



**Faculty of Engineering, including Schools of  
Architecture and Urban Planning  
Programs, Courses and University Regulations  
2015-2016**



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

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- 1 About the Faculty of Engineering, page 9
- 2 History of the Faculty, page 9
- 3 Engineering Microcomputing Facility, page 10
- 4 Schulich Library of Science and Engineering, page 10
- 5 About the Faculty of Engineering (Undergraduate), page 10
  - 5.1 Location, page 11
  - 5.2 Administrative Officers, page 11
- 6 Degrees and Requirements for Professional Registration, page 12
- 7 Admission Requirements, page 13
- 8 Student Progress, page 13
- 9 Student Activities, page 13
- 10 Degrees and Programs Offered, page 13
- 11 Engineering Internship Program, page 14
  - 11.1 Student Eligibility, page 14
- 12 Academic Programs, page 15
  - 12.1 General Engineering Program, page 15
    - 12.1.1 Bachelor of Engineering (B.Eng.) - General Engineering - Undeclared (30 credits) , page 15
  - 12.2 School of Architecture, page 16
    - 12.2.1 Location, page 16
    - 12.2.2 About the School of Architecture, page 17
    - 12.2.3 Architectural Certification in Canada, page 17
    - 12.2.4 Programs of Study, page 17
      - 12.2.4.1 Student Exchanges, page 17
    - 12.2.5 Ancillary Academic Facilities, page 18
    - 12.2.6 Architecture Faculty, page 18
    - 12.2.7 Bachelor of Science (B.Sc.) (Architecture) - Architecture (126 credits) , page 19
  - 12.3 Department of Bioengineering, page 21
    - 12.3.1 Location,

- 12.5.1 Location, page 29
- 12.5.2 About the Department of Civil Engineering and Applied Mechanics, page 29
- 12.5.3 Academic Programs, page 29
- 12.5.4 Civil Engineering and Applied Mechanics F

- 12.9.1 Location, page 78
- 12.9.2 About the School of Urban Planning, page 78
- 12.9.3 Undergraduate Courses in Urban Planning, page 79
- 12.9.4 Urban Planning Faculty, page 79
- 12.10 Other Engineering Related Programs, page 80
  - 12.10.1 Bioresource Engineering, page 80
  - 12.10.2 Biomedical Engineering, page 80
- 12.11 Minor Programs, page 80
  - 12.11.1 Bachelor of Engineering (B.Eng.) - Minor Arts (24 credits) , page 81
  - 12.11.2 Bachelor of Engineering (B.Eng.) - Minor Biomedical Engineering (21 credits) , page 81
  - 12.11.3 Bachelor of Engineering (B.Eng.) - Minor Biotechnology (for Engineering Students) (24 credits) ,





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## 1 About the Faculty of Engineering

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

### Departments

Bioengineering

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### **3 Engineering Microcomputing Facility**

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

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 [Faculty of Engineering > Graduate](#).

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

- [section 1: About the Faculty of Engineering](#)
- [section 2: History of the Faculty](#)
- [section 3: Engineering Microcomputing Facility](#)
- [section 4: Schulich Library of Science and Engineering](#)
- [section 6: Degrees and Requirements for Professional Registration](#)
- [section 9: Student Activities](#)
- [section 11: Engineering Internship Program \(EIP\)](#)
- Undergraduate [Programs](#) and [Courses](#)
- [section 12.11: 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.

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## 5.1 Location

### Faculty of Engineering

Macdonald Engineering Building  
817 Sherbrooke Street West  
Montreal QC H3A 0C3  
Canada

Telephone: 514-398-7250

Faculty website: [www.mcgill.ca/engineering](http://www.mcgill.ca/engineering)

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

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

Telephone: 514-398-7257

McGill Engineering Student Centre website: [www.mcgill.ca/engineering/current-students/undergraduate/mesc](http://www.mcgill.ca/engineering/current-students/undergraduate/mesc)

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## 5.2 Administrative Officers

### Dean

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

### Associate Deans

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

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

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

Laurent Mydlarski; B.A.Sc.(Wat.), Ph.D.(Cornell), ing. (W-M.A.Sc., 1 408.6 209.3300 Tm(A55M.A.Sc., 1 399.638 327.(St09(A55M.A.Sc., 0 g/F11 0 0 1 362.569 177.28

**Department Chairs**

Dan V. Nicolau; B.Eng., M.Eng.(Polytechnic Univ. of Bucharest), M.S.(Acad. of Economic Studies at Bucharest), Ph.D.(Polytechnic Univ. of Bucharest) (*Bioengineering*)

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

**Director, School of Architecture**

Annamarie 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**

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

**Building Manager**

Kevin Hart (*Acting*)

**Human Resources**

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## 7 Admission Requirements

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

**Major Programs**

Mechanical Engineering (B.Eng.)

Software Engineering (B.S.E.)

**Honours Programs**

Electrical Engineering (B.Eng.)

Mechanical Engineering (B.Eng.)

**Minors**

Arts

Biomedical Engineering

Biotechnology

Chemistry

Computer Science

Construction Engineering and Management

Economics

Environment

Environmental Engineering

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

Materials Engineering

Mathematics

Mining Engineering

Musical Science and Technology

Physics

Software Engineering

Technological Entrepreneurship

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## 11 Engineering Internship Program

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

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

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

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### 11.1 Student Eligibility

To participate in the Engineering Internship Program, you must:

- have a CGPA of 2.00 or higher;
- be in good financial standing with the University;
- obtain approval from the Engineering Career Centre before registering for or starting your internship;

- be registered full-time in your program before and after your internship;
- remain a degree candidate while on internship;
- return to complete your undergraduate degree at McGill, with a minimum of 15 credits remaining in your program after your internship (i.e., you are not allowed to complete your degree during your internship).

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

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

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



**Important Information:**

- While on internship, you are expected to complete any deferrals you may have been granted, regardless of the location of the internship. If you do not write a deferred exam as scheduled, you will receive a final grade of J. The J grade will calculate as a failure in both 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).

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## 12 Academic Programs

The programs and courses in the following sections have been approved for the 2015–2016 session as listed, but the Faculty reserves the right to introduce changes as may be deemed necessary or desirable.

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### 12.1 General Engineering Program

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

The GEP is not open to students with more than 6 transfer credits toward their engineering major (e.g., transfer credits from Advanced Pan 6 tran 0 md Pan 1 247.908 488.7

Note: FA



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**

Founded in 1896, the School of

## 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

Blackader-Lauterman Library of Architecture and Art, located in the Redpath Library – Jennifer Garland, Liaison Librarian

### 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 Sijpkens

## 12.2.6 Architecture Faculty

### Director

Anmarie Adams; B.A.(McG.), M.Arch., Ph.D.(Calif., Berk.) (*Term ending Aug. 31, 2015*)

Martin Bressani; B.Arch.(McG.), M.Sc.(MIT), Ph.D.(Paris 1) (*Effective Sept. 1, 2015*)

### Graduate Program Directors

Martin Bressani (*Post-pr*)

**Assistant Professors**

David Ne





- . BIEN 320
- . BIEN 330
- . BIEN 340
- . BIEN 350
- . BIEN 462
- . BIEN 510
- . BIEN 520
- . BIEN 530
- . BIEN 550
- . BIEN 570

#### 12.3.4 Bioengineering Faculty

##### Chair

Dan V. Nicolau

##### Professors

Dan V. Nicolau; B.Eng., M.Eng. (Poly Univ. Bucharest), M.S. (Acad. Economic Studies, Bucharest), Ph.D. (Poly Bucharest)  
 Amine Kamen; Ph.D. (Mines Paris Tech), Ph.D. (cole Poly Montr.)

##### Associate Professor

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

##### Assistant Professors

Allen Ehrlicher; B.Sc., B.A. (Texas-Austin), M.Sc., Ph.D. (Leipzig)  
 Adam Hendricks; B.S., M.S. (Mg. Poly Inst. & State Uni.), Ph.D. (Mich.)  
 J. Matt Kinsella; B.Sc. (SXU, Chicago), M.S., Ph.D. (Purd.)  
 J. Poly



## Professors

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

Alejandro D. Rey; B.Ch.E.(CCNY), Ph.D.(Calif.), F



**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.

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

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

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

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

**Required Non-Departmental Courses**

24 credits

CHEM 212	(4)	Introductory Organic Chemistry 1
	(3)	Calcry 1
	(3)	
	(3)	Producties Measuranagemlus 1
	(4)	
	(3)	



- CHEE 593 or CIVE 430

List B

0-6 credits from the following:

BIEN 320	(3)	Molecular, Cellular and Tissue Biomechanics
BIEN 330	(3)	Introduction to Tissue Engineering
BIEN 340	(3)	Transport Processes in Biological Systems
BIEN 350	(3)	Biosystems and Control
BIEN 462	(3)	Engineering Principles in Physiological Systems
BIEN 510	(3)	Nanoparticles in the Medical Sciences
BIEN 520	(3)	High Throughput Bioanalytical Devices
BIEN 550	(3)	Biomolecular Devices
BIEN 570	(3)	Active Mechanics in Biology
BIOT 505*	(3)	Selected Topics in Biotechnology
BREE 325	(3)	Food Process Engineering
CHEE 363**	(2)	Projects Chemical Engineering 1
CHEE 494**	(3)	Research Project and Seminar 1
CHEE 495**	(4)	Research Project and Seminar 2
CHEE 496**	(3)	Environmental Research Project
CIVE 557	(3)	Microbiology for Environmental Engineering
MIME 470	(3)	Engineering Biomaterials
MIME 558	(3)	Engineering Nanomaterials

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

\*\* Students may choose only one project course: CHEE 363, CHEE 494, CHEE 495, or CHEE 496.

List C

0-3 credits

The remaining credits, up to a maximum of 3 credits, may be taken from other suitable undergraduate courses in the Faculty of Engineering, with departmental permission.

**Complementary Studies**

6 credits (9 credits for students from Quebec CEGEPs)

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

3 credits from the following:

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

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

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

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

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

Anthropology (ANTH)

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

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

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

Religious Studies (RELG)

School of Social Work (SWRK)

Sociology (excluding SOCI 350)

OR 3 credits from 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 6 credits of courses at the 100 level or higher in that language. A maximum of 3 credits of language courses will be counted toward the Complementary Studies requirement.

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

**Revision, July 2015. End of revision.**

### 12.4.6.1 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 12.11.9: Bachelor of Engineering \(B.Eng.\) - Minor Environmental Engineering \(21 credits\)](#).

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 12.11.3: Bachelor of Engineering \(B.Eng.\) - Minor Biotechnology \(for Engineering Students\) \(24 credits\)](#).



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

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## 12.5 Department of Civil Engineering and Applied Mechanics

### 12.5.1 Location

Macdonald Engineering Building, Room 492  
817 Sherbrooke Street West  
Montreal QC H3A 0C3

Telephone: 514-398-6860

Fax: 514-398-7361

Email: [ugradinfo.civil@mcgill.ca](mailto:ugradinfo.civil@mcgill.ca)

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

### 12.5.2 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, rehabilitation, and sustainability. Examples include buildings; bridges; roads; railways; dams; facilities for water supply and treatment; w

- Environmental Engineering;
- Geotechnical and Geoenvironmental Engineering;
- Water Resources and Hydraulic Engineering;
- Structural Engineering;
- 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



MATH 262	(3)	Intermediate Calculus
MATH 263	(3)	Ordinary Differential Equations for Engineers
MATH 264	(3)	Advanced Calculus for Engineers
MECH 261	(2)	Measurement Laboratory
MECH 289	(3)	Design Graphics

\* 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
	(3)	Matrix Structural Analysis

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 6 credits of courses 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 Electrical and Computer Engineering

### 12.6.1 Location

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

Telephone: 514-398-3943  
Fax: 514-398-4653  
Email: [reception.ece@mcgill.ca](mailto:reception.ece@mcgill.ca)  
Website: [www.mcgill.ca/ece](http://www.mcgill.ca/ece)

### 12.6.2 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
- Software Engineering

All programs provide students with a strong background in mathematics, natural 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.

### 12.6.3 Electrical and Computer Engineering Faculty

#### Chair

Andrew G. Kirk

#### Associate Chair, Academic

Roni Khazaka

#### Associate Chair, Undergraduate Studies

Jonathan P. Webb

#### Associate Chair, Graduate Programs

Milica Popovich

#### Emeritus Professors

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

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

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

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

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

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

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

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

## Emeritus Professors

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

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

## Professors

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

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

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

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

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

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

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

Harry Leib; B.Sc.(Technion), Ph.D.(Tor.) (*on sabbatical 2015–2016*)

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

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

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

Da



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

\* Students with prior programming experience can replace COMP 202 with COMP 250 upon receiving permission from the department.

\*\* 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 415	(3)	Intro to Computer Vision
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 463	(3)	Electric Power Generation
ECSE 464	(3)	Power Systems Analysis
ECSE 465	(3)	Power Electronic Systems
ECSE 466*	(3)	Réseaux de distribution
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





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 6 credits of courses 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, 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

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

### Technical Complementaries and Laboratories (15 credits)

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

#### Required Courses

9 credits

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

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:

ECSE 404	(3)	Control Systems
ECSE 460*	(3)	Appareillage électrique (Electrical Power Equipment)
ECSE 463	(3)	Electric Power Generation
ECSE 466*	(3)	Réseaux de distribution
ECSE 467*	(3)	Comportement des réseaux électriques
ECSE 468*	(3)	Electricité industrielle (Industrial Power Systems)
ECSE 469*	(3)	Protection des réseaux électriques

\* Courses taught in French.

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

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

Program credit weight: 138-139 credits

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

#### Entry into the Electrical Engineering Honours Program

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

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

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

#### Required Year 0 (Freshman) Courses (29 credits)

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

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

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

CHEM 110	(4)	General Chemistry 1
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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

\* Students with prior programming experience can replace COMP 202 with COMP 250 upon receiving permission from the department.

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

### Required Electrical Engineering Courses

57 credits

Electric Circuits 1

ECSE 352	(3)	Electromagnetic Waves
ECSE 361	(3)	Power Engineering
ECSE 434	(2)	Microelectronics Laboratory
ECSE 498	(3)	Honours Thesis 1
ECSE 499	(3)	Honours Thesis 2
ECSE 543	(3)	Numerical Methods in Electrical Engineering

### Complementary Courses

17-18 credits

#### Technical Complementaries

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

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

#### Laboratory Complementaries

2-3 credits from the following:

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

### Complementary Studies

6 credits

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

3 credits from the following:

ANTH 212	(3)	Anthropology of Development
BTEC 502	(3)	Biotechnology Ethics and Society
CIVE 469	(3)	Infrastructure and Society
ECON 225	(3)	Economics of the Environment
ECON 347	(3)	Economics of Climate Change

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

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

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

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

Anthropology (ANTH)

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

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

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

Religious Studies (RELG)

School of Social Work (SWRK)

Sociology (excluding SOCI 350)

OR one of the following:

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

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

### **Language Courses**

If you are not proficient in a certain language, no more than 3 credits will be given for 6 credits of courses 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

\* Students with prior programming experience can replace COMP 202 with an additional technical complementary upon receiving permission from the department.

\*\* 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

#### Natural 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





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
	(3)	Sociology of Work and Industry

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

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

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

### Required Year 0 (Freshman) Courses

29 credits

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

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

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

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

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

### Required Courses

76 credits

COMP 202*	(3)	Foundations of Programming
COMP 206	(3)	Introduction to Software Systems
COMP 250	(3)	Introduction to Computer Science
COMP 251	(3)	Algorithms and Data Structures
COMP 302	(3)	Programming Languages and Paradigms
COMP 360	(3)	Algorithm Design
COMP 421	(3)	Database Systems
ECSE 211	(3)	Design Principles and Methods
ECSE 221	(3)	Introduction to Computer Engineering
ECSE 321	(3)	Introduction to Software Engineering
ECSE 322	(3)	Computer Engineering
ECSE 323	(5)	Digital System Design
ECSE 414	(3)	Introduction to Telecommunication Networks
ECSE 420	(3)	Parallel Computing
ECSE 427	(3)	Operating Systems
ECSE 428	(3)	Software Engineering Practice
ECSE 429	(3)	Software Validation
ECSE 456	(3)	ECSE Design Project 1
ECSE 457	(3)	ECSE Design Project 2
FACC 100**	(1)	Introduction to the Engineering Profession

FACC 400	(1)	Engineering Professional Practice
MATH 262	(3)	Intermediate Calculus
MATH 263	(3)	Ordinary Differential Equations for Engineers
MATH 264	(3)	Advanced Calculus for Engineers
MATH 270	(3)	Applied Linear Algebra
MATH 363	(3)	Discrete Mathematics

\* Students with prior programming experience can replace COMP 202 with an additional technical complementary course upon receiving permission from the department.

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

**Engineering Breadth Required Courses**

20 credits

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

**Complementary Courses**

12-19 credits

**Natural 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)

Biological Sciences (BIO) (E04-101, E04-102, E04-103, E04-104, E04-105, E04-106, E04-107, E04-108, E04-109, E04-110, E04-111, E04-112, E04-113, E04-114, E04-115, E04-116, E04-117, E04-118, E04-119, E04-120, E04-121, E04-122, E04-123, E04-124, E04-125, E04-126, E04-127, E04-128, E04-129, E04-130, E04-131, E04-132, E04-133, E04-134, E04-135, E04-136, E04-137, E04-138, E04-139, E04-140, E04-141, E04-142, E04-143, E04-144, E04-145, E04-146, E04-147, E04-148, E04-149, E04-150, E04-151, E04-152, E04-153, E04-154, E04-155, E04-156, E04-157, E04-158, E04-159, E04-160, E04-161, E04-162, E04-163, E04-164, E04-165, E04-166, E04-167, E04-168, E04-169, E04-170, E04-171, E04-172, E04-173, E04-174, E04-175, E04-176, E04-177, E04-178, E04-179, E04-180, E04-181, E04-182, E04-183, E04-184, E04-185, E04-186, E04-187, E04-188, E04-189, E04-190, E04-191, E04-192, E04-193, E04-194, E04-195, E04-196, E04-197, E04-198, E04-199, E04-200)

COMP 566	(3)	Discrete Optimization 1
COMP 575	(3)	Fundamentals of Distributed Algorithms
ECSE 404	(3)	Control Systems
ECSE 411	(3)	Communications Systems 1
ECSE 412	(3)	Discrete Time Signal Processing
ECSE 413	(3)	Communications Systems 2
ECSE 415	(3)	Intro to Computer Vision
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 539	(3)	Software Language Engineering
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 6 credits of courses 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 Department of Mechanical Engineering

### 12.7.1 Location

Macdonald Engineering Building, Room 270  
817 Sherbrooke Street West  
Montreal QC H3A 0C3

Telephone: 514-398-6296

Fax: 514-398-7365

Email: [ugrad.mecheng@mcgill.ca](mailto:ugrad.mecheng@mcgill.ca)

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

### 12.7.2 About the Department of Mechanical Engineering

Mechanical engineers are involved in the conception, design, implementation, and operation of mechanical systems. Typical application areas include aerospace, energy, manufacturing, machinery, and transportation. Because of the very broad nature of the discipline, there is 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, are organized frequently.



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

### 12.7.3 Mechanical Engineering Faculty

#### Chair

Luc Mongeau

#### Associate Chair (Academic Affairs)

David L. Frost

#### Associate Chair (Undergraduate Student Affairs)

Tim Lee

#### Associate Chair (Graduate Student Affairs)

Meyer Nahon

#### Graduate Aerospace Director

Mathias Legrand

#### Emeritus Professors

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

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

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

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

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

#### Post-Retirement

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.Sc.(Ancona), Ph.D.(Bologna), F.A.S.M.E. (*Canada Research Chair*)

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

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

Wagdi G. Habashi; B.Eng., M.Eng.(McG.), Ph.D.(Cornell), ing., F.A.S.M.E., F.A.I.A.A., F.C.A.E., F.R.S.C. (*NSERC; Lockheed Martin; Bell Helicopter Industrial Research Chair*)

Pascal Hubert; B.Eng., M.A.Sc.(École Poly., Montr.), Ph.D.(Br. Col.), ing. (*Warner Graupe Professor*)

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

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

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

Luc Mongeau; B.Sc., M.Sc.(École Poly., Montr.), Ph.D.(Penn St.), ing. (*Canada Research Chair*)

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

I. Sharf; B.A.Sc., Ph.D.(Tor.)

## Associate Professors

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

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

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

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

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

Michael Kokkolaras; Dipl.Ing.(TUM), Ph.D.(Rice)

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

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

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





MATH 264	(3)	Advanced Calculus for Engineers
MATH 271	(3)	Linear Algebra and Partial Differential Equations
MIME 260	(3)	Materials Science and Engineering

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

### Required Mechanical Engineering Courses

65 credits

MECH 201	(2)	Introduction to Mechanical Engineering
MECH 210	(2)	Mechanics 1
MECH 220	(4)	Mechanics 2
MECH 240	(3)	Thermodynamics 1
MECH 262	(3)	Statistics and Measurement Laboratory
MECH 290	(3)	Design Graphics for Mechanical Engineering
MECH 292	(3)	Design 1: Conceptual Design
MECH 309	(3)	Numerical Methods in Mechanical Engineering
MECH 314	(3)	Dynamics of Mechanisms
MECH 315	(4)	Mechanics 3
MECH 321	(3)	Mechanics of Deformable Solids
MECH 331	(3)	Fluid Mechanics 1
MECH 341	(3)	Thermodynamics 2
MECH 346	(3)	Heat Transfer
MECH 360	(3)	Principles of Manufacturing
MECH 362	(2)	Mechanical Laboratory 1
MECH 383	(3)	Applied Electronics and Instrumentation
MECH 393	(3)	Design 2: Machine Element Design
MECH 412	(3)	System Dynamics and Control
MECH 430	(3)	Fluid Mechanics 2
MECH 463D1	(3)	Design 3: Mechanical Engineering Project
MECH 463D2	(3)	Design 3: Mechanical Engineering Project

### 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



History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

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

Program credit weight: 142-148 credits

Program credit weight for Quebec CEGEP students: 119 credits

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

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

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

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

### Required Year 0 (Freshman) Courses

29 credits

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

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

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

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

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

### Required Non-Departmental Courses

27 credits

CCOM 206	(3)	Communication in Engineering
CIVE 207	(4)	Solid Mechanics
COMP 208	(3)	Computers in Engineering
FA(3)	(1)	Introduction to the Engineering Profession



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	()	

\*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 Society

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 6 credits of courses 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





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

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

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

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

Total concentration credit weight: 15-16 credits

**Required Courses**

6 credits

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

**Complementary Courses**

9-10 credits from the following:

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



MECH 573 (3) Mechanics of Robotic Systems

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

**\*\*Not offered until further notice\*\***

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

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

#### Required Courses

12 credits

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

#### Complementary Courses

6 credits from the following:

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

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## 12.8 Department of Mining and Materials Engineering

### 12.8.1 Location

#### General Office:

Wong Building, Room 2140  
3610 University Street  
Montreal QC H3A 0C5

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

#### Materials:

Wong Building, Room 2140  
3610 University Street  
Montreal QC H3A 0C5  
Telephone: 514-398-1040  
Fax: 514-398-4492

Email: [coordinator.minmat@mcgill.ca](mailto:coordinator.minmat@mcgill.ca)

#### Mining:

Frank Dawson Adams Building, Room 125  
3450 University Street  
Montreal QC H3A 0E8  
Telephone: 514-398-2215  
Fax: 514-398-7099

Email: [admin.mining@mcgill.ca](mailto:admin.mining@mcgill.ca)

## About the Department of Mining and Materials Engineering



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.

#### 12.8.4.2 Student Advising

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

For more information, please refer to the [Academic Advising](#) section of our website.

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

Program credit weight: 148 credits

Program credit weight for Quebec CEGEP students: 119 credits

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

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

#### Required Year 0 (Freshman) Courses

29 credits

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

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

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

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

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

#### Required Non-Departmental Courses

33 credits

CCOM 206	(3)	Communication in Engineering
CHEM 233	(3)	Topics in Physical Chemistry
CIVE 205	(3)	Statics
CIVE 207	(4)	Solid Mechanics
COMP 208	(3)	Computers in Engineering
FACC 100*	(1)	Introduction to the Engineering Profession
FACC 300	(3)	Engineering Economy
FACC 400	(1)	Engineering Professional Practice
MATH 262	(3)	Intermediate Calculus
MATH 263	(3)	Ordinary Differential Equations for Engineers
MATH 264	(3)	Advanced Calculus for Engineers
MECH 289	(3)	Design Graphics

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

**Required Materials Engineering Courses**

71 credits

ECSE 461	(3)	Electric Machinery
MIME 209	(3)	Mathematical Applications
MIME 212	(3)	Engineering Thermodynamics
MIME 250	(3)	Introduction to Extractive Metallurgy
MIME 261	(3)	Structure of Materials
MIME 280	(2)	Industrial Training 1
MIME 311	(3)	Modelling and Automatic Control
MIME 317	(3)	Analytical and Characterization Techniques
MIME 341	(3)	Introduction to Mineral Processing
MIME 345	(3)	Applications of Polymers
MIME 350	(3)	Extractive Metallurgical Engineering
MIME 352	(3)	Hydrochemical Processing
MIME 356	(4)	Heat, Mass and Fluid Flow
MIME 360	(3)	Phase Transformations: Solids
MIME 362	(3)	Mechanical Properties
MIME 380	(2)	Industrial Training 2
MIME 442	(3)	Analysis, Modelling and Optimization in Mineral Processing
MIME 452	(4)	Process and Materials Design
MIME 455	(3)	Advanced Process Engineering
MIME 456	(3)	Steelmaking and Steel Processing
MIME 465	(3)	Metallic and Ceramic Powders Processing
MIME 467	(3)	Electronic Properties of Materials
MIME 473	(3)	Introduction to Computational Materials Design
MIME 480	(2)	Industrial Training 3

**Complementary Courses**

15 credits

**Technical Complementaries**

9 credits

6-9 credits from the following:

CHEE 515*	(3)	Material Surfaces: A Biomimetic Approach
CIVE 512	(3)	Advanced Civil Engineering Materials
MECH 530	(3)	Mechanics of Composite Materials
MIME 410	(3)	Research Project
MIME 470	(3)	Engineering Biomaterials
MIME 512	(3)	Corrosion and Degradation of Materials
MIME 515*	(3)	Material Surfaces: A Biomimetic Approach
MIME 526	(3)	Mineral Economics
MIME 542	(3)	Transmission Electron Microscopy
MIME 544	(3)	Analysis: Mineral Processing Systems 1

MIME 545	(3)	Analysis: Mineral Processing Systems 2
MIME 551	(3)	Electrochemical Processing
MIME 556	(3)	Sustainable Materials Processing
MIME 558	(3)	Engineering Nanomaterials
MIME 559	(3)	Aluminum Physical Metallurgy





Students must register for each work term:

- MIME 290
- MIME 291
- MIME 392

and pay associated fees by the Course Change (add/drop) registration deadline. Before registering for any work term course, students must contact the Mining Co-op Liaison Officer for approval.

### 12.8.5.2 Student Advising

Students entering this program must plan their schedule of studies in consultation with one of the departmental advisers: Professor Mustafa Kumral or Professor Agus Sasmito.

For more information, please refer to the [Academic Advising](#) section of our website.

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

**Revision, April 2015. Start of revision.**

Program credit weight: 150-152 credits

Program credit weight for Quebec CEGEP students: 121-123 credits

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

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

### Required Year 0 (Freshman) Courses

29 credits

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

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

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

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

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

### Required Non-Departmental Courses

34 credits

CCOM 206	(3)	Communication in Engineering
CIVE 205	(3)	Statics
CIVE 207	(4)	Solid Mechanics
COMP 208	(3)	Computers in Engineering
EPSC 221	(3)	General Geology
EPSC 225	(1)	Properties of Minerals
FACC 100*	(1)	Introduction to the Engineering Profession Engineering 3A

FACC 400	(1)	Engineering Professional Practice
MATH 262	(3)	Intermediate Calculus
MATH 263	(3)	Ordinary Differential Equations for Engineers
MATH 264	(3)	Advanced Calculus for Engineers
MECH 289	(3)	Design Graphics

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

### Required Mining Engineering Courses

59 credits

ECSE 461	(3)	Electric Machinery
MIME 200	(3)	Introduction to the Minerals Industry
MIME 203	(2)	Mine Surveying
MIME 209	(3)	Mathematical Applications
MIME 260	(3)	Materials Science and Engineering
MIME 290	(2)	Industrial Work Period 1
MIME 291	(2)	Industrial Work Period 2
MIME 322	(3)	Rock Fragmentation
MIME 323	(3)	Rock and Soil Mass Characterization
MIME 325	(3)	Mineral Industry Economics
MIME 333	(3)	Materials Handling
MIME 340	(3)	Applied Fluid Dynamics
MIME 341	(3)	Introduction to Mineral Processing
MIME 392	(2)	Industrial Work Period 3
MIME 413	(3)	Strategic Mine Planning With Uncertainty
MIME 419	(3)	Surface Mining
MIME 422	(3)	Mine Ventilation
MIME 425	(3)	Applied Stochastic Orebody Modelling
MIME 426	(6)	Mine Design and Feasibility Study Project
MPMC 328*	(3)	Environnement et gestion des rejets miniers

\* Mining courses taken at École Polytechnique

### Complementary Courses

28-30 credits

14-15 credits from either Stream A or Stream B

### Stream A - CEGEP Students

14 credits

CEGEP students must take the following courses:

MPMC 321*	(3)	Mécanique des roches et contrôle des terrains
MPMC 326*	(3)	Recherche opérationnelle I
MPMC 329*	(2)	Géologie minière
MPMC 330*	(3)	Géotechnique minière
MPMC 421*	(3)	Exploitation en souterrain

\* Mining courses taken at École Polytechnique

**Stream B - Non-CEGEP Students**

15 credits

Non-CEGEP students must take the following courses:

CIVE 208	(3)	Civil Engineering System Analysis
CIVE 311	(4)	Geotechnical Mechanics
MIME 329	(2)	Mining Geology
MIME 421	(3)	Rock Mechanics
MIME 424	(3)	Underground Mining Methods

**Technical Complementaries**

8-9 credits

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

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

CFIN 410	(3)	Investment and Portfolio Management
CIVE 416	(3)	Geotechnical Engineering
CIVE 421	(3)	Municipal Systems
CIVE 514	(3)	Structural Mechanics
CIVE 584	(3)	Groundwater Engineering
EPSC 320	(3)	Elementary Earth Physics
EPSC 549	(3)	Hydrogeology
FINE 482	(3)	International Finance 1
MIME 320	(3)	Extraction of Energy Resources
MIME 442	(3)	Analysis, Modelling and Optimization in Mineral Processing
MIME 484	(3)	Mining Project
MIME 494	(2)	Industrial Work Period 4
MIME 520	(3)	Stability of Rock Slopes
MIME 527	(3)	Selected Topics in Mineral Resource Engineering
MIME 544	(3)	Analysis: Mineral Processing Systems 1
MIME 545	(3)	Analysis: Mineral Processing Systems 2
MIME 588	(3)	Reliability Analysis of Mining Systems
MPMC 320*	(3)	CAO et informatique pour les mines

\* Mining course taken at École Polytechnique

**Complementary Studies**

6 credits

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

3 credits from the following:

ANTH 212	(3)	Anthropology of Development
BTEC 502	(3)	Biotechnology Ethics and Society
CIVE 469	(3)	Infrastructure and Society



## Language Courses

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

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

**Revision, April 2015. End of revision.**

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## 12.9 School of Urban Planning

### 12.9.1 Location

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

Telephone: 514-398-4075

Fax: 514-398-8376

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

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

### 12.9.2 About the School of Urban Planning

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

Modern urban planning developed into a profession largely as a response to the appalling sanitary, social, and economic conditions of rapidly developing industrial cities. Initially, the disciplines of architecture, landscape architecture, civil engineering, and public health provided the nucleus of concerned professionals; beautification schemes and infrastructure works marked the early stages of public intervention in the 19th century. Architects, engineers, and public health specialists were joined by economists, sociologists, lawyers, and geographers as the complexities of the city's problems came to be more fully understood and public pressure mounted for their solution. Contemporary urban and regional planning techniques for survey, analysis, design, and implementation developed from an interdisciplinary synthesis of these various fields. This multidisciplinary nature 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* (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](#), as well as *Faculties & Schools* > *Faculty of Engineering* > *Graduate* > *Academic Programs* > *Urban Planning*.

Although the M.U.P. program is primarily a professional degree program, it has a very important research component.







Students considering this Minor should contact the Minor Advisers listed abo

BMDE 505	(3)	Cell and Tissue Engineering
BMDE 508	(3)	Introduction to Micro and Nano-Bioengineering
CHEE 380	(3)	Materials Science
ECSE 424	(3)	Human-Computer Interaction
MECH 553	(3)	Design and Manufacture of Microdevices
MIME 360	(3)	Phase Transformations: Solids
MIME 362	(3)	Mechanical Properties
MIME 470	(3)	Engineering Biomaterials
PHYS 534	(3)	Nanoscience and Nanotechnology

### **Biomechanics and Prosthetics**

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

\* Students choose either CHEE 563 or MECH 563.

### **Medical Physics and Imaging**

BMDE 519	(3)	Biomedical Signals and Systems
COMP 302	(3)	Programming Languages and Paradigms
COMP 360	(3)	Algorithm Design
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 517	(3)	Neural Prosthetic Systems
ECSE 526	(3)	Artificial Intelligence
PHYS 413	(3)	Physical Basis of Physiology

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## 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.

### 12.11.3 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

BIOT 505	(3)	Selected Topics in Biotechnology
CHEE 200	(3)	Chemical Engineering Principles 1
CHEE 204	(3)	Chemical Engineering Principles 2
CHEE 474	(3)	Biochemical Engineering

OR

#### Alternative Required Courses (for Chemical Engineering students)

A Chemical Engineering student may complete the Biotechnology Minor by taking the courses below plus one course from the list of complementary courses, not including FACC 300.

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

#### Complementary Courses

12 credits selected from courses outside the Department of the student's major program and/or from the lists below. If courses are chosen from the lists below, at least three courses must be taken from one area of concentration as grouped.

##### Biomedicine

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

##### Chemistry

CHEM 482	(0)	
CHEM 502	(3)	Advanced Bio-Organic Chemistry

CHEM 552 (3) Physical Organic Chemistry

### General

FACC 300 (3) Engineering Economy

### Immunology

ANAT 261 (4) Introduction to Dynamic Histology

BIOC 503 (3) Immunochemistry

MIMM 214 (3) Introductory Immunology: Elements of Immunity

MIMM 414 (3) Advanced Immunology

PHGY 513 (3) Cellular Immunology

### Management

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

ECON 208 (3) Microeconomic Analysis and Applications

MGCR 211 (3) Introduction to Financial Accounting

MGCR 341 (3) Introduction to Finance

MGCR 352 (3) Marketing Management 1

MGCR 472 (3) Operations Management

### Microbiology

MIMM 323 (3) Microbial Physiology

MIMM 324 (3) Fundamental Virology

MIMM 413 (3) Parasitology

MIMM 465 (3) Bacterial Pathogenesis

MIMM 466 (3) Viral Pathogenesis

### Molecular Biology (Biology)

BIOL 300 (3) Molecular Biology of the Gene

BIOL 314 (3) Molecular Biology of Oncogenes

BIOL 520 (3) Gene Activity in Development

BIOL 524 (3) Topics in Molecular Biology

BIOL 551 (3) Principles of Cellular Control

### Molecular Biology (Biochemistry)

BIOC 311 (3) Metabolic Biochemistry

BIOC 312 (3) Biochemistry of Macromolecules

BIOC 450 (3) Protein Structure and Function

BIOC 454 (3) Nucleic Acids

PSYT 455 (3) Neurochemistry

**Physiology**

EXMD 401	(3)	Physiology and Biochemistry Endocrine Systems
EXMD 502	(3)	Advanced Endocrinology 01
EXMD 503	(3)	Advanced Endocrinology 02

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 482	(0)	

**Physical Chemistry**

CHEM 345	(3)	Introduction to Quantum Chemistry
CHEM 355	(3)	Molecular Properties and Structure 2
CHEM 493*	(2)	Advanced Physical Chemistry Laboratory
CHEM 574	(3)	Introductory Polymer Chemistry

**12.11.5 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.

Students interested in this Minor should contact:

Liette Chin  
Undergraduate Program Coordinator  
School of Computer Science  
Lorne Trottier Building, Room 2070  
Telephone: 514-398-7071, ext. 00118  
Email: [liette.chin@mcgill.ca](mailto:liette.chin@mcgill.ca)

and the Minor Adviser in the *School of Computer Science*.

**12.11.5.1 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.

Search under *All Courses* for other courses offered by the School of Computer Sciences (subject code COMP).

**Computer Science Courses in Engineering Programs**

COMP 202	(3)	Foundations of Programming
COMP 206	(3)	Introduction to Software Systems
COMP 208	(3)	Computers in Engineering
COMP 250	(3)	Introduction to Computer Science
COMP 251	(3)	Algorithms and Data Structures
COMP 302	(3)	Programming Languages and Paradigms
COMP 360	(3)	Algorithm Design
COMP 421	(3)	Database Systems

**12.11.5.2 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 2060) 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 Minor in Computer Science as part of their B.Eng., B.S.E., or B.Sc.(Arch.) degree by completing the 24 credits of courses passed with a grade of C or better. In general, some complementary courses within B.Eng. and B.S.E. programs may be used to satisfy some of these requirements, but the Minor will require at least 12 extra credits from Computer Science (COMP) courses beyond those needed for the B.Eng. or B.S.E. degree. Students should consult their departments about the use of complementaries, and credits that can be double counted.

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

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

### Required Courses

6 credits

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

### Complementary Courses

18 credits

3 credits from the following:

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

3 credits from the following:

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

3-4 credits from the following:

CIVE 320	(4)	Numerical Methods
COMP 350	(3)	Numerical Computing
ECSE 443	(3)	Introduction to Numerical Methods in Electrical Engineering
MATH 317	(3)	Numerical Analysis
MECH 309	(3)	Numerical Methods in Mechanical Engineering

0-3 credits from the following:

COMP 251	(3)	Algorithms and Data Structures
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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.



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

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

Minor program credit weight: 24-25 credits

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

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

**Prerequisites**

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

**Required Courses: Management and Law**

15 credits

CIVE 324	(3)	Sustainable Project Management
FACC 220	(3)	Law for Architects and Engineers
INDR 294	(3)	Introduction to Labour-Management Relations
MGCR 211	(3)	Introduction to Financial Accounting
MGCR 341	(3)	Introduction to Finance

**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	(0)	
CIVE 492	(2)	Structures

OR

List B - Heavy Construction

3 credits from the following:

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

**Construction-Related Complementary Courses**

6 credits from the following:

BUSA 462	(3)	Management of New Enterprises
CIVE 446	(3)	Construction Engineering
CIVE 527	(3)	Renovation and Preservation: Infrastructure
ECSE 461	(3)	Electric Machinery
FINE 445	(3)	Real Estate Finance

MIME 520	(3)	Stability of Rock Slopes
MIME 521	(3)	Stability of Underground Openings
MPMC 321*	(3)	Mécanique des roches et contrôle des terrains

\* Course offered in French at École Polytechnique in Montreal

### 12.11.7 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 eCalendar, unless they have obtained permission from the Faculty of Engineering.

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

#### Required Courses

9 credits

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

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

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

#### Complementary Courses

9 credits from:

ECON 225	(3)	Economics of the Environment
ECON 303	(3)	Canadian Economic Policy
ECON 304	(3)	Financial Instruments & Institutions
ECON 305	(3)	Industrial Organization
ECON 306	(3)	Labour Markets and Wages
ECON 308	(3)	Governmental Policy Towards Business
ECON 313	(3)	Economic Development 1
ECON 314	(3)	Economic Development 2
ECON 316	(3)	The Underground Economy
ECON 326	(3)	Ecological Economics
ECON 330D1	(3)	Macroeconomic Theory
ECON 330D2	(3)	Macroeconomic Theory
ECON 335	(3)	The Japanese Economy
ECON 336	(3)	The Chinese Economy
ECON 337	(3)	Introductory Econometrics 1
ECON 344	(3)	Industrial Revolution and Economic Development
ECON 345	(3)	The International Economy since 1914
ECON 347	(3)	Economics of Climate Change
ECON 405	(3)	Natural Resource Economics



**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

AND

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

**Engineering Course List**

Courses offered at the Macdonald campus:

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

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

Courses offered at the Downtown campus:

ARCH 377	(3)	Energy, Environment and Buildings
	(3)	Sustainable Design



**12.11.10.1 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)**

FINE 342	(3)	Corporate Finance
FINE 441	(3)	Investment Management
MGCR 341*	(3)	Introduction to Finance

**Complementary Courses (9 credits)**

9 credits selected from:

FINE 442	(3)	Capital Markets and Institutions
FINE 443	(3)	Applied Corporate Finance
FINE 445	(3)	Real Estate Finance
FINE 448	(3)	Financial Derivatives
FINE 449	(3)	Market Risk Models
FINE 451	(3)	Fixed Income Analysis
FINE 480	(3)	Global Investments
FINE 482	(3)	International Finance 1
FINE 492	(3)	International Finance 2
FINE 541N1	(1.5)	Applied Investments
FINE 541N2	(1.5)	Applied Investments
FINE 547	(3)	Advanced Finance Seminar

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.

**12.11.10.2 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**

3 credits selected from:

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

**Category B**

9 credits selected from:

MGCR 222	(3)	Introduction to Organizational Behaviour
MGCR 271**	(3)	Business Statistics
MGCR 293***	(3)	Managerial Economics
MGCR 331	(3)	Information Systems
MGCR 352	(3)	Marketing Management 1
MGCR 382	(3)	International Business
MGCR 472*	(3)	Operations Management

### Category C

6 credits selected from:

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

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

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

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

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

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

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

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

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

#### Required Courses (9 credits)

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

#### Complementary Courses (9 credits)

3 credits:

MGCR 271*	(3)	Business Statistics
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6 credits selected from:

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



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

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

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

#### **12.11.10.4 Minor Operations Management (For Non-Management Students) (18 credits)**

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)**

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

#### **Complementary Courses (12 credits)**

3 credits

MGCR 271*	(3)	Business Statistics
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9 credits selected from:

MGSC 372	(3)	Advanced Business Statistics
MGSC 402	(3)	Operations Strategy
MGSC 403	(3)	Introduction to Logistics Management
MGSC 405	(3)	Quality Management
MGSC 415	(3)	Supplier Management
MGSC 431	(3)	Operations and Supply Chain Analysis
MGSC 479MGSC 415	(3)	Applied Optimization

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

\* Students choose either CHEE 380 or MIME 260.

### Complementary Courses

9 credits from the following:

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

### 12.11.12 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

### 12.11.13 Bachelor of Engineering (B.Eng.) - Minor Mining Engineering (23 credits)

Minor Adviser: Prof. Hani Mitri (Minor Coordinator)

Frank Dawson Adams Building, Room 121

Program credit weight: 23 credits

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

#### Required Courses

14 credits

MIME 200	(3)	Introduction to the Minerals Industry
MIME 291	(2)	Industrial Work Period 2
MIME 322	(3)	Rock Fragmentation
MIME 325	(3)	Mineral Industry Economics
MIME 333	(3)	Materials Handling

#### Complementary Courses

9 credits

#### List A: Mining Engineering

3-9 credits from the following:

MIME 320	(3)	Extraction of Energy Resources
MIME 323	(3)	Rock and Soil Mass Characterization
MIME 341	(3)	Introduction to Mineral Processing
MIME 419	(3)	Surface Mining
MIME 422	(3)	Mine Ventilation
MIME 520	(3)	Stability of Rock Slopes
MIME 521	(3)	Stability of Underground Openings
MIME 526	(3)	Mineral Economics
MIME 588	(3)	Reliability Analysis of Mining Systems

#### 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:



9 credits from the following:

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

### 12.11.16 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

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

#### Complementary Courses

12 credits from the following:

#### Engineering Courses

6-12 credits from the following:

CHEE 571	(3)	Small Computer Applications: Chemical Engineering
CIVE 460	(3)	Matrix Structural Analysis
CIVE 550	(3)	Water Resources Management
CIVE 572	(3)	Computational Hydraulics
ECSE 322	(3)	Computer Engineering
ECSE 420	(3)	Parallel Computing
ECSE 421	(3)	Embedded Systems
ECSE 422	(3)	Fault Tolerant Computing
ECSE 424	(3)	Human-Computer Interaction
ECSE 427	(3)	Operating Systems
ECSE 429	(3)	Software Validation
ECSE 526	(3)	Artificial Intelligence

ECSE 532	(3)	Computer Graphics
MECH 524	(3)	Computer Integrated Manufacturing
MECH 539	(3)	Computational Aerodynamics

**Computer Science Courses**

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

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

**12.11.17 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 ap-4w16281theoe Sstudent wihoh