Faculty of Engineering, including the Schools of Architecture and Urban Planning
Programs, Courses and University Regulations
2013-2014
This publication provides guidance to prospects, applicants, students, faculty and staff.

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

Published by

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

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McGill University, Faculty of Engineering, including the Schools of Architecture and Urban Planning, 2013-2014
1 About the Faculty of Engineering

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

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

Schools
- Architecture
- Urban Planning

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

The Faculty serves approximately 3,010 undergraduate students and 1,150 graduate students in a wide 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 Programs, Courses and University Regulations > Faculties & Schools > Faculty of Engineering > Graduate (available at 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 and requirements, refer to section 12: Academic Programs.

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

Postgraduate programs leading to master's and doctoral degrees are offered in all sectors of the Faculty. Numerous areas of specialization are available in each of the departments and schools. All postgraduate programs, including the professional degree programs in Architecture and in Urban Planning, are described in Programs, Courses and University Regulations > Faculties & Schools > Faculty of Engineering > Graduate (available at www.mcgill.ca/study).

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/about-faculty/history.
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.

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 Hitzfeld 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
Telephone: 514-398-4769
Email: schulich.library@mcgill.ca

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 Programs, Courses and University Regulations > Faculties & Schools > Faculty of Engineering > Graduate (available at 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)
ABOUT THE FACULTY OF ENGINEERING (UNDERGRADUATE)

• Undergraduate Programs and Courses
• section 12.10: Minor Programs for students in the Faculty of Engineering

For regulations that are specific to undergraduate studies in the Faculty of Engineering, see University Regulations and Resources (Undergraduate) 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

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

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

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

5.2 Administrative Officers

Dean
Andrew G. Kirk; B.Sc.(Brist.), Ph.D.(Lond.) (James McGill Professor) (Interim)
James Nicell; B.A.Sc., M.A.Sc., Ph.D.(Windsor), P.Eng. (James McGill Professor) (Effective July 1, 2013)

Associate Deans
Lawrence Chen; B.Eng.(McG.), M.A.Sc., Ph.D.(Tor.), P.Eng. (Academic Affairs)
Mohamed A. Meguid; B.Sc.(Azhar, Cairo), M.Sc., Ph.D.(W. Ont.), P.Eng. (Undergraduate Education)
Showan Nazhat; B.Eng., M.Sc., Ph.D.(Lond.) (Gerald Hatch Faculty Fellow) (Research and Graduate Education)

Department Chairs
Sylvain Coloumbe; B.Sc., M.Sc.A.(Sher.), Ph.D.(McG.), ing. (Chemical Engineering)
Fabrice Labeaup; B.Eng., Ph.D.(Louvain), P.Eng. (Electrical and Computer Engineering) (Interim)
Van Thanh Van Nguyen; B.M.E.(Vietnam), M.C. Eng.(A.I.T.), D.A.Sc.(Montr.), Eng. (Civil Engineering and Applied Mechanics)
Steve Yue; B.Sc., Ph.D.(Leeds) (James McGill Professor) (Lorne Trottier Chair in Aerospace Engineering) (Mining and Materials Engineering)

Director, School of Architecture
Annmarie 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.
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 Programs, Courses and University Regulations > Faculties & Schools > Faculty of Engineering > Graduate (available at 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. All students are expected to seek professional registration after graduation.

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

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

7 Admission Requirements

The Faculty of Engineering offers programs leading to the degrees of B.Eng., B.S.E., and B.Sc.(Arch.). Enrolment in Engineering programs is limited. For detailed information on admissions requirements, see the Undergraduate Admissions Guide at 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 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.

For more information on extra-curricular activities and organizations, see www.mcgill.ca/engineering/student/sao/life.

For more information on student design teams and projects, see www.mcgill.ca/engineering/student/sao/studentdesign.

10 Degrees and Programs Offered

Internship Programs
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

McGill University, Faculty of Engineering, including the Schools of Architecture and Urban Planning, 2013-2014
(Published April 01, 2013)
Minors

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
Musical Science and Technology
Physics
Software Engineering
Technological Entrepreneurship

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 months or more qualifies you to graduate with the Internship Program designation on your transcript.

11.1 Student Eligibility

To participate in the Engineering Internship Program, you must:

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

Internship students will receive an automatic extension for the completion of their studies. International students are eligible (a few restrictions may apply).

For more information, see [www.mcgill.ca/careers4engineers](http://www.mcgill.ca/careers4engineers) or send an email to careers4engineers@mcgill.ca.

Important Information:

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

### 12 Academic Programs

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

#### 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.

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

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

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

#### 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)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 110</td>
<td>4</td>
<td>General Chemistry 1</td>
</tr>
<tr>
<td>CHEM 120</td>
<td>4</td>
<td>General Chemistry 2</td>
</tr>
<tr>
<td>FACC 100</td>
<td>1</td>
<td>Introduction to the Engineering Profession</td>
</tr>
<tr>
<td>MATH 133</td>
<td>3</td>
<td>Linear Algebra and Geometry</td>
</tr>
<tr>
<td>MATH 140</td>
<td>3</td>
<td>Calculus 1</td>
</tr>
<tr>
<td>MATH 141</td>
<td>4</td>
<td>Calculus 2</td>
</tr>
<tr>
<td>PHYS 131</td>
<td>4</td>
<td>Mechanics and Waves</td>
</tr>
<tr>
<td>PHYS 142</td>
<td>4</td>
<td>Electromagnetism and Optics</td>
</tr>
</tbody>
</table>

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

### Humanities and Social Sciences, Management Studies, and Law

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

- Anthropology (ANTH)
- Economics (any 200- or 300-level course excluding ECON 227 and ECON 337)
- History (HIST)
- Philosophy (excluding PHIL 210 and PHIL 310)
- Political Science (POLI)
- Psychology (excluding PSYC 204 and PSYC 305, but including PSYC 100)
- Religious Studies (RELG)
- School of Social Work (SWRK)
Sociology (excluding SOCI 350)

OR one of the following:

- 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/.

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

**Language Courses**

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

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

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/territorial associations/institutes/orders 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 Master of Architecture and the Bachelor of Architecture (B.Arch.). A program may be granted a two-year, three-year, or six-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.

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

12.2.4 Programs of Study

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

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

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

12.2.4.1 Student Exchanges

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

12.2.5 Ancillary Academic Facilities

Laboratories and Workshops

Facility for Architectural Research in Media Mediation (FARMM) – Professor Michael Jemtrud
Laboratory for Integrated Prototyping and Hybrid Environments (LIPHE) – Professor Aaron Sprecher
Media Centre – Juan Osorio, Media Technician
Workshop Facilities – David Speller, Technician

Library


Collections

Architecture Slide Library – Professor 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 Sijpkes

12.2.6 School of Architecture Faculty

Director

Annmarie Adams

Emeritus Professors

Bruce Anderson; B.Arch.(McG.), M.Arch.(Harv.), F.R.A.I.C., O.A.Q.
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.
**Professors**

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

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

**Assistant Professors**

- Aaron Sprecher; B.Arch.(Bezalel), M.Arch.(Calif.-LA)
- Ipek Tureli; B.Arch.(Istanbul), Diploma (A.A.), Ph.D. (Calif., Berk.)

**Adjunct Professors**

- Sinisha Brdar
- Robert L. Claiborne
- Howard Davies
- Talia Dorsey
- Julia Gersovitz
- Phyllis Lambert
- Maria Mingallon
- Mark Poddubniuk
- Pierina Saia
- Conor Sampson

**Course Lecturers**

- Manon Asselin
- Morgan M. Carter
- Jaime Coll
- Nancy Dunton
- Marc Hallé
- Francisca Insulza
- Andrew King
- Judith Leclerc
- Sevag Pogharian
- Pieter Sijpkes
- Katsuhiro Yamazaki

**Visiting Critics and Guest Lecturers**

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


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 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.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 110</td>
<td>4</td>
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<td>Mechanics and Waves</td>
</tr>
<tr>
<td>PHYS 142</td>
<td>4</td>
<td>Electromagnetism and Optics</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVE 284</td>
<td>4</td>
<td>Structural Engineering Basics</td>
</tr>
<tr>
<td>CIVE 385*</td>
<td>3</td>
<td>Structural Steel and Timber Design</td>
</tr>
<tr>
<td>CIVE 388*</td>
<td>3</td>
<td>Foundation and Concrete Design</td>
</tr>
<tr>
<td>CIVE 492*</td>
<td>2</td>
<td>Structures</td>
</tr>
<tr>
<td>FACC 220</td>
<td>3</td>
<td>Law for Architects and Engineers</td>
</tr>
</tbody>
</table>

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 378 (3) Site Usage
ARCH 379 (3) Summer Course Abroad
ARCH 383 (3) Geometry and Architecture
ARCH 461 (1) Freehand Drawing and Sketching
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 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
History of Architecture in Canada (ARCH 535) (3)
Heritage Conservation (ARCH 536) (3)
Selected Topics in Architecture 1 (ARCH 540) (3)
Selected Topics in Architecture 2 (ARCH 541) (3)
Mechanical Services (ARCH 554) (2)
Design for Development (ARCH 564) (3)
Cultural Landscapes Seminar (ARCH 566) (3)
Environments for the Disabled (OCC1 442) (2)

Electives
6 credits of elective courses outside the School of Architecture must be completed, subject to approval by the Student Adviser.

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

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 142 credits (116 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 technical complementary courses.
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

<table>
<thead>
<tr>
<th>Chair</th>
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<tbody>
<tr>
<td>Sylvain Coulombe</td>
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<table>
<thead>
<tr>
<th>Emeritus Professors</th>
</tr>
</thead>
<tbody>
<tr>
<td>David G. Cooper; B.Sc., Ph.D.(Tor.)</td>
</tr>
<tr>
<td>John M. Dealy; B.S. (Kansas), M.S.E., Ph.D. (Mich.), Eng.</td>
</tr>
<tr>
<td>Musa R. Kamal; B.S. (Ill.), M.S., Ph.D. (Carne. MeIl), Eng.</td>
</tr>
<tr>
<td>Richard J. Munz; B.A.Sc., M.A.Sc. (Wat.), Ph.D. (McG.), Eng.</td>
</tr>
<tr>
<td>Juan H. Vera; B.Mat. (Chile), Ing. Quim. (U.T.E.), M.S. (Calif., Berk.), Dr.Ing. (Santa Maria), Eng.</td>
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<table>
<thead>
<tr>
<th>Professor</th>
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<tbody>
<tr>
<td>Alejandro D. Rey; B.Ch.Eng. (CCNY), Ph.D. (Calif., Berk.) (James McGill Professor)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Associate Professors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimitrios Berk; B.Sc. (Bosphorus), M.E.Sc. (W. Ont.), Ph.D. (Calg.), P.Eng.</td>
</tr>
<tr>
<td>Sylvain Coulombe; B.Sc., M.Sc.A. (Sher.), Ph.D. (McG.), ing.</td>
</tr>
<tr>
<td>Reghan James Hill; B.Eng. (Auck.), Ph.D. (C'nell)</td>
</tr>
<tr>
<td>Richard L. Leask; B.A.Sc., M.A.Sc. (Wat.), Ph.D. (Tor.), P.Eng.</td>
</tr>
<tr>
<td>Milan Maric; B.Sc., M.Eng. &amp; Mgmt(McM.), Ph.D. (Minn.), P.Eng.</td>
</tr>
<tr>
<td>Jean-Luc Meunier; Dipl.Eng., EPFL(Lausanne), M.Sc., Ph.D., INRS(Varennes), ing.</td>
</tr>
<tr>
<td>Sasha Omanovic; Dipl.Eng., Ph.D. (Zagreb), P.Eng.</td>
</tr>
<tr>
<td>Thomas Quinn; B.Sc. (Qu.), S.M., Ph.D. (MIT), ing.</td>
</tr>
<tr>
<td>Phillip Servio; B.Sc., Ph.D. (Br. Col.)</td>
</tr>
<tr>
<td>Nathalie Tufenkji; B.Eng. (McG.), M.Sc., Ph.D. (Yale)</td>
</tr>
<tr>
<td>Viviane Yargeau; B.Eng., M.Sc., Ph.D. (Sher.), ing.</td>
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<table>
<thead>
<tr>
<th>Assistant Professors</th>
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<tbody>
<tr>
<td>P.-Luc Girard-Lauriault; B.Sc. (Montr.), Ph.D. (École Poly., Montr.)</td>
</tr>
<tr>
<td>Jeff Gostick; B.Eng. (Ryerson), M.A.Sc., Ph.D. (Wat.), P.Eng.</td>
</tr>
<tr>
<td>Elizabeth Jones; B.A.Sc. (Wat.), M.S., Ph.D. (Calif. Tech.)</td>
</tr>
<tr>
<td>Anne-Marie Kietzig; B.Eng. (T.U. Berlin), Ph.D. (Br. Col.)</td>
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<tr>
<th>Post-Retirement</th>
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</thead>
<tbody>
<tr>
<td>W.J. Murray Douglas; B.Sc. (Qu.), M.S.E., Ph.D. (Mich.)</td>
</tr>
</tbody>
</table>

12.3.6 Bachelor of Engineering (B.Eng.) – Chemical Engineering (142 credits)

Program credit weight: 142-145 credits
Program credit weight for CEGEP students: 116 credits
Program credit weight for out-of-province students: 142 credits
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 technical complementary courses.

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 116-credit program.


<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
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<tr>
<td>PHYS 142</td>
<td>4</td>
<td>Electromagnetism and Optics</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 212</td>
<td>4</td>
<td>Introductory Organic Chemistry 1</td>
</tr>
<tr>
<td>CHEM 234</td>
<td>3</td>
<td>Topics in Organic Chemistry</td>
</tr>
<tr>
<td>COMP 208</td>
<td>3</td>
<td>Computers in Engineering</td>
</tr>
<tr>
<td>FACC 100*</td>
<td>1</td>
<td>Introduction to the Engineering Profession</td>
</tr>
<tr>
<td>FACC 300</td>
<td>3</td>
<td>Engineering Economy</td>
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<tr>
<td>FACC 400</td>
<td>1</td>
<td>Engineering Professional Practice</td>
</tr>
<tr>
<td>MATH 262</td>
<td>3</td>
<td>Intermediate Calculus</td>
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<tr>
<td>MATH 263</td>
<td>3</td>
<td>Ordinary Differential Equations for Engineers</td>
</tr>
<tr>
<td>MATH 264</td>
<td>3</td>
<td>Advanced Calculus for Engineers</td>
</tr>
</tbody>
</table>

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

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

**Technical Complementaries**

9 credits

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

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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Title</th>
</tr>
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<tbody>
<tr>
<td>BIOT 505*</td>
<td>3</td>
<td>Selected Topics in Biotechnology</td>
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<tr>
<td>CHEE 363**</td>
<td>2</td>
<td>Projects Chemical Engineering 1</td>
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<tr>
<td>CHEE 438</td>
<td>3</td>
<td>Engineering Principles in Pulp and Paper Processes</td>
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<tr>
<td>CHEE 494**</td>
<td>3</td>
<td>Research Project and Seminar 1</td>
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<tr>
<td>CHEE 495**</td>
<td>4</td>
<td>Research Project and Seminar 2</td>
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<tr>
<td>CHEE 496**</td>
<td>3</td>
<td>Environmental Research Project</td>
</tr>
<tr>
<td>CHEE 510</td>
<td>3</td>
<td>Advanced Separation Processes</td>
</tr>
<tr>
<td>CHEE 515+</td>
<td>3</td>
<td>Material Surfaces: A Biomimetic Approach</td>
</tr>
<tr>
<td>CHEE 521+</td>
<td>3</td>
<td>Nanomaterials and the Aquatic Environment</td>
</tr>
<tr>
<td>CHEE 541</td>
<td>3</td>
<td>Electrochemical Engineering</td>
</tr>
<tr>
<td>CHEE 543</td>
<td>3</td>
<td>Plasma Engineering</td>
</tr>
<tr>
<td>CHEE 561</td>
<td>3</td>
<td>Introduction to Soft Tissue Biophysics</td>
</tr>
</tbody>
</table>
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
CIVE 521+ (3)  Nanomaterials and the Aquatic Environment
MECH 534+ (3)  Air Pollution Engineering
MECH 563+ (3)  Biofluids and Cardiovascular Mechanics
MIME 515+ (3)  Material Surfaces: A Biomimetic Approach

* BIOT 505 can only be chosen by students taking the Minor in Biotechnology.
** Students may choose only one project course: CHEE 363, CHEE 495, or CHEE 496.
+ Students may choose only one course in each of the following sets:
- CHEE 515 or MIME 515
- CHEE 521 or CIVE 521
- CHEE 563 or MECH 563
- CHEE 592 or MECH 534
- CHEE 593 or CIVE 430

Complementary Studies
6 credits (9 credits for students from Quebec CEGEPs)

Group A - Impact of Technology on Society
3 credits from the following:

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

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

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

3 credits (6 credits for students from Quebec CEGEPs) at the 200 level or higher from the following departments:
Anthropology (ANTH)
Economics (any 200- or 300-level course excluding ECON 227 and ECON 337)
History (HIST)
Philosophy (excluding PHIL 210 and PHIL 310)
Political Science (POLI)
Psychology (excluding PSYC 204 and PSYC 305, but including PSYC 100)
Religious Studies (RELG)
School of Social Work (SWRK)
Sociology (excluding SOCI 350)

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

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

Language Courses

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

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

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 574) or at the graduate level (CHEE 681). 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 complementsaries are offered only in alternate years. Students should, therefore, plan their complementsaries as far ahead as possible. With the approval of the instructor and Academic Adviser, students may take graduate (500-level) CHEE courses as technical complementsaries.

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

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

<table>
<thead>
<tr>
<th>Chair</th>
<th>Van-Thanh-Van Nguyen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associate Chair</td>
<td>Yixin Shao</td>
</tr>
</tbody>
</table>
Emeritus Professors

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.
James Nicell; B.A.Sc., M.A.Sc., Ph.D.(Windsor), P.Eng. (James McGill Professor)
Suresh C. Shrivastava; B.Sc.(Eng.) (Vikram), M.C.E.(Delhi), Sc.D.(Col.), Eng.

Associate Professors

Mohamed A. Meguid; B.Sc.(Cairo, Azhar), M.Sc., Ph.D.(W. Ont.), P.Eng.; Associate Dean, Undergraduate Education
Andrew J. Boyd; B.Sc.Eng.(New Br.), M.A.Sc.(Tor.), Ph.D.(Br. Col.), P.Eng., F.A.C.I.
Susan J. Gaskin; B.Sc.(Qu.), Ph.D.(Cant.), P.Eng.
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. (William Dawson Scholar)
Ghyslaine McClure; B.Ing.(Montr.), S.M.C.E.(MIT), Ph.D.(Montr.), Eng.; Graduate Program Director
Colin Rogers; B.A.Sc., M.A.Sc.(Wat.), Ph.D.(Syd.), P.Eng.
Yixin Shao; B.Sc., M.S.(Tongji), Ph.D.(Nwestern), P.Eng., F.A.C.I.; Undergraduate Program Director

Assistant Professors

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 Hatzopoulos; 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
Adjunct Professors
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.


<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 110</td>
<td>4</td>
<td>General Chemistry 1</td>
</tr>
<tr>
<td>CHEM 120</td>
<td>4</td>
<td>General Chemistry 2</td>
</tr>
<tr>
<td>MATH 133</td>
<td>3</td>
<td>Linear Algebra and Geometry</td>
</tr>
<tr>
<td>MATH 140</td>
<td>3</td>
<td>Calculus 1</td>
</tr>
<tr>
<td>MATH 141</td>
<td>4</td>
<td>Calculus 2</td>
</tr>
<tr>
<td>PHYS 131</td>
<td>4</td>
<td>Mechanics and Waves</td>
</tr>
<tr>
<td>PHYS 142</td>
<td>4</td>
<td>Electromagnetism and Optics</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCOM 206</td>
<td>3</td>
<td>Communication in Engineering</td>
</tr>
<tr>
<td>COMP 208</td>
<td>3</td>
<td>Computers in Engineering</td>
</tr>
<tr>
<td>EPSC 221</td>
<td>3</td>
<td>General Geology</td>
</tr>
<tr>
<td>FACC 100*</td>
<td>1</td>
<td>Introduction to the Engineering Profession</td>
</tr>
<tr>
<td>FACC 300</td>
<td>3</td>
<td>Engineering Economy</td>
</tr>
<tr>
<td>FACC 400</td>
<td>1</td>
<td>Engineering Professional Practice</td>
</tr>
<tr>
<td>MATH 262</td>
<td>3</td>
<td>Intermediate Calculus</td>
</tr>
<tr>
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<td>3</td>
<td>Ordinary Differential Equations for Engineers</td>
</tr>
<tr>
<td>MATH 264</td>
<td>3</td>
<td>Advanced Calculus for Engineers</td>
</tr>
</tbody>
</table>
MECH 261 (2) Measurement Laboratory
MECH 289 (3) Design Graphics

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

**Required Civil Engineering Courses**

61 credits

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

**Complementary Courses**

21 credits

**List A - Design Technical Complementaries**

6-15 credits from the following:

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

**List B - General Technical Complementaries**

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

CHEE 521* (3) Nanomaterials and the Aquatic Environment
CIVE 433 (3) Urban Planning
CIVE 446 (3) Construction Engineering
CIVE 451 (3) Geoenvironmental Engineering
CIVE 460 (3) Matrix Structural Analysis
CIVE 470 (3) Undergraduate Research Project
CIVE 512 (3) Advanced Civil Engineering Materials
CIVE 514 (3) Structural Mechanics
CIVE 520 (3) Groundwater Hydrology
CIVE 521* (3) Nanomaterials and the Aquatic Environment
CIVE 527 (3) Renovation and Preservation: Infrastructure
CIVE 540 (3) Urban Transportation Planning
CIVE 542 (3) Transportation Network Analysis
CIVE 546 (3) Selected Topics in Civil Engineering 1
CIVE 550 (3) Water Resources Management
CIVE 551 (3) Environmental Transport Processes
CIVE 555 (3) Environmental Data Analysis
CIVE 558 (3) Biomolecular Techniques for Environmental Engineering
CIVE 560 (3) Transportation Safety and Design
CIVE 561 (3) Urban Activity, Air Pollution, and Health
CIVE 572 (3) Computational Hydraulics
CIVE 573 (3) Hydraulic Structures
CIVE 574 (3) Fluid Mechanics of Water Pollution
CIVE 577 (3) River Engineering
CIVE 584 (3) Groundwater Engineering

* Students may choose only one of CHEE 521 or CIVE 521.

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
<table>
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<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Name</th>
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<tbody>
<tr>
<td>PHIL 343</td>
<td>3</td>
<td>Biomedical Ethics</td>
</tr>
<tr>
<td>RELG 270</td>
<td>3</td>
<td>Religious Ethics and the Environment</td>
</tr>
<tr>
<td>SOCI 235</td>
<td>3</td>
<td>Technology and Society</td>
</tr>
<tr>
<td>SOCI 312</td>
<td>3</td>
<td>Sociology of Work and Industry</td>
</tr>
<tr>
<td>URBP 201</td>
<td>3</td>
<td>Planning the 21st Century City</td>
</tr>
</tbody>
</table>

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

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

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

- Anthropology (ANTH)
- Economics (any 200- or 300-level course excluding ECON 227 and ECON 337)
- History (HIST)
- Philosophy (excluding PHIL 210 and PHIL 310)
- Political Science (POLI)
- Psychology (excluding PSYC 204 and PSYC 305, but including PSYC 100)
- Religious Studies (RELG)
- School of Social Work (SWRK)
- Sociology (excluding SOCI 350)

OR one of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARCH 528</td>
<td>3</td>
<td>History of Housing</td>
</tr>
<tr>
<td>BUSA 465*</td>
<td>3</td>
<td>Technological Entrepreneurship</td>
</tr>
<tr>
<td>ENVR 203</td>
<td>3</td>
<td>Knowledge, Ethics and Environment</td>
</tr>
<tr>
<td>ENVR 400</td>
<td>3</td>
<td>Environmental Thought</td>
</tr>
<tr>
<td>FACC 220</td>
<td>3</td>
<td>Law for Architects and Engineers</td>
</tr>
<tr>
<td>FACC 500</td>
<td>3</td>
<td>Technology Business Plan Design</td>
</tr>
<tr>
<td>FACC 501</td>
<td>3</td>
<td>Technology Business Plan Project</td>
</tr>
<tr>
<td>INDR 294*</td>
<td>3</td>
<td>Introduction to Labour-Management Relations</td>
</tr>
<tr>
<td>MATH 338</td>
<td>3</td>
<td>History and Philosophy of Mathematics</td>
</tr>
<tr>
<td>MGCR 222*</td>
<td>3</td>
<td>Introduction to Organizational Behaviour</td>
</tr>
<tr>
<td>MGCR 352*</td>
<td>3</td>
<td>Marketing Management 1</td>
</tr>
<tr>
<td>ORGB 321*</td>
<td>3</td>
<td>Leadership</td>
</tr>
<tr>
<td>ORGB 423*</td>
<td>3</td>
<td>Human Resources Management</td>
</tr>
</tbody>
</table>

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

**Language Courses**

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

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

### 12.5 Department of Electrical and Computer Engineering

#### 12.5.1 Location

Department of Electrical and Computer Engineering
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

<table>
<thead>
<tr>
<th>Interim Chair</th>
<th>Fabrice Labeau</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associate Chair, Academic</td>
<td>Roni Khazaka</td>
</tr>
<tr>
<td>Associate Chair, Undergraduate Studies</td>
<td>Jonathan P. Webb</td>
</tr>
<tr>
<td>Associate Chair, Graduate Studies</td>
<td>Richard Rose</td>
</tr>
<tr>
<td>Emeritus Professors</td>
<td></td>
</tr>
<tr>
<td>Eric L. Adler; B.Sc.(Lond.), M.A.Sc.(Tor.), Ph.D.(McG.), F.I.E.E.E., Eng.</td>
<td></td>
</tr>
<tr>
<td>Clifford H. Champness; M.Sc.(Lond.), Ph.D.(McG.)</td>
<td></td>
</tr>
<tr>
<td>Gerry W. Farnell; B.A.Sc.(Tor.), S.M.(MIT), Ph.D.(McG.), F.I.E.E.E., Eng.</td>
<td></td>
</tr>
<tr>
<td>Peter Kabal; B.A.Sc., M.A.Sc., Ph.D.(Tor.)</td>
<td></td>
</tr>
<tr>
<td>Lorne Mason; B.Eng., Ph.D.(Sask.)</td>
<td></td>
</tr>
<tr>
<td>Boon-Teck Ooi; B.E.(Adel.), S.M.(MIT), Ph.D.(McG.), Eng.</td>
<td></td>
</tr>
<tr>
<td>Professors</td>
<td></td>
</tr>
<tr>
<td>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)</td>
<td></td>
</tr>
<tr>
<td>Benoit Champagne; B.Eng., M.Eng.(Montr.), Ph.D.(Tor.)</td>
<td></td>
</tr>
<tr>
<td>Lawrence Chen; B.Eng.(McG.), M.A.Sc., Ph.D.(Tor.), Associate Dean, Academic Affairs</td>
<td></td>
</tr>
<tr>
<td>James Clark; B.A.Sc., Ph.D.(Br. Col.)</td>
<td></td>
</tr>
<tr>
<td>Frank Ferrie; B.Eng., Ph.D.(McG.)</td>
<td></td>
</tr>
<tr>
<td>Geza Joos; B.Sc.(C'dia), M.Eng., Ph.D.(McG.) (CRC Chair)</td>
<td></td>
</tr>
</tbody>
</table>
Professors
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.
David A. Lowther; B.Sc.(Lond.), Ph.D.(C.N.A.A.), F.C.A.E., Eng. (James McGill Professor)
Gordon Roberts; B.A.Sc.(Wat.), M.A.Sc., Ph.D.(Tor.), F.I.E.E.E., Eng. (James McGill Professor)
Jonathan P. Webb; B.A., Ph.D.(Cant.)

Associate Professors
Tal Arbel; M.Eng., Ph.D.(McG.)
Jan Bajcsy; B.Sc.(Harv.), M.Eng., Ph.D.(Princ.)
Benoit Boulet; B.Sc.(Laval), M.Eng.(McG.), Ph.D.(Tor.) (William Dawson Scholar)
Vamsy Chodavarapu; B.Eng.(Osmania), M.S., Ph.D.(NYU)
Mark Coates; B.Eng.(Adel.), Ph.D.(Camb.)
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.)
Zetian Mi; B.A.Sc.(Beijing), M.Sc.(Iowa), Ph.D.(Mich.)
Hannah Michalska; B.Sc., M.Sc.(Warsaw), Ph.D.(Lond.)
Sam Musallam; B.Sc., M.Sc., Ph.D.(Tor.)
Milica Popovich; B.Sc.(Colo.), M.Sc., Ph.D.(N'western)
Ioannis Psaromiligkos; B.Sc.(Patras), M.Sc., Ph.D.(Buffalo)
Martin Rochette; B.A., M.Eng., Ph.D.(Laval)
Richard Rose; B.Sc., M.S.(Ill.), Ph.D.(GIT)
Ishiang Shih; M.Eng., Ph.D.(McG.)
Thomas Szkopek; B.A.Sc., M.A.Sc.(Tor.), Ph.D.(Calif.-LA)
Zeljko Zilic; B.Eng.(Zagreb), M.Sc., Ph.D.(Tor.)

Assistant Professors
Francois Bouffard; Ph.D.(McG.)
Odile Liboiron-Ladouceur; M.Sc., Ph.D.(Col.)
Aditya Mahajan; B.Tech.(Indian IT), M.S., Ph.D.(Mich.)
Brett Meyer; Ph.D.(Carn. Mellon)
Michael Rabbat; B.S.(Ill.), M.S.(Texas), Ph.D.(Wisc.)
Haibo Zeng, Ph.D.(Calif., Berk.)

Associate Members
Gregory Dudek; B.Sc.(Qu.), M.Sc., Ph.D.(Tor.)
Alan C. Evans; M.Sc.(Surrey), Ph.D.(Leeds)


**Associate Members**

William R. Funnell; M.Eng., Ph.D.(McG.)
Henrietta L. Galiana; M.Eng., Ph.D.(McG.)
Jean Gotman; M.E.(Dart.), Ph.D.(McG.)
David Juncker; Ph.D.(Neuchatel)
Robert E. Kearney; M.Eng., Ph.D.(McG.)
Nathaniel J. Quitoriano; B.S.(Calif.), Ph.D.(MIT)

**Adjunct Professors**

Rhys Allan Adams
Robert Diraddo
Danny Grant
Cedric Guss
Vincent Hayward
Ricardo Izquierdo
Cheng K. Jen
Innocent Kamwa
George Kesidis
Irene Leszkowicz
Martin Maier
Shie Mannor
Frederic Nabki
Douglas O'Shaughnessy
Katarzyna Radecka
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.

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

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

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

**Required Non-Departmental Courses**

35 credits

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

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

**Required Electrical Engineering Courses**

57 credits

ECSE 200 (3) Electric Circuits 1
ECSE 210 (3) Electric Circuits 2
ECSE 211 (3) Design Principles and Methods
ECSE 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 227 and ECON 337)
History (HIST)
Philosophy (excluding PHIL 210 and PHIL 310)
Political Science (POLI)
Psychology (excluding PSYC 204 and PSYC 305, but including PSYC 100)
Religious Studies (RELG)
School of Social Work (SWRK)
Sociology (excluding SOCI 350)

OR one of the following:

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

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

Language Courses
If you are not proficient in a certain language, no more than 3 credits will be given for one 6-credit course at the 100 level or higher in that language. A maximum of 3 credits of language courses will be counted toward the Complementary Studies requirement. However, 3-6 credits may be given for language courses at the 200 level or higher that have a sufficient cultural component. These courses must be approved by the McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22).

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 2013, the applicant must:
- be registered in the B.Eng. program (regular Electrical Engineering);
- have a cumulative GPA of at least 2.5
- have completed or be registered in ECSE 361 (Power Engineering);
- be able to complete the degree requirements by December 2014;
- 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**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECSE 462</td>
<td>3</td>
<td>Electromechanical Energy Conversion</td>
</tr>
<tr>
<td>ECSE 464</td>
<td>3</td>
<td>Power Systems Analysis 1</td>
</tr>
<tr>
<td>ECSE 465</td>
<td>3</td>
<td>Power Electronic Systems</td>
</tr>
</tbody>
</table>

Students must also complete ECSE 456 and 457 (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:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECSE 404</td>
<td>3</td>
<td>Control Systems</td>
</tr>
<tr>
<td>ECSE 460*</td>
<td>3</td>
<td>Appareillage électrique (Electrical Power Equipment)</td>
</tr>
<tr>
<td>ECSE 467*</td>
<td>3</td>
<td>Comportement des réseaux électriques</td>
</tr>
<tr>
<td>ECSE 468*</td>
<td>3</td>
<td>Electricité industrielle (Industrial Power Systems)</td>
</tr>
<tr>
<td>ECSE 469*</td>
<td>3</td>
<td>Protection des réseaux électriques</td>
</tr>
</tbody>
</table>

* 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.

**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 110-credit program.


<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 110</td>
<td>4</td>
<td>General Chemistry 1</td>
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<tr>
<td>Course Code</td>
<td>Credits</td>
<td>Course Name</td>
</tr>
<tr>
<td>-------------</td>
<td>---------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>CHEM 120</td>
<td>(4)</td>
<td>General Chemistry 2</td>
</tr>
<tr>
<td>MATH 133</td>
<td>(3)</td>
<td>Linear Algebra and Geometry</td>
</tr>
<tr>
<td>MATH 140</td>
<td>(3)</td>
<td>Calculus 1</td>
</tr>
<tr>
<td>MATH 141</td>
<td>(4)</td>
<td>Calculus 2</td>
</tr>
<tr>
<td>PHYS 131</td>
<td>(4)</td>
<td>Mechanics and Waves</td>
</tr>
<tr>
<td>PHYS 142</td>
<td>(4)</td>
<td>Electromagnetism and Optics</td>
</tr>
</tbody>
</table>

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

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

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

### Required Electrical Engineering Courses

57 credits

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECSE 200</td>
<td>(3)</td>
<td>Electric Circuits 1</td>
</tr>
<tr>
<td>ECSE 210</td>
<td>(3)</td>
<td>Electric Circuits 2</td>
</tr>
<tr>
<td>ECSE 211</td>
<td>(3)</td>
<td>Design Principles and Methods</td>
</tr>
<tr>
<td>ECSE 221</td>
<td>(3)</td>
<td>Introduction to Computer Engineering</td>
</tr>
<tr>
<td>ECSE 291</td>
<td>(2)</td>
<td>Electrical Measurements Laboratory</td>
</tr>
<tr>
<td>ECSE 303</td>
<td>(3)</td>
<td>Signals and Systems 1</td>
</tr>
<tr>
<td>ECSE 304</td>
<td>(3)</td>
<td>Signals and Systems 2</td>
</tr>
<tr>
<td>ECSE 305</td>
<td>(3)</td>
<td>Probability and Random Signals 1</td>
</tr>
<tr>
<td>ECSE 322</td>
<td>(3)</td>
<td>Computer Engineering</td>
</tr>
<tr>
<td>ECSE 323</td>
<td>(5)</td>
<td>Digital System Design</td>
</tr>
<tr>
<td>ECSE 330</td>
<td>(3)</td>
<td>Introduction to Electronics</td>
</tr>
<tr>
<td>ECSE 334</td>
<td>(3)</td>
<td>Introduction to Microelectronics</td>
</tr>
<tr>
<td>ECSE 351</td>
<td>(3)</td>
<td>Electromagnetic Fields</td>
</tr>
<tr>
<td>ECSE 352</td>
<td>(3)</td>
<td>Electromagnetic Waves</td>
</tr>
</tbody>
</table>
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

Complementary Courses

17-18 credits

Technical Complementaries

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

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

Laboratory Complementaries

2-3 credits from the following:

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

Complementary Studies

6 credits

Group A - Impact of Technology on Society

3 credits from the following:

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

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

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

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

- Anthropology (ANTH)
- Economics (any 200- or 300-level course excluding ECON 227 and ECON 337)
- History (HIST)
- Philosophy (excluding PHIL 210 and PHIL 310)
- Political Science (POLI)
- Psychology (excluding PSYC 204 and PSYC 305, but including PSYC 100)
- Religious Studies (RELG)
- School of Social Work (SWRK)
- Sociology (excluding SOCI 350)

OR one of the following:

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

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

**Language Courses**

If you are not proficient in a certain language, no more than 3 credits will be given for one 6-credit course at the 100 level or higher in that language. A maximum of 3 credits of language courses will be counted toward the Complementary Studies 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 McGill Engineering Student Centre (Student Affairs Office) (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
Program credit weight for out-of-province students: 139-140 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.


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).

* 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
COMP 250 (3) Introduction to Computer Science
COMP 251 (3) Algorithms and Data Structures
FACC 100* (1) Introduction to the Engineering Profession
FACC 300 (3) Engineering Economy
FACC 400 (1) Engineering Professional Practice
MATH 262 (3) Intermediate Calculus
MATH 263 (3) Ordinary Differential Equations for Engineers
MATH 264 (3) Advanced Calculus for Engineers
MATH 270 (3) Applied Linear Algebra
MATH 363 (3) Discrete Mathematics

* 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
**Embedded Systems**
ECSE 421 (3)

**Fault Tolerant Computing**
ECSE 422 (3)

**Human-Computer Interaction**
ECSE 424 (3)

**Software Engineering Practice**
ECSE 428 (3)

**Software Validation**
ECSE 429 (3)

**Introduction to VLSI CAD**
ECSE 431 (3)

**Signal Processing Hardware**
ECSE 436 (3)

**Introduction to Numerical Methods in Electrical Engineering**
ECSE 443 (3)

**Electromagnetic Compatibility**
ECSE 450 (3)

**Logic Synthesis**
ECSE 530 (3)

**Computer Graphics**
ECSE 532 (3)

**Advanced Digital Integrated Circuits**
ECSE 537 (3)

**Introduction to VLSI Systems**
ECSE 548 (3)

**Laboratory Complementaries**
2-3 credits from the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECSE 434</td>
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<tr>
<td>ECSE 436</td>
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<td>ECSE 489</td>
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<td>ECSE 490</td>
<td>2</td>
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<tr>
<td>ECSE 491</td>
<td>2</td>
</tr>
<tr>
<td>ECSE 493</td>
<td>2</td>
</tr>
</tbody>
</table>

**Microelectronics Laboratory**
ECSE 434 (2)

**Signal Processing Hardware**
ECSE 436 (3)

**Computer Architecture Laboratory**
ECSE 487 (2)

**Telecommunication Network Laboratory**
ECSE 489 (2)

**Digital Signal Processing Laboratory**
ECSE 490 (2)

**Communication Systems Laboratory**
ECSE 491 (2)

**Control and Robotics Laboratory**
ECSE 493 (2)

**Complementary Studies**
6 credits

**Group A - Impact of Technology on Society**
3 credits from the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANTH 212</td>
<td>3</td>
</tr>
<tr>
<td>BTEC 502</td>
<td>3</td>
</tr>
<tr>
<td>CIVE 469</td>
<td>3</td>
</tr>
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<td>ECON 225</td>
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<td>ECON 347</td>
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<tr>
<td>ENVR 201</td>
<td>3</td>
</tr>
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<td>GEOG 200</td>
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<td>GEOG 203</td>
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<td>GEOG 205</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 302</td>
<td>3</td>
</tr>
<tr>
<td>MECH 526</td>
<td>3</td>
</tr>
<tr>
<td>MGPO 440*</td>
<td>3</td>
</tr>
<tr>
<td>MIME 308</td>
<td>3</td>
</tr>
<tr>
<td>PHIL 343</td>
<td>3</td>
</tr>
</tbody>
</table>

**Anthropology of Development**
ANTH 212 (3)

**Biotechnology Ethics and Society**
BTEC 502 (3)

**Infrastructure and Society**
CIVE 469 (3)

**Economics of the Environment**
ECON 225 (3)

**Economics of Climate Change**
ECON 347 (3)

**Society, Environment and Sustainability**
ENVR 201 (3)

**Geographical Perspectives: World Environmental Problems**
GEOG 200 (3)

**Environmental Systems**
GEOG 203 (3)

**Global Change: Past, Present and Future**
GEOG 205 (3)

**Environmental Management 1**
GEOG 302 (3)

**Manufacturing and the Environment**
MECH 526 (3)

**Strategies for Sustainability**
MGPO 440* (3)

**Social Impact of Technology**
MIME 308 (3)

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

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

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

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

- Anthropology (ANTH)
- Economics (any 200- or 300-level course excluding ECON 227 and ECON 337)
- History (HIST)
- Philosophy (excluding PHIL 210 and PHIL 310)
- Political Science (POLI)
- Psychology (excluding PSYC 204 and PSYC 305, but including PSYC 100)
- Religious Studies (RELG)
- School of Social Work (SWRK)
- Sociology (excluding SOCI 350)

Or one of the following:

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

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

**Language Courses**

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

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

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

Program credit weight: 137-144 credits
Program credit weight for CEGEP students: 114-115 credits
Program credit weight for out-of-province students: 137-140 credits

This program offers students the opportunity to focus their studies on the skills needed to design and develop complex software systems. This emerging field of engineering is a major component of the growing Information Technology (IT) sector of the economy, in which the demand for qualified personnel continues to outstrip supply. Graduates of this program will have a solid foundation for careers in the software industry.
In addition to technical complementary courses, students take general complementary courses in social sciences, management studies, and humanities. These courses allow students to develop specific interests in areas such as psychology, economics, management, or political science.

**Required Year 0 (Freshman) Courses**

29 credits

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


<table>
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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>CHEM 110</td>
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<td>General Chemistry 1</td>
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<td>CHEM 120</td>
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<td>MATH 133</td>
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<td>Linear Algebra and Geometry</td>
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<td>MATH 140</td>
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<td>Calculus 1</td>
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<td>MATH 141</td>
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<td>Calculus 2</td>
</tr>
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<td>PHYS 131</td>
<td>4</td>
<td>Mechanics and Waves</td>
</tr>
<tr>
<td>PHYS 142</td>
<td>4</td>
<td>Electromagnetism and Optics</td>
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</tbody>
</table>

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**

76 credits

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Name</th>
</tr>
</thead>
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<tr>
<td>COMP 202</td>
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<td>Foundations of Programming</td>
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<td>COMP 206</td>
<td>3</td>
<td>Introduction to Software Systems</td>
</tr>
<tr>
<td>COMP 250</td>
<td>3</td>
<td>Introduction to Computer Science</td>
</tr>
<tr>
<td>COMP 251</td>
<td>3</td>
<td>Algorithms and Data Structures</td>
</tr>
<tr>
<td>COMP 302</td>
<td>3</td>
<td>Programming Languages and Paradigms</td>
</tr>
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<td>COMP 360</td>
<td>3</td>
<td>Algorithm Design</td>
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<td>COMP 421</td>
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<td>Database Systems</td>
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<td>ECSE 211</td>
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<td>Introduction to Computer Engineering</td>
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<td>Introduction to Telecommunication Networks</td>
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<td>FACC 100*</td>
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<td>FACC 400</td>
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<td>Engineering Professional Practice</td>
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<td>MATH 262</td>
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<td>Intermediate Calculus</td>
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<td>MATH 263</td>
<td>3</td>
<td>Ordinary Differential Equations for Engineers</td>
</tr>
<tr>
<td>MATH 264</td>
<td>3</td>
<td>Advanced Calculus for Engineers</td>
</tr>
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</table>
**Engineering Breadth Required Courses**

20 credits

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

**Complementary Courses**

12-19 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**

6-7 credits

500-level ECSE 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.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Description</th>
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<td>COMP 330</td>
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<td>COMP 350</td>
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<td>Numerical Computing</td>
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<td>COMP 409</td>
<td>3</td>
<td>Concurrent Programming</td>
</tr>
<tr>
<td>COMP 424</td>
<td>3</td>
<td>Artificial Intelligence</td>
</tr>
<tr>
<td>COMP 520</td>
<td>4</td>
<td>Compiler Design</td>
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<td>COMP 557*</td>
<td>3</td>
<td>Fundamentals of Computer Graphics</td>
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<td>COMP 566</td>
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<td>Discrete Optimization 1</td>
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<td>COMP 575</td>
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<td>Fundamentals of Distributed Algorithms</td>
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<td>ECSE 404</td>
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<td>Control Systems</td>
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<td>ECSE 411</td>
<td>3</td>
<td>Communications Systems 1</td>
</tr>
<tr>
<td>ECSE 412</td>
<td>3</td>
<td>Discrete Time Signal Processing</td>
</tr>
<tr>
<td>ECSE 413</td>
<td>3</td>
<td>Communications Systems 2</td>
</tr>
</tbody>
</table>
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 504 (3) Sampled Data Control
ECSE 507 (3) Optimization and Optimal Control
ECSE 523 (3) Speech Communications
ECSE 529 (3) Computer and Biological Vision
ECSE 530 (3) Logic Synthesis
ECSE 532* (3) Computer Graphics
ECSE 570 (3) Automatic Speech Recognition

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

Anthropology (ANTH)
Economics (any 200- or 300-level course excluding ECON 227 and ECON 337)
History (HIST)
Philosophy (excluding PHIL 210 and PHIL 310)
Political Science (POLI)
Psychology (excluding PSYC 204 and PSYC 305, but including PSYC 100)
Religious Studies (RELG)
School of Social Work (SWRK)
Sociology (excluding SOCI 350)

OR one of the following:

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

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

Language Courses

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

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

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

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.


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

#### Post-Retirement


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

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

#### Professors

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


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*)


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

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

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


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

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

#### Associate Professors

Francois Barthelat; M.Sc.(Roch.), Ph.D.(NWesterne), ing.

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

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


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

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

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

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

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

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

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

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

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

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**

James R. Forbes; B.A.Sc.(Wat.), M.A.Sc., Ph.D.(Tor.)

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

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

Xinyu Liu; B.Eng., M.Eng.(Harbin Inst. Tech.), Ph.D.(Tor.) (Chwang-Seto Faculty Scholar)

Yaoyao Fiona Zhao; B.Sc.(BIT), M.Sc., Ph.D.(Auck.)

**Adjunct Professors**

Helmi Attia

Farhang Daneshmand

Sudarshan Martins

Christophe Pierre

**Course Lecturers**

Youki Cropas

Anthony Rodolakis

Angelo Segall

Josef Slanik

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

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

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

Special interests are satisfied by selecting appropriate complementary courses from among those offered with a specific subject concentration, such as management, industrial engineering, computer science, controls and robotics, bio-engineering, aeronautics, combustion, systems engineering, etc.
### Required Year 0 (Freshman) Courses

29 credits

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


<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Title</th>
</tr>
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<tbody>
<tr>
<td>CHEM 110</td>
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<td>General Chemistry 1</td>
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<td>CHEM 120</td>
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<td>MATH 133</td>
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<td>MATH 141</td>
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<td>Calculus 2</td>
</tr>
<tr>
<td>PHYS 131</td>
<td>4</td>
<td>Mechanics and Waves</td>
</tr>
<tr>
<td>PHYS 142</td>
<td>4</td>
<td>Electromagnetism and Optics</td>
</tr>
</tbody>
</table>

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

33 credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCOM 206</td>
<td>3</td>
<td>Communication in Engineering</td>
</tr>
<tr>
<td>CIVE 207</td>
<td>4</td>
<td>Solid Mechanics</td>
</tr>
<tr>
<td>COMP 208</td>
<td>3</td>
<td>Computers in Engineering</td>
</tr>
<tr>
<td>ECSE 461</td>
<td>3</td>
<td>Electric Machinery</td>
</tr>
<tr>
<td>FACC 100</td>
<td>1</td>
<td>Introduction to the Engineering Profession</td>
</tr>
<tr>
<td>FACC 300</td>
<td>3</td>
<td>Engineering Economy</td>
</tr>
<tr>
<td>FACC 400</td>
<td>1</td>
<td>Engineering Professional Practice</td>
</tr>
<tr>
<td>MATH 262</td>
<td>3</td>
<td>Intermediate Calculus</td>
</tr>
<tr>
<td>MATH 263</td>
<td>3</td>
<td>Ordinary Differential Equations for Engineers</td>
</tr>
<tr>
<td>MATH 264</td>
<td>3</td>
<td>Advanced Calculus for Engineers</td>
</tr>
<tr>
<td>MATH 271</td>
<td>3</td>
<td>Linear Algebra and Partial Differential Equations</td>
</tr>
<tr>
<td>MIME 260</td>
<td>3</td>
<td>Materials Science and Engineering</td>
</tr>
</tbody>
</table>

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

### Required Mechanical Engineering Courses

65 credits

<table>
<thead>
<tr>
<th>Course</th>
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</tr>
</thead>
<tbody>
<tr>
<td>MECH 201</td>
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<td>Introduction to Mechanical Engineering</td>
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<td>MECH 220</td>
<td>4</td>
<td>Mechanics 2</td>
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<tr>
<td>MECH 240</td>
<td>3</td>
<td>Thermodynamics I</td>
</tr>
<tr>
<td>MECH 262</td>
<td>3</td>
<td>Statistics and Measurement Laboratory</td>
</tr>
<tr>
<td>MECH 290</td>
<td>3</td>
<td>Design Graphics for Mechanical Engineering</td>
</tr>
<tr>
<td>MECH 292</td>
<td>3</td>
<td>Conceptual Design</td>
</tr>
<tr>
<td>MECH 309</td>
<td>3</td>
<td>Numerical Methods in Mechanical Engineering</td>
</tr>
<tr>
<td>MECH 314</td>
<td>3</td>
<td>Dynamics of Mechanisms</td>
</tr>
<tr>
<td>Course Code</td>
<td>Credits</td>
<td>Course Title</td>
</tr>
<tr>
<td>-------------</td>
<td>---------</td>
<td>--------------</td>
</tr>
<tr>
<td>MECH 315</td>
<td>4</td>
<td>Mechanics 3</td>
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<tr>
<td>MECH 321</td>
<td>3</td>
<td>Mechanics of Deformable Solids</td>
</tr>
<tr>
<td>MECH 331</td>
<td>3</td>
<td>Fluid Mechanics 1</td>
</tr>
<tr>
<td>MECH 341</td>
<td>3</td>
<td>Thermodynamics 2</td>
</tr>
<tr>
<td>MECH 346</td>
<td>3</td>
<td>Heat Transfer</td>
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<tr>
<td>MECH 360</td>
<td>3</td>
<td>Principles of Manufacturing</td>
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<td>MECH 362</td>
<td>2</td>
<td>Mechanical Laboratory 1</td>
</tr>
<tr>
<td>MECH 383</td>
<td>3</td>
<td>Applied Electronics and Instrumentation</td>
</tr>
<tr>
<td>MECH 393</td>
<td>3</td>
<td>Machine Element Design</td>
</tr>
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<td>MECH 412</td>
<td>3</td>
<td>System Dynamics and Control</td>
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<td>MECH 430</td>
<td>3</td>
<td>Fluid Mechanics 2</td>
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<td>MECH 463D1</td>
<td>3</td>
<td>Mechanical Engineering Project</td>
</tr>
<tr>
<td>MECH 463D2</td>
<td>3</td>
<td>Mechanical Engineering Project</td>
</tr>
</tbody>
</table>

**Technical Complementary Courses**

9 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 553 (3) Design and Manufacture of Microdevices
- MECH 557 (3) Mechatronic Design
- MECH 563* (3) Biofluids and Cardiovascular Mechanics
- MECH 565 (3) Fluid Flow and Heat Transfer Equipment
- MECH 573 (3) Mechanics of Robotic Systems
- MECH 577 (3) Optimum Design
- MECH 593 (3) Design Theory and Methodology

* Students select either CHEE 563 or MECH 563.

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

**Complementary Studies**
6 credits

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

3 credits from the following:

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

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

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

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

- Anthropology (ANTH)
- Economics (any 200- or 300-level course excluding ECON 227, and ECON 337)
- History (HIST)
- Philosophy (excluding PHIL 210 and PHIL 310)
- Political Science (POLI)
- Psychology (excluding PSYC 204 and PSYC 305, but including PSYC 100)
- Religious Studies (RELG)
- School of Social Work (SWRK)
- Sociology (excluding SOCI 350)

OR one of the following:

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

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

Language Courses

If you are not proficient in a certain language, no more than 3 credits will be given for one 6-credit course at the 100 level or higher in that language. A maximum of 3 credits of language courses will be counted toward the Complementary Studies requirement.
However, 3-6 credits may be given for language courses at the 200 level or higher that have a sufficient cultural component. These courses must be approved by the McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22).

Elective Courses

0-6 credits
Students from Quebec CEGEPs must take 6 credits of courses at the 200 level or higher from the following faculties/schools:
- Desautels Faculty of Management
- Faculty of Agricultural and Environmental Sciences
- Faculty of Arts
- Faculty of Engineering
- Faculty of Religious Studies
- Faculty of Science
- Schulich School of Music

Typical Program of Study

Students entering the program from Quebec CEGEPs follow a different curriculum from those entering from outside the province. Students will be advised by the Department as to which courses they should select from the course lists above.
For a detailed curriculum, please see http://www.mcgill.ca/mecheng/undergrad/curriculum.
For all minors and concentrations, students should complete a Course Authorization Form, available from the McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22) or from the Undergraduate Program Coordinator, indicating their intention to take the minor or concentration.

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

To prepare the mechanical engineer for a wide range of career possibilities, there is a heavy emphasis in our curriculum on the fundamental analytical disciplines. This is balanced by a sequence of experimental and design Engineering courses, which include practice in design, manufacturing, and experimentation. In these courses, students learn how to apply their analytical groundwork to the solution of practical problems.
The Honours program is particularly suitable for those with a high aptitude in mathematics and physics and gives a thorough grounding in the basic engineering sciences.
Special interests are satisfied by selecting appropriate complementary courses from among those offered with a specific subject concentration, such as management, industrial engineering, computer science, controls and robotics, bio-engineering, aeronautics, combustion, systems engineering, etc.

Required Year 0 (Freshman) Courses

29 credits
Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credit for these Year 0 (Freshman) courses and enter a 119-credit program.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 110</td>
<td>(4)</td>
<td>General Chemistry 1</td>
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<tr>
<td>CHEM 120</td>
<td>(4)</td>
<td>General Chemistry 2</td>
</tr>
<tr>
<td>MATH 133</td>
<td>(3)</td>
<td>Linear Algebra and Geometry</td>
</tr>
<tr>
<td>MATH 140</td>
<td>(3)</td>
<td>Calculus 1</td>
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<tr>
<td>MATH 141</td>
<td>(4)</td>
<td>Calculus 2</td>
</tr>
<tr>
<td>PHYS 131</td>
<td>(4)</td>
<td>Mechanics and Waves</td>
</tr>
<tr>
<td>PHYS 142</td>
<td>(4)</td>
<td>Electromagnetism and Optics</td>
</tr>
</tbody>
</table>

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**

27 credits

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>CCOM 206</td>
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<td>Communication in Engineering</td>
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<tr>
<td>CIVE 207</td>
<td>(4)</td>
<td>Solid Mechanics</td>
</tr>
<tr>
<td>COMP 208</td>
<td>(3)</td>
<td>Computers in Engineering</td>
</tr>
<tr>
<td>FACC 100*</td>
<td>(1)</td>
<td>Introduction to the Engineering Profession</td>
</tr>
<tr>
<td>FACC 300</td>
<td>(3)</td>
<td>Engineering Economy</td>
</tr>
<tr>
<td>FACC 400</td>
<td>(1)</td>
<td>Engineering Professional Practice</td>
</tr>
<tr>
<td>MATH 262</td>
<td>(3)</td>
<td>Intermediate Calculus</td>
</tr>
<tr>
<td>MATH 263</td>
<td>(3)</td>
<td>Ordinary Differential Equations for Engineers</td>
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<td>MATH 264</td>
<td>(3)</td>
<td>Advanced Calculus for Engineers</td>
</tr>
<tr>
<td>MATH 271</td>
<td>(3)</td>
<td>Linear Algebra and Partial Differential Equations</td>
</tr>
</tbody>
</table>

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

**Required Mechanical Engineering Courses**

62 credits

<table>
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<td>MECH 210</td>
<td>(2)</td>
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<td>MECH 220</td>
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<td>Mechanics 2</td>
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<td>MECH 240</td>
<td>(3)</td>
<td>Thermodynamics 1</td>
</tr>
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<td>MECH 262</td>
<td>(3)</td>
<td>Statistics and Measurement Laboratory</td>
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<td>MECH 290</td>
<td>(3)</td>
<td>Design Graphics for Mechanical Engineering</td>
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<td>MECH 292</td>
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<td>Conceptual Design</td>
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<td>MECH 309</td>
<td>(3)</td>
<td>Numerical Methods in Mechanical Engineering</td>
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<td>MECH 321</td>
<td>(3)</td>
<td>Mechanics of Deformable Solids</td>
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<td>(3)</td>
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<td>MECH 341</td>
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<td>MECH 346</td>
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<td>MECH 360</td>
<td>(3)</td>
<td>Principles of Manufacturing</td>
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<td>MECH 362</td>
<td>(2)</td>
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<td>MECH 383</td>
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Academic Programs

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<tr>
<td>MECH 494</td>
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<td>Honours Design Project</td>
</tr>
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</table>

### Technical Complementary Courses

18 credits

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

<table>
<thead>
<tr>
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<th>Credits</th>
<th>Course Title</th>
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</thead>
<tbody>
<tr>
<td>MATH 327</td>
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<td>Matrix Numerical Analysis</td>
</tr>
<tr>
<td>MATH 381</td>
<td>3</td>
<td>Complex Variables and Transforms</td>
</tr>
<tr>
<td>MATH 417</td>
<td>3</td>
<td>Mathematical Programming</td>
</tr>
</tbody>
</table>

6 credits from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
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</thead>
<tbody>
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<td>MECH 513</td>
<td>3</td>
<td>Control Systems</td>
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<tr>
<td>MECH 546</td>
<td>3</td>
<td>Finite Element Methods in Solid Mechanics</td>
</tr>
<tr>
<td>MECH 562</td>
<td>3</td>
<td>Advanced Fluid Mechanics</td>
</tr>
<tr>
<td>MECH 577*</td>
<td>3</td>
<td>Optimum Design</td>
</tr>
<tr>
<td>MECH 578</td>
<td>3</td>
<td>Advanced Thermodynamics</td>
</tr>
<tr>
<td>MECH 579*</td>
<td>3</td>
<td>Multidisciplinary Design Optimization</td>
</tr>
</tbody>
</table>

* Note: Students select either MECH 577 or MECH 579

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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEE 563*</td>
<td>3</td>
<td>Biofluids and Cardiovascular Mechanics</td>
</tr>
<tr>
<td>MECH 497</td>
<td>3</td>
<td>Value Engineering</td>
</tr>
<tr>
<td>MECH 498</td>
<td>3</td>
<td>Interdisciplinary Design Project 1</td>
</tr>
<tr>
<td>MECH 499</td>
<td>3</td>
<td>Interdisciplinary Design Project 2</td>
</tr>
<tr>
<td>MECH 513</td>
<td>3</td>
<td>Control Systems</td>
</tr>
<tr>
<td>MECH 529</td>
<td>3</td>
<td>Discrete Manufacturing Systems</td>
</tr>
<tr>
<td>MECH 530</td>
<td>3</td>
<td>Mechanics of Composite Materials</td>
</tr>
<tr>
<td>MECH 532</td>
<td>3</td>
<td>Aircraft Performance, Stability and Control</td>
</tr>
<tr>
<td>MECH 535</td>
<td>3</td>
<td>Turbomachinery and Propulsion</td>
</tr>
<tr>
<td>MECH 536</td>
<td>3</td>
<td>Aircraft Structures</td>
</tr>
<tr>
<td>MECH 541</td>
<td>3</td>
<td>Kinematic Synthesis</td>
</tr>
<tr>
<td>MECH 543</td>
<td>3</td>
<td>Design with Composite Materials</td>
</tr>
<tr>
<td>MECH 544</td>
<td>3</td>
<td>Processing of Composite Materials</td>
</tr>
<tr>
<td>MECH 553</td>
<td>3</td>
<td>Design and Manufacture of Microdevices</td>
</tr>
<tr>
<td>MECH 557</td>
<td>3</td>
<td>Mechatronic Design</td>
</tr>
<tr>
<td>MECH 563*</td>
<td>3</td>
<td>Biofluids and Cardiovascular Mechanics</td>
</tr>
<tr>
<td>MECH 565</td>
<td>3</td>
<td>Fluid Flow and Heat Transfer Equipment</td>
</tr>
<tr>
<td>MECH 573</td>
<td>3</td>
<td>Mechanics of Robotic Systems</td>
</tr>
</tbody>
</table>
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
SOCL 235 (3) Technology and Society
SOCI 312 (3) Sociology of Work and Industry
URBP 201 (3) Planning the 21st Century City

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

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

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

Anthropology (ANTH)
Economics (any 200- or 300-level course excluding ECON 227 and ECON 337)
History (HIST)
Philosophy (excluding PHIL 210 and PHIL 310)
Political Science (POLI)
Psychology (excluding PSYC 204 and PSYC 305, but including PSYC 100)
Religious Studies (RELG)
School of Social Work (SWRK)
Sociology (excluding SOCI 350)

OR one of the following:

ARCH 528 (3) History of Housing
BUSA 465* (3) Technological Entrepreneurship

* Note: Management courses have limited enrolment and registration dates. See Important Dates at http://www.mcgill.ca/importantdates.
ENVR 203 (3) Knowledge, Ethics and Environment
ENVR 400 (3) Environmental Thought
FACC 220 (3) Law for Architects and Engineers
FACC 500 (3) Technology Business Plan Design
FACC 501 (3) Technology Business Plan Project
INDR 294* (3) Introduction to Labour-Management Relations
MATH 338 (3) History and Philosophy of Mathematics
MGCR 222* (3) Introduction to Organizational Behaviour
MGCR 352* (3) Marketing Management 1
ORGB 321* (3) Leadership
ORGB 423* (3) Human Resources Management

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

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

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

Elective Courses
0-6 credits
Students from Quebec CEGEPs must take 6 credits of courses at the 200 level or higher from the following faculties/schools:
- Desautels Faculty of Management
- Faculty of Agricultural and Environmental Sciences
- Faculty of Arts
- Faculty of Engineering
- Faculty of Religious Studies
- Faculty of Science
- Schulich School of Music

Typical Program of Study
Students entering the program from 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 McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22) or from the Undergraduate Program Coordinator, indicating their intention to take the minor or concentration.

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 McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22) or from the Undergraduate Program Coordinator, indicating their intention to take the concentration.

Required Courses
6 credits

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

9 credits
3-6 credits from the following:

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

3-6 credits from the following:

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

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 McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22) or from the Undergraduate Program Coordinator, indicating their intention to take the concentration.

Required Courses

6 credits

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

Complementary Courses

9 credits
3-6 credits from the following:

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

3-6 credits from the following:

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

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 McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22) or from the Undergraduate Program Coordinator, indicating their intention to take the concentration.

Total concentration credit weight: 15-16 credits
### Required Courses

6 credits

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

### Complementary Courses

9-10 credits from the following:

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

### 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 McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22) or from the Undergraduate Program Coordinator, indicating their intention to take the concentration.

Total concentration credit weight: 15-16 credits

### Required Courses

6 credits

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

### Complementary Courses

9-10 credits from the following:

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

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 McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22) or from the Undergraduate Program Coordinator, indicating their intention to take the concentration.

Required Courses

12 credits

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

Complementary Courses

6 credits from the following:

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

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

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

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

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
<table>
<thead>
<tr>
<th>Title</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Associate Chair, Student Affairs</strong></td>
<td>Mathieu Brochu</td>
</tr>
<tr>
<td><strong>Associate Chair, Research</strong></td>
<td>James A. Finch</td>
</tr>
<tr>
<td><strong>Associate Chair, Graduate Studies</strong></td>
<td>George P. Demopoulos</td>
</tr>
<tr>
<td><strong>Emeritus Professors</strong></td>
<td></td>
</tr>
<tr>
<td>John E. Gruzleski; B.Sc., M.Sc.(Qu.), Ph.D.(Tor.), Eng., F.C.I.M., F.A.S.M.</td>
<td></td>
</tr>
<tr>
<td>Henry Birks Emeritus Professor</td>
<td></td>
</tr>
<tr>
<td>Roussos Dimitrakopoulos; B.Sc.(Thessaloniki), M.Sc.(Alta), Ph.D.(École Poly., Montr.)</td>
<td></td>
</tr>
<tr>
<td>Faramarz (Ferri) P. Hassani; Ph.D.(Nott.), C.Eng.(U.K. Reg.)</td>
<td></td>
</tr>
<tr>
<td>Stephen Yue; B.Sc., Ph.D.(Leeds)</td>
<td></td>
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<tr>
<td><strong>Professors</strong></td>
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</tr>
<tr>
<td>George P. Demopoulos; Dipl.Eng.(NTU Athens), M.Sc., Ph.D.(McG.), Eng., F.C.I.M.</td>
<td></td>
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<tr>
<td>Roussos Dimitrakopoulos; B.Sc.(Thessaloniki), M.Sc.(Alta), Ph.D.(École Poly., Montr.)</td>
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<tr>
<td>Raynald Gauvin; B.Eng., Ph.D.(Montr.), Eng.</td>
<td></td>
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<tr>
<td>Faramarz (Ferri) P. Hassani; Ph.D.(Nott.), C.Eng.(U.K. Reg.)</td>
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<tr>
<td>Stephen Yue; B.Sc., Ph.D.(Leeds)</td>
<td></td>
</tr>
<tr>
<td><strong>Associate Professors</strong></td>
<td></td>
</tr>
<tr>
<td>Mathieu Brochu; B.Eng.(Laval), Ph.D.(McG.)</td>
<td></td>
</tr>
<tr>
<td>Richard Chromik; B.Sc.(Penn. St.), M.Sc., Ph.D.(SUNY)</td>
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</tr>
<tr>
<td>Mainul Hasan; B.Eng.(Dhaka), M.Sc.(Dhahran), Ph.D.(McG.)</td>
<td></td>
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<tr>
<td>Mustafa Kumral; B.Eng.(Hacettepe), M.Eng.(Cukurova), Ph.D.(Leeds)</td>
<td></td>
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<tr>
<td>Showan Nazhat; B.Eng., M.Sc., Ph.D.(Lond.)</td>
<td></td>
</tr>
<tr>
<td>Mihriban Pekguleryuz; B.Eng., M.Eng.(Flor.), Ph.D.(McG.)</td>
<td></td>
</tr>
<tr>
<td><strong>Assistant Professors</strong></td>
<td></td>
</tr>
<tr>
<td>Kirk Bevan; Ph.D.(Purd.)</td>
<td></td>
</tr>
<tr>
<td>Marta Cerruti; B.Sc., Ph.D., Laurea in Chemistry (Torino)</td>
<td></td>
</tr>
<tr>
<td>In-Ho Jung; B.Sc.(POSTECH ), Ph.D.(École Poly., Montr.)</td>
<td></td>
</tr>
<tr>
<td>Jun Song; Ph.D., M.Sc.(Princ.)</td>
<td></td>
</tr>
<tr>
<td>Nathaniel Quitoriano; B.Sc.(Calif., Berk.), Ph.D.(MIT)</td>
<td></td>
</tr>
<tr>
<td>Kristian Waters; M.Sc., M.Eng.(Manc.), Ph.D.(Birm.)</td>
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</tr>
<tr>
<td><strong>Faculty Lecturer</strong></td>
<td></td>
</tr>
<tr>
<td>Florence Paray; B.Eng.(CSP), M.Eng., Ph.D.(McG.)</td>
<td></td>
</tr>
<tr>
<td><strong>Course Lecturer</strong></td>
<td></td>
</tr>
<tr>
<td>Bruno Benedetto</td>
<td></td>
</tr>
<tr>
<td><strong>Adjunct Professors</strong></td>
<td></td>
</tr>
<tr>
<td>Mostafa Benzaazoua</td>
<td></td>
</tr>
</tbody>
</table>
### Adjunct Professors

Marc Bétournay  
Martin Bureau  
Robin A.L. Drew  
Daryoush Emadi  
Elhachmi Essadiqi  
Carlton Fuerst  
Mory Ghomshei  
Bryn Harris  
Ahmad Hemami  
Wynand J. Kleingeld  
Eric Lifshin  
Arun Mujumdar  
Jan Nessett  
Joe Stachulak  
Karim Zaghib

### Co-op Program Liaison Officers

Teresa Barrett (Mining)  
Genevieve Snider (Materials)

#### 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 within the university registration period for returning students or late fees will apply. Before registering for any work term course, students must contact the Materials Co-op Liaison Officer for approval.

**12.7.4.2 Student Advising**

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

**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 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 118- to 119-credit program.


<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 110</td>
<td>4</td>
<td>General Chemistry 1</td>
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<tr>
<td>CHEM 120</td>
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<td>MATH 133</td>
<td>3</td>
<td>Linear Algebra and Geometry</td>
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<td>MATH 140</td>
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<td>Calculus 1</td>
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<tr>
<td>MATH 141</td>
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<td>PHYS 131</td>
<td>4</td>
<td>Mechanics and Waves</td>
</tr>
<tr>
<td>PHYS 142</td>
<td>4</td>
<td>Electromagnetism and Optics</td>
</tr>
</tbody>
</table>

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**

33 credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CCOM 206</td>
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<td>Communication in Engineering</td>
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<tr>
<td>CHEM 233</td>
<td>3</td>
<td>Topics in Physical Chemistry</td>
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<tr>
<td>CIVE 205</td>
<td>3</td>
<td>Statics</td>
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<td>CIVE 207</td>
<td>4</td>
<td>Solid Mechanics</td>
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<tr>
<td>COMP 208</td>
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<td>Computers in Engineering</td>
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<tr>
<td>FACC 100*</td>
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<td>Introduction to the Engineering Profession</td>
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<tr>
<td>FACC 300</td>
<td>3</td>
<td>Engineering Economy</td>
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<tr>
<td>FACC 400</td>
<td>1</td>
<td>Engineering Professional Practice</td>
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<tr>
<td>MATH 262</td>
<td>3</td>
<td>Intermediate Calculus</td>
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<tr>
<td>MATH 263</td>
<td>3</td>
<td>Ordinary Differential Equations for Engineers</td>
</tr>
<tr>
<td>MATH 264</td>
<td>3</td>
<td>Advanced Calculus for Engineers</td>
</tr>
<tr>
<td>MECH 289</td>
<td>3</td>
<td>Design Graphics</td>
</tr>
</tbody>
</table>

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

**Required Materials Engineering Courses**

67-70 credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECSE 461*</td>
<td>3</td>
<td>Electric Machinery</td>
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<tr>
<td>MIME 209</td>
<td>3</td>
<td>Mathematical Applications</td>
</tr>
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<td>MIME 212</td>
<td>3</td>
<td>Engineering Thermodynamics</td>
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<tr>
<td>MIME 250</td>
<td>3</td>
<td>Introduction to Extractive Metallurgy</td>
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<tr>
<td>MIME 261</td>
<td>3</td>
<td>Structure of Materials</td>
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<tr>
<td>MIME 280</td>
<td>2</td>
<td>Industrial Training 1</td>
</tr>
<tr>
<td>MIME 311</td>
<td>3</td>
<td>Modelling and Automatic Control</td>
</tr>
<tr>
<td>MIME 317</td>
<td>3</td>
<td>Analytical and Characterization Techniques</td>
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<td>MIME 337*</td>
<td>2</td>
<td>Electrotechnology</td>
</tr>
<tr>
<td>MIME 341</td>
<td>3</td>
<td>Introduction to Mineral Processing</td>
</tr>
<tr>
<td>MIME 345</td>
<td>3</td>
<td>Applications of Polymers</td>
</tr>
<tr>
<td>Course Code</td>
<td>Credits</td>
<td>Course Title</td>
</tr>
<tr>
<td>-------------</td>
<td>---------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>MIME 350</td>
<td>3</td>
<td>Extractive Metallurgical Engineering</td>
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<tr>
<td>MIME 352</td>
<td>3</td>
<td>Hydrochemical Processing</td>
</tr>
<tr>
<td>MIME 356</td>
<td>4</td>
<td>Heat, Mass and Fluid Flow</td>
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<tr>
<td>MIME 360</td>
<td>3</td>
<td>Phase Transformations: Solids</td>
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<tr>
<td>MIME 362</td>
<td>3</td>
<td>Mechanical Properties</td>
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<tr>
<td>MIME 380</td>
<td>2</td>
<td>Industrial Training 2</td>
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<tr>
<td>MIME 442</td>
<td>3</td>
<td>Analysis, Modelling and Optimization in Mineral Processing</td>
</tr>
<tr>
<td>MIME 452</td>
<td>4</td>
<td>Process and Materials Design</td>
</tr>
<tr>
<td>MIME 455</td>
<td>3</td>
<td>Advanced Process Engineering</td>
</tr>
<tr>
<td>MIME 456</td>
<td>3</td>
<td>Steelmaking and Steel Processing</td>
</tr>
<tr>
<td>MIME 465</td>
<td>3</td>
<td>Metallic and Ceramic Powders Processing</td>
</tr>
<tr>
<td>MIME 467</td>
<td>3</td>
<td>Electronic Properties of Materials</td>
</tr>
<tr>
<td>MIME 480</td>
<td>2</td>
<td>Industrial Training 3</td>
</tr>
</tbody>
</table>

* Students choose either ECSE 461 or MIME 337

**Complementary Courses**

18 credits

**Technical Complementaries**

12 credits

9-12 credits from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEE 515*</td>
<td>3</td>
<td>Material Surfaces: A Biomimetic Approach</td>
</tr>
<tr>
<td>CIVE 512</td>
<td>3</td>
<td>Advanced Civil Engineering Materials</td>
</tr>
<tr>
<td>MECH 530</td>
<td>3</td>
<td>Mechanics of Composite Materials</td>
</tr>
<tr>
<td>MIME 410</td>
<td>3</td>
<td>Research Project</td>
</tr>
<tr>
<td>MIME 470</td>
<td>3</td>
<td>Engineering Biomaterials</td>
</tr>
<tr>
<td>MIME 512</td>
<td>3</td>
<td>Corrosion and Degradation of Materials</td>
</tr>
<tr>
<td>MIME 515*</td>
<td>3</td>
<td>Material Surfaces: A Biomimetic Approach</td>
</tr>
<tr>
<td>MIME 542</td>
<td>3</td>
<td>Transmission Electron Microscopy</td>
</tr>
<tr>
<td>MIME 544</td>
<td>3</td>
<td>Analysis: Mineral Processing Systems 1</td>
</tr>
<tr>
<td>MIME 545</td>
<td>3</td>
<td>Analysis: Mineral Processing Systems 2</td>
</tr>
<tr>
<td>MIME 551</td>
<td>3</td>
<td>Electrochemical Processing</td>
</tr>
<tr>
<td>MIME 556</td>
<td>3</td>
<td>Sustainable Materials Processing</td>
</tr>
<tr>
<td>MIME 558</td>
<td>3</td>
<td>Engineering Nanomaterials</td>
</tr>
<tr>
<td>MIME 559</td>
<td>3</td>
<td>Aluminum Physical Metallurgy</td>
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<tr>
<td>MIME 560</td>
<td>3</td>
<td>Joining Processes</td>
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<tr>
<td>MIME 561</td>
<td>3</td>
<td>Advanced Materials Design</td>
</tr>
<tr>
<td>MIME 563</td>
<td>3</td>
<td>Hot Deformation of Metals</td>
</tr>
<tr>
<td>MIME 565</td>
<td>3</td>
<td>Aerospace Metallic-Materials and Manufacturing Processes</td>
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<tr>
<td>MIME 568</td>
<td>3</td>
<td>Topics in Advanced Materials</td>
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<tr>
<td>MIME 569</td>
<td>3</td>
<td>Electron Beam Analysis of Materials</td>
</tr>
<tr>
<td>MIME 571</td>
<td>3</td>
<td>Surface Engineering</td>
</tr>
<tr>
<td>MIME 572</td>
<td>3</td>
<td>Computational Thermodynamics</td>
</tr>
</tbody>
</table>
* 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 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:

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FACULTY OF ENGINEERING, INCLUDING THE SCHOOLS OF ARCHITECTURE AND URBAN PLANNING

70

2013-2014, Faculty of Engineering, including the Schools of Architecture and Urban Planning, McGill University

(Published April 01, 2013)
History of Housing (3)  ARCH 528
Technological Entrepreneurship (3)  BUSA 465*
Knowledge, Ethics and Environment (3)  ENVR 203
Environmental Thought (3)  ENVR 400
Law for Architects and Engineers (3)  FACC 220
Technology Business Plan Design (3)  FACC 500
Technology Business Plan Project (3)  FACC 501
Introduction to Labour-Management Relations (3)  INDR 294*
History and Philosophy of Mathematics (3)  MATH 338
Introduction to Organizational Behaviour (3)  MGCR 222*
Marketing Management 1 (3)  MGCR 352*
Leadership (3)  ORGB 321*
Human Resources Management (3)  ORGB 423*

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

Language Courses

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

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

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: Professor Ferri Hassani or Professor Hani Mitri.

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.


<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 110</td>
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</tr>
<tr>
<td>CHEM 120</td>
<td>4</td>
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<tr>
<td>MATH 133</td>
<td>3</td>
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<tr>
<td>MATH 140</td>
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<td>MATH 141</td>
<td>4</td>
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<tr>
<td>PHYS 131</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 142</td>
<td>4</td>
</tr>
</tbody>
</table>

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
34 credits

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>CCOM 206</td>
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<td>CIVE 205</td>
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<td>CIVE 207</td>
<td>4</td>
</tr>
<tr>
<td>COMP 208</td>
<td>3</td>
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<tr>
<td>EPSC 221</td>
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<td>EPSC 225</td>
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<tr>
<td>FACC 100*</td>
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<td>FACC 300</td>
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<td>FACC 400</td>
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<td>MATH 262</td>
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<td>MATH 263</td>
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<tr>
<td>MATH 264</td>
<td>3</td>
</tr>
<tr>
<td>MECH 289</td>
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</tr>
</tbody>
</table>

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

### Required Mining Engineering Courses
72-73 credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tr>
<td>ECSE 461*</td>
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</tr>
<tr>
<td>MIME 200</td>
<td>3</td>
</tr>
<tr>
<td>MIME 203</td>
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<td>MIME 209</td>
<td>3</td>
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<td>MIME 260</td>
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<td>MIME 291</td>
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<td>MIME 322</td>
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<tr>
<td>MIME 325</td>
<td>3</td>
</tr>
<tr>
<td>MIME 333</td>
<td>3</td>
</tr>
</tbody>
</table>

* Note: MIME 200 (Introduction to the Minerals Industry) must be taken during the first year of study.
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 413 (3) Strategic Mine Planning With Uncertainty
MIME 419 (3) Surface Mining
MIME 420 (3) Feasibility Study
MIME 422 (3) Mine Ventilation
MIME 425 (3) Applied Stochastic Orebody Modelling
MIME 426 (3) Development and Services
MPMC 321** (3) Mécanique des roches et contrôle des terrains
MPMC 326** (3) Recherche opérationnelle 1
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
8-9 credits of Departmental complementary courses, selected from Stream A or Stream B, as described below.

Stream A
8 credits
MIME 494 (2) Industrial Work Period 4

and 6 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 3 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 484 (3) Mining Project
MIME 520 (3) Stability of Rock Slopes
MIME 521 (3) Stability of Underground Openings
MIME 526 (3) Mineral Economics
MIME 527 (3) Selected Topics in Mineral Resource Engineering
Complementary Studies

6 credits

Group A - Impact of Technology on Society

3 credits from the following:

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

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

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

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

- Anthropology (ANTH)
- Economics (any 200- or 300-level course excluding ECON 227 and ECON 337)
- History (HIST)
- Philosophy (excluding PHIL 210 and PHIL 310)
- Political Science (POLI)
- Psychology (excluding PSYC 204 and PSYC 305, but including PSYC 100)
- Religious Studies (RELG)
- School of Social Work (SWRK)
- Sociology (excluding SOCI 350)

OR one of the following:

- ARCH 528 (3) History of Housing
- BUSA 465* (3) Technological Entrepreneurship

* Note: Management courses have limited enrolment and registration dates. See Important Dates at http://www.mcgill.ca/importantdates.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Name</th>
</tr>
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<tbody>
<tr>
<td>ENVR 203</td>
<td>(3)</td>
<td>Knowledge, Ethics and Environment</td>
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<td>ENVR 400</td>
<td>(3)</td>
<td>Environmental Thought</td>
</tr>
<tr>
<td>FACC 220</td>
<td>(3)</td>
<td>Law for Architects and Engineers</td>
</tr>
<tr>
<td>FACC 500</td>
<td>(3)</td>
<td>Technology Business Plan Design</td>
</tr>
<tr>
<td>FACC 501</td>
<td>(3)</td>
<td>Technology Business Plan Project</td>
</tr>
<tr>
<td>INDR 294*</td>
<td>(3)</td>
<td>Introduction to Labour-Management Relations</td>
</tr>
<tr>
<td>MATH 338</td>
<td>(3)</td>
<td>History and Philosophy of Mathematics</td>
</tr>
<tr>
<td>MGCR 222*</td>
<td>(3)</td>
<td>Introduction to Organizational Behaviour</td>
</tr>
<tr>
<td>MGCR 352*</td>
<td>(3)</td>
<td>Marketing Management 1</td>
</tr>
<tr>
<td>ORGB 321*</td>
<td>(3)</td>
<td>Leadership</td>
</tr>
<tr>
<td>ORGB 423*</td>
<td>(3)</td>
<td>Human Resources Management</td>
</tr>
</tbody>
</table>

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**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 McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22).

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

#### 12.8.2 About the School of Urban Planning

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

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

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

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

The objective of the School is to enable young urban planners to exercise leadership in the public, private, and community sectors. Training is provided at the postgraduate level. The main degree offered is the Master of Urban Planning (M.U.P.). Many specializations are possible within the program; one of them, in Transportation Planning, is formally recognized as a concentration. M.U.P. students in the core program may also opt to spend a semester in Barbados as part of the Barbados Field Study Semester, which focuses on global environmental issues. Details concerning each of these concentrations can be found at [www.mcgill.ca/urbanplanning/programs/mup-transportation-planning](http://www.mcgill.ca/urbanplanning/programs/mup-transportation-planning) (see also [www.tram.mcgill.ca](http://www.tram.mcgill.ca)) and at [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 School also welcomes a small number of students into its ad hoc Ph.D. in Urban Planning, Policy, and Design. That program aims to prepare students for careers in high-level research and teaching.

The professional program of study offered by the School is fully recognized by the [Ordre des Urbanistes du Québec](http://www.oqub.org.qc.ca) (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, and therefore of C.I.P., 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 School’s website at [www.mcgill.ca/urbanplanning](http://www.mcgill.ca/urbanplanning) as well as [Programs, Courses and University Regulations > Faculties & Schools > Faculty of Engineering > Graduate > Academic Programs > Urban Planning](http://www.mcgill.ca/urbanplanning) (available at [www.mcgill.ca/study](http://www.mcgill.ca/study)).

Although the M.U.P. program is primarily a professional degree program, it has a very important research component. The work done on the Supervised Research Project in the course of the second year of study qualifies for funding by federal and provincial funding agencies such as SSHRC, NSERC, FQRSC, and FQRNT. Some students enter the M.U.P. program with fellowships from these agencies; others obtain them after joining the School, for their second year of study.

The School of Urban Planning hosts a number of events that are open to undergraduate students and to the public: the Brenda and Samuel Gewurz Lectures in Urban Design bring speakers of international calibre to McGill; the Transportation Research Group at McGill holds seminars on issues pertaining to various aspects of urban and regional transportation; and the [urban.studies@mcgill](http://www.urban.studies@mcgill.ca) seminars bring speakers from academia, the profession and the community to talk about contemporary urban issues.

For details of the M.U.P. admission requirements and curriculum, consult the [Programs, Courses and University Regulations](http://www.mcgill.ca/study) publication for Graduate and Postdoctoral Studies 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:

<table>
<thead>
<tr>
<th>Undergraduate Courses in Urban Planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARCH 520 (3)</td>
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<tr>
<td>ARCH 550 (3)</td>
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<td>CIVE 433 (3)</td>
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<td>URBP 201 (3)</td>
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<tr>
<td>URBP 551 (3)</td>
</tr>
</tbody>
</table>

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.)
Ahmed Elgeneidy; B.Sc., M.Sc.(Alexandria), Ph.D.(Port. St.)
Raphaël Fischler; B.Eng.(U. Tech. Eindhoven), M.Sc., M.C.P.(MIT), Ph.D.(Calif., Berk.)
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 Polese; 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.)

Guest Lecturers

Heather Braiden
Suzanne Doucet
Paul LeCavalier
Denis Lévesque
James McGregor
Pierre Morissette
Larry Sherman
Martin Wexler

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
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

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 McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, 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 12.10.14: Minor in Musical Science and Technology
- 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 McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22), 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 McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, 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):

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANAT 212</td>
<td>3</td>
<td>Molecular Mechanisms of Cell Function</td>
</tr>
<tr>
<td>BIOC 212</td>
<td>3</td>
<td>Molecular Mechanisms of Cell Function</td>
</tr>
<tr>
<td>BIOL 200</td>
<td>3</td>
<td>Molecular Biology</td>
</tr>
<tr>
<td>BIOL 201</td>
<td>3</td>
<td>Cell Biology and Metabolism</td>
</tr>
<tr>
<td>CHEM 212</td>
<td>4</td>
<td>Introductory Organic Chemistry 1</td>
</tr>
<tr>
<td>PHGY 209</td>
<td>3</td>
<td>Mammalian Physiology 1</td>
</tr>
<tr>
<td>PHGY 210</td>
<td>3</td>
<td>Mammalian Physiology 2</td>
</tr>
</tbody>
</table>

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
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMDE 505</td>
<td>3</td>
<td>Cell and Tissue Engineering</td>
</tr>
<tr>
<td>CHEE 562</td>
<td>3</td>
<td>Engineering Principles in Physiological Systems</td>
</tr>
<tr>
<td>PHGY 311</td>
<td>3</td>
<td>Channels, Synapses &amp; Hormones</td>
</tr>
<tr>
<td>PHGY 312</td>
<td>3</td>
<td>Respiratory, Renal, &amp; Cardiovascular Physiology</td>
</tr>
<tr>
<td>PHGY 313</td>
<td>3</td>
<td>Blood, Gastrointestinal, &amp; Immune Systems Physiology</td>
</tr>
<tr>
<td>PHGY 517</td>
<td>3</td>
<td>Artificial Internal Organs</td>
</tr>
<tr>
<td>PHGY 518</td>
<td>3</td>
<td>Artificial Cells</td>
</tr>
</tbody>
</table>

**Bioinformatics, Genomics and Proteomics**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANAT 365*</td>
<td>3</td>
<td>Cellular Trafficking</td>
</tr>
<tr>
<td>ANAT 458</td>
<td>3</td>
<td>Membranes and Cellular Signaling</td>
</tr>
<tr>
<td>BIOC 311</td>
<td>3</td>
<td>Metabolic Biochemistry</td>
</tr>
<tr>
<td>BIOC 312</td>
<td>3</td>
<td>Biochemistry of Macromolecules</td>
</tr>
<tr>
<td>BIOC 458*</td>
<td>3</td>
<td>Membranes and Cellular Signaling</td>
</tr>
<tr>
<td>BMDE 506</td>
<td>3</td>
<td>Molecular Biology Techniques</td>
</tr>
<tr>
<td>COMP 302</td>
<td>3</td>
<td>Programming Languages and Paradigms</td>
</tr>
<tr>
<td>COMP 360</td>
<td>3</td>
<td>Algorithm Design</td>
</tr>
<tr>
<td>COMP 421</td>
<td>3</td>
<td>Database Systems</td>
</tr>
<tr>
<td>COMP 424</td>
<td>3</td>
<td>Artificial Intelligence</td>
</tr>
<tr>
<td>COMP 462</td>
<td>3</td>
<td>Computational Biology Methods</td>
</tr>
<tr>
<td>COMP 526</td>
<td>3</td>
<td>Probabilistic Reasoning and AI</td>
</tr>
</tbody>
</table>

* Students choose either ANAT 365 or BIOC 458

**Biomaterials, Biosensors, and Nanotechnology**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMDE 504</td>
<td>3</td>
<td>Biomaterials and Bioperformance</td>
</tr>
<tr>
<td>BMDE 505</td>
<td>3</td>
<td>Cell and Tissue Engineering</td>
</tr>
<tr>
<td>BMDE 508</td>
<td>3</td>
<td>Introduction to Micro and Nano-Bioengineering</td>
</tr>
<tr>
<td>CHEE 380</td>
<td>3</td>
<td>Materials Science</td>
</tr>
<tr>
<td>ECSE 424</td>
<td>3</td>
<td>Human-Computer Interaction</td>
</tr>
<tr>
<td>MECH 553</td>
<td>3</td>
<td>Design and Manufacture of Microdevices</td>
</tr>
<tr>
<td>MIME 360</td>
<td>3</td>
<td>Phase Transformations: Solids</td>
</tr>
<tr>
<td>MIME 362</td>
<td>3</td>
<td>Mechanical Properties</td>
</tr>
<tr>
<td>MIME 470</td>
<td>3</td>
<td>Engineering Biomaterials</td>
</tr>
<tr>
<td>PHYS 534</td>
<td>3</td>
<td>Nanoscience and Nanotechnology</td>
</tr>
</tbody>
</table>

**Biomechanics and Prosthetics**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMDE 503</td>
<td>3</td>
<td>Biomedical Instrumentation</td>
</tr>
<tr>
<td>CHEE 561</td>
<td>3</td>
<td>Introduction to Soft Tissue Biophysics</td>
</tr>
<tr>
<td>CHEE 563*</td>
<td>3</td>
<td>Biofluids and Cardiovascular Mechanics</td>
</tr>
<tr>
<td>MECH 315</td>
<td>4</td>
<td>Mechanics 3</td>
</tr>
<tr>
<td>MECH 321</td>
<td>3</td>
<td>Mechanics of Deformable Solids</td>
</tr>
<tr>
<td>MECH 530</td>
<td>3</td>
<td>Mechanics of Composite Materials</td>
</tr>
</tbody>
</table>
Biomechanics of Musculoskeletal Systems (3) MECH 561
Biofluids and Cardiovascular Mechanics (3) MECH 563*
Phase Transformations: Solids (3) MIME 360
Mechanical Properties (3) MIME 362

* Students choose either CHEE 563 or MECH 563.

Medicine Physics and Imaging

BMDE 519 (3) Biomedical Signals and Systems
COMP 302 (3) Programming Languages and Paradigms
COMP 360 (3) Algorithm Design
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 McGill Engineering Student Centre (Student Affairs Office) (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 McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22)
Faculty of Science Adviser (for selection of Science courses only): Nancy Nelson, Undergraduate Adviser, Department of Biology

McGill University, Faculty of Engineering, including the Schools of Architecture and Urban Planning, 2013-2014 (Published April 01, 2013)
12.10.3.1 Bachelor of Engineering (B.Eng.) - Minor Biotechnology (for Engineering Students) (24 credits)

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

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

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOT 505</td>
<td>3</td>
<td>Selected Topics in Biotechnology</td>
</tr>
<tr>
<td>CHEE 200</td>
<td>3</td>
<td>Chemical Engineering Principles 1</td>
</tr>
<tr>
<td>CHEE 204</td>
<td>3</td>
<td>Chemical Engineering Principles 2</td>
</tr>
<tr>
<td>CHEE 474</td>
<td>3</td>
<td>Biochemical Engineering</td>
</tr>
</tbody>
</table>

**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 FACC 300.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 200</td>
<td>3</td>
<td>Molecular Biology</td>
</tr>
<tr>
<td>BIOL 201</td>
<td>3</td>
<td>Cell Biology and Metabolism</td>
</tr>
<tr>
<td>BIOL 202</td>
<td>3</td>
<td>Basic Genetics</td>
</tr>
<tr>
<td>BIOT 505</td>
<td>3</td>
<td>Selected Topics in Biotechnology</td>
</tr>
<tr>
<td>MIMM 211</td>
<td>3</td>
<td>Introductory Microbiology</td>
</tr>
</tbody>
</table>

**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**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANAT 541</td>
<td>3</td>
<td>Cell and Molecular Biology of Aging</td>
</tr>
<tr>
<td>EXMD 504</td>
<td>3</td>
<td>Biology of Cancer</td>
</tr>
<tr>
<td>PATH 300</td>
<td>3</td>
<td>Human Disease</td>
</tr>
</tbody>
</table>

**Chemistry**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 382</td>
<td>3</td>
<td>Organic Chemistry: Natural Products</td>
</tr>
<tr>
<td>CHEM 502</td>
<td>3</td>
<td>Advanced Bio-Organic Chemistry</td>
</tr>
<tr>
<td>CHEM 552</td>
<td>3</td>
<td>Physical Organic Chemistry</td>
</tr>
</tbody>
</table>

**General**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FACC 300</td>
<td>3</td>
<td>Engineering Economy</td>
</tr>
<tr>
<td>Immunology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------</td>
<td>-------------------------------------------</td>
</tr>
<tr>
<td>ANAT 261</td>
<td>(4)</td>
<td>Introduction to Dynamic Histology</td>
</tr>
<tr>
<td>BIOC 503</td>
<td>(3)</td>
<td>Immunochemistry</td>
</tr>
<tr>
<td>MIMM 214</td>
<td>(3)</td>
<td>Introductory Immunology: Elements of Immunity</td>
</tr>
<tr>
<td>MIMM 414</td>
<td>(3)</td>
<td>Advanced Immunology</td>
</tr>
<tr>
<td>PHGY 513</td>
<td>(3)</td>
<td>Cellular Immunology</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Management</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Note: Engineering students may not use these courses to count toward a Management minor, nor toward the Complementary Studies requirement.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECON 208</td>
<td>(3)</td>
<td>Microeconomic Analysis and Applications</td>
</tr>
<tr>
<td>MGCR 211</td>
<td>(3)</td>
<td>Introduction to Financial Accounting</td>
</tr>
<tr>
<td>MGCR 341</td>
<td>(3)</td>
<td>Finance 1</td>
</tr>
<tr>
<td>MGCR 352</td>
<td>(3)</td>
<td>Marketing Management 1</td>
</tr>
<tr>
<td>MGCR 472</td>
<td>(3)</td>
<td>Operations Management</td>
</tr>
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<table>
<thead>
<tr>
<th>Microbiology</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>MIMM 323</td>
<td>(3)</td>
<td>Microbial Physiology</td>
</tr>
<tr>
<td>MIMM 324</td>
<td>(3)</td>
<td>Fundamental Virology</td>
</tr>
<tr>
<td>MIMM 413</td>
<td>(3)</td>
<td>Parasitology</td>
</tr>
<tr>
<td>MIMM 465</td>
<td>(3)</td>
<td>Bacterial Pathogenesis</td>
</tr>
<tr>
<td>MIMM 466</td>
<td>(3)</td>
<td>Viral Pathogenesis</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Molecular Biology (Biology)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 300</td>
<td>(3)</td>
<td>Molecular Biology of the Gene</td>
</tr>
<tr>
<td>BIOL 314</td>
<td>(3)</td>
<td>Molecular Biology of Oncogenes</td>
</tr>
<tr>
<td>BIOL 520</td>
<td>(3)</td>
<td>Gene Activity in Development</td>
</tr>
<tr>
<td>BIOL 524</td>
<td>(3)</td>
<td>Topics in Molecular Biology</td>
</tr>
<tr>
<td>BIOL 551</td>
<td>(3)</td>
<td>Principles of Cellular Control</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Molecular Biology (Biochemistry)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOC 311</td>
<td>(3)</td>
<td>Metabolic Biochemistry</td>
</tr>
<tr>
<td>BIOC 312</td>
<td>(3)</td>
<td>Biochemistry of Macromolecules</td>
</tr>
<tr>
<td>BIOC 450</td>
<td>(3)</td>
<td>Protein Structure and Function</td>
</tr>
<tr>
<td>BIOC 454</td>
<td>(3)</td>
<td>Nucleic Acids</td>
</tr>
<tr>
<td>PSYT 455</td>
<td>(3)</td>
<td>Neurochemistry</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Physiology</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>EXMD 401</td>
<td>(3)</td>
<td>Physiology and Biochemistry Endocrine Systems</td>
</tr>
<tr>
<td>EXMD 502</td>
<td>(3)</td>
<td>Advanced Endocrinology 01</td>
</tr>
<tr>
<td>EXMD 503</td>
<td>(3)</td>
<td>Advanced Endocrinology 02</td>
</tr>
<tr>
<td>PHAR 562</td>
<td>(3)</td>
<td>General Pharmacology 1</td>
</tr>
</tbody>
</table>
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

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

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

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

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

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

Program credit weight: 25 credits

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 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 Trottier Building, Room 2070) and the Minor Adviser in Computer Science.


12.10.5.1 **Computer Science Courses in Engineering Programs**
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 Programs, Courses and University Regulations > All Courses (available at [www.mcgill.ca/study](http://www.mcgill.ca/study)) for other courses offered by the School of Computer Sciences (subject code COMP).

**Computer Science Courses in Engineering Programs**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP 202</td>
<td>3</td>
<td>Foundations of Programming</td>
</tr>
<tr>
<td>COMP 206</td>
<td>3</td>
<td>Introduction to Software Systems</td>
</tr>
<tr>
<td>COMP 208</td>
<td>3</td>
<td>Computers in Engineering</td>
</tr>
<tr>
<td>COMP 250</td>
<td>3</td>
<td>Introduction to Computer Science</td>
</tr>
<tr>
<td>COMP 251</td>
<td>3</td>
<td>Algorithms and Data Structures</td>
</tr>
<tr>
<td>COMP 302</td>
<td>3</td>
<td>Programming Languages and Paradigms</td>
</tr>
<tr>
<td>COMP 360</td>
<td>3</td>
<td>Algorithm Design</td>
</tr>
<tr>
<td>COMP 421</td>
<td>3</td>
<td>Database Systems</td>
</tr>
</tbody>
</table>

12.10.5.2 **Bachelor of Engineering (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 Trottier 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 complementsaries, 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 Courses**
6 credits

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP 206</td>
<td>3</td>
<td>Introduction to Software Systems</td>
</tr>
<tr>
<td>COMP 250</td>
<td>3</td>
<td>Introduction to Computer Science</td>
</tr>
</tbody>
</table>

**Complementary Courses**
18 credits

3 credits from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP 302</td>
<td>3</td>
<td>Programming Languages and Paradigms</td>
</tr>
<tr>
<td>COMP 303</td>
<td>3</td>
<td>Software Development</td>
</tr>
</tbody>
</table>

3 credits from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP 273</td>
<td>3</td>
<td>Introduction to Computer Systems</td>
</tr>
<tr>
<td>ECSE 221</td>
<td>3</td>
<td>Introduction to Computer Engineering</td>
</tr>
</tbody>
</table>

3 credits from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP 350</td>
<td>3</td>
<td>Numerical Computing</td>
</tr>
<tr>
<td>MECH 309</td>
<td>3</td>
<td>Numerical Methods in Mechanical Engineering</td>
</tr>
</tbody>
</table>

0-3 credits from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP 251</td>
<td>3</td>
<td>Algorithms and Data Structures</td>
</tr>
</tbody>
</table>

6-9 credits chosen from other Computer Science courses at the 300 level or higher.

Notes:
A. COMP 208 may be taken before COMP 250; however, it cannot be taken for credit in the same term or afterward.
B. 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**

- CIWE 208 (3) Civil Engineering System Analysis
- CIWE 302 (3) Probabilistic Systems
- COMP 208 (3) Computers in Engineering
- FACC 300 (3) Engineering Economy

**Required Courses: Management and Law**

15 credits

- CIWE 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
- CIWE 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
- CIWE 446 (3) Construction Engineering
- CIWE 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 > Undergraduate > Academic Programs > Economics (available at www.mcgill.ca/study), unless they have obtained permission from the Faculty of Engineering.

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

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

Minor Adviser: Faculty Student Adviser in the McGill Engineering Student Centre (Student Affairs Office) (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, FACC 300, 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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECON 209*</td>
<td>(3)</td>
<td>Macroeconomic Analysis and Applications</td>
</tr>
<tr>
<td>ECON 230D1**</td>
<td>(3)</td>
<td>Microeconomic Theory</td>
</tr>
<tr>
<td>ECON 230D2**</td>
<td>(3)</td>
<td>Microeconomic Theory</td>
</tr>
</tbody>
</table>

* 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:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECON 225</td>
<td>(3)</td>
<td>Economics of the Environment</td>
</tr>
<tr>
<td>ECON 303</td>
<td>(3)</td>
<td>Canadian Economic Policy</td>
</tr>
<tr>
<td>ECON 305</td>
<td>(3)</td>
<td>Industrial Organization</td>
</tr>
<tr>
<td>ECON 308</td>
<td>(3)</td>
<td>Governmental Policy Towards Business</td>
</tr>
<tr>
<td>ECON 311</td>
<td>(3)</td>
<td>United States Economic Development</td>
</tr>
<tr>
<td>ECON 313</td>
<td>(3)</td>
<td>Economic Development 1</td>
</tr>
<tr>
<td>ECON 314</td>
<td>(3)</td>
<td>Economic Development 2</td>
</tr>
<tr>
<td>ECON 316</td>
<td>(3)</td>
<td>The Underground Economy</td>
</tr>
<tr>
<td>ECON 326</td>
<td>(3)</td>
<td>Ecological Economics</td>
</tr>
<tr>
<td>ECON 330D1</td>
<td>(3)</td>
<td>Macroeconomic Theory</td>
</tr>
<tr>
<td>ECON 330D2</td>
<td>(3)</td>
<td>Macroeconomic Theory</td>
</tr>
<tr>
<td>ECON 331</td>
<td>(3)</td>
<td>Economic Development: Russia and USSR</td>
</tr>
<tr>
<td>ECON 335</td>
<td>(3)</td>
<td>The Japanese Economy</td>
</tr>
<tr>
<td>ECON 337</td>
<td>(3)</td>
<td>Introductory Econometrics 1</td>
</tr>
<tr>
<td>ECON 344</td>
<td>(3)</td>
<td>Industrial Revolution and Economic Development</td>
</tr>
<tr>
<td>ECON 345</td>
<td>(3)</td>
<td>The International Economy since 1914</td>
</tr>
<tr>
<td>ECON 347</td>
<td>(3)</td>
<td>Economics of Climate Change</td>
</tr>
<tr>
<td>ECON 348</td>
<td>(3)</td>
<td>Urban Economics</td>
</tr>
<tr>
<td>ECON 405</td>
<td>(3)</td>
<td>Natural Resource Economics</td>
</tr>
</tbody>
</table>
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 > Undergraduate > : Minor in Environment.

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

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

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

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

12.10.9.1 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.
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 course (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
9 credits chosen from the Engineering Course List below, excluding CHEE 496.

### Engineering Course List

Courses offered at the Macdonald campus:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BREE 217*</td>
<td>(3)</td>
<td>Hydrology and Water Resources</td>
</tr>
<tr>
<td>BREE 322</td>
<td>(3)</td>
<td>Organic Waste Management</td>
</tr>
<tr>
<td>BREE 416</td>
<td>(3)</td>
<td>Engineering for Land Development</td>
</tr>
<tr>
<td>BREE 518</td>
<td>(3)</td>
<td>Bio-Treatment of Wastes</td>
</tr>
</tbody>
</table>

* Not open to students who have passed CIVE 323.

Courses offered at the Downtown campus:

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

** Not open to students who have passed BREE 217.
Non-Engineering Course List

Courses offered at the Macdonald campus:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>LSCI 230+</td>
<td>3</td>
<td>Introductory Microbiology</td>
</tr>
<tr>
<td>MICR 331+</td>
<td>3</td>
<td>Microbial Ecology</td>
</tr>
<tr>
<td>MICR 341</td>
<td>3</td>
<td>Mechanisms of Pathogenicity</td>
</tr>
<tr>
<td>RELG 270</td>
<td>3</td>
<td>Religious Ethics and the Environment</td>
</tr>
<tr>
<td>SOIL 210+</td>
<td>3</td>
<td>Principles of Soil Science</td>
</tr>
<tr>
<td>SOIL 331</td>
<td>3</td>
<td>Soil Physics</td>
</tr>
<tr>
<td>WILD 375</td>
<td>3</td>
<td>Issues: Environmental Sciences</td>
</tr>
<tr>
<td>WILD 415</td>
<td>2</td>
<td>Conservation Law</td>
</tr>
<tr>
<td>WOOD 420</td>
<td>3</td>
<td>Environmental Issues: Forestry</td>
</tr>
</tbody>
</table>

+ Not open to students who have passed CHEE 370.
++ Not part of the Minor for Agricultural Engineering students.

Courses offered at the Downtown campus:

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

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 McGill Engineering Student Centre (Student Affairs Office) (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.

Each Minor is comprised of 18 credits of courses available from the core program of the Desautels Faculty of Management (subject to timetable requirements). 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.

12.10.10.1 Minor Finance (For Non-Management Students) (18 credits)

The Minor Finance consists of 18 credits of Management courses and is offered to non-Management students in the Faculties of Arts, Engineering, and Science.

The Minor has been designed to provide students with an understanding of the key concepts in corporate finance as well as investment banking.

Required Courses (9 credits)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FINE 342</td>
<td>3</td>
<td>Finance 2</td>
</tr>
<tr>
<td>FINE 441</td>
<td>3</td>
<td>Investment Management</td>
</tr>
<tr>
<td>MGCR 341*</td>
<td>3</td>
<td>Finance 1</td>
</tr>
</tbody>
</table>

Complementary Courses (9 credits)

9 credits selected from:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FINE 442</td>
<td>3</td>
<td>Capital Markets and Institutions</td>
</tr>
<tr>
<td>FINE 443</td>
<td>3</td>
<td>Applied Corporate Finance</td>
</tr>
<tr>
<td>FINE 445</td>
<td>3</td>
<td>Real Estate Finance</td>
</tr>
<tr>
<td>FINE 448</td>
<td>3</td>
<td>Financial Derivatives</td>
</tr>
<tr>
<td>FINE 449</td>
<td>3</td>
<td>Market Risk Models</td>
</tr>
<tr>
<td>FINE 451</td>
<td>3</td>
<td>Fixed Income Analysis</td>
</tr>
<tr>
<td>FINE 480</td>
<td>3</td>
<td>Global Investments</td>
</tr>
<tr>
<td>FINE 482</td>
<td>3</td>
<td>International Finance 1</td>
</tr>
<tr>
<td>FINE 492</td>
<td>3</td>
<td>International Finance 2</td>
</tr>
<tr>
<td>FINE 541N1</td>
<td>1.5</td>
<td>Applied Investments</td>
</tr>
<tr>
<td>FINE 541N2</td>
<td>1.5</td>
<td>Applied Investments</td>
</tr>
<tr>
<td>FINE 547</td>
<td>3</td>
<td>Advanced Finance Seminar</td>
</tr>
</tbody>
</table>

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

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

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

12.10.10.2 Minor Management (For Non-Management Students) (18 credits)

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

This Minor is designed to provide non-management students with the opportunity to obtain basic knowledge in various aspects of management.

Complementary Courses (18 credits)

Selected from categories A, B, and C:

Category A
### Minor Marketing (For Non-Management Students) (18 credits)

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

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

#### Required Courses (9 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MGCR 352</td>
<td>Marketing Management 1</td>
</tr>
<tr>
<td>MRKT 354</td>
<td>Marketing Management 2</td>
</tr>
<tr>
<td>MRKT 451</td>
<td>Marketing Research</td>
</tr>
</tbody>
</table>

#### Complementary Courses (9 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MGCR 271*</td>
<td>Business Statistics</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRKT 357</td>
<td>Marketing Planning 1</td>
</tr>
<tr>
<td>MRKT 365</td>
<td>New Products</td>
</tr>
</tbody>
</table>

---

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

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

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

Note: Students should select their Statistics course only after consulting the "Course Overlap" section in the Faculty of Arts, the "Course Overlap" section in the Faculty of Science, and the "Course Overlap" section in the Desautels Faculty of Management to avoid overlapping Statistics courses.
Brand Management (3) MRKT 438
Consumer Behaviour (3) MRKT 452
Advertising Management (3) MRKT 453
Sales Management (3) MRKT 455
Retail Management (3) MRKT 459
International Marketing Management (3) MRKT 483

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

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

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

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

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

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

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

Required Courses (6 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MGCR 472</td>
<td>3</td>
<td>Operations Management</td>
</tr>
<tr>
<td>MGSC 373</td>
<td>3</td>
<td>Operations Research 1</td>
</tr>
</tbody>
</table>

Complementary Courses (12 credits)

3 credits selected from:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MGCR 271*</td>
<td>3</td>
<td>Business Statistics</td>
</tr>
</tbody>
</table>

9 credits selected from:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MGSC 372</td>
<td>3</td>
<td>Advanced Business Statistics</td>
</tr>
<tr>
<td>MGSC 402</td>
<td>3</td>
<td>Operations Strategy</td>
</tr>
<tr>
<td>MGSC 403</td>
<td>3</td>
<td>Introduction to Logistics Management</td>
</tr>
<tr>
<td>MGSC 405</td>
<td>3</td>
<td>Quality Management</td>
</tr>
<tr>
<td>MGSC 415</td>
<td>3</td>
<td>Supplier Management</td>
</tr>
<tr>
<td>MGSC 431</td>
<td>3</td>
<td>Operations Analysis</td>
</tr>
<tr>
<td>MGSC 479</td>
<td>3</td>
<td>Applied Optimization</td>
</tr>
<tr>
<td>MGSC 575</td>
<td>3</td>
<td>Applied Time Series Analysis Managerial Forecasting</td>
</tr>
<tr>
<td>MGSC 578</td>
<td>3</td>
<td>Simulation of Management Systems</td>
</tr>
</tbody>
</table>

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

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

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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEE 380*</td>
<td>(3)</td>
<td>Materials Science</td>
</tr>
<tr>
<td>CHEE 484</td>
<td>(3)</td>
<td>Materials Engineering</td>
</tr>
<tr>
<td>MIME 260*</td>
<td>(3)</td>
<td>Materials Science and Engineering</td>
</tr>
<tr>
<td>MIME 345</td>
<td>(3)</td>
<td>Applications of Polymers</td>
</tr>
<tr>
<td>MIME 465</td>
<td>(3)</td>
<td>Metallic and Ceramic Powders Processing</td>
</tr>
<tr>
<td>MIME 467</td>
<td>(3)</td>
<td>Electronic Properties of Materials</td>
</tr>
</tbody>
</table>

* Students choose either CHEE 380 or MIME 260.

Complementary Courses

9 credits from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECSE 545</td>
<td>(3)</td>
<td>Microelectronics Technology</td>
</tr>
<tr>
<td>MECH 530</td>
<td>(3)</td>
<td>Mechanics of Composite Materials</td>
</tr>
<tr>
<td>MIME 360</td>
<td>(3)</td>
<td>Phase Transformations: Solids</td>
</tr>
<tr>
<td>MIME 512</td>
<td>(3)</td>
<td>Corrosion and Degradation of Materials</td>
</tr>
<tr>
<td>MIME 560</td>
<td>(3)</td>
<td>Joining Processes</td>
</tr>
<tr>
<td>MIME 561</td>
<td>(3)</td>
<td>Advanced Materials Design</td>
</tr>
<tr>
<td>MIME 563</td>
<td>(3)</td>
<td>Hot Deformation of Metals</td>
</tr>
<tr>
<td>MIME 569</td>
<td>(3)</td>
<td>Electron Beam Analysis of Materials</td>
</tr>
</tbody>
</table>

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

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

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

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

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

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

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

The remaining credits may be chosen from mathematically-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 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 (3) Process Control
- CHEE 484 (3) Materials Engineering

### List E: Electrical Engineering
0-6 credits from the following:

- ECSE 404 (3) Control Systems
- ECSE 426 (3) Microprocessor Systems
- ECSE 436 (3) Signal Processing Hardware
- ECSE 451 (3) EM Transmission and Radiation
- ECSE 464 (3) Power Systems Analysis 1
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; 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. Further information on this program is also available on the Music Technology website at www.music.mcgill.ca/musictech/programmes_and_admissions.

Minor Adviser: Prof. Philippe Depalle (Area Chair for the Music Technology program); email: philippe.depalle@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

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 253</td>
<td>(3)</td>
<td>Thermal Physics</td>
</tr>
<tr>
<td>PHYS 357*</td>
<td>(3)</td>
<td>Honours Quantum Physics 1</td>
</tr>
<tr>
<td>PHYS 457*</td>
<td>(3)</td>
<td>Honours Quantum Physics 2</td>
</tr>
</tbody>
</table>

* 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:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 351</td>
<td>(3)</td>
<td>Honours Classical Mechanics 2</td>
</tr>
<tr>
<td>PHYS 362</td>
<td>(3)</td>
<td>Statistical Mechanics</td>
</tr>
<tr>
<td>PHYS 432</td>
<td>(3)</td>
<td>Physics of Fluids</td>
</tr>
<tr>
<td>PHYS 514</td>
<td>(3)</td>
<td>General Relativity</td>
</tr>
<tr>
<td>PHYS 551</td>
<td>(3)</td>
<td>Quantum Theory</td>
</tr>
<tr>
<td>PHYS 557</td>
<td>(3)</td>
<td>Nuclear Physics</td>
</tr>
<tr>
<td>PHYS 558</td>
<td>(3)</td>
<td>Solid State Physics</td>
</tr>
<tr>
<td>PHYS 559</td>
<td>(3)</td>
<td>Advanced Statistical Mechanics</td>
</tr>
<tr>
<td>PHYS 562</td>
<td>(3)</td>
<td>Electromagnetic Theory</td>
</tr>
<tr>
<td>PHYS 567</td>
<td>(3)</td>
<td>Particle Physics</td>
</tr>
</tbody>
</table>

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 McGill Engineering Student Centre (Student Affairs Office) (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 McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, 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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP 250</td>
<td>3</td>
<td>Introduction to Computer Science</td>
</tr>
<tr>
<td>ECSE 221</td>
<td>3</td>
<td>Introduction to Computer Engineering</td>
</tr>
<tr>
<td>ECSE 321</td>
<td>3</td>
<td>Introduction to Software Engineering</td>
</tr>
<tr>
<td>ECSE 428</td>
<td>3</td>
<td>Software Engineering Practice</td>
</tr>
</tbody>
</table>

Complementary Courses

12 credits from the following:

Engineering Courses

6-12 credits from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEE 571</td>
<td>3</td>
<td>Small Computer Applications: Chemical Engineering</td>
</tr>
<tr>
<td>CIVE 460</td>
<td>3</td>
<td>Matrix Structural Analysis</td>
</tr>
<tr>
<td>CIVE 550</td>
<td>3</td>
<td>Water Resources Management</td>
</tr>
<tr>
<td>CIVE 572</td>
<td>3</td>
<td>Computational Hydraulics</td>
</tr>
<tr>
<td>ECSE 322</td>
<td>3</td>
<td>Computer Engineering</td>
</tr>
<tr>
<td>ECSE 420</td>
<td>3</td>
<td>Parallel Computing</td>
</tr>
<tr>
<td>ECSE 421</td>
<td>3</td>
<td>Embedded Systems</td>
</tr>
<tr>
<td>ECSE 422</td>
<td>3</td>
<td>Fault Tolerant Computing</td>
</tr>
<tr>
<td>ECSE 424</td>
<td>3</td>
<td>Human-Computer Interaction</td>
</tr>
<tr>
<td>ECSE 427</td>
<td>3</td>
<td>Operating Systems</td>
</tr>
<tr>
<td>ECSE 429</td>
<td>3</td>
<td>Software Validation</td>
</tr>
<tr>
<td>ECSE 526</td>
<td>3</td>
<td>Artificial Intelligence</td>
</tr>
<tr>
<td>ECSE 532</td>
<td>3</td>
<td>Computer Graphics</td>
</tr>
<tr>
<td>MECH 524</td>
<td>3</td>
<td>Computer Integrated Manufacturing</td>
</tr>
<tr>
<td>MECH 539</td>
<td>3</td>
<td>Computational Aerodynamics</td>
</tr>
<tr>
<td>MECH 576</td>
<td>3</td>
<td>Geometry in Mechanics</td>
</tr>
</tbody>
</table>

Computer Science Courses

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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP 302</td>
<td>3</td>
<td>Programming Languages and Paradigms</td>
</tr>
<tr>
<td>COMP 421</td>
<td>3</td>
<td>Database Systems</td>
</tr>
<tr>
<td>COMP 424</td>
<td>3</td>
<td>Artificial Intelligence</td>
</tr>
<tr>
<td>COMP 527</td>
<td>3</td>
<td>Logic and Computation</td>
</tr>
</tbody>
</table>
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 McGill Engineering Student Centre (Student Affairs Office) (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 McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22).

This Minor is offered jointly by the Faculties of Engineering and Management. It will appeal to those students who 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 I
- MGCR 423 (3) Organizational Policy
- ORGB 321 (3) Leadership
- ORGB 423 (3) Human Resources Management