite Materials       |
| MECH 541 | (3) | Kinematic Synthesis                    |
| MECH 543 | (3) | Design with Composite Materials        |
| MECH 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)**

Not offered until further notice.

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

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

**Required Courses**

12 credits

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

**Complementary Courses**

6 credits from the following:

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

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

Not offered until further notice.

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

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

**Required Courses**

12 credits

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

**Complementary Courses**

6 credits from the following:

|          |     |                              |
|----------|-----|------------------------------|
| MECH 528 | (3) | Product Design               |
| MECH 541 | (3) | Kinematic Synthesis          |
| MECH 573 | (3) | Mechanics of Robotic Systems |
| 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 0C5

Website: [www.mcgill.ca/minmat](http://www.mcgill.ca/minmat)

#### Materials

Wong Building, Room 2140  
3610 University Street  
Montreal, Quebec H3A 0C5  
Telephone: 514-398-1040  
Fax: 514-398-4492  
Email: [coordinator.minmat@mcgill.ca](mailto:coordinator.minmat@mcgill.ca)

#### Mining

Frank Dawson Adams Building, Room 125  
3450 University Street  
Montreal, Quebec H3A 0E8  
Telephone: 514-398-2215  
Fax: 514-398-7099  
Email: [admin.mining@mcgill.ca](mailto: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 12.7.4.3: Bachelor of Engineering \(B.Eng.\) - Materials Engineering CO-OP \(147 credits\)](#)*

*[section 12.7.5.3: Bachelor of Engineering \(B.Eng.\) - Mining Engineering CO-OP \(149 credits\)](#)*

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

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

**Post-Retirement**

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

**Professors**George P. Demopoulos; Dipl.Eng.(NTU Athens), M.Sc., Ph.D.(McG.), Eng., F.C.I.M. (*Gerald Hatch Faculty Fellow*)Roussos Dimitrakopoulos; B.Sc.(Thessaloniki), M.Sc.(Alta.), Ph.D.(École Poly., Montr.) (*Canada Research Chair I*)James A. Finch; B.Sc.(Birm.), M.Eng., Ph.D.(McG.), Eng., F.C.I.M., F.R.S.C. (*Gerald G. Hatch Professor*)

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

Roderick I.L. Guthrie; B.Sc., Ph.D.(Lond.), D.I.C., A.R.S.M., Eng., F.C.I.M., R.R.S.C. (*William C. Macdonald Professor*)Faramarz (Ferri) P. Hassani; Ph.D.(Nott.), C.Eng.(U.K. Reg.) (*George Boyd Webster Professor*)

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

Stephen Yue; B.Sc., Ph.D.(Leeds) (*James McGill Professor*) (*Lorne Trottier Chair in Aerospace Engineering*)**Associate Professors**Mathieu Brochu; B.Eng.(Laval), Ph.D.(McG.) (*Canada Research Chair II*)

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

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

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

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

**Assistant Professors**

Kirk Bevan; Ph.D.(Purd., Indiana)

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

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

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

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

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

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

**Faculty Lecturer**

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

**Course Lecturers**

Bruno Benedetto

Raad Jassim

**Course Lecturers**

John Mossop

Jan Nessel

**Adjunct Professors**

Martin Bureau

Robin A.L. Drew

Daryoush Emadi

Elhachmi Essadiqi

Carlton Fuerst

Bryn Harris

Ahmad Hemami

Eric Lifshin

Serge Vézina

**Affiliated Member**

Angelina Mehta

**Co-op Program Liaison Officers**

Teresa Barrett (Mining)

Genevieve Snider (Materials)

**12.7.4 About Materials Engineering****12.7.4.1 Materials Engineering (Co-op)**

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

Regarding the Co-op program fees, an amount of \$200 will be billed during ten consecutive terms for a total amount of \$2,000 before graduation. These fees cover expenses directly related to the operation of the Co-op program. Students must register for each of their industrial training courses 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.

**12.7.4.2 Student Advising**

Students entering this program must plan their schedule of studies in consultation with one of the departmental advisers, Prof. Richard Chromik or Prof. Kristian Waters. Appointments can be obtained by contacting the Administrative and Undergraduate Coordinator.

**12.7.4.3 Bachelor of Engineering (B.Eng.) - Materials Engineering CO-OP (147 credits)**

Program credit weight: 147-148 credits

Program credit weight for CEGEP students: 118-119 credits

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

Students entering this program must plan their schedule of studies in consultation with the Departmental Adviser.

**Required Year 0 (Freshman) Courses**

29 credits

Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credit for these Year 0 (Freshman) courses and enter a 118- to 119-credit program.

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

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

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

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

### Required Non-Departmental Courses

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                               |

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

### 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 380 | (2) | Industrial Training 2                                      |
| MIME 442 | (3) | Analysis, Modelling and Optimization in Mineral Processing |
| MIME 452 | (4) | Process and Materials Design                               |
| MIME 455 | (3) | Advanced Process Engineering                               |
| MIME 456 | (3) | Steelmaking and Steel Processing                           |
| MIME 465 | (3) | Metallic and Ceramic Powders Processing                    |
| MIME 467 | (3) | Electronic Properties of Materials                         |
| MIME 480 | (2) | Industrial Training 3                                      |

\* Students choose either ECSE 461 or MIME 337

### Complementary Courses

18 credits

### Technical Complementaries

12 credits

9-12 credits from the following:

|           |     |  |
|-----------|-----|--|
| CHEE 515* | (3) | Material Surfaces: A Biomimetic Approach                 |
| CIVE 512  | (3) | Advanced Civil Engineering Materials                     |
| MECH 530  | (3) | Mechanics of Composite Materials                         |
| MIME 410  | (3) | Research Project   |
| MIME 457  | (3) | Light Metals Extraction and Processing                   |
| MIME 470  | (3) | Engineering Biomaterials                                 |
| MIME 512  | (3) | Corrosion and Degradation of Materials                   |
| MIME 515* | (3) | Material Surfaces: A Biomimetic Approach                 |
| MIME 542  | (3) | Transmission Electron Microscopy                         |
| MIME 544  | (3) | Analysis: Mineral Processing Systems 1                   |
| MIME 545  | (3) | Analysis: Mineral Processing Systems 2                   |
| MIME 551  | (3) | Electrochemical Processing                               |
| MIME 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                                 |

\* Students choose either CHEE 515 or MIME 515

0-3 credits from the following:

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

### Complementary Studies

6 credits

#### Group A - Impact of Technology on Society

3 credits from the following:

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

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

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

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

Anthropology (ANTH)

Economics (any 200- or 300-level course excluding ECON 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, no more than 3 credits will be given for one 6-credit course at the 100 level or higher in that language. A maximum of 3 credits of language courses will be counted toward the Complementary Studies requirement.

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

## 12.7.5 About Mining Engineering

### 12.7.5.1 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 by subject code MPMC in the program.

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

### 12.7.5.2 Student Advising

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

### 12.7.5.3 Bachelor of Engineering (B.Eng.) - Mining Engineering CO-OP (149 credits)

Program credit weight: 149-151 credits

Program credit weight for CEGEP students: 120-122 credits

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

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

### Required Year 0 (Freshman) Courses

29 credits

Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credit for these Year 0 (Freshman) courses and enter a 120- to 122-credit program.

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

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

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

### 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                               |

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

### 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 choose 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 "Courses" section of this publication to know if 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                        |
| CIVE 469  | (3) | Infrastructure and Society                              |
| ECON 225  | (3) | Economics of the Environment                            |
| ECON 347  | (3) | Economics of Climate Change                             |
| ENVR 201  | (3) | Society, Environment and Sustainability                 |
| GEOG 200  | (3) | Geographical Perspectives: World Environmental Problems |
| GEOG 203  | (3) | Environmental Systems                                   |
| GEOG 205  | (3) | Global Change: Past, Present and Future                 |
| GEOG 302  | (3) | Environmental Management 1                              |
| MECH 526  | (3) | Manufacturing and the Environment                       |
| MGPO 440* | (3) | Strategies for Sustainability                           |
| MIME 308  | (3) | Social Impact of Technology                             |
| PHIL 343  | (3) | Biomedical Ethics                                       |
| RELG 270  | (3) | Religious Ethics and the Environment                    |
| SOCI 235  | (3) | Technology and Society                                  |
| SOCI 312  | (3) | Sociology of Work and Industry                          |
| URBP 201  | (3) | Planning the 21st Century City                          |

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

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

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

Anthropology (ANTH)

Economics (any 200- or 300-level course excluding ECON 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, no more than 3 credits will be given for one 6-credit course at the 100-level in that language. A maximum of 3 credits of language courses will be counted toward the Complementary Studies requirement.

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

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## 12.8 School of Urban Planning

### 12.8.1 Location

Macdonald-Harrington Building, Room 400  
815 Sherbrooke Street West  
Montreal, Quebec H3A 0C2

Telephone: 514-398-4075

Fax: 514-398-8376

Email: [admissions.planning@mcgill.ca](mailto:admissions.planning@mcgill.ca)

Website: [www.mcgill.ca/urbanplanning](http://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 that brings together actors from the public, private, and community spheres. Planners participate in that process in a variety of ways, as designers and analysts, advocates and mediators, facilitating the search for equitable and efficient solutions to problems of urban 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 has a rich track record of contribution to the community and to the profession. It devotes its energy to the study of urban problems and the formulation of policies in developing regions as well as in Montreal and other Canadian cities. Faculty and students collaborate actively with members of other McGill departments, notably Architecture, Geography, Civil Engineering, and Law, and with colleagues at other institutions in Canada and abroad.

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.). Two formal specializations are available: in Urban Design and in Transportation Planning. M.U.P. students in the core program may also opt to spend a semester in Barbados as part of the Barbados Field Study Semester, which focuses on Global Environmental Issues. Details concerning each of these concentrations can be found at [www.mcgill.ca/urbandesign](http://www.mcgill.ca/urbandesign), [www.tram.mcgill.ca](http://www.tram.mcgill.ca), and [www.mcgill.ca/bfss](http://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 *Programs, Courses and University Regulations* publication for Graduate and Postdoctoral Studies, available at [www.mcgill.ca/study](http://www.mcgill.ca/study).

### 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:

| Undergraduate Courses in Urban Planning |     |                                    |
|---|-----|------------------------------------|
| 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 504                                | (3) | Planning for Active Transportation |
| 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       |
| URBP 536                                | (1) | Transportation Seminar 1           |
| URBP 537                                | (1) | Transportation Seminar 2           |
| URBP 538                                | (1) | Transportation Seminar 3           |

### 12.8.4 School of Urban Planning Faculty

| Director         |
|------------------|
| Raphaël Fischler |

**Emeritus Professors**

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

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

**Associate Professors**

Madhav G. Badami; B.Tech., M.S.(IIT, Madr.), M.E.Des.(Calg.), Ph.D.(Br. Col.) (*joint appt. 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.(U. Tech. Eindhoven), M.Sc., M.C.P.(MIT), Ph.D.(Calif., Berk.)

**Assistant Professors**

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

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

**Adjunct Professors**

Cameron Charlebois; B.Sc.(Arch.), B.Arch., M.B.A.(McG.)

Murtaza Haider; B.Sc.(NWFP UET-Pesh.), M.A.Sc., Ph.D.(Tor.)

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

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

Richard Shearmur; B.A.(Camb.), M.U.P.(McG.), Ph.D.(Montr.)

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

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

**Guest Lecturers**

Heather Braiden

Paul LeCavalier

Denis Lévesque

James McGregor

Pierre Morissette

Larry Sherman

Martin Wexler

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**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, refer to the B.Eng.(Bioresource) program requirements in *Programs, Courses and University Regulations > Faculties & Schools > Faculty of Agricultural and Environmental Sciences* .

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

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

Department of Bioresource Engineering  
Macdonald-Stewart Building, Room MS1-027  
21,111 Lakeshore Road  
Sainte-Anne-de-Bellevue, Quebec H9X 3V9  
Telephone: 514-398-7773

Fax: 514-398-8387  
 Website: [www.mcgill.ca/bioeng](http://www.mcgill.ca/bioeng)

### 12.9.2 Department of Biomedical Engineering

Lyman Duff Medical Sciences Building  
 3775 University Street  
 Montreal, Quebec H3A 2B4  
 Telephone: 514-398-6736  
 Website: [www.bmed.mcgill.ca](http://www.bmed.mcgill.ca)

Some of the courses offered by the Department of Biomedical Engineering (subject code BMDE) may be of interest to Engineering students, and may be approved as complementary courses. The Faculty of Engineering also offers a Minor in Biomedical Engineering; for more information, see [section 12.10.2.1: Bachelor of Engineering \(B.Eng.\) - Minor Biomedical Engineering \(21 credits\)](#).

## 12.10 Minor Programs

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

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

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



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

### Minor Programs:

- [section 12.10.1: Arts Minor](#)
- [section 12.10.2: Biomedical Engineering Minor](#)
- [section 12.10.3: Biotechnology Minor](#)
- [section 12.10.4: Chemistry Minor](#)
- [section 12.10.5: Computer Science Courses and Minor Program](#)
- [section 12.10.6: Construction Engineering and Management Minor](#)
- [section 12.10.7: Economics Minor](#)
- [section 12.10.8: Minor in Environment](#)
- [section 12.10.9: Environmental Engineering Minor](#)
- [section 12.10.10: Minor Programs in Finance, Management, Marketing, and Operations Management](#)
- [section 12.10.11: Materials Engineering Minor](#)
- [section 12.10.12: Mathematics Minor](#)
- [section 12.10.13: Mining Engineering Minor](#)
- [section 12.10.15: Physics Minor](#)
- [section 12.10.16: Software Engineering Minor](#)
- [section 12.10.17: Technological Entrepreneurship Minor](#)

### 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.

Minor Adviser: Faculty Student Adviser in the Engineering Student Centre (Frank Dawson Adams, Room 22) OR Donald Sedgwick (Senior Faculty Adviser, Faculty of Arts)

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

Minor Adviser: Faculty Student Adviser in the Engineering Student Centre (Frank Dawson Adams Building, Room 22) OR Donald Sedgwick (Senior Faculty Adviser, Faculty of Arts)

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 completing 24 credits, as described below.

Students must select courses for this Minor in consultation with one of the Advisers indicated above.

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

**Requirements**

24 credits as follows:

- a) At least two areas of concentration in 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).

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

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

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

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

Minor program credit weight: 21-25 credits

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

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

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

**Complementary Introductory Courses in Life Sciences**

3-7 credits

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

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

12-18 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                          |
| CHEE 562 | (3) | Engineering Principles in Physiological Systems      |
| 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 choose either ANAT 365 or BIOC 458

**Biomaterials, Biosensors, and Nanotechnology**

|          |     |   |
|----------|-----|---|
| BMDE 504 | (3) | Biomaterials and Bioperformance               |
| BMDE 505 | (3) | Cell and Tissue Engineering                   |
| BMDE 508 | (3) | Introduction to Micro and Nano-Bioengineering |
| 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                         |
| MIME 470 | (3) | Engineering Biomaterials                      |
| PHYS 534 | (3) | Nanoscience and Nanotechnology                |

**Biomechanics and Prosthetics**

|           |     |  |
|-----------|-----|--|
| BMDE 503  | (3) | Biomedical Instrumentation             |
| CHEE 561  | (3) | Introduction to Soft Tissue Biophysics |
| 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 choose 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 student's major program or a maximum of 12 credits of overlap with the major 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 Faculty of Engineering and the Faculty 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 a faculty student adviser in the Engineering Student Centre (Frank Dawson Adams Building, Room 22).

Students who are interested in this Minor should inform their departmental academic adviser in Year 1 and at the time of registration in Year 2. With the agreement of their departmental academic adviser, students must submit a Request for Course Authorization to the Engineering Student Centre in order to add the Minor.

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

Faculty of Science Adviser (for selection of Science courses only): Nancy Nelson, Undergraduate Adviser, Department of Biology

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

Minor Adviser: Faculty Student Adviser in the Engineering Student Centre (Frank Dawson Adams Building, Room 22). For advising regarding Science courses, contact Nancy Nelson, Undergraduate Adviser, Department of Biology, Faculty of Science.

This Minor is offered by the Faculty of Engineering and the Faculty 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 a Faculty Student Adviser in the 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 that are part of the student's major 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 courses. Chemical Engineering students complete 15 credits beyond their 141-credit (115-credit for CEGEP students) B.Eng. program to obtain this Minor.

**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 major program and/or from the lists below. If courses are chosen from the lists below, 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                  |
| PSYT 455 | (3) | Neurochemistry                 |

**Physiology**

|          |     |   |
|----------|-----|---|
| EXMD 401 | (3) | Physiology and Biochemistry Endocrine Systems |
| EXMD 502 | (3) | Advanced Endocrinology 01                     |
| EXMD 503 | (3) | Advanced Endocrinology 02                     |
| PHAR 562 | (3) | General Pharmacology 1                        |

|          |     |                            |
|----------|-----|----------------------------|
| PHAR 563 | (3) | General Pharmacology 2     |
| PHGY 517 | (3) | Artificial Internal Organs |
| PHGY 518 | (3) | Artificial Cells           |

**Pollution**

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

|          |     |                                       |
|----------|-----|---------------------------------------|
| CIVE 225 | (4) | Environmental Engineering             |
| CIVE 430 | (3) | Water Treatment and Pollution Control |
| 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 in the *Faculty of Science* section of this publication (see Chemistry programs)). Students taking the Chemistry Minor complete 10 credits of required courses in physical and organic chemistry, and choose an additional 15 credits of complementary courses from the areas of inorganic, analytical, organic, and physical chemistry.

Minor Adviser (program coordinator): Dr. Gonzalo Cosa (Chemistry)

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

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

Minor Adviser (program coordinator): Dr. Gonzalo Cosa (Department of Chemistry)

Program credit weight: 25 credits

A passing grade for courses in 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 choose 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       |

## 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 completing 24 credits of courses, passed with a grade of C or better.

Minor Adviser: Students interested in this Minor should see Liette Chin, Undergraduate Program Coordinator (School of Computer Science, Lorne Trotter Building, Room 2070) and the Minor Adviser in Computer Science.

School of Computer Science website, [www.cs.mcgill.ca](http://www.cs.mcgill.ca).

### 12.10.5.1 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 *Courses* section of this publication to see other courses offered by the School of Computer Sciences (subject code COMP).

#### Computer Science Courses

|          |     |                                     |
|----------|-----|-------------------------------------|
| COMP 202 | (3) | Foundations of Programming          |
| COMP 208 | (3) | Computers in Engineering            |
| COMP 250 | (3) | Introduction to Computer Science    |
| COMP 302 | (3) | Programming Languages and Paradigms |

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

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

Minor Adviser: Students interested in this Minor should see Liette Chin, Undergraduate Program Coordinator, in the School of Computer Science (Lorne Trotter Building, Room 2070) to obtain the appropriate forms, and should see both the Minor Adviser in Computer Science and their department adviser for approval of their course selection. Forms must be submitted and approved before the end of the Course Change (drop/add) period of the student's final term.

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

Engineering students may obtain the Computer Science minor as part of their B.Eng., B.S.E., or B.Sc.(Arch.) degree by completing the 24-credits of 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.

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

For more information, see the School of Computer Science website: <http://www.cs.mcgill.ca>.

### Required Course

6 credits

|          |     |                                  |
|----------|-----|----------------------------------|
| COMP 206 | (3) | Introduction to Software Systems |
| COMP 250 | (3) | Introduction to Computer Science |

### Complementary Courses

18 credits

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) | Algorithms and Data Structures |
|----------|-----|--------------------------------|

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 afterward.
- C. COMP 396 (Undergraduate Research Project) cannot be taken for credit toward 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.

This Minor is particularly designed for Civil Engineering students.

Minor Adviser: Prof. L. Chouinard, Macdonald Engineering Building, Room 491 (Telephone: 514-398-6446)

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

Minor Adviser: Prof. L. Chouinard, Macdonald Engineering Building, Room 491 (Telephone: 514-398-6446)

Minor program credit weight: 24-25 credits

Note: This Minor is particularly designed for Civil Engineering students but, is open to all B.Eng., B.S.E., and B.Sc.(Arch.) students.

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

**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) | Sustainable 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 Complementary Courses**

6 credits from the following:

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

\* Course offered in French at École Polytechnique in Montreal

### 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 *Programs, Courses and University Regulations > Faculties & Schools > Faculty of Arts*, unless they have obtained permission from the Faculty of Engineering.

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

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

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

Program credit weight: 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 this publication, unless they have obtained permission from the Faculty of Engineering.

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

#### 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 complementary courses. 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 303   | (3) | Canadian Economic Policy                       |
| ECON 305   | (3) | Industrial Organization                        |
| 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) | Industrial Revolution and Economic Development |
| 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 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 are permitted to include (MIME 526) Mineral Economics among the Complementary Courses.

### 12.10.8 Minor in Environment

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

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

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



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

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

### 12.10.9 Environmental Engineering Minor

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

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

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

For more information on the Barbados Field Study Semester, see [www.mcgill.ca/bfss](http://www.mcgill.ca/bfss).

For more information on the Barbados Interdisciplinary Tropical Studies field semester, see [www.mcgill.ca/bits](http://www.mcgill.ca/bits).

For more information on environmental studies in the Faculty of Engineering, see [www.mcgill.ca/enveng](http://www.mcgill.ca/enveng).

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

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

Minor program credit weight: 21-22 credits

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

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

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

Note: Not all courses listed are offered every year. Students should see the "Courses" section of this publication to know if a course is offered.

### Complementary Courses

21-22 credits

18 credits from Stream A, B, or C below

and

One course (3-4 credits) 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);

AND

One courses (3-4) 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 (3 credits):

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

AND

One of the following cross-listed project courses (6 credits):

|          |     |                               |
|----------|-----|-------------------------------|
| 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          |

\* Not open to students who have passed CIVE 323.

Courses offered at the Downtown campus:

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

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

### Non-Engineering Course List

Courses offered at the Macdonald campus:

|            |     |                                      |
|------------|-----|--------------------------------------|
| LSCI 230+  | (3) | Introductory Microbiology            |
| MICR 331+  | (3) | Microbial Ecology                    |
| MICR 341   | (3) | Mechanisms of Pathogenicity          |
| RELG 270   | (3) | Religious Ethics and the Environment |
| SOIL 210++ | (3) | Principles of Soil Science           |
| SOIL 331   | (3) | Soil Physics                         |
| WILD 375   | (3) | Issues: Environmental Sciences       |
| WILD 415   | (2) | Conservation Law                     |
| WOOD 420   | (3) | Environmental Issues: Forestry       |

+ Not open to students who have passed CHEE 370.

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

Courses offered at the Downtown campus:

|          |     |   |
|----------|-----|---|
| ANTH 206 | (3) | Environment and Culture                                 |
| BIOL 205 | (3) | Biology of Organisms                                    |
| BIOL 432 | (3) | Limnology   |
| 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                               |

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

#### Prerequisite: None

Management Minors Adviser: Students considering one of these minor programs should consult a Faculty Student Adviser in the Engineering Student Centre (Frank Dawson Adams Building, Room 22) or an adviser in the Desautels Faculty of Management.

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.

A student embarking on a minor must be prepared to take credits additional to their Engineering program. Students in a B.Eng. or B.S.E. program may be able to count up to 6 credits of Complementary Studies Group B courses (Humanities and Social Sciences, Management Studies, and Law courses) toward both their Engineering major program and a Management minor where applicable. More information about Complementary Studies is given in the B.Eng./B.S.E. program section.

Students must have a CGPA of 3.0 or better to be considered for one of these Minor programs.

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 these Minor programs can be found in *Programs, Courses and University Regulations > Faculties & Schools > Desautels Faculty of Management > Undergraduate > Overview of Programs Offered by the Desautels Faculty of Management > : Minors for Non-Management Students*.

Further information can also be found at [www.mcgill.ca/engineering/degrees/minors](http://www.mcgill.ca/engineering/degrees/minors).

### 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.

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

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

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

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

#### Required Courses

15 credits

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

\* Students choose either CHEE 380 or MIME 260.

#### Complementary Courses

9 credits from the following:

|          |     |  |
|----------|-----|--|
| CHEE 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.

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

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

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

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

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

#### Course Selection

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

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

The remaining credits may be chosen from mathematically-allied courses.

The following courses cannot be used toward 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.

Minor Adviser: Prof. Hani Mitri (Minor Coordinator), Frank Dawson Adams Building, Room 121

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

Minor Adviser: Prof. Hani Mitri (Minor Coordinator)

Frank Dawson Adams Building, Room 121

Program credit weight: 24 credits

One of the required courses is a work term for which enrolment may be limited.

#### 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

**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 Minor in Musical Science and Technology

The Musical Science and Technology Minor focuses on interdisciplinary topics in science and technology applied to music. The goal of the program is to help prepare students for commercial jobs in the audio technology sector and/or for subsequent graduate research study. The MST Minor is designed to serve students who already have a good background in the sciences and prior experience with math and computer science courses.

Engineering students may apply for admission to the Minor in Musical Science and Technology. Detailed information on this program can be found in *Programs, Courses and University Regulations > Faculties & Schools > Schulich School of Music > Undergraduate > Programs of study > Department of Music Research: Composition; Music Education; Music History; Theory; Faculty Program > : [Minor Musical Science and Technology \(18 credits\)](#)*. Enrolment in Music Technology programs is highly restricted.

Application forms will be available from the Department of Music Research ([research.music@mcgill.ca](mailto:research.music@mcgill.ca); Room A726C) in the Schulich School of Music from February 1, and must be completed and returned to the Department of Music Research by June 1. Late applications will not be accepted and no students will be admitted to the Minor in January. Successful applicants will be notified by June 20. Registration will be limited to available lab space.

For further information about this Minor, call 514-398-4540 or email [research.music@mcgill.ca](mailto:research.music@mcgill.ca). Further information on this program is also available on the Music Technology website at [www.music.mcgill.ca/musictech/programmes\\_and\\_admissions](http://www.music.mcgill.ca/musictech/programmes_and_admissions).

Minor Adviser: Prof. Ichiro Fujinaga (Area Chair for the Music Technology program); email: [ichiro.fujinaga@mcgill.ca](mailto:ichiro.fujinaga@mcgill.ca)

### 12.10.15 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).

Minor Adviser: Prof. F. Buchinger (Department of Physics)

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

Minor Adviser: Prof. F. Buchinger, Department of Physics

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.

#### 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               |

**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.

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

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

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

The Software Engineering Minor will prepare engineering students 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 toward 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 this Minor should consult with the Minor Adviser listed above.

**Required Courses**

12 credits

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

**Complementary Courses**

12 credits from the following:

**Engineering Courses**

6-12 credits from the following:

|          |     |   |
|----------|-----|---|
| CHEE 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                             |

**Computer Science Courses**

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

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

### 12.10.17 Technological Entrepreneurship Minor

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

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

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

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

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

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

Students considering this Minor should consult the Minor Adviser listed above.

#### 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            |
| ORGB 321 | (3) | Leadership                       |
| ORGB 423 | (3) | Human Resources Management       |

