



**Faculty of Engineering, including Peter Guo-hua  
Fu School of Architecture and School of Urban  
Planning  
Programs, Courses and University Regulations  
2019-2020**



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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

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

### Departments

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

### Schools

The Peter Guo-hua Fu School of Architecture  
 Urban Planning

### Institutes

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

The Faculty serves approximately 3,300 undergraduate students and 1,300 graduate students in a wide variety of academic programs.

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

The curricula are structured to provide suitable preparation for those who plan to continue their education in postgraduate studies either at McGill or elsewhere. The professional degrees in Architecture and Urban Planning are offered at the master's level and are described at [Faculty of Engineering > Graduate](#).

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

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

**Graduate and postgraduate programs** leading to master's and doctoral degrees are offered in all sectors of the Faculty. Numerous areas of specialization are available in each of the departments and schools. All postgraduate programs, including the professional degree programs in Architecture and in Urban Planning, are described at [Faculty of Engineering > Graduate](#).

## 2 History of the Faculty

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

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

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### 3 Engineering Microcomputing Facility

In addition to the services provided by McGill's Information Technology Services, the Faculty maintains computing resources in support of teaching and research activities specific to Engineering (CAD/CAM, testing and simulation, etc). This includes workstations and software for undergraduate use and support for labs, workshops and administration. The goal is to make these resources as accessible as possible and constantly evolve to meet the demands of the program.

Individual departments also offer additional services designed around specialised roles such as software engineering, microelectronic design and process control. They also provide additional support for graduate students and research activities.

Further information is available at [www.mcgill.ca/emf](http://www.mcgill.ca/emf).

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### 4 Schulich Library of Physical Sciences, Life Sciences, and Engineering

Schulich Library of Physical Sciences, Life Sciences, and Engineering  
Macdonald-Stewart Library Building  
809 Sherbrooke Street West  
Montreal QC H3A 0C1  
Telephone: 514-398-4769  
Email: [schulich.library@mcgill.ca](mailto:schulich.library@mcgill.ca)  
Website: [www.mcgill.ca/library/branches/schulich](http://www.mcgill.ca/library/branches/schulich)

The Schulich Library of Physical Sciences, Life Sciences, and Engineering provides resources and services to support research and teaching programs in engineering, physical and natural sciences, medicine, and dentistry. The Library holds more than 300,000 books, journals, and other materials and provides access to an extensive collection of online resources, with thousands of electronic journals, e-books, and databases.

The Schulich Library has over 100 networked computer workstations, and the entire building is a McGill wireless zone. Within the library's six floors are many options for both quiet and group study, and numerous uPrint machines on site for copying, printing, and scanning. The Library provides support for users with disabilities, including wheelchair access and an adaptive workstation. Schulich Library staff includes eleven subject-specialized liaison librarians who offer one-on-one research consultations, as well as a range of tours and w

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/students/undergraduate/mesc](http://www.mcgill.ca/engineering/students/undergraduate/mesc)

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## 5.2 About the Faculty of Engineering

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

Goals:

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

In this section, you will find up-to-date information about the Faculty and about the undergraduate programs and courses it offers. For information about graduate studies in the Faculty of Engineering, see [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 Physical Sciences, Life Sciences, and Engineering](#)
- [section 6: Degrees and Requirements for Professional Registration](#)
- [section 9: Student Activities](#)
- [section 11](#)

### **Department Chairs**

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

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*)

Viviane Yargeau; B.Eng., M.Eng., Ph.D.(Sherbrooke) (*Chemical Engineering*)

### **Director, The Peter Guo-hua Fu School of Architecture**

## 8 Student Progress

The length of the B.Eng. and B.Sc.(Arch.) programs varies depending on the program and basis of admission. You can find the curriculum for your program on the website of your department/school. See [www.mcgill.ca/engineering/departments-schools-and-institutes](http://www.mcgill.ca/engineering/departments-schools-and-institutes) for links to department/school websites.

You are expected to complete the B.Eng. or B.Sc.(Arch.) program within six years of entry. However, this may vary if students are admitted to a shortened program (e.g., on account of Advanced Standing). Extensions may be granted by the Committee on Standing in cases of serious medical problems or where other similarly uncontrollable factors have affected your progress, or your program is lengthened (e.g., participation in the Engineering Internship Program).

## 9 Student Activities

The campus offers a wide variety of extracurricular activities for students. All are encouraged to participate. Many of these are organized within the Faculty under the auspices of the Engineering Undergraduate Society (EUS). EUS publishes a handbook describing their operations and the activities of various Faculty clubs and societies; you can also find these on their website (see below). All undergraduate students automatically become members of the EUS. Each department and school also has a student association.

- For more information about **EUS and links to department/school student association websites**, visit the EUS website at [www.mcgilleus.ca](http://www.mcgilleus.ca).
- For more information on **extra-curricular activities and organizations**, see [www.mcgill.ca/engineering/students/current-students/undergraduate/student-life](http://www.mcgill.ca/engineering/students/current-students/undergraduate/student-life).
- For more information on **student design teams and projects**, see [mcgill.ca/engineering/students/current-students/undergraduate/student-life/design-teams-projects](http://mcgill.ca/engineering/students/current-students/undergraduate/student-life/design-teams-projects).

## 10 Degrees and Programs Offered

### Internship Program

Engineering Internship Program

### Co-op Programs

Materials Engineering (B.Eng.)

Mining Engineering (B.Eng.)

### Major Programs

Architecture (B.Sc.(Arch.))

Bioengineering (B.Eng.)

Chemical Engineering (B.Eng.)

Civil Engineering (B.Eng.)

Computer Engineering (B.Eng.)

Electrical Engineering (B.Eng.)

Materials Engineering (B.Eng.)

Mechanical Engineering (B.Eng.)

Mining Engineering (B.Eng.)

Software Engineering (B.S.E.)

### Honours Programs

Electrical Engineering (B.Eng.)

Mechanical Engineering (B.Eng.)

## Minors

Aerospace Engineering

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

Nanotechnology

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 and technical 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 12 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).
- If you have a scholarship, please check with the administrator of the scholarship for information on eligibility (you will not be a full-time student during the internship).

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## 12 Browse Academic Units & Programs

The programs and courses in the following sections have been approved for the 2019–2020 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 Architecture

#### 12.1.1 Location

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

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

#### **12.1.4 Programs of Study**

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

- complete the B.Sc.(Arch.) degree, including the series of required and complementary courses stipulated for professional studies, with a minimum CGPA of 3.00. Please note that the minimum CGP



### **Emeritus Professors**

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

### **Professors**

Annmarie Adams; B.A.(McG.), M.Arch., Ph.D.(Calif., Berk.), M.R.A.I.C. (*Stevenson Chair in the History and Philosophy of Science*)

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

Martin Bressani; B.Sc.(Arch.), B.Arch.(McG.), M.Sc.(Arch.)(MIT), D.E.A., Docteur(Paris IV), O.A.Q. (*William C. Macdonald Professor of Architecture*)

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

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

### **Required Non-Departmental Courses**

13 credits

CIVE 284	(4)	Structural Engineering Basics
CIVE 385	(3)	Structural Steel and Timber Design
CIVE 388	(3)	Foundation and Concrete Design
FACC 220	(3)	Law for Architects and Engineers

### **Required Architectural Courses**

75 credits

ARCH 201	(6)	Communication, Behaviour and Architecture
ARCH 202	(6)	Architectural Graphics and Elements of Design
ARCH 221	(2)	Architectural Drawing
		Org

## Complementary Courses

6 credits from the following:

ARCH 378	(3)	Site Usage
ARCH 379	(3)	Summer Course Abroad
ARCH 383	(3)	Geometry and Architecture
ARCH 461	(1)	Freehand Drawing and Sketching
ARCH 490	(2)	Selected Topics in Design
ARCH 514	(4)	Community Design Workshop
ARCH 515	(3)	Sustainable Design
ARCH 517	(3)	Sustainable Residential Development
ARCH 520	(3)	Montreal: Urban Morphology
ARCH 521	(3)	Structure of Cities
ARCH 523	(3)	Significant Texts and Buildings
ARCH 525	(3)	Seminar on Analysis and Theory
ARCH 526	(3)	Philosophy of Structure
ARCH 527	(3)	Civic Design
		History of Housing

## 12.2.2 About the Department of Bioengineering

The Department of Bioengineering, established in 2012, is the newest academic unit in McGill University's renowned Faculty of Engineering. In Fall 2016, the Department launched a full-time undergraduate program, admitting its first cohort of students. The program is designed to provide students with fundamental knowledge in natural sciences, engineering, and mathematics, as they relate to the field of bioengineering. Those pursuing an undergraduate degree in Bioengineering may select courses in one of the following three streams:

- Biological materials and mechanics
- Biomolecular and cellular engineering
- Biomedical, diagnostics, and high throughput screening engineering

## 12.2.3 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. Univ. Bucharest)

Amine Kamen; Ph.D.(Mines ParisTech), Ph.D.(École Poly., Montr.)

Sebastian Wachsmann-Hogiu; Dipl.(Poly. Univ. Bucharest), Ph.D.(Humboldt)

Y

CHEM 110

(4)

General Chemistry 1

CHEM 120

(4)

General Chemistry 2

MATH 133

(3)

Linear Algebra and Geometry

MATH 140

(3)

Calculus 1

Ge6 Tm(Mecstry 1)Tj1 0 0 1 16

MATH 141

(4)

Calculus 2

Mechanics and cchanict29 1 72.542 646.9a Tm(cchanict0 097 72.542 646.9v Tm(cchanict05420372.542 646.9esulus 2)

BIEN 471 (2) Bioengineering Research Project

### Complementary Courses

39-40 credits

### Bioengineering Complementary Courses

30-31 credits

Starting in the third year (second year for CEGEP students) (Year 2), students will need to take 30-31 credits of courses to upgrade their general knowledge of Bioengineering. Students are required to choose all courses in one of the three streams of bioengineering knowledge and practice: 1) Biological Materials and Mechanics (31 credits); 2) Biomolecular and Cellular Engineering (30 credits); or 3) Biomedical, Diagnostics, and High Throughput Screening Engineering (30 credits).

#### Stream 1: Biological Materials and Mechanics (31 credits)

BIEN 320	(3)	Molecular, Cellular and Tissue Biomechanics
BIEN 330	(3)	Tissue Engineering and Regenerative Medicine
BIEN 462	(3)	Engineering Principles in Physiological Systems
BIEN 510	(3)	Engineered Nanomaterials for Biomedical Applications
BIEN 570	(3)	Active Mechanics in Biology
CHEE 563*	(3)	Biofluids and Cardiovascular Mechanics
CIVE 207	(4)	Solid Mechanics
MECH 547	(3)	Mechanics of Biological Materials
MIME 261	(3)	Structure of Materials
MIME 470	(3)	Engineering Biomaterials

\* Note: Students may choose only one of CHEE 563 and MECH 563 Biofluids and Cardiovascular Mechanics

#### Stream 2: Biomolecular and Cellular Engineering (30 credits)

BIEN 310	(3)	Introduction to Biomolecular Engineering
BIEN 320	(3)	Molecular, Cellular and Tissue Biomechanics
BIEN 330	(3)	Tissue Engineering and Regenerative Medicine
BIEN 410	(3)	Computational Methods in Biomolecular Engineering
BIEN 510	(3)	Engineered Nanomaterials for Biomedical Applications
BIEN 520	(3)	High Throughput Bioanalytical Devices
BIEN 540	(3)	Information Storage and Processing in Biological Systems
BIEN 550	(3)	Biomolecular Devices
BIEN 570	(3)	Active Mechanics in Biology
BIEN 590	(3)	Cell Culture Engineering

#### Stream 3: Biomedical, Diagnostics and High Throughput Screening Engineering (30 credits)

BIEN 310	(3)	Introduction to Biomolecular Engineering
BIEN 410	(3)	Computational Methods in Biomolecular Engineering
BIEN 462	(3)	Engineering Principles in Physiological Systems
BIEN 520	(3)	High Throughput Bioanalytical Devices
BIEN 530	(3)	Imaging and Bioanalytical Instrumentation
BIEN 540	(3)	Information Storage and Processing in Biological Systems
BIEN 560	(3)	Biosensors

CHEM 267	(3)	Introductory Chemical Analysis
CHEM 367	(3)	Instrumental Analysis 1
ECSE 415	(3)	Intro to Computer Vision

### Complementary Studies

9 credits

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

3 credits from the following:

ANTH 212	(3)	Anthropology of Development
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
MGPO 440*	(3)	Strategies for Sustainability
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 [www.mcgill.ca/importantdates](http://www.mcgill.ca/importantdates).

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

Generally, students admitted to Engineering from Quebec CEGEP's are granted transfer credits for 3 credits (one course) from the Complementary Studies Group B list.

6 credits of courses 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) (excluding courses that principally impart language skills, such as Sanskrit, Tibetan, Tamil, New Testament Greek, and Biblical Hebrew)\*\*\*

School of Social Work (SWRK)

Sociology (excluding SOCI 350)

OR from the following courses:

ARCH 528	(3)	History of Housing
BUSA 465*	(3)	Technological Entrepreneurship
CLAS 203	(3)	Greek Mythology
ENVR 203	(3)	Knowledge, Ethics and Environment





- petroleum refining;
- ceramics; and
- paint industries;

as well as substantial portions of the:

- food processing;
- textile;
- nuclear energy;
- alternative energy;
- biochemical;
- biomedical; and
- pharmaceutical industries.

The technological problems and opportunities in these industries are often closely linked to social, economic, and environmental concerns. For this reason, chemical engineers often deal with these questions while working in management, pollution abatement, product development, marketing, and equipment design.

By means of complementary courses, students can also obtain further depth in technical areas and breadth in non-technical subjects. Some students elect to complete a minor in biotechnology, nanotechnology, management, materials engineering, computer science, environmental engineering, chemistry, or another minor (see [section 12.10: Minor Programs](#) for minors available to engineering students).

The solution to many environmental problems requires an understanding of technological principles; a Chemical Engineering degree provides an ideal background. In addition to relevant material learned in the core program, a selection of environmental complementary courses and minor programs is available. The involvement of many Chemical Engineering faculty members in en

## Professors

Sylvain Coulombe; B.Sc., M.Sc.A.(Sher.), Ph.D.(McG.), ing. (*Gerald Hatch Faculty Fellow*)

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

Milan Maric; B.Eng.Mgt.(McM.), Ph.D.(Minn.), P.Eng.

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

Sasha Omanovic; Dipl.Ing., Dr.Sc.(Zagreb), P.Eng.

Alejandro D. Rey; B.Ch.E.(CCNY), Ph.D.(Calif.), F.R.S.C. (*James McGill Professor*)

Phillip Servio; B.A.Sc., Ph.D.(Br. Col.)

Nathalie Tufenkji; B.Eng.(McG.), M.Sc., Ph.D.(Yale), ing. (CRC-Tier I)

Viviane Yargeau; B.Ch.E., M.Sc.A., Ph.D.(Sher.), ing.

## Associate Professors

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

P

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
CHEM 234	(3)	Topics in Organic Chemistry
COMP 208	(3)	Computer Programming for Physical Sciences and Engineering
FACC 100*	(1)	Introduction to the Engineering Profession
FACC 250	(0)	Responsibilities of the Professional Engineer
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

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

### Required Chemical Engineering Courses

75 credits

CHEE 200	(3)	Chemical Engineering Principles 1
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CHEE 390	(3)	Computational Methods in Chemical Engineering
CHEE 400	(3)	Principles of Energy Conversion
CHEE 401	(3)	Energy Systems Engineering
CHEE 423	(3)	Chemical Reaction Engineering
CHEE 440	(3)	Process Modelling
CHEE 453	(4)	Process Design
CHEE 455	(3)	Process Control
CHEE 456	(3)	Design Project 1
CHEE 457	(5)	Design Project 2
	(3)	Biochemical Engineering

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

List B

0-6 credits from the following:

BIEN 320	(3)	Molecular, Cellular and Tissue Biomechanics
BIEN 330	(3)	Tissue Engineering and Regenerative Medicine
BIEN 340	(3)	Transport Phenomena in Biological Systems 2
BIEN 350	(3)	Biosignals, Systems and Control
BIEN 462	(3)	Engineering Principles in Physiological Systems
BIEN 510	(3)	Engineered Nanomaterials for Biomedical Applications
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
BREE 522	(3)	Bio-Based Polymers
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

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
MGPO 440*	(3)	Strategies for Sustainability
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) (excluding courses that principally impart language skills, such as Sanskrit, Tibetan, Tamil, New Testament Greek, and Biblical Hebrew) \*\*\*

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
CLAS 203	(3)	Greek Mythology
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
HISP 225	(3)	Hispanic Civilization 1
HISP 226	(3)	Hispanic Civilization 2
INDR 294*	(3)	Introduction to Labour-Management Relations
INTG 201**	(3)	Integrated Management Essentials 1
INTG 202**	(3)	Integrated Management Essentials 2
MATH 338	(3)	History and Philosophy of Mathematics
MGCR 222*	(3)	Introduction to Organizational Behaviour
MGCR 352*	(3)	Principles of Marketing
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>.

\*\* Note: INTG 201 and INTG 202 are not open to students who have taken certain Management courses. Please see the INTG 201 and INTG 202 course information for a list of these courses.

- and others.

These require additional credits to be taken from a specified list of topics relating to the chosen field. Further information on the various minors may be found in [section 12.10: Minor Programs](#). Details on how minors can be accommodated within the Civil Engineering program will be made available during preregistration counselling.

### **12.4.3 Academic Programs**

Considerable freedom exists for students to influence the nature of the program of study which they follow in the Department of Civil Engineering and



## Associate Professors

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

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

Dominic Frigon; B.Sc., M.Sc.(McG.), Ph.D.(Ill.-Urbana-Champaign), L.L.E.

Susan J. Gaskin; B.Sc.(Eng.)(Qu.), Ph.D.(Cant.), Eng.

Jinxia Liu; B.E./M.E.(Tianjin), M.E.(Rensselaer Polytechnic), M2.Em(Shanghai), M2.Eng(PolyMcG.), Sc.D.(Rensselaer Polytechnic) TAEMaige(BrBr)

FACC 100*	(1)	Introduction to the Engineering Profession
FACC 250	(0)	Responsibilities of the Professional Engineer
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 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 446	(3)	Construction Engineering
CIVE 451	(3)	Geoenvironmental Engineering
CIVE 460	(3)	Matrix Structural Analysis
CIVE 470	(3)	Undergraduate Research Project
CIVE 512	(3)	Advanced Civil Engineering Materials
CIVE 514	(3)	Structural Mechanics
CIVE 520	(3)	Groundwater Hydrology
CIVE 521*	(3)	Nanomaterials and the Aquatic Environment
CIVE 527	(3)	Renovation and Preservation: Infrastructure

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
MGPO 440*	(3)	Strategies for Sustainability
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) (excluding courses that principally impart language skills, such as Sanskrit, Tibetan, Tamil, New Testament Greek, and Biblical Hebrew) \*\*\*

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
CLAS 203	(3)	Greek Mythology
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
HISP 225	(3)	Hispanic Civilization 1
HISP 226	(3)	Hispanic Civilization 2
INDR 294*	(3)	Introduction to Labour-Management Relations
INTG 201**	(3)	Integrated Management Essentials 1
	(3)	Integrated Management Essentials 2

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

\*\* Note: INTG 201 and INTG 202 are not open to students who have taken certain Management courses. Please see the INTG 201 and INTG 202 course information for a list of these courses.

\*\*\* If you are uncertain whether or not a course principally imparts language skills, please see an adviser in the McGill Engineering Student Centre (Frank Dawson Adams Building, Room 22) or email an adviser.

Note regarding language courses: Language courses are not accepted to satisfy the Complementary Studies Group B requirement, effective for students who entered the program as of F

### Emeritus Professors

Maier L. Blostein; B.Eng., M.Eng.(McG.), Ph.D.(Ill.), F.I.E.E.E., Eng.  
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.)  
Martin D. Levine; B.Eng., M.Eng.(McG.), Ph.D.(Lond.), F.C.I.A.R., F.I.E.E.E., Eng.  
Boon-Teck Ooi; B.E.(Adel.), S.M.(MIT), Ph.D.(McG.), Eng.  
Tomas J.F. Pavlasek; B.Eng., M.Eng., Ph.D.(McG.), Eng.  
Nicholas C. Rumin; B.Eng., M.Sc., Ph.D.(McG.), Eng.  
Jonathan P. Webb; B.A., Ph.D.(Camb.)

### Professors

Tal Arbel; M.Eng., Ph.D.(McG.) P.Eng.  
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., P.Eng. (*James McGill Professor and Macdonald Professor*)  
Benoit Champagne; B.Eng., M.Eng.(Montr.), Ph.D.(Tor.) P.Eng.  
Lawrence Chen; B.Eng.(McG.), M.A.Sc., Ph.D.(Tor.) ing.  
James Clark; B.Sc., Ph.D.(Br. Col.) (*Currently on sabbatical 2019-2020*) P.Eng.  
Mark Coates; B.Eng.(Adel.), Ph.D.(Camb.) P.Eng.  
Jeremy R. Cooperstock; A.Sc.(Br. Col.), M.Sc., Ph.D.(Tor.) ing.Jr.  
Frank Ferrie; B.Eng., Ph.D.(McG.) P.Eng.  
Warren Gross; B.A.Sc.(Wat.), M.A.Sc., Ph.D.(Tor.) (*Louis-Ho Faculty Scholar in Technological Innovation*) P.Eng.  
Geza Joos; B.Sc.(C'dia), M.Eng., Ph.D.(McG.) (*CRC Chair*) P.Eng.  
Andrew G. Kirk; B.Sc.(Brist.), Ph.D.(Lond.), P.Eng. (*James McGill Professor*) (*Currently on sabbatical 2019-2020*)  
Fabrice Labeau; M.S., Ph.D.(Louvain) (*Interim Deputy Provost, Student Life and Learning (SLL)*) P.Eng.  
Harry Leib; B.Sc.(Technion), Ph.D.(Tor.)  
Tho Le-Ngoc; M.Eng.(McG.), Ph.D.(Ott.), F.I.E.E.E. P. Eng.  
David A. Lowther; B.Sc.(Lond.), Ph.D.(C.N.A.A.), F.C.A.E., P.Eng.  
David V. Plant; M.S., Ph.D.(Brown), F.I.E.E.E., F.O.S.A., F.E.I.C., F.C.A.E., P.Eng. (*James McGill Professor*)  
Gordon Roberts; B.A.Sc.(Wat.), M.A.Sc., Ph.D.(Tor.), F.I.E.E.E., Eng. (*James McGill Professor*) P.Eng.  
Martin Rochette; B.A., M.Eng., Ph.D.(Laval), P.Eng. (*Currently on sabbatical 2019-2020*)  
Thomas Szkopek; B.A.Sc., M.A.Sc.(Tor.), Ph.D.(Calif.-LA) P.Eng.  
Dániel Varró; M.Sc., Ph.D.(BME)  
Zeljko Zilic; B.Eng.(Zagreb), M.Sc., Ph.D.(Tor.) P.Eng.

### Associate Professors

Jan Bajcsy; B.Sc.(Harv.), M.Eng., Ph.D.(Princ.)  
François Bouffard; B.Eng., Ph.D.(McG.) (*William Dawson Scholar*) P.Eng.  
Benoit Boulet; B.Sc.(Laval), M.Eng.(McG.), Ph.D.(Tor.) (*Associate Dean, Research & Innovation*) P.Eng.  
Mourad El-Gamal; B.Sc.(Cairo), M.Sc.(Nashville), Ph.D.(McG.) (*Currently on sabbatical 2019-2020*)  
Dennis Giannacopoulos; M.Eng., Ph.D.(McG.)  
Roni Khazaka; M.Eng., Ph.D.(Car.), ing  
Odile Liboiron-Ladouceur; B.Eng.(McG.), M.Sc., Ph.D.(Col.) P.Eng.  
Aditya Mahajan, B.Tech.(Indian IT), M.S., Ph.D.(Mich.), P.Eng.  
Muthucumar Maheswaran; B.Sc.(Peradeniya), M.S.E.E., Ph.D.(Purd.) (*joint appt. with School of Computer Science*)  
Brett Meyer; B.S.(Wisc. Madison), M.S., Ph.D.(Carn. Mell), P.Eng.

## Associate Professors

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

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

23 credits

CCOM 206	(3)	Communication in Engineering
CIVE 281	(3)	Analytical Mechanics
COMP 250	(3)	Introduction to Computer Science
FACC 100*	(1)	Introduction to the Engineering Profession
FACC 250	(0)	Responsibilities of the Professional Engineer
FACC 300	(3)	Engineering Economy
FACC 400	(1)	Engineering Professional Practice
MATH 262	(3)	Intermediate Calculus
MATH 263	(3)	Ordinary Differential Equations for Engineers
MIME 262	(3)	Properties of Materials in Electrical Engineering

\* 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 202	(3)	Introduction to Software Development
ECSE 205	(3)	Probability and Statistics for Engineers
ECSE 206	(3)	Introduction to Signals and Systems
ECSE 210	(3)	Electric Circuits 2
ECSE 211	(3)	Design Principles and Methods
ECSE 222	(3)	Digital Logic
ECSE 251	(3)	Electric and Magnetic Fields
ECSE 307	(4)	Linear Systems and Control
ECSE 308	(4)	Introduction to Communication Systems and Networks
ECSE 324	(4)	Computer Organization
ECSE 331	(4)	Electronics
ECSE 354	(4)	Electromagnetic Wave Propagation
ECSE 362	(4)	Fundamentals of Power Engineering
ECSE 443	(3)	Introduction to Numerical Methods in Electrical Engineering
ECSE 458D1	(3)	Capstone Design Project
ECSE 458D2	(3)	Capstone Design Project



Note: ECSE 478N1 and ECSE 478N2 can be taken instead of ECSE 478D1 and ECSE 478D2.

### Complementary Courses (26-30 credits)

#### Technical Complementaries

20-24 credits (6 courses) must be taken, chosen as follows:

8 credits (2 courses) from List A

12-16 credits (4 courses) from List A or List B

#### List A: Technical Complementaries with Laboratory Experience

8-24 credits

ECSE 335	(4)	Microelectronics
ECSE 403	(4)	Control
ECSE 408	(4)	Communication Systems
ECSE 416	(4)	Telecommunication Networks
ECSE 433	(4)	Physical Basis of Transistor Devices
ECSE 444	(4)	Microprocessors
ECSE 470	(4)	Electromechanical Systems

#### List B: Technical Complementaries

0-12 credits

ECSE 310	(3)	Thermodynamics of Computing
ECSE 325	(3)	Digital Systems
ECSE 405	(3)	Antennas
ECSE 412	(3)	Discrete Time Signal Processing
ECSE 413	(3)	Communications Systems 2
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 Architecture
ECSE 427	(3)	Operating Systems
ECSE 430	(3)	Photonic Devices and Systems
ECSE 431	(3)	Introduction to VLSI CAD
ECSE 435	(3)	Mixed-Signal Test Techniques
ECSE 436	(3)	Signal Processing Hardware
ECSE 446	(3)	Realistic Image Synthesis
ECSE 450	(3)	Electromagnetic Compatibility
ECSE 451	(3)	EM Transmission and Radiation
ECSE 460*	(3)	Appareillage électrique (Electrical Power Equipment)
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
ECSE 472	(3)	Fundamentals of Circuit Simulation and Modelling
PHYS 434	(3)	Optics
PHYS 446	(3)	Majors Quantum Physics

\* Courses taught in French.

### **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
		mental Systems Environmental Systems

ARCH 528	(3)	History of Housing
BUSA 465*	(3)	Technological Entrepreneurship
CLAS 203	(3)	Greek Mythology
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
HISP 225	(3)	Hispanic Civilization 1
HISP 226	(3)	Hispanic Civilization 2
INDR 294*	(3)	Introduction to Labour-Management Relations
INTG 201**	(3)	Integrated Management Essentials 1
INTG 202**	(3)	Integrated Management Essentials 2
MATH 338	(3)	History and Philosophy of Mathematics
MGCR 222*	(3)	Introduction to Organizational Behaviour
MGCR 352*	(3)	Principles of Marketing
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>.

\*\* Note: INTG 201 and INTG 202 are not open to students who have taken certain Management courses. Please see the INTG 201 and INTG 202 course information for a list of these courses.

\*\*\* If you are uncertain whether or not a course principally imparts language skills, please see an adviser in the McGill Engineering Student Centre (Frank Dawson Adams Building, Room 22) or email an adviser.

Note regarding language courses: Language courses are not accepted to satisfy the Complementary Studies Group B requirement, effective for students who entered the program as of Fall 2017.

### Elective Course

One 3-credit course at the 200-level or higher from any department at McGill, approved by the Undergraduate Programs Office in the Department of Electrical and Computer Engineering.

### Enhanced Power Concentration

Students following this program must complete 16-17 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

Admission to the program is granted only in the Fall semester of every academic year. To be considered, the applicant must:

- be registered in the B.Eng. program (regular Electrical Engineering);
- have a cumulative GPA of at least 2.5;
- have completed or be registered in ECSE 362 (Fundamentals of Power Engineering);
- be able to complete the degree requirements within three semesters after initial registration in the concentration (excluding summer semesters);
- agree to follow the curriculum requirements set out below.

#### SELECTION CRITERIA

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

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 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 0dup B).

ECSE 478D1	(3)	Electrical Engineering Honours Thesis
ECSE 478D2	(3)	Electrical Engineering Honours Thesis
ECSE 496	(1)	Honours Research Laboratory Rotation 3
ECSE 497	(1)	Honours Research Laboratory Rotation 4
ECSE 543	(3)	Numerical Methods in Electrical Engineering

Note: ECSE 478N1 and ECSE 478N2 can be taken instead of ECSE 478D1 and ECSE 478D2.

### Complementary Courses (29-33 credits)

#### Technical Complementaries

20-24 credits (6 courses) must be taken, chosen as follows:

8 credits (2 courses) from List A

6-8 credits (2 courses) from 500-level ECSE courses

3-4 credits (1 course) from List A, List B, or from 500-level ECSE courses

3-4 credits (1 course) from List C or from 500-level ECSE courses

#### List A: Technical Complementaries with Laboratory Experience

8-12 credits from the following:

ECSE 335	(4)	Microelectronics
ECSE 403*	(4)	Control
ECSE 408**	(4)	Communication Systems
ECSE 416	(4)	Telecommunication Networks
ECSE 433	(4)	Physical Basis of Transistor Devices
ECSE 444	(4)	Microprocessors
ECSE 470	(4)	Electromechanical Systems

\* ECSE 403 and ECSE 501 cannot both be taken.

\*\* ECSE 408 and ECSE 511 cannot both be taken.

#### List B: Technical Complementaries

0-3 credits

ECSE 310	(3)	Thermodynamics of Computing
ECSE 325	(3)	Digital Systems
ECSE 415	(3)	Intro to Computer Vision
ECSE 420	(3)	Parallel Computing
ECSE 421	(3)	Embedded Systems
ECSE 422	(3)	Fault Tolerant Computing
ECSE 424	(3)	Human-Computer Interaction
ECSE 425	(3)	Computer Architecture
ECSE 427	(3)	Operating Systems
ECSE 431	(3)	Introduction to VLSI CAD
ECSE 435	(3)	Mixed-Signal Test Techniques
ECSE 436	(3)	Signal Processing Hardware
ECSE 446	(3)	Realistic Image Synthesis

ECSE 460*	(3)	Appareillage électrique (Electrical Power Equipment)
ECSE 464	(3)	Power Systems Analysis
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.

### List C: Honours Math/Physics Complementary Courses

0-4 credits

COMP 551	(4)	Applied Machine Learning
MATH 247	(3)	Honours Applied Linear Algebra
MATH 249	(3)	Honours Complex Variables
MATH 547	(4)	Stochastic Processes
MATH 560	(4)	Optimization
PHYS 357	(3)	Honours Quantum Physics 1
PHYS 434	(3)	Optics
PHYS 457	(3)	Honours Quantum Physics 2
PHYS 558	(3)	Solid State Physics

### Complementary Studies

6 credits

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

3 credits from the following:

ANTH 212	(3)	Anthropology of Development
BTEC 502	(3)	Biotechnology Ethics and Society
CIVE 469	(3)	Infrastructure and Society
ECON 225	(3)	Economics of the Environment
ECON 347	(3)	Economics of Climate Change
ENVR 201	(3)	Society, Environment and Sustainability
GEOG 200	(3)	Geographical Perspectives: World Environmental Problems
GEOG 203	(3)	Environmental Systems
GEOG 205	(3)	Global Change: Past, Present and Future
GEOG 302	(3)	Environmental Management 1
MGPO 440*	(3)	Strategies for Sustainability
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) (excluding courses that principally impart language skills, such as Sanskrit, Tibetan, Tamil, New Testament Greek, and Biblical Hebrew) \*\*\*

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
CLAS 203	(3)	Greek Mythology
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
HISP 225	(3)	Hispanic Civilization 1
HISP 226	(3)	Hispanic Civilization 2
INDR 294*	(3)	Introduction to Labour-Management Relations
INTG 201**	(3)	Integrated Management Essentials 1
INTG 202**	(3)	Integrated Management Essentials 2
MATH 338	(3)	History and Philosophy of Mathematics
MGCR 222*	(3)	Introduction to Organizational Behaviour
MGCR 352*	(3)	Principles of Marketing
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>.

\*\* Note: INTG 201 and INTG 202 are not open to students who have taken certain Management courses. Please see the INTG 201 and INTG 202 course information for a list of these courses.

\*\*\* If you are uncertain whether or not a course principally imparts language skills, please see an adviser in the McGill Engineering Student Centre (Frank Dawson Adams Building, Room 22) or email an adviser.

Note regarding language courses: Language courses are not accepted to satisfy the Complementary Studies Group B requirement, effective for students who entered the program as of Fall 2017.

### **Elective Course**

One 3-credit course at the 200-level or higher from any de0 T3ent and re



to meet the growing demands by industry for engineers with a strong background in modern computer technology, it also provides the underlying depth for graduate studies in all fields of Computer Engineering.

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

### Required Year 0 (Freshman) Courses

25 credits

Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credit for these Year 0 (Freshman) courses and enter a 111- to 114-credit program.

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

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

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

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

### Required Non-Departmental Courses

23 credits

CCOM 206	(3)	Communication in Engineering
COMP 250	(3)	Introduction to Computer Science
COMP 251	(3)	Algorithms and Data Structures
FACC 100*	(1)	Introduction to the Engineering Profession
FACC 250	(0)	Responsibilities of the Professional Engineer
FACC 300	(3)	Engineering Economy
FACC 400	(1)	Engineering Professional Practice
MATH 240	(3)	Discrete Structures
MATH 262	(3)	Intermediate Calculus
MATH 263	(3)	Ordinary Differential Equations for Engineers

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

### Required Computer Engineering Courses

64 credits

ECSE 200	(3)	Electric Circuits 1
ECSE 202	(3)	Introduction to Software Development
ECSE 205	(3)	Probability and Statistics for Engineers
ECSE 206	(3)	Introduction to Signals and Systems
ECSE 210	(3)	Electric Circuits 2
ECSE 211	(3)	Design Principles and Methods
ECSE 222	(3)	Digital Logic
ECSE 223	(3)	Model-Based Programming
ECSE 308	(4)	Introduction to Communication Systems and Networks

ECSE 310	(3)	Thermodynamics of Computing
ECSE 321	(3)	Introduction to Software Engineering
ECSE 324	(4)	Computer Organization
ECSE 325	(3)	Digital Systems
ECSE 331	(4)	Electronics
ECSE 353	(3)	Electromagnetic Fields and Waves
ECSE 425	(3)	Computer Architecture
ECSE 427	(3)	Operating Systems
ECSE 444	(4)	Microprocessors
ECSE 458D1	(3)	Capstone Design Project
ECSE 458D2	(3)	Capstone Design Project

Note: ECSE 478N1 and ECSE 478N2 can be taken instead of ECSE 478D1 and ECSE 478D2.

### Complementary Courses

18-24 credits

Technical Complementaries

12-15 credits (4 courses) must be taken, chosen as follows:

9-11 credits (3 courses) from List A

3-4 credits (1 course) from List A or List B

#### List A

9-14 credits from the following:

COMP 424	(3)	Artificial Intelligence
ECSE 335	(4)	Microelectronics
ECSE 412	(3)	Discrete Time Signal Processing
ECSE 416	(4)	Telecommunication Networks
ECSE 420	(3)	Parallel Computing
ECSE 421	(3)	Embedded Systems
ECSE 422	(3)	Fault Tolerant Computing
ECSE 424	(3)	Human-Computer Interaction
ECSE 428	(3)	Software Engineering Practice
ECSE 429	(3)	Software Validation
ECSE 439	(3)	Software Language Engineering

#### List B

0-4 credits from the following:

COMP 551	(4)	Applied Machine Learning
COMP 559	(4)	Fundamentals of Computer Animation
	(4)	Linear Systems and Control

ECSE 435	(3)	Mixed-Signal Test Techniques
ECSE 436	(3)	Signal Processing Hardware
ECSE 446	(3)	Realistic Image Synthesis
ECSE 450	(3)	Electromagnetic Compatibility
ECSE 472	(3)	Fundamentals of Circuit Simulation and Modelling
ECSE 532	(4)	Computer Graphics

### **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)

### **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
MGPO 440*	(3)	Strategies for Sustainability
PHIL 343	(3)	Biomedical Ethics
RELG 270	(3)	Religious Ethics and the Environment
SOCI 235	(3)	Technology and Society
		Sociology of W

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) (excluding courses that principally impart language skills, such as Sanskrit, Tibetan, Tamil, New Testament Greek, and Biblical Hebrew) \*\*\*

School of Social Work (SWRK)

Sociology (excluding SOCI 350)

OR 3 credits from one the following:

ARCH 528	(3)	History of Housing
BUSA 465*	(3)	Technological Entrepreneurship
CLAS 203	(3)	Greek Mythology
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
HISP 225	(3)	Hispanic Civilization 1
HISP 226	(3)	Hispanic Civilization 2
INDR 294*	(3)	Introduction to Labour-Management Relations
INTG 201**	(3)	Integrated Management Essentials 1
INTG 202**	(3)	Integrated Management Essentials 2
MATH 338	(3)	History and Philosophy of Mathematics
MGCR 222*	(3)	Introduction to Organizational Behaviour
MGCR 352*	(3)	Principles of Marketing
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>.

\*\* Note: INTG 201 and INTG 202 are not open to students who have taken certain Management courses. Please see the INTG 201 and INTG 202 course information for a list of these courses.

\*\*\* If you are uncertain whether or not a course principally imparts language skills, please see an adviser in the McGill Engineering Student Centre (Frank Dawson Adams Building, Room 22) or email an adviser.

Note regarding language courses: Language courses are not accepted to satisfy the Complementary Studies Group B requirement, effective for students who entered the program as of Fall 2017.

### **Elective Course**

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

25 credits

Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credit for these Year 0 (Freshman) courses and enter a 115- to 119-credit program.

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

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
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
FACC 100*	(1)	Introduction to the Engineering Profession
FACC 250	(0)	Responsibilities of the Professional Engineer
FACC 300	(3)	Engineering Economy
FACC 400	(1)	Engineering Professional Practice
MATH 240	(3)	Discrete Structures
MATH 262	(3)	Intermediate Calculus
MATH 263	(3)	Ordinary Differential Equations for Engineers

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

### Required Software Engineering Courses

52 credits

ECSE 200	(3)	Electric Circuits 1
ECSE 202	(3)	Introduction to Software Development
ECSE 205	(3)	Probability and Statistics for Engineers
ECSE 211	(3)	Design Principles and Methods
ECSE 222	(3)	Digital Logic
ECSE 223	(3)	Model-Based Programming

ECSE 310	(3)	Thermodynamics of Computing
ECSE 316	(3)	Signals and Networks
ECSE 321	(3)	Introduction to Software Engineering
ECSE 324	(4)	Computer Organization
ECSE 326	(3)	Software Requirements Engineering
ECSE 420	(3)	Parallel Computing
ECSE 427	(3)	Operating Systems
ECSE 428	(3)	Software Engineering Practice
ECSE 429	(3)	Software Validation
ECSE 456	(3)	ECSE Design Project 1
ECSE 457	(3)	ECSE Design Project 2

### Complementary Courses

21-28 credits

#### Technical Complementaries

15-20 credits (5 courses) from the following:

COMP 330	(3)	Theory of Computation
COMP 350	(3)	Numerical Computing
COMP 409	(3)	Concurrent Programming
COMP 417	(3)	Introduction Robotics and Intelligent Systems
COMP 424	(3)	Artificial Intelligence
COMP 512	(4)	Distributed Systems
COMP 520	(4)	Compiler Design
COMP 521	(4)	Modern Computer Games
COMP 525	(3)	Formal Verification
COMP 529	(4)	Software Architecture
COMP 533	(3)	Model-Driven Software Development
COMP 551	(4)	Applied Machine Learning
COMP 557	(4)	Fundamentals of Computer Graphics
COMP 575	(3)	Fundamentals of Distributed Algorithms
ECSE 325	(3)	Digital Systems
ECSE 415	(3)	Intro to Computer Vision
ECSE 416	(4)	Telecommunication Networks
ECSE 421	(3)	Embedded Systems
ECSE 422	(3)	Fault Tolerant Computing
ECSE 424	(3)	Human-Computer Interaction
ECSE 425	(3)	Computer Architecture
ECSE 439	(3)	Software Language Engineering
ECSE 444	(4)	Microprocessors

#### Natural Science Complementary Courses

3-6 credits

Students from CEGEP must complete 6 credits of Natural Science complementary courses; all other students must complete 3 credits of courses.

Natural Science complementary courses must be chosen from courses at the 200-level or higher 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)

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

ARCH 528	(3)	History of Housing
BUSA 465*	(3)	Technological Entrepreneurship
CLAS 203	(3)	Greek Mythology
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
HISP 225	(3)	Hispanic Civilization 1
HISP 226	(3)	Hispanic Civilization 2
INDR 294*	(3)	Introduction to Labour-Management Relations
INTG 201**	(3)	Integrated Management Essentials 1
INTG 202**	(3)	Integrated Management Essentials 2
MATH 338	(3)	History and Philosophy of Mathematics
MGCR 222*	(3)	Introduction to Organizational Behaviour
MGCR 352*	(3)	Principles of Marketing
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>



Concentrations in **Aeronautical Engineering** 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.

### 12.6.3 Mechanical Engineering Faculty

#### Chair

Meyer Nahon

#### Associate Chair (Curriculum Affairs)

David L. Frost

#### Associate Chair (Undergraduate Affairs)

Srikar T. Vengallatore

#### Associate Chair (Graduate Affairs)

Siva Nadarajah

#### Dir

### Professors

Luc Mongeau; B.Sc., M.Sc.(École Poly., Montr.), Ph.D.(Penn St.), ing. (*Canada Research Chair*)  
Rosaire Mongrain; B.Sc., M.Sc.(Montr.), Ph.D.(École Poly., Montr.), ing.  
Meyer Nahon; B.Sc.(Qu.), M.A.Sc.(Tor.), Ph.D.(McG.), ing., A.F.A.I.A.A., F.C.A.S.I.  
Damiano Pasini; M.Eng.(Pavia), Ph.D.(Brist.), ing.  
Inna Sharf; B.A.Sc., Ph.D.(Tor.)

### Associate Professors

Jeffrey M. Bergthorson; B.Sc.(Manit.), M.Sc., Ph.D.(Calif. Tech.), P.Eng. (*William Dawson Scholar*)  
James R. Forbes; B.Eng.(Wat), M.A.Sc., Ph.D.(Tor) (*William Dawson Scholar*)  
Michael Kokkolaras; Dipl.Ing.(TUM), Ph.D.(Rice)  
Tim Lee; M.S.(Portland St.), Ph.D.(Idaho)  
Mathias Legrand; M.Sc., Ph.D.(École Centrale, Nantes)  
Laurent Mydlarski; B.Sc.(Wat.), Ph.D.(Cornell)  
Siva Nadarajah; B.Sc.(Kansas), M.S., Ph.D.(Stan.)  
Evgeny V. Timofeev; M.Sc., Ph.D.(S.T.U. St. Petersburg), Eng., A.F.A.I.A.A.  
Srikar T. Vengallatore; B.Tech.(B.H.U), Ph.D.(MIT)  
Yaoyao Fiona Zhao; B.Eng.(B.I.T.), M.Eng., Ph.D.(Auck.)

### Assistant Professors

Mark Driscoll; B.Eng.(McG.), M.Sc.(Montr.), Ph.D.(École Poly., Montr.), P.Eng.  
Emmeline Kao; B.S.E.(Princ.), M.Sc., Ph.D.(Calif., Berk.)  
Jianyu Li; B.Eng.(Zhejiang), M.Sc., Ph.D.(Harv.)  
Jovan Nedi ; M.Eng., Ph.D.(Imperial Coll.)  
Outi Supponen; M.Eng.(Imperial Coll.), D.Sc.(EPFL)  
Mélanie Tétreault-Friend; B.Eng.(McG.), M.Sc., Ph.D.(MIT)

### Adjunct Professors

Helmi Attia; B.Sc., M.Sc.(AlexandriaU), Ph.D.(McG.)  
Olivier Bertrand; B.Sc., M.D.(Liège)  
Gilles Bourque; B.Sc.(Sher.), M.Sc., Ph.D.(INRS)  
Xinyu Liu; B.Eng., M.Eng.(Harbin Inst. Tech.), Ph.D.(Tor.)  
Mouhab Meshreki; B.Sc., M.Sc.(AUC), Ph.D.(McG.)

### Course Lecturers

Marwan Kanaan  
Richard Klopp  
Alexei Morozov  
Amar Sabih

### Associate Members

Jake Barralet  
Renzo Cecere  
Allen Ehrlicher  
Dan Nicolau  
Abdolhamid Akbarzadeh Shafaroudi

**12.6.4 Bachelor of Engineering (B.Eng.) - 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.

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**

33 credits

CCOM 206	(3)	Communication in Engineering
CIVE 207	(4)	Solid Mechanics
COMP 208	(3)	Computer Programming for Physical Sciences and Engineering
ECSE 461	(3)	Electric Machinery
FACC 100	(1)	Introduction to the Engineering Profession
FACC 250	(0)	Responsibilities of the Professional Engineer
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 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
MECH 530	(3)	Mechanics of Composite Materials
MECH 532	(3)	Aircraft Performance, Stability and Control
MECH 535	(3)	Turbomachinery and Propulsion
MECH 536	(3)	Aerospace 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 559	(3)	Engineering Systems Optimization
MECH 560	(0)	Eco-design and Product Life Cycle Assessment
MECH 563*	(3)	Biofluids and Cardiovascular Mechanics Fluid Flow and Heat Transfer Equipment

OR one of the following:

ARCH 528	(3)	History of Housing
BUSA 465*	(3)	Technological Entrepreneurship
CLAS 203	(3)	Greek Mythology
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
HISP 225	(3)	Hispanic Civilization 1
HISP 226	(3)	Hispanic Civilization 2
INDR 294*	(3)	Introduction to Labour-Management Relations
INTG 201**	(3)	Integrated Management Essentials 1
INTG 202**	(3)	Integrated Management Essentials 2
MATH 338	(3)	History and Philosophy of Mathematics
MGCR 222*	(3)	Introduction to Organizational Behaviour
MGCR 352*	(3)	Principles of Marketing
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>.

\*\* Note: INTG 201 and INTG 202 are not open to students who have taken certain Management courses. Please see the INTG 201 and INTG 202 course information for a list of these courses.

\*\*\* If you are uncertain whether or not a course principally imparts language skills, please see an adviser in the McGill Engineering Student Centre (Frank Dawson Adams Building, Room 22) or email an adviser.

Note regarding language courses: Language courses are not accepted to satisfy the Complementary Studies Group B requirement, effective for students who entered the program as of Fall 2017.

### 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

FE3nh52 266m79nh Studies Group B reC 4 506.48 Tmi

### **12.6.5 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.

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

### Technical Complementary Courses

18 credits

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

MATH 323	(3)	Probability
MATH 326	(3)	Nonlinear Dynamics and Chaos
MATH 327	(3)	Matrix Numerical Analysis
MATH 363	(3)	Discrete Mathematics
MATH 381	(3)	Complex Variables and Transforms
MATH 407	(3)	Dynamic Programming
MATH 417	(3)	Linear Optimization
MATH 478	(3)	Computational Methods in Applied Mathematics

6 credits from the following:

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



\* Note: Students select either MECH 577 or MECH 579

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

CHEE 563*	(3)	Biofluids and Cardiovascular Mechanics
MECH 497	(3)	Value Engineering
MECH 498	(3)	Interdisciplinary Design Project 1
MECH 499	(3)	Interdisciplinary Design Project 2
MECH 513	(3)	Control Systems
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)	Aerospace 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 559	(3)	Engineering Systems Optimization
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

\*Students choose either CHEE 563 or MECH 563

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

### Complementary Studies

6 credits

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

3 credits from the following:

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

### **Elective Courses**

0-6 credits

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

Desautels Faculty of Management

Faculty of Agricultural and Environmental Sciences

Faculty of Arts

Faculty of Engineering

Faculty of Religious Studies

Faculty of Science

Schulich School of Music

### **Typical Program of Study**

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

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

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

## **12.6.6 Bachelor of Engineering (B.Eng.) - Mechanical Engineering - Aeronautical Engineering (15 credits)**

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

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

### **Required Courses (6 credits)**

6 credits

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

### **Complementary Cour**

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

**Required Courses (6 credits)**

MECH 577	(3)	Optimum Design
MECH 579	(3)	Multidisciplinary Design Optimization

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

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

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

Total concentration credit weight: 15-16 credits

#### Required Courses

6 credits

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

#### Complementary Courses

9-10 credits from the following:

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

## 12.7 Mining and Materials Engineering

### 12.7.1 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)

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

## Professors

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

Raynald Gauvin; B.Ing., Ph.D.(Montr.), Eng. (*Henry Birks Professor*)

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

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## 12.7.4 About Materials Engineering

### 12.7.4.1 Co-op in Materials Engineering

The Materials Engineering degree is a cooperative program leading to a **B.Eng.** and includes formal industrial work periods. It is built on a strong background of mathematics, basic sciences, computer skills and applications, and specific engineering and design courses to provide up-to-date training in materials engineering. Students take core courses covering processing, fabrication, applications, and performance of materials.

The program is fully accredited by the Canadian Engineering Accreditation Board (CEAB) and is designed to offer students exceptional training for employment in the field.

The core courses are supplemented by complementary courses, which provide a diverse selection of specialties for the graduating engineer. The course structure is reinforced with laboratory exercises. Graduates find employment in a wide range of industries, including the resource and manufacturing sectors. Students in the Co-op program benefit from practical learning experience gained from work-term employment in meaningful engineering jobs, as well as non-tangible learning experiences arising from the responsibilities required to obtain and successfully complete the work terms.

Regarding the Co-op **program fees**, an amount of \$220.57 will be billed during ten consecutive terms for a total amount of \$2,205.70 before graduation. These fees cover expenses directly related to the operation of the Co-op program. Students must register for each of their industrial training courses within the university registration period for returning students or late fees will apply. Before registering for any work term course, students must contact the Co-op in Materials Engineering Liaison Officer for approval.

### 12.7.4.2 Student Advising

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

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

### 12.7.4.3 Bachelor of Engineering (B.Eng.) - Materials Engineering (148 credits)

Program credit weight: 148 credits

Program credit weight for Quebec CEGEP students: 119 credits

Students wanting to study Materials Engineering may only be admitted into the B.Eng.; Co-op in Materials Engineering program. There is no direct admission to the B.Eng.; Materials Engineering program (which does not include the work terms required for the Co-op program). Students can transfer from the B.Eng.; Co-op in Materials Engineering to the B.Eng.; Materials Engineering program once they have met certain requirements and obtained approval from the departmental adviser.

The department offers a Major in Materials Engineering leading to an accredited B.Eng. de



### **Required Non-Departmental Courses**

36 credits

CCOM 206	(3)	Communication in Engineering
CHEM 233	(3)	Topics in Physical Chemistry
CIVE 205	(3)	Statics
CIVE 207	(4)	Solid Mechanics
	(3)	Computer Programming for Physical Sciences and Engineering

**Technical Complementaries**

15 credits

9-15 credits from the following:

CHEE 515*	(3)	Material Surfaces: A Biomimetic Approach
		Advanced Civil Engineering Materials

GEOG 203	(3)	Environmental Systems
GEOG 205	(3)	Global Change: Past, Present and Future
GEOG 302	(3)	Environmental Management 1
MGPO 440*	(3)	Strategies for Sustainability
PHIL 343	(3)	Biomedical Ethics
RELG 270	(3)	Religious Ethics and the Environment
SOCI 235	(3)	Technology and Society
SOCI 312	(3)	Sociology of Work and Industry
URBP 201	(3)	Planning the 21st Century City

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

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

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

Anthropology (ANTH)

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

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

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

Religious Studies (RELG) (excluding courses that principally impart language skills, such as Sanskrit, Tibetan, Tamil, New Testament Greek, and Biblical Hebrew) \*\*\*

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
CLAS 203	(3)	Greek Mythology
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
HISP 225	(3)	Hispanic Civilization 1
HISP 226	(3)	Hispanic Civilization 2
INDR 294*	(3)	Introduction to Labour-Management Relations
INTG 201**	(3)	Integrated Management Essentials 1
INTG 202**	(3)	Integrated Management Essentials 2
MATH 338	(3)	History and Philosophy of Mathematics
MGCR 222*	(3)	Introduction to Organizational Behaviour
MGCR 352*	(3)	Principles of Marketing
ORGB 321*	(3)	Leadership
ORGB 423*	(3)	Human Resources Management

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

\*\* Note: INTG 201 and INTG 202 are not open to students who have taken certain Management courses. Please see the INTG 201 and INTG 202 course information for a list of these courses.

\*\*\* If you are uncertain whether or not a course principally imparts language skills, please see an adviser in the McGill Engineering Student Centre (Frank Dawson Adams building, Room 22) or email an adviser.

Note regarding language courses: Language courses are not accepted to satisfy the Complementary Studies Group B requirement, effective for students who entered the program as of Fall 2017.

**Bachelor of Engineering (B.Eng.) - Co-op in Materials Engineering (148 credits)**

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

68 credits

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 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 470	(3)	Engineering Biomaterials
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 442	(3)	Analysis, Modelling and Optimization in Mineral Processing
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

\* 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) (excluding courses that principally impart language skills, such as Sanskrit, Tibetan, Tamil, New Testament Greek, and Biblical Hebrew) \*\*\*

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
CLAS 203	(3)	Greek Mythology
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 5011 m.181 Tm(La)Tj(2)28.56 Tm01.218vilizon dat11 0 0 1 165.864 40756 Tm01.218)

The Department offers a co-operative program leading to an accredited



CIVE 207	(4)	Solid Mechanics
COMP 208	(3)	Computer Programming for Physical Sciences and Engineering
ECSE 461	(3)	Electric Machinery
EPSC 221	(3)	General Geology
EPSC 225	(1)	Properties of Minerals

MPMC 421\* (3) Exploitation en souterrain

\* Mining courses taken at Ecole Polytechnique

### Stream B - Non-CEGEP Students

Non-CEGEP students must take the following courses:

CIVE 208	(3)	Civil Engineering System Analysis
MIME 329	(2)	Mining Geology
MIME 330	(3)	Mining Geotechnics
MIME 421	(3)	Rock Mechanics
MIME 424	(3)	Underground Mining Methods
MIME 428	(3)	Environmental Mining Engineering

### Technical Complementaries

8-9 credits can be chosen from the following or from any other approved technical courses in Engineering, Management or Science.

Note: Not all course are given annually; see the "Courses" section of this publication 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)	Mechanics of Groundwater Flow
EPSC 320	(3)	Elementary Earth Physics
EPSC 549	(3)	Hydrogeology
FINE 482	(3)	International Finance 1
MIME 290	(2)	Industrial Work Period 1
MIME 320	(3)	Extraction of Energy Resources
MIME 442	(3)	Analysis, Modelling and Optimization in Mineral Processing
MIME 484	(3)	Mining Project
MIME 511	(3)	Advanced Subsurface Ventilation and Air Conditioning
MIME 514	(3)	Sustainability Analysis of Mining Systems
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 courses taken at Ecole Polytechnique.

### Complementary Studies (6 credits)

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

3 credits from the following:

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

CIVE 469	(3)	Infrastructure and Society
ECON 225	(3)	Economics of the Environment
ECON 347	(3)	Economics of Climate Change
ENVR 201	(3)	Society, Environment and Sustainability
GEOG 200	(3)	Geographical Perspectives: World Environmental Problems
GEOG 203	(3)	Environmental Systems
GEOG 205	(3)	Global Change: Past, Present and Future
GEOG 302	(3)	Environmental Management 1
MGPO 440*	(3)	Strategies for Sustainability
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 - Human 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)

MATH 338	(3)	History and Philosophy of Mathematics
MGCR 222*	(3)	Introduction to Organizational Behaviour
MGCR 352*	(3)	Principles of Marketing
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>.

\*\* Note: INTG 201 and INTG 202 are not open to students who have taken certain Management courses. Please see the INTG 201 and INTG 202 course information for a list of these courses.

\*\*\* If you are uncertain whether or not a course principally imparts language skills, please see an adviser in the McGill Engineering Student Centre (Frank Dawson Adams Building, Room 22) or email an adviser.

Note regarding language courses: Language courses are not accepted to satisfy the Complementary Studies Group B requirement, effective for students who entered the program as of Fall 2017.

#### **12.7.5.4 Bachelor of Engineering (B.Eng.) - Co-op in Mining Engineering (150 credits)**

Program credit weight: 150-151 credits

Program credit weight for Quebec CEGEP students: 121-122 credits

The Department of

ECSE 461	(3)	Electric Machinery
EPSC 221	(3)	General Geology
EPSC 225	(1)	Properties of Minerals
gat.profession		Introduction to the Engineering Profession

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

Non-CEGEP students must take the following courses:

CIVE 208	(3)	Civil Engineering System Analysis
MIME 329	(2)	Mining Geology
MIME 330	(3)	Mining Geotechnics
MIME 421	(3)	Rock Mechanics
MIME 424	(3)	Underground Mining Methods
MIME 428	(3)	Environmental Mining Engineering

### Technical Complementaries

8-9 credits 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)	Mechanics of Groundwater Flow
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 511	(3)	Advanced Subsurface Ventilation and Air Conditioning
MIME 514	(3)	Sustainability Analysis of Mining Systems
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
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
MGPO 440*	(3)	Strategies for Sustainability
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,**

INTG 202**	(3)	Integrated Management Essentials 2
MATH 338	(3)	History and Philosophy of Mathematics
MGCR 222*	(3)	Introduction to Organizational Behaviour
MGCR 352*	(3)	Principles of Marketing
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>.

\*\* Note: INTG 201 and INTG 202 are not open to students who have taken certain Management courses. Please see the INTG 201 and INTG 202 course information for a list of these courses.

\*\*\* If you are uncertain whether or not a course principally imparts language skills, please see an adviser in the McGill Engineering Student Centre (Frank Dawson Adams Building, Room 22) or email an adviser.

Note regarding language courses: Language courses are not accepted to satisfy the Complementary Studies Group B requirement, effective for students who entered the program as of Fall 2017.

## 12.8 Urban Planning

### 12.8.1 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)

### 12.8.2 About the School of Urban Planning

Urban planning can be described as the collecti



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. For details of the M.U.P. admission requirements and curriculum, consult the School's [website](#), as well as [Faculty of Engineering > Graduate > Browse Academic Units & Programs > Urban Planning](#).

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

The School of Urban Planning hosts a number of events that are open to undergraduate students and to the public: the Brenda and Samuel Gewurz Lectures in Urban Design bring speakers of international calibre to McGill; and the "urban.studies@mcgill" seminars bring speakers from academia, the profession and the community to talk about contemporary urban issues.

For details of the M.U.P. admission requirements and curriculum, consult the [Faculty of Engineering](#) section for Graduate and Postdoctoral Studies.

### 12.8.3 Undergraduate Courses in Urban Planning

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

Undergraduate Courses in Urban Planning		
ARCH 520	(3)	Montreal: Urban Morphology
URBP 201	(3)	Planning the 21st Century City
URBP 501	(2)	Principles and Practice I
URBP 504	(3)	Planning for Active Transportation
URBP 505	(3)	Geographic Information Systems
URBP 506	(3)	Environmental Policy and Planning
URBP 507	(3)	Planning and Infrastructure
URBP 514	(4)	Community Design Workshop
URBP 519	(6)	Sustainable Development Plans
URBP 520	(3)	Globalization: Planning and Change
URBP 530	(3)	Urban Environmental Planning
URBP 536	(2)	Current Issues in Transportation 1
URBP 537	(2)	Current Issues in Transportation 2
URBP 541	(1)	Selected Topics in Planning
URBP 542	(1)	Selected Topics in Visual Analysis
URBP 551	(3)	Urban Design and Planning
	(3)	Urban Governance

## Professors

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

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

## Associate Professors

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

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

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

## Assistant Professor

David Wachsmuth; B.A.(McG.), M.Sc.(Tor.), Ph.D.(NYU)

## Adjunct Professors

Jayne Engle; B.Sc.(Eastern Univ., Penn.), M.B.A.(Temple), M.U.R.P.(Pitt.), Ph.D.(McG.)

Nilson Espino; B.Arch.(Catolica Santa Maria La Antigua), M.Sc.(Ariz.), Ph.D.(Rice)

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

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

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

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

## Associate Member

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

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**Required Courses (6 credits)**

AERO 401	(3)	Introduction to Aerospace Engineering
AERO 410	(3)	Aerospace Design and Certification Process

**Complementary Courses (18 credits)**

18 credits from one of the following streams:

**Aerodynamics and Propulsion Stream**

MECH 463D1*	(3)	Design 3: Mechanical Engineering Project
MECH 463D2*	(3)	Design 3: Mechanical Engineering Project

\* An aerospace engineering project will be defined for students enrolled in the Minor

AND

12 credits from the following:

MECH 447	(3)	Combustion
MECH 532	(3)	Aircraft Performance, Stability and Control
MECH 533	(3)	Subsonic Aerodynamics
MECH 535	(3)	Turbomachinery and Propulsion
MECH 539	(3)	Computational Aerodynamics
MECH 566	(3)	Fluid-Structure Interactions
MECH 579	(3)	Multidisciplinary Design Optimization

**Aircraft Structure Stream**

MECH 463D1*	(3)	Design 3: Mechanical Engineering Project
MECH 463D2*	(3)	Design 3: Mechanical Engineering Project

\* An aerospace engineering project will be defined for students enrolled in the Minor.

AND

12 credits from the following:

MECH 530	(3)	Mechanics of Composite Materials
MECH 536	(3)	Aerospace Structures
MECH 543	(3)	Design with Composite Materials
MECH 544	(3)	Processing of Composite Materials
MECH 546	(3)	Finite Element Methods in Solid Mechanics
MECH 550	(3)	Vibrations of Continuous Systems
MECH 551	(3)	Nonlinear Dynamics of Shell Structures
MECH 567	(3)	Structural Dynamics of Turbomachines
MIME 560	(3)	Joining Processes
MIME 565	(3)	Aerospace Metallic-Materials and Manufacturing Processes

**Spacecraft and Systems Stream**

MECH 463D1*	(3)	Design 3: Mechanical Engineering Project
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MECH 463D2\* (3) Design 3: Mechanical Engineering Project

\* An aerospace engineering project will be defined for students enrolled in the Minor.

AND

12 credits from the following:

GEOG 308	(3)	Principles of Remote Sensing
MECH 513	(3)	Control Systems
MECH 536	(3)	Aerospace Structures
MECH 542	(3)	Spacecraft Dynamics
MECH 546	(3)	Finite Element Methods in Solid Mechanics
MECH 550	(3)	Vibrations of Continuous Systems
MECH 559	(3)	Engineering Systems Optimization
MIME 565	(3)	Aerospace Metallic-Materials and Manufacturing Processes
PHYS 214	(3)	Introductory Astrophysics

#### Material and Processes Stream

AERO 460D1	(3)	Aerospace Project
AERO 460D2	(3)	Aerospace Project

AND

12 credits from the following:

CHEE 515*	(3)	Material Surfaces: A Biomimetic Approach
CHEE 541	(3)	Electrochemical Engineering
CHEE 543	(3)	Plasma Engineering
MECH 544	(3)	Processing of Composite Materials
MIME 512	(3)	Corrosion and Degradation of Materials
MIME 515*	(3)	Material Surfaces: A Biomimetic Approach
MIME 559	(3)	Aluminum Physical Metallurgy
MIME 560	(3)	Joining Processes
MIME 563	(3)	Hot Deformation of Metals
MIME 565	(3)	Aerospace Metallic-Materials and Manufacturing Processes
MIME 571	(3)	Surface Engineering
MIME 580	(3)	Additive Manufacturing Using Metallic and Ceramic Materials

\* Students may choose only one of CHEE 515 or MIME 515.

#### Avionics Stream

ECSE 456*	(3)	ECSE Design Project 1
ECSE 457*	(3)	ECSE Design Project 2

\* An aerospace engineering project will be defined for students enrolled in the Minor.

AND

12 credits from the following:

ECSE 403	(4)	Control
ECSE 408	(4)	Communication Systems
ECSE 412	(3)	Discrete Time Signal Processing
ECSE 420	(3)	Parallel Computing
ECSE 421	(3)	Embedded Systems
ECSE 422	(3)	Fault Tolerant Computing
ECSE 425	(3)	Computer Architecture

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BIEN 410	(3)	Computational Methods in Biomolecular Engineering
BIEN 520	(3)	High Throughput Bioanalytical Devices
BIEN 540	(3)	Information Storage and Processing in Biological Systems
BIEN 590	(3)	Cell Culture Engineering
BIOC 311	(3)	Metabolic Biochemistry
BIOC 312	(3)	Biochemistry of Macromolecules
BIOC 458*	(3)	Membranes and Cellular Signaling
BMDE 508	(3)	Introduction to Micro and Nano-Bioengineering
COMP 424	(3)	Artificial Intelligence
COMP 462	(3)	Computational Biology Methods

\* Students select either ANAT 458 or BIOC 458.

### **Biomaterials, Biosensors and Nanotechnology**

BIEN 330	(3)	Tissue Engineering and Regenerative Medicine
BIEN 510	(3)	Engineered Nanomaterials for Biomedical Applications
BIEN 550	(3)	Biomolecular Devices
BIEN 560	(3)	Biosensors
BMDE 504	(3)	Biomaterials and Bioperformance
BMDE 505	(3)	Cell and Tissue Engineering
BMDE 508	(3)	Introduction to Micro and Nano-Bioengineering
CHEE 380	(3)	Materials Science
ECSE 424	(3)	Human-Computer Interaction
MECH 553	(3)	Design and Manufacture of Microdevices
MIME 360	(3)	Phase Transformations: Solids
MIME 362	(3)	Mechanical Properties
MIME 470	(3)	Engineering Biomaterials
PHYS 534	(3)	Nanoscience and Nanotechnology

### **Biomechanics and Prosthetics**

BIEN 320	(3)	Molecular, Cellular and Tissue Biomechanics
BIEN 570	(3)	Active Mechanics in Biology
BMDE 512	(3)	Finite-Element Modelling in Biomedical Engineering
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**



BIEN 350*	(4)	Biosignals, Systems and Control
BIEN 530	(3)	Imaging and Bioanalytical Instrumentation
BMDE 512	(3)	Finite-Element Modelling in Biomedical Engineering
BMDE 519	(3)	Biomedical Signals and Systems
COMP 424	(3)	Artificial Intelligence
COMP 558	(3)	Fundamentals of Computer Vision
ECSE 206*	(3)	Introduction to Signals and Systems
ECSE 412	(3)	Discrete Time Signal Processing
PHYS 557	(3)	Nuclear Physics

\* Students choose either BIEN 350 or ECSE 206.

#### Neural Systems and Biosignal Processing

BIEN 350*	(4)	Biosignals, Systems and Control
BIEN 462	(3)	Engineering Principles in Physiological Systems
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 206*	(3)	Introduction to Signals and Systems
ECSE 517	(3)	Neural Prosthetic Systems
ECSE 526	(3)	Artificial Intelligence
PHYS 413	(3)	Physical Basis of Physiology

\* Students choose either BIEN 350 or ECSE 206.

0-6 credits can be taken by permission of the Departmental Adviser and approval of the Minor Adviser.

**Revision, May 2019. End of revision.**

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

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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 1
EXMD 503	(3)	Advanced Endocrinology 02
PHAR 562	(3)	Neuropharmacology
PHAR 563	(3)	Endocrine Pharmacology
PHGY 517	(3)	Artificial Internal Organs
PHGY 518	(3)	Artificial Cells

### **Pollution**

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

CIVE 225	(4)	Environmental Engineering
CIVE 430	(3)	Water Treatment and Pollution Control
CIVE 557	(3)	Microbiology for Environmental Engineering

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

Minor Adviser (program coordinator): Dr. Samuel Se

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

\* Students choose either CHEM 233 or CHEE 310

\*\* or CEGEP equivalent

### Complementary Courses

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

Note that CHEM 212 is a prerequisite for most of the courses listed below, and CHEM 213 (Introductory Physical Chemistry 1) and CHEM 273 (Introductory Physical Chemistry 2) or their equivalents are prerequisites for the Physical Chemistry courses. If students take CHEM 222 (Introductory Organic Chemistry 2), which includes a lab, instead of CHEM 234, they will receive credit for one of the two required laboratory courses, but they must complete a total of 25 credits in chemistry for the Minor.

### Inorganic Chemistry

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

### Analytical Chemistry

CHEM 267	(3)	Introductory Chemical Analysis
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	(3)	Organic Chemistry: Natural Products

### Physical Chemistry

CHEM 345	(3)	Introduction to Quantum Chemistry
CHEM 355	(3)	Applications of Quantum Chemistry
CHEM 493*	(2)	Advanced Physical Chemistry Laboratory
CHEM 574	(3)	Introductory Polymer Chemistry

## 12.10.6 Computer Science Courses and Minor Program

The School of Computer Science offers an extensive range of courses for students in the Faculty of Engineering who are interested in computers. Students in the Faculty of Engineering may obtain a **Computer Science Minor** 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  
McConnell Engineering Building, Room 320  
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*.

#### **12.10.6.1 Computer Science Courses in Engineering Programs**

The School of Computer Science offers an extensive range of courses for students in the Faculty of Engineering who are 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. programs are listed below.

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

9 credits from:

COMP 251	(3)	Algorithms and Data Structures
MATH 240	(3)	Discrete Structures

COMP courses at the 300 level or above except COMP 396, COMP 400.

It is strongly recommended that students take COMP 251, as it is a prerequisite of many later computer science courses.

\* Students who have taken ECSE 221 may use it instead of ECSE 222 or COMP 273.

### 12.10.7 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. 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)	Computer Programming for Physical Sciences and 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
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
	(3)	Renovation and Preservation: Infrastructure

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 Industrial Rev



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

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

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

### **Complementary Courses**

21-22 credits

18 credits from Stream A, B, or C below

and

One course (3-4 credits) from the following list:

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

### **Stream A**

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

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

### **Stream B**

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

AND

One 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)	Ecological Engineering

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

Courses offered at the Downtown campus:

ARCH 377	(3)	Energy, Environment and Buildings
ARCH 515	(3)	Sustainable Design
CHEE 351	(3)	Separation Processes
CHEE 370	(3)	Elements of Biotechnology
CHEE 496	(3)	Environmental Research Project
CHEE 591	(3)	Environmental Bioremediation
CHEE 592	(3)	Industrial Air Pollution Control
CHEE 593	(3)	Industrial Water Pollution Control
CIVE 225	(4)	Environmental Engineering
CIVE 323**	(3)	Hydrology and Water Resources
CIVE 421	(3)	Municipal Systems
CIVE 428	(3)	Water Resources and Hydraulic Engineering
CIVE 430	(3)	Water Treatment and Pollution Control
CIVE 451	(3)	Geoenvironmental Engineering
CIVE 550	(3)	Water Resources Management
CIVE 555	(3)	Environmental Data Analysis
CIVE 557	(3)	Microbiology for Environmental Engineering
CIVE 572	(3)	Computational Hydraulics
CIVE 573	(3)	Hydraulic Structures
CIVE 574	(3)	Fluid Mechanics of Water Pollution
CIVE 577	(3)	River Engineering
CIVE 584	(3)	Mechanics of Groundwater Flow
MECH 447	(3)	Combustion
MECH 526	(3)	Manufacturing and the Environment
MECH 534	(3)	Air Pollution Engineering
MECH 535	(3)	Turbomachinery and Propulsion

(3) t:3iniers Environnement et gestion des rejets miniers

Each Minor comprises 18 credits of courses available from the core program of the Desautels Faculty of Management (subject to timetable requirements). Some courses from the Management core program have considerable overlap with Engineering courses and thus are not available to Engineering students.

Students embarking on a minor must be prepared to take credits additional to their Engineering program. Students in a B.Eng. program may be able to count up to 6 credits of Complementary Studies Group B courses (Humanities and Social Sciences, Management Studies, and Law courses) toward both their Engineering major program and a Management minor where applicable. More information about Complementary Studies is given in each individual academic program listing for the B.Eng. degree (see [section 12: Browse Academic Units & Programs](#)).

Admission requirements for the Management Minors change annually. Please consult the [Desautels Faculty of Management website](#) for more details.

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

### **Application and Program Requirements**

Detailed information on the following Minor programs can be found in [Desautels Faculty of Management](#) > [Undergraduate](#) > [Overview of Progr](#)



Note: MATH 262, MATH 263 (or any course with substantial overlap in content with these two courses) and/or MATH 338 cannot be credited towards this minor.

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

Minor Adviser: Prof. Mustafa Kumral (Minor Coordinator)

Frank Dawson Adams Building, Room 119

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:

CIVE 416	(3)	Geotechnical Engineering
CIVE 451	(3)	Geoenvironmental Engineering



Minor Adviser: Prof. N. Tufenkji, Wong Building, Room 4300

Students must complete 21 credits of courses as indicated below. A maximum of 12 credits of courses in the student's major may double-count with the Minor.

Students who have not taken the listed prerequisites for any of these courses should ensure that they have the adequate background and/or meet with the instructor before registering for the course. Permission from the instructor and/or department may be required.

The program is open to undergraduate students that are in Year 2 or higher.

### Complementary Courses (21-22 credits)

#### Group A

Students must complete a minimum of 3 credits from the following list of courses:

BIEN 510	(3)	Engineered Nanomaterials for Biomedical Applications
BMDE 508	(3)	Introduction to Micro and Nano-Bioengineering
CHEE 521*	(3)	Nanomaterials and the Aquatic Environment
CHEM 534*	(3)	Nanoscience and Nanotechnology
CIVE 521*	(3)	Nanomaterials and the Aquatic Environment
ECSE 535**	(3)	Nanoelectronic Devices
MIME 570	(3)	Micro- and Nano-Fabrication Fundamentals
PHYS 534*	(3)	Nanoscience and Nanotechnology

#### Group B

Students will be required to take up to 18-19 credits of courses from Group B, depending on how many courses from Group A were taken.

#### Bioengineering

BIEN 520	(3)	High Throughput Bioanalytical Devices
BIEN 550	(3)	Biomolecular Devices

#### Chemical Engineering

CHEE 380*	(3)	Materials Science
CHEE 515*	(3)	Material Surfaces: A Biomimetic Approach
CHEE 543	(3)	Plasma Engineering
CHEE 582	(3)	Polymer Science & Engineering
CHEE 585	(3)	Foundations of Soft Matter
CHEE 587	(3)	Chemical Processing: Electronics Industry

#### Chemistry

CHEM 334	(3)	Advanced Materials
CHEM 531	(3)	Chemistry of Inorganic Materials
CHEM 582	(3)	Supramolecular Chemistry
CHEM 585	(3)	Colloid Chemistry
CHEM 587	(3)	Topics in Modern Analytical Chemistry

#### Electrical Engineering

ECSE 423	(3)	Fundamentals of Photonics
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ECSE 430	(3)	Photonic Devices and Systems
ECSE 433	(4)	Physical Basis of Transistor Devices
ECSE 519**	(3)	Semiconductor Nanostructures and Nanophotonic Devices
ECSE 536**	(3)	RF Microelectronics
ECSE 571**	(3)	Optoelectronic Devices
ECSE 596**	(3)	Optical Waveguides
MIME 262*	(3)	Properties of Materials in Electrical Engineering

Mechanical Engineering

MECH 500***	(3)	Selected Topics in Mechanical Engineering
MECH 553	(3)	Design and Manufacture of Microdevices
MECH 556	(3)	Microfluidics and BioMEMS

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

Minor Adviser: Prof. G. Holder, Department of Physics, undergraduate.advisor@physics.mcgill.ca. For names and other contact information, see <http://www.physics.mcgill.ca/ugrads/advsched.html>.

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

#### Required Courses

9 credits

PHYS 253	(3)	Thermal Physics
PHYS 357	(3)	Honours Quantum Physics 1
PHYS 457	(3)	Honours Quantum Physics 2

#### Complementary Courses (9 credits)

9 credits from the following:

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

### 12.10.18 Bachelor of Engineering (B.Eng.) - Minor Software Engineering (18 credits)

Minor Adviser: Undergraduate Program Office, Department of Electrical and Computer Engineering (Lorne Trotter Building, Room 2070)

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.

The Minor program does not carry professional recognition.

Up to two courses (6 credits) may be double-counted towards a degree program.

#### Required Courses

12 credits

COMP 250	(3)	Introduction to Computer Science
ECSE 223	(3)	Model-Based Programming
ECSE 321	(3)	Introduction to Software Engineering
ECSE 428	(3)	Software Engineering Practice

#### Complementary Courses

6 credits from the following:

COMP 302	(3)	Programming Languages and Paradigms
COMP 409	(3)	Concurrent Programming
COMP 421	(3)	Database Systems



BUSA 465	(3)	Technological Entrepreneurship
LAWG 570	(3)	Innovation for Non-Law Students
MGPO 438	(3)	Social Entrepreneurship and Innovation
ORGB 321	(3)	Leadership