Faculty of Engineering, including Peter Guo-hua Fu School of Architecture and School of Urban Planning (Undergraduate)

Programs, Courses and University Regulations

2020-2021

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

1 . McGill University reserves the right to mak

Publication Information

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1 About Engineering (Undergraduate)

1.1 Location

Faculty of Engineering

Macdonald Engineering Building
817 Sherbrooke Street West
Montreal QC H3A 0C3
Canada
Telephone: 514-398-7250
Faculty website: *www.mcgill.ca/engineering*

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 Da

1.3 Administrative Officers

Dean

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

Associate Deans

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

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

David L. Frost; B.A.Sc.(Br. Col.), M.S., Ph.D.(Caltech), P.Eng. (*Student Affairs*)

Laurent Mydlarski; B.A.Sc.(Wat.), Ph.D.(Cornell), ing. (*Academic Programs*)

Department Chairs

George P. Demopoulos; Dipl.Eng.(Nat. Tech., Athens), M.Sc., Ph.D.(McG.), ing. (*Mining and Materials Engineering*)

Warren Gross; B.A.Sc.(Wat.), M.A.Sc., Ph.D.(Tor.) (*Electrical and Computer Engineering*)

Mohamed Meguid; B.C.E.(Cairo), M.E.Sc., Ph.D.(UWO) (*Civil Engineering and Applied Mechanics*)

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.(Bucharest Tech.), M.S.(ASE Bucharest), Ph.D.(Bucharest Tech.) (*Bioengineering*)

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

Director, The Peter Guo-hua Fu School of Architecture

Martin Bressani; B.Sc.(Arch.), B.Arch.(McG.), M.Sc.(Arch.)(MIT), Ph.D.(Sorbonne)

Director, School of Urban Planning

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

Director of Administration

Chidinma Offoh-Robert; Ph.D.

Associate Director, Engineering Student Centre

Kaila Folinsbee; Ph.D.

2 Degrees and Requirements for Professional Registration

Non-Professional

Bachelor of Science (Architecture)

The first professional degree in architecture is the Master of Architecture (Professional). Further information can be found in *Faculty of Engineering* > *Graduate*.

Professional

Bachelor of Engineering

The B.Eng. programs are accredited by the Canadian Engineering Accreditation Board (CEAB) of Engineers Canada, with the sole exception of the new Bioengineering program (see note below). Our accredited programs fulfil the **academic** requirements for admission to the provincial engineering professional organizations. Engineers Canada has also negotiated agreements with engineering organizations in other countries to grant Canadian licensed engineers the same privileges accorded to professional engineers in those countries. For more information, visit the Engineers Canada website at *www.engineerscanada.ca*.

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

In Quebec, the professional engineering body is the *Ordre des ingénieurs du Québec* (OIQ). In order to better prepare new graduates for the practice of their profession, McGill organizes seminars in cooperation with the OIQ on various aspects of the profession. The OIQ also has a student section. For more information, visit the OIQ website at *www.oiq.qc.ca*.

Note Regarding the Accreditation Status of the B.Eng. Bioengineering Program: Accreditation for new undergraduate engineering programs in Canada can only be granted by CEAB after students have graduated from the program. Following normal procedures for the accreditation of new engineering programs, the B.Eng. Bioengineering program at McGill University will undergo a formal accreditation review and site visit during the final year of study of its first cohort of students. For more information on the accreditation status of the Bioengineering program, please see the *Department of Bioengineering website*.

3 Admission Requirements

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

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

4 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* for links to department/school websites.

You are expected to complete the B.Eng. epare neTxpecof admission.Txpecof ad 476.51 Tpare ne

Major Programs
Computer Engineering (B.Eng.)
Electrical Engineering (B.Eng.)
Materials Engineering (B.Eng.)
Mechanical Engineering (B.Eng.)
Mining Engineering (B.Eng.)
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

7 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 yers v g

7.1 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* or send an email to *careers4engineers@mcgill.ca*.

Important Information:

- While on internship, you are expected to complete any deferrals you may have been granted, regardless of the location of the internship. If you do not write a deferred exam as scheduled, you will receive a final grade of J. The J grade will calculate as a failure in both the TGPA and CGPA.
- International students must ensure that their health coverage remains in force during their internship.
- During your time as an intern, you are not considered to be in full-time status. Your government loans will become due and payable within the prescribed grace period (usually six months).
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- develops professional and post-professional research-based Masters and Ph.D. programs that enable graduates to contribute responsibly to the profession, to research, and to careers in related fields;
- enriches multidisciplinary teaching and research within the University and in connection with other local and international universities;
- engages citizens' groups, local, provincial, and national governments, the private sector, and the profession toward the improvement of the built environment.

8.1.3 Architectural Certification in Canada

In Canada, all provincial/territorial associations/institutes/orders recommend a degree from an accredited professional degree program as a prerequisite for licensure. The Canadian Architectural Certification Board (CACB), which is the sole agency authorized to accredit Canadian professional degree programs in architecture, recognizes two types of accredited degrees: the **Master of Architecture (M.Arch.)**, and the **Bachelor of Architecture (B.Arch.)**. A program may be granted a two-year, three-year, or six-year term of accreditation, depending on its degree of conformance with established educational standards.

Master's degree programs may consist of a preprofessional undergraduate degree and a professional graduate degree, which, when earned sequentially, comprise an accredited professional education. However, the preprofessional degree is not, by itself, recognized as an accredited degree.

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

8.1.4 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 CGPA requirement does not guarantee entry into M.Arch program;
- submit a portfolio of work executed in the sequence of six design studios, as well as samples of professional and personal work;
- complete the minimum period of relevant work experience according to the current Work Experience Guidelines (see *www.mcgill.ca/architecture/programs/professional/workexperience*).

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

8.1.4.1 Student Exchanges

A limited number of qualified students may participate in an exchange with schools of architecture at other universities that have agreements with the McGill

8.1.6 Architecture Faculty

Director

Martin Bressani

Graduate Program Director

David Theodore

Emeritus Professors

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

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

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

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

Associate Professors (Post-Retirement)

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

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

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

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*)

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

Kiel Moe; B.Arch.(Cinc.), M.Arch.(Virg.), M.Des.(Harv.) (*Gerald Sheff Chair in Architecture*)

Alberto Pérez-Gómez; Dipl.Eng.Arch.(IPN), M.A., Ph.D.(Essex), M.R.A.I.C. (*Saidye Rosner Bronfman Professor of Architectur*

Course Lecturers

Vedanta Balbahadur, Morgan Carter, Diana Cheng, Laurie Damme Gonneville, Aniel Guxholli, Tania Delage, Nancy Dunton, Tom Egli, Fabrizio Gallanti, Marc Hallé, Sybil McKenna, Hugh Pelletier

ARCH 250	(3)	Architectural History 1
ARCH 251	(3)	Architectural History 2
ARCH 303	(6)	Design and Construction 1
ARCH 304	(6)	Design and Construction 2
ARCH 325	(2)	Architectural Sketching
ARCH 342	(3)	Digital Representation
ARCH 354	(3)	Architectural History 3
ARCH 355	(3)	Architectural History 4
ARCH 375	(2)	Landscape
		Energy, 986fEstory 4

ARCH 566	(3)	Cultural Landscapes Seminar
OCC1 442	(2)	Environments for the Disabled

Electives

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

8.2 Bioengineering

8.2.1 Location

McConnell Engineering Building
Room 350
3480 University Street
Montreal QC H3A 0E9
Telephone: 514-398-3647
Fax: 514-398-7379
Email: *studentaffairs.bioeng@mcgill.ca*
Website: *www.mcgill.ca/bioengineering*

8.2.2 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

8.2.3 Bioengineering Faculty

Chair

Dan V. Nicolau

Professors

Dan V. Nicolau; B.Eng., M.Eng.(Bucharest Tech.), M.S.(ASE, Bucharest), Ph.D.(Bucharest Tech.)

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

Sebastian Wachsmann-Hogiu; B.S.(Bucharest), Ph.D.(HU Berlin)

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

Associate Professors

Allen Ehrlicher; B.Sc., B.A.(Texas-Austin), M.Sc., Ph.D.(Leipzig)

J. Matt Kinsella; B.Sc.(SXU, Chicago), M.S., Ph.D.(Purd.)

Georgios Mitsis; Dipl.(Nat. Tech., Athens), M.S.(Elect. Eng.), M.S.(Biomed. Eng.), Ph.D.(USC)

Assistant Professors

Adam Hendricks; B.S., M.S.(Virginia Tech), Ph.D.(Mich.)

Sara Mahshid; B.Sc.(IUST, Tehran), M.Sc., Ph.D.(SUT, Tehran)

8.2.4 Bachelor of Engineering (B.Eng.) - Bioengineering (142 credits)

Program credit weight: 142-152 credits

Program credit weight for Quebec CEGEP students: 122-123 credits

Program credit weight for out-of-province students: 142-143 credits

The B.Eng.; Major in Bioengineering will 1) provide students with the ability to apply systematic knowledge of biology, physical sciences and mathematics; and sound engineering foundations in order to solve problems of a biological nature; and 2) prepare students for the broad area of bioengineering, incorporating both biology-focused biological engineering and medicine-focused biomedical engineering.

Students will acquire fundamental knowledge in bioengineering-related natural sciences and mathematics, as well as in the foundations of general engineering and bioengineering. Students will also acquire knowledge in one area of specialization of bioengineering: 1) biological materials and biomechanics; 2) biomolecular and cellular engineering; or 3) biomedical, diagnostic and high throughput screening engineering.

Required Year 0 (Freshman) Courses

29 credits

Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credits for Year 0 (Freshman) courses, except BIOL 112, and enter a 122-123-credit program. Students from Quebec CEGEPs who have successfully completed a course at CEGEP that is equivalent to BIOL 112 may obtain transfer credits for this course by passing the McGill Science Placement Exam for BIOL 112. For information on transfer credit for French Baccalaureate, International Baccalaureate exams, Advanced Placement exams, Advanced Levels and Science Placement Exams, see www.mcgill.ca/engineering/student/sao/newstudents and select your term of admission.

BIOL 112	(3)	Cell and Molecular Biology
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

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
CHEM 212**	(4)	Introductory Organic Chemistry 1
CIVE 281	(3)	Analytical Mechanics
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 203	(3)	Principles of Statistics 1
MATH 262	(3)	Intermediate Calculus
MATH 263	(3)	Ordinary Differential Equations for Engineers
MATH 264	(3)	Advanced Calculus for Engineers
MECH 210	(2)	Mechanics 1
PHYS 319	(3)	Introduction to Biophysics

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

** Students from a CEGEP background who have completed a CEGEP course equivalent to CHEM 212 may obtain transfer credits for this course by passing the McGill Placement Exam before the start of their first term. For information on Science Placement Exams, see www.mcgill.ca/exams/dates/science. CEGEP students who do not successfully complete the CHEM 212 Placement Exam must take CHEM 212 at McGill, as outlined in the program requirements.

Required Bioengineering Courses

39 credits

Introduction to Bioengineering

BIEN 330	(3)	Tissue Engineering and Regenerative Medicine
BIEN 410	(3)	Computational Methods in Biomolecular Engineering
BIEN 420	(3)	High Throughput Bioanalytical Devices
BIEN 510	(3)	Engineered Nanomaterials for Biomedical Applications
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 420	(3)	High Throughput Bioanalytical Devices
BIEN 462	(3)	Engineering Principles in Physiological Systems
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.

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
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
		Introduction to Labour-Management Relations

8.3 Chemical Engineering

8.3.1 Location

M.H. Wong Building, Room 3060
3610 University Street
Montreal QC H3A 0C5
Telephone: 514-398-4494
Fax: 514-398-6678
Email: *ugrad.chemeng@mcgill.ca*
Website: *www.mcgill.ca/chemeng*

8.3.2 About the Department of Chemical Engineering

The central purpose of engineering is to pursue solutions to technological problems in order to satisfy the needs and desires of society. Chemical engineers are trained to solve the kinds of problems that are typically found in the "**chemical pr**

8.3.4 Canadian Society for Chemical Engineering

The *Chemical Engineering Student Society* has for many years been affiliated with both the *CSChE* (Canadian Society for Chemical Engineering) and with the *AIChE* (American Institute of Chemical Engineers). For a nominal fee, students receive *Canadian Chemical News*, a monthly publication, and the *AIChE Student Members Bulletin*, as well as other privileges of student membership in the two societies. The student chapter also organizes a series of local social, educational, and sporting events. Recent events hav

* Note: FACC 100 (Introduction to the Engineering Profession) must be tak

CHEE 585	(3)	Foundations of Soft Matter
CHEE 587	(3)	Chemical Processing: Electronics Industry
CHEE 591	(3)	Environmental Bioremediation
CHEE 593+	(3)	Industrial Water Pollution Control
CIVE 430+	(3)	Water Treatment and Pollution Control
CIVE 521+	(3)	Nanomaterials and the Aquatic Environment
MECH 534+	(3)	Air Pollution Engineering
MECH 563+	(3)	Biofluids and Cardiovascular Mechanics
MIME 515+	(3)	Material Surfaces: A Biomimetic Approach

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

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

List B

0-6 credits from the following:

BIEN 550	(3)	Biomolecular Devices
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.

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

List C

0-3 credits

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

Complementary Studies

6 credits (9 credits for students from Quebec CEGEPs)

Group A - Impact of Technology on Society

3 credits from the following:

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

ECON 225	(3)	Economics of the Environment
ECON 347	(3)	Economics of Climate Change
ENVR 201	(3)	Society, Environment and Sustainability
GEOG 200	(3)	Geographical Perspectives: World Environmental Problems
GEOG 203	(3)	Environmental Systems
GEOG 205	(3)	Global Change: Past, Present and Future
GEOG 302	(3)	Environmental Management 1
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 - Hum92o 491.12 0 0 1 221.949 536.92 Tm Hj1 0 0 1 175.6636.92 Tm Hj1oTm6

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.

8.3.6.1 More about B.Eng. Degree in Chemical Engineering

Courses CHEE 582 and CHEE 584 comprise a **Polymeric Materials** course sequence, while courses CHEE 380 and CHEE 484 present fundamental aspects of materials science and engineering, respectively. Additional courses in the polymer materials area are available in the Chemistry Department (e.g., CHEM 574). The Department has considerable expertise in the polymer area.

Courses CHEE 370 and CHEE 474 make up a sequence in **Biochemical Engineering and Biotechnology**. Students interested in this area may take additional courses, particularly those offered by the *section 8.2: Bioengineering* (Faculty of Engineering); by the *: Department of Food Science and Agricultural Chemistrywr*

- Economics;
- Management;
- Environmental Engineering;
- Construction Engineering and Management;
-

Professors

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

Yixin Shao; B.Sc., M.S.(Tongji), Ph.D.(N'Western), P.Eng., F.A.C.I.

Laxmi Sushama; B.Tech.(Kerala), M.Eng.(IISc, India), MS.(NUI), Ph.D.(Melb.) (*Trottier Chair in Sustainability Engineering and Design*)

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.Ing., M.Ing.(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 Poly.), Ph.D.(Purd.)

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

Assistant Professor

Mary Kang; B.A.Sc., M.A.Sc.(Wat.), Ph.D.(Princ.)

Lijun Sun; B.Eng.(Tsinghua), Ph.D.(NUS)

8.4.5 Bachelor of Engineering (B.Eng.) - Civil Engineering (139 credits)

Program credit weight: 139 credits

Program credit weight for Quebec CEGEP students: 110 credits

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

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

Required Non-Departmental Courses

28 credits

CCOM 206	(3)	Communication in Engineering
COMP 208	(3)	Computer Programming for Physical Sciences and Engineering
EPSC 221	(3)	General Geology
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

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
CIVE 540	(3)	Urban Transportation Planning
CIVE 542	(3)	Transportation Network Analysis
CIVE 546	(3)	Selected Topics in Civil Engineering 1
CIVE 550	(3)	Water Resources Management
CIVE 551	(3)	Environmental Transport Processes
CIVE 555	(3)	Environmental Data Analysis
CIVE 557	(3)	Microbiology for Environmental Engineering
CIVE 558	(3)	Biomolecular Techniques for Environmental Engineering
CIVE 560	(3)	Transportation Safety and Design
CIVE 561	(3)	Urban Activity, Air Pollution, and Health
CIVE 572	(3)	Computational Hydraulics
CIVE 573	(3)	Hydraulic Structures
CIVE 574	(3)	Fluid Mechanics of Water Pollution
CIVE 577	(3)	River Engineering
CIVE 584	(3)	Mechanics of Groundwater Flow
URBP 551	(3)	Urban Design and Planning

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

Complementary Studies

6 credits

Group A - Impact of Technology on Society

3 credits from the following:

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

8.5 Electrical and Computer Engineering

8.5.1 Location

Department of Electrical and Computer Engineering
Undergraduate Programs Office
Lorne Trottier Building, Room 2060
3630 University Street
Montreal QC H3A 0C6
Telephone: 514-398-3943
Email: *undergrad.ece@mcgill.ca*
Website: *www.mcgill.ca/ece*

8.5.2 About the Department of Electrical and Computer Engineering

The Department of Electrical and Computer Engineering offers undergraduate degree programs in:

- Electrical Engineering
- Electrical Engineering (Honours)
- Computer Engineering

All programs provide students with a strong background in mathematics, natural sciences, engineering science, engineering design, and complementary studies, in conformity with the requirements of the *Canadian Engineering Accreditation Board* (CEAB).

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

8.5.3 Electrical and Computer Engineering Faculty

Chair

Warren Gross

Associate Chair, Academic

Roni Khazaka

Associate Chair, Undergraduate Programs

François Bouffard

Associate Chair, Graduate Programs

Odile Liboiron-Ladouceur

Associate Chair

Associate Professors

Odile Liboiron-Ladouceur; B.Eng.(McG.), M.Sc., Ph.D.(Col.) (*CRC Tier 2*) P.Eng.

Aditya Mahajan; B.Tech.(Indian IT), M.S., Ph.D.(Mich.), P.Eng.

Muthucumaru 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.

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

Gunter Mussbacher; Ph.D.(Ott.) (*William Dawson Scholar*) P.Eng.

Derek Nowrouzezahrai; B.Sc.(Wat.), M.Sc., Ph.D.(Tor.) (*Endowed Chair*) (*Currently on sabbatical*)

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

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

Assistant Professors

Narges Armanfard; B.Sc.(Shahid), M.Sc.(Tarbiat Mod), Ph.D.(McM.)

Sharmistha Bhadra; B.Sc.(New Br.), M.Sc., Ph.D.(Manit.)

Amin Emad; B.Sc.(Sharif), M.Sc.(Alta.), Ph.D.(Ill.)

Shane McIntosh; B.A.(Comp.)(Guelph), M.Sc., Ph.D.(Qu.) (*CRC Tier 2*)

AJung Moon; B.A.Sc.(Wat.), M.A.Sc., Ph.D.(Br.Col.)

Boris Vaisband; B.S.(Technion), M.S., Ph.D.(Roch.)

Xiaozhe Wang; B.Sc.(Zhejiang), M.Sc., Ph.D.(Cornell)

Songrui Zhao; B.Sc.(Chu Ke-Chen), Ph.D.(Zhejiang), Ph.D.(McG)

Associate Members

Matthew Adam Dobbs; B.Sc.(McG.), Ph.D.(Vic., BC)

William R. Funnell; M.Eng., Ph.D.(McG.)

David Juncker; Ph.D.(Neuchâtel)

Paul Kry; M.Sc., Ph.D.(Br. Col.)

Adjunct Professors

Rhys Allan Adams, Donald Davis, Tiago H. Falk, Vincent Hayward, Mehrsan Javan-Roshtkhari, Innocent Kamwa, Marthe Kassouf, Morgan McGuire, Zetian Mi, Frédéric Nabki, Douglas O'Shaughnessy, Michael Rabbat, Joseph J. Schlesinger, Joshua David Schwartz, Kenneth D. Wagner, Di Wu, Qunbi Zhuge

8.5.4 Bachelor of Engineering (B.Eng.) - Electrical Engineering (134 credits)

Program credit weight: 134-138 credits

Program credit weight for Quebec CEGEP students: 109-113 credits

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

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

Required Year 0 (Freshman) Courses

25 credits

Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credit for these Year 0 (Freshman) courses and enter a 109- to 113-credit program.

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

Note: ECSE 458N1 and ECSE 458N2 can be taken instead of ECSE 458D1 and ECSE 458D2.

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

COMP 551^	(4)	Applied Machine Learning
COMP 559	(4)	Fundamentals of Computer Animation
ECSE 310	(3)	Thermodynamics of Computing

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
ECSE 500	(3)	Mathematical Foundations of Systems
ECSE 501	(3)	Linear Systems
ECSE 507	(3)	Optimization and Optimal Control
ECSE 508	(3)	Multi-Agent Systems
ECSE 509	(3)	Probability and Random Signals 2
ECSE 510	(3)	Filtering and Prediction for Stochastic Systems
ECSE 516	(3)	Nonlinear and Hybrid Control Systems
ECSE 519	(3)	Semiconductor Nanostructures and Nanophotonic Devices
ECSE 521	(3)	Digital Communications 1
ECSE 526	(3)	Artificial Intelligence
ECSE 532	(4)	Computer Graphics
ECSE 543	(3)	Numerical Methods in Electrical Engineering
ECSE 544	(4)	Computational Photography
ECSE 551^	(4)	Machine Learning for Engineers
ECSE 562**	(4)	Low-Carbon Power Generation Engineering
ECSE 563	(3)	Power Systems Operation and Planning
ECSE 565***	(3)	Introduction to Power Electronics
PHYS 434	(3)	Optics

* Courses taught in French.

** ECSE 463 and ECSE 562 cannot both be taken.

*** ECSE 465 and ECSE 565 cannot both be taken.

^ ECSE 551 and COMP 551 cannot both be taken.

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 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
		Knowledg0 0 1Kno

*** 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 de

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

61 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 343	(3)	Numerical Methods in Engineering
ECSE 354	(4)	Electromagnetic Wave Propagation
ECSE 362	(4)	Fundamentals of Power Engineering
ECSE 396	(1)	Honours Research Laboratory Rotation 1
ECSE 397	(1)	Honours Research Laboratory Rotation 2
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

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 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
		EM

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, effecti

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 458N1 and ECSE 458N2 can be taken instead of ECSE 458D1 and ECSE 458D2.

Complementary Courses

18-25 credits

Technical Complementaries

12-16 credits (4 courses) must be taken, chosen as follows:

3-4 credits (1 course) from List A

9-12 credits (3 courses) from List A or List B

List A

3-16 credits from the following:

ECSE 307	(4)	Linear Systems and Control
ECSE 335	(4)	Microelectronics
ECSE 343	(3)	Numerical Methods in Engineering
ECSE 403	(4)	Control
ECSE 408	(4)	Communication Systems
ECSE 412	(3)	Discrete Time Signal Processing
ECSE 415	(3)	Intro to Computer Vision
ECSE 416	(4)	Telecommunication Networks
ECSE 420	(3)	Parallel Computing
ECSE 422	(3)	Fault Tolerant Computing
ECSE 428	(3)	Software Engineering Practice
ECSE 429	(3)	Software Validation
ECSE 435	(3)	Mixed-Signal Test Techniques
ECSE 436	(3)	Signal Processing Hardware
ECSE 437	(3)	Software Delivery
ECSE 439	(3)	Software Language Engineering
ECSE 446	(3)	Realistic Image Synthesis
ECSE 450	(3)	Electromagnetic Compatibility
ECSE 472	(3)	Fundamentals of Circuit Simulation and Modelling
ECSE 501	(3)	Linear Systems
ECSE 508	(3)	Multi-Agent Systems
ECSE 510	(3)	Filtering and Prediction for Stochastic Systems
ECSE 516	(3)	Nonlinear and Hybrid Control Systems
ECSE 544	(4)	Computational Photography
ECSE 551	(4)	Machine Learning for Engineers

List B

0-12 credits from the following:

COMP 424**	(3)	Artificial Intelligence
COMP 551*	(4)	Applied Machine Learning
COMP 559	(4)	Fundamentals of Computer Animation
		Embedded Systems

** COMP 424 and ECSE 526 cannot both be taken.

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
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 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

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.

8.6 Mechanical Engineering

8.6.1 Location

Macdonald Engineering Building, Room 270
817 Sherbrooke Street West
Montreal QC H3A 0C3
Telephone: 514-398-6296
Fax: 514-398-7365
Email: *ugrad.mecheng@mcgill.ca*
Website: *www.mcgill.ca/mecheng*

8.6.2 About the Department of Mechanical Engineering

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

Many mechanical engineers follow other career paths, including sales, finance, and management. Graduate studies are useful for the specialists working in research establishments, consulting firms, or in corporate research and development.

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

The Honours program has a greater emphasis on research and prepares students for future graduate studies. 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. Many students participate in extra-curriucular design teams, such as Aerospace Design, Formula Electric, Racing, Rocketry, and Robotics. Student associations, including the McGill Association of Mechanical Engineers (MAME) and the Engineering Undergraduate Society (EUS), allow students to shape their community.

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.

8.6.3 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

Director, M.Eng. Aerospace Program

Tim Lee

Emeritus Professors

Abdul M. Ahmed; B.Sc.(Dhaka), Ph.D.(McG.), ing. (*Thomas Workman Emeritus Pr*

Professors

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

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

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

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

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

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

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

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.(Caltech), 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.(Port. St.), Ph.D.(Idaho)

Mathias Legrand; M.Sc., Ph.D.(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.(SPbSTU), Eng., A.F.A.I.A.A.

Srikar T. Vengallatore; B.Tech.(BHU), Ph.D.(MIT)

Yaoyao Fiona Zhao; B.Eng.(BIT.), 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.)

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

Olivier Bertrand; B.Sc., M.D.(ULiège)

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

Course Lecturers

Amar Sabih

Associate Members

Jake Barralet

Renzo Cecere

Allen Ehrlicher

Dan Nicolau

Abdolhamid Akbarzadeh Shafaroudi

8.6.4 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

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	()	Eco-design and Product Life Cycle Assessment
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 select either CHEE 563 or MECH 563.

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

Complementary Studies

6 credits

Group A - Impact of Technology on Society

3 credits from the following:

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

Faculty of Science

Schulich School of Music

Typical Program of Study

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

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

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

8.6.5 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.

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

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

Required Year 0 (Freshman) Courses

29 credits

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

For information on transfer credit for French Baccalaureate, International Baccalaureate exams, Advanced Placement exams, Advanced Levels, and Science Placement E 386.0laureate e(ancedTj Tm(v)TjaaGuFreshman) c3 Tm(anced lmat4 386.g3567.52 376.30t.5y)Tjaea)Tj Tm(v)Tjaa384 627./8y

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

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

Required Mechanical Engineering Courses

62 credits

MECH 201	(2)	Introduction to Mechanical Engineering
MECH 210	(2)	Mechanics 1
MECH 220	(4)	Mechanics 2
MECH 240	(3)	Thermodynamics 1
MECH 262	(3)	Statistics and Measurement Laboratory
MECH 290	(3)	Design Graphics for Mechanical Engineering
MECH 292	(3)	Design 1: Conceptual Design

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
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
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

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.

8.6.6 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 Courses (9 credits)

MECH 535	(3)	Turbomachinery and Propulsion
MECH 536	(3)	Aerospace Structures
MECH 537	(3)	High-Speed Aerodynamics
MECH 538	(3)	Unsteady Aerodynamics
MECH 539	(3)	Computational Aerodynamics
MECH 559*	(3)	Engineering Systems Optimization
MECH 565	(3)	Fluid Flow and Heat Transfer Equipment
MECH 566	(3)	Fluid-Structure Interactions
MECH 567	(3)	Structural Dynamics of Turbomachines
MECH 579*	(3)	Multidisciplinary Design Optimization

* Students cannot get credit for both MECH 559 and MECH 579.

8.6.7 Bachelor of Engineering (B.Eng.) - Honours Mechanical Engineering - Aeronautical Engineering (15 credits)

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

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

Required Courses (6 credits)

6 credits

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

Complementary Courses (9 credits)

MECH 535	(3)	Turbomachinery and Propulsion
MECH 536	(3)	Aerospace Structures
MECH 537	(3)	High-Speed Aerodynamics
MECH 538	(3)	Unsteady Aerodynamics
MECH 539	(3)	Computational Aerodynamics
MECH 559*	(3)	Engineering Systems Optimization
MECH 565	(3)	Fluid Flow and Heat Transfer Equipment
MECH 566	(3)	Fluid-Structure Interactions
MECH 567	(3)	Structural Dynamics of Turbomachines
MECH 579*	(3)	Multidisciplinary Design Optimization

* Students cannot get credit for both MECH 559 and MECH 579.

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

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

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

Total concentration credit weight: 15-16 credits

Required Courses

6 credits

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

Complementary Courses

9-10 credits from the following:

ARCH 515	(3)	Sustainable Design
CHEE 453	(4)	Process Design
MECH 497	(3)	Value Engineering
MECH 526	(3)	Manufacturing and the Environment
MECH 528	(3)	Product Design
	(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
	(3)(3)	Multidisciplinary Design Optimization

Montreal QC H3A 0C5
Telephone: 514-398-1040
Fax: 514-398-4492
Email: *coordinator.minmat@mcgill.ca*
Website:*www.mcgill.ca/materials*

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*
Website: *www*

Senior Faculty Lecturer

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

Course Lecturers – Mining

Yves Buro

Shahe Shnorhokian

Co-op Program Liaison Officers

Genevieve Snider (*Materials*)

Lisa Thiess (*Mining*)

8.7.4 About Materials Engineering

8.7.4.1 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 $234.69 will be billed during ten consecutive terms for a total amount of $2,346.90 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.

8.7.4.2 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.

8.7.4.3 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.

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

36 credits

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

62 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 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 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

Complementary Courses (21 credits)

Technical Complementaries

15 credits

9-15 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
MIME 556	(3)	Sustainable Materials Processing
MIME 558	(3)	Engineering Nanomaterials
MIME 559	(3)	Aluminum Physical Metallurgy
MIME 560	(3)	Joining Processes
MIME 561	(3)	Advanced Materials Design
MIME 563	(3)	Hot Deformation of Metals
MIME 565	(3)	Aerospace Metallic-Materials and Manufacturing Processes
MIME 568	(3)	Topics in Advanced Materials
MIME 569	(3)	Electron Beam Analysis of Materials
MIME 570	(3)	Micro- and Nano-Fabrication Fundamentals
MIME 571	(3)	Surface Engineering
MIME 572	(3)	Computational Thermodynamics
MIME 580	(3)	Additive Manufacturing Using Metallic and Ceramic Materials

* Students choose either CHEE 515 or MIME 515, offered in alternate years.

6 credits may be taken from courses outside of the Department of Mining and Materials Engineering, with department approval.

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
	(3)	Society, Environment and Sustainability

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.

CIVE 205	(3)	Statics
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

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
MIME 553	(3)	Impact of Materials Production
MIME 556	(3)	Sustainable Materials Processing
MIME 558	(3)	Engineering Nanomaterials
		Aluminum Ph

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

* 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 course are not accepted to satisfy the Complementary Studies Group B requirement, effective for students who entered the program as of Fall 2017.

8.7.5 About Mining Engineering

8.7.5.1 Co-op in Mining Engineering

McGill is proud to be the host of the oldest mining engineering program in Canada, which started in 1871. The program is known for the excellence of its courses as well as the training it provides in mining science and technology, mineral economics, strategic mine planning, rock mechanics, renewable energy, and mine design. Mining offers excellent career opportunities in Canada and around the world. There have been rapid technological developments in recent years, presenting numerous challenges to students with strong interest in engineering and a taste for innovation.

The Department offers a co-operative program leading to an accredited **B.Eng.** degree in Mining Engineering. It includes three paid industrial work terms. The program is offered in one of two streams: English Stream for non-CEGEP students and Bilingual Stream (six courses in French) for CEGEP students, in collaboration with the mining engineering program at *École Polytechnique* in Montreal. Students in the Bilingual Stream take six mining courses, designated by subject code MPMC, at *École Polytechnique* in the latter part of the program.

A wide range of scholarships is available to new and continuing students from the Department, Faculty of Engineering, as well as from industry.

When taking a Co-op work term, students must register for MIME 290, MIME 291, or MIME 392; thus, Co-op work terms appear on the student transcript. Interested students may also take a fourth work term.

8.7.5.2 Student Advising

Each student in the mining engineering program is assigned an academic adviser at the start of their study at McGill and for the duration of their undergraduate degree. Academic advising is mandatory for each undergraduate student of the mining engineering program and as such, each student will meet with their academic adviser at least once per academic year to discuss their progress through the curriculum and path towards graduation.

For more information, please refer to the *Academic Advising* section of our website.

8.7.5.3 Bachelor of Engineering (B.Eng.) - Mining Engineering (144 credits)

Enrolment in this program is subject to departmental approval, please consult with an Academic Advisor within the appropriate program further to discuss your suitability in this program.

The Department offers a Major in Mining Engineering leading to an accredited B.Eng. degree in Mining Engineering. The program is offered in one of two streams: English Stream for non-CEGEP students and Bilingual Stream (six courses in French) for CEGEP students, in collaboration with the mining engineering program at Ecole Polytechnique in Montreal. Students in the Bilingual Stream are required to take six mining courses, designated by subject code MPMC, at Ecole Polytechnique in the latter part of the program. In addition to regular courses and laboratories, the curriculum of the Major in Mining Engineering programs include seminars, colloquia, and student projects reinforced by field trips to industrial operations.

B.Eng.; Major in Mining Engineering

Program credit weight: 144-145 credits

Program credit weight for CEGEP students: 115-116 credits

Entry into the Major in Mining Engineering

Students in Mining can be admitted only into the B.Eng.; Co-op in Mining Engineering. There is no direct entry to the Major in Mining Engineering (which does not include the work terms required for the Co-op program).

Students may enter the Major in Mining Engineering if they wish at any point in time during their study.

To transfer into the Major program, students must obtain approval from the department adviser and submit a Request for Course Authorization form to the McGill Engineering Student Centre (Frank Dawson Adams, Room 22).

Required Year 0 (Freshman) Courses

29 credits

Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credit for these Year 0 (Freshman) courses and enter a 115- to 116-credit program.

CHEM 110	(4)	General Chemistry 1
CHEM 120	(4)	General Chemistry 2

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

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

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

Required Non-Departmental Courses (37 credits)

CCOM 206	(3)	Communication in Engineering
CIVE 205	(3)	Statics
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

Complementary Courses

31-32 credits

17 credits from one of Stream A or Stream B

Stream A - CEGEP Students

CEGEP students must take the following courses:

MPMC 321*	(3)	Mécanique des roches et contrôle des terrains
MPMC 326*	(3)	Recherche opérationnelle I
MPMC 328*	(3)	Environnement et gestion des rejets miniers
MPMC 329*	(2)	Géologie minière
MPMC 330*	(3)	Géotechnique minière
MPMC 421*	(3)	Exploitation en souterrain

* 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 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.

8.7.5.4 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 offers a Co-op in Mining Engineering and a Mining Engineering program (without co-op terms), both leading to an accredited B.Eng. degree in Mining Engineering. The co-op program includes three paid industrial work terms. The co-op program is offered in one of two streams: English Stream for non-CEGEP students and Bilingual Stream (six courses in French) for CEGEP students, in collaboration with the mining engineering program at Ecole Polytechnique in Montreal. Students in the Bilingual Stream are required to take six mining courses, designated by subject code MPMC, at Ecole Polytechnique in the latter part of the program.

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

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

Required Year 0 (Freshman) Courses

29 credits

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

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

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

PHYS 142	(4)	Electromagnetism and Optics

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

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

Required Non-Departmental Courses

37 credits

CCOM 206	(3)	Communication in Engineering
CIVE 205	(3)	Statics
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

MIME 426	(6)	Mine Design and Prefeasibility Study

Complementary Courses

31-32 credits

17 credits from one of Stream A or Stream B

Stream A - CEGEP Students

CEGEP students must take the following courses:

MPMC 321*	(3)	Mécanique des roches et contrôle des terrains
MPMC 326*	(3)	Recherche opérationnelle I
MPMC 328*	(3)	Environnement et gestion des rejets miniers
MPMC 329*	(2)	Géologie minière
MPMC 330*	(3)	Géotechnique minière
MPMC 421*	(3)	Exploitation en souterrain

* 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
		Environmental Systems

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.

8.8 Urban Planning

8.8.1 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*
Website: *www.mcgill.ca/urbanplanning*

8.8.2 About the School of Urban Planning

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

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

implementation developed from an interdisciplinary synthesis of these various fields. This multidisciplinarity is still a hallmark of planning practice and of planning education.

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

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

The objective of the School is to enable young urban planners to exercise leadership in the public, private, and community sectors. Training is provided at the graduate level. The main degree offered is the **Master of Urban Planning (M.U.P.)**. Many specializations are possible within the program, e.g., Transportation Planning; and Urban Development and Urban Design. Details concerning these concentrations can be found at *www.mcgill.ca/urbanplanning/programs/mup-transportation-planning* (see also *tram.mcgill.ca*), and at *www.mcgill.ca/urbanplanning/programs/mup-urban-development-and-urban-design*, respectively. Upon completion of the two-year program of studies, graduates are expected to have acquired basic planning skills, a broad understanding of urban issues, and specialized knowledge in a field of their own choice.

The 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 concerning 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 agencies such as SSHRC and NSERC. 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 Friday seminar series (held occasionally) brings 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.

8.8.3 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 1
URBP 504	(3)	Planning for Active Transportation
URBP 505	(3)	Geographic Information Systems
URBP 506	(3)	Environmental Policy and Planning
URBP 507	(3)	Planning and Infrastructure
URBP 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
URBP 553	(3)	Urban Governance
URBP 555	(3)	Real Estate and Planning
URBP 556	(3)	Urban Economy: A Spatial Perspective

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

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

Department of Bioresource Engineering
Macdonald-Stewart Building, Room MS1-028
21,111 Lakeshore Road
Sainte-Anne-de-Bellevue QC H9X 3V9
Telephone: 514-398-7773
Fax: 514-398-7990
Website: *www.mcgill.ca/bioeng*

8.9.2 Biomedical Engineering

The Faculty of Engineering cooperates with the Faculty of Medicine in graduate degrees in biological and biomedical engineering. Some of the **(500-level)** courses of

- *section 8.10.16: Bachelor of Engineering (B.Eng.) - Minor Nanotechnology (21 credits)*
- *section 8.10.17: Bachelor of Engineering (B.Eng.) - Minor Physics (18 credits)*
- *section 8.10.18: Bachelor of Engineering (B.Eng.) - Minor Software Engineering (18 credits)*
- *section 8.10.19: Bachelor of Engineering (B.Eng.) - Minor Technolo*

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
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 320	()	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
ECSE 427	(3)	Operating Systems
ECSE 429	(3)	Software Validation
ECSE 436	(3)	Signal Processing Hardware
ECSE 444	(4)	Microprocessors
ECSE 450	(3)	Electromagnetic Compatibility
ECSE 465	(3)	Power Electronic Systems
ECSE 501	(3)	Linear Systems
ECSE 507	(3)	Optimization and Optimal Control
ECSE 511	(3)	Introduction to Digital Communication
ECSE 512	(3)	Digital Signal Processing 1
ECSE 513	(3)	Robust Control Systems
ECSE 516	(3)	Nonlinear and Hybrid Control Systems
ECSE 524	(3)	Interconnects and Signal Integrity
ECSE 565	(3)	Introduction to Power Electronics
ECSE 593	(3)	Antennas and Propagation

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

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

B.Sc.(Arch.), and B.Eng., students may obtain the Arts Minor as part of their B.Eng., or B.Sc.(Arch.) degree by completing 24 credits, as described below.

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

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

Requirements

24 credits as follows:

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

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

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

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

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

Note: Open to students in the Faculty of Engineering and the Department of Bioresource Engineering.

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

To complete this Minor, students must obtain a grade of C or better in all approved courses and satisfy the requirements of both the major program and the Minor. By careful selection of courses, the Minor can be satisfied with 9 additional credits in the student's major program or a maximum of 12 credits overlap with the major program.

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

Minor Advisers: Prof. R. Leask (Wong Building, Room 4120), Prof. R. Mongrain (Macdonald Engineering Building, Room 369) or Prof. G. Mitsis (McConnell Engineering Building, Room 361).

Complementary Courses

(21-25 credits)

Introductory Life Sciences

Minimum of 3 credits from the courses below:

ANAT 212*	(3)	Molecular Mechanisms of Cell Function
BIEN 219**	(4)	Introduction to Physical Molecular and Cell Biology
BIOC 212*	(3)	Molecular Mechanisms of Cell Function
BIOL 200	(3)	Molecular Biology
BIOL 201*	(3)	Cell Biology and Metabolism
BIOL 219**	(4)	Introduction to Physical Molecular and Cell Biology
CHEM 212***	(4)	Introductory Organic Chemistry 1
PHGY 209	(3)	Mammalian Physiology 1
PHGY 210	(3)	Mammalian Physiology 2

* Students can choose one of ANAT 212, BIOC 212 or BIOL 201.

** Students can choose one of ANAT 212, BIEN 219, BIOC 212, BIOL 200, BIOL 201 or BIOL 219.

*** Cannot be taken by Chemical Engineering students.

Specialization Courses

Minimum of 12 credits from courses below:

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

Physiological Systems, Artificial Cells and Organs

BIEN 340	(3)	Transport Phenomena in Biological Systems 2
BIEN 360	(3)	Physical Chemistry in Bioengineering
BIEN 462	(3)	Engineering Principles in Physiological Systems
BIEN 540	(3)	Information Storage and Processing in Biological Systems

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

Bioinformatics, Genomics and Proteomics

ANAT 365	(3)	Cellular Trafficking
ANAT 458*	(3)	Membranes and Cellular Signaling
BIEN 310	(3)	Introduction to Biomolecular Engineering
BIEN 410	(3)	Computational Methods in Biomolecular Engineering
BIEN 420	(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 AN

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	(4)	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.

8.10.4 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. Approv

PHGY 513	(3)	Cellular Immunology

Management

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

ECON 208	(3)	Microeconomic Analysis and Applications
MGCR 211	(3)	Introduction to Financial Accounting
MGCR 341	(3)	Introduction to Finance
MGCR 352	(3)	Principles of Marketing
		Operations Management

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

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

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

Program credit weight: 25 credits

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

Required Courses

10 credits

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

* Students choose either CHEM 233 or CHEE 310

** or CEGEP equivalent

Complementary Courses

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

Note that CHEM 212 is a prerequisite for most of the courses listed below, and CHEM 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

8.10.6 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*

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

8.10.6.1 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.

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

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

8.10.6.2 Bachelor of Engineering (B.Eng.) - Minor Computer Science

24-25 credits

This program gives students in Engineering an introduction to core computer science concepts. The Minor is open to B.Eng. and B.Sc.(Arch.) students in Engineering who have already taken ECSE 202, COMP 202, or COMP 208. These courses are all considered equivalent as prerequisites for COMP 250. This program is not open to students in the B.S.E. program. All courses in the Minor must be passed with a grade of C or better. The Minor program requires the completion of 24 credits, of which no more than 6 credits may overlap with the primary program.

Students who are interested in this Minor should consult with the Undergraduate Program Coordinator in the School of Computer Science (ENGMC 320) for administrative matters, and should consult with both the Minor Adviser in Computer Science and with their department adviser for approval of their course selection. Forms must be submitted and approved before the end of the drop/add period of the student's final term.

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

3 credits from the following:

COMP 273	(3)	Introduction to Computer Systems
ECSE 222*	(3)	Digital Logic

3-4 credits from the following:

CHEE 390	(3)	Computational Methods in Chemical Engineering
CIVE 320	(4)	Numerical Methods
COMP 350	(3)	Numerical Computing
ECSE 343	(3)	Numerical Methods in 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.

8.10.7 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

Complementary Courses

9 credits from:

ECON 225	(3)	Economics of the Environment
ECON 303	(3)	Canadian Economic Policy
ECON 304	(3)	Financial Instruments & Institutions
ECON 305	(3)	Industrial Organization
ECON 306	(3)	Labour Markets and Wages
ECON 308	(3)	Governmental Policy Towards Business
ECON 313	(3)	Economic Development 1
ECON 314	(3)	Economic Development 2
ECON 316	(3)	The Underground Economy
ECON 326	(3)	Ecological Economics
ECON 330D1	(3)	Macroeconomic Theory
ECON 330D2	(3)	Macroeconomic Theory
ECON 335	(3)	The Japanese Economy
ECON 336	(3)	The Chinese Economy
ECON 337	(3)	Introductory Econometrics 1
ECON 344	(3)	Industrial Revolution and Economic Development
ECON 345	(3)	The International Economy since 1914
ECON 347	(3)	Economics of Climate Change
ECON 405	(3)	Natural Resource Economics
ECON 406	(3)	Topics in Economic Policy
ECON 408	(3)	Public Sector Economics 1
ECON 409	(3)	Public Sector Economics 2
ECON 411	(3)	Economic Development: A World Area
ECON 416	(3)	Topics in Economic Development 2
ECON 420	(3)	Topics in Economic Theory
ECON 426	(3)	Labour Economics
ECON 434	(3)	Current Economic Problems
ECON 440	(3)	Health Economics
ECON 468	(3)	Econometrics 1 - Honours
ECON 469	(3)	Econometrics 2 - Honours
ECON 525	(3)	Project Analysis
ECON 546	(3)	Game Theory

Note: Mining Engineering students are permitted to include MIME 526 Mineral Economics among the Complementary Courses.

8.10.9 Minor in Environment

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

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

Since the program comprises a total of 18 credits for the Minor, additional credits beyond those needed for the B.Eng. degree are required. Students wishing to complete the Minornor shTheory, additional :Theoional rgoional RG2 T2(En)Tj1 0 0 1 1SE949 3.7107.78236.416 10(3)

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

Minor Adviser: Students interested in this Minor should contact:

Kathy Roulet
McGill School of Environment Program Adviser
Telephone: 514-398-4306
Email: *kathy.roulet@mcgill.ca*

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

Minor Adviser: Prof. S. Ghoshal, Macdonald Engineering Building, Room 569C

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

(3) Microbiology for Environmental Engineering

Complementary Courses

9 credits from the following:

CHEE 587	(3)	Chemical Processing: Electronics Industry
ECSE 545	(3)	Microelectronics Technology
	(3)	Mechanics of Composite Materials

MATH 417	(3)	Linear Optimization
MATH 427	(3)	Statistical Quality Control
MATH 447	(3)	Introduction to Stochastic Processes
MATH 475	(3)	Honours Partial Differential Equations
MATH 478	(3)	Computational Methods in Applied Mathematics

0-6 credits from the following:

8.10.16 Bachelor of Engineering (B.Eng.) - Minor Nanotechnology (21 credits)

Through courses already offered in the Faculties of Science, Engineering, and Medicine, depending on the courses completed, undergraduate students will acquire knowledge in some of the following areas related to nanotechnology:

- Nanomaterial synthesis and processing approaches
- Physicochemistry and quantum behavior of nanomaterials
- State-of-the-art techniques for nanomaterial characterization and detection
- Applications of nanomaterials in engineered solutions
- Nanomaterials in medicine and pharmacology
- Nanomaterials in electronics and energy
- Environmental, health, and social impacts of nanomaterials

Minor program credit weight: 21-22 credits

Minor Adviser: Prof. N. Tufenkji, W

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
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
MIME 260*	(3)	Materials Science and Engineering

Materials Engineering

MIME 261*	(3)	Structure of Materials
MIME 467	(3)	Electronic Properties of Materials
MIME 515*	(3)	Material Surfaces: A Biomimetic Approach
MIME 542	(3)	Transmission Electron Microscopy
MIME 558	(3)	Engineering Nanomaterials
MIME 569	(3)	Electron Beam Analysis of Materials
MIME 571	(3)	Surface Engineering

Pharmacology

PHAR 504	(3)	Drug Discovery and Development 2

Physics

BIOL 319*	(3)	Introduction to Biophysics
PHYS 319*	(3)	Introduction to Biophysics

PHYS 346	(3)	Majors Quantum Physics
PHYS 558	(3)	Solid State Physics

* Students can take only one course from each set of the following courses:

- MIME 260, MIME 261, MIME 262 or CHEE 380

- CHEE 515 or MIME 515

- CHEE 521 or CIVE 521

- CHEM 534 or PHYS 534

- BIOL 319 or PHYS 319

** A 3.0 or higher CGPA is required in order to take these courses.

*** When topic is appropriate, with approval from the Minor Adviser.

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

This Minor is restricted to students in Honours Engineering programs (Honours Electrical Engineering and Honours Mechanical Engineering). Students take 9 credits of required courses in thermal physics and honours quantum physics and choose three other Physics courses (subject code PHYS).

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

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

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

Minor Adviser: Undergraduate Program Office, Department of Electrical and Computer Engineering (Lorne Trottier 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
COMP 424*	(3)	Artificial Intelligence
COMP 527	(3)	Logic and Computation
ECSE 326	(3)	Software Requirements Engineering
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 429	(3)	Software Validation
ECSE 439*	(3)	Software Language Engineering
ECSE 446*	(3)	Realistic Image Synthesis
ECSE 526*+	(3)	Artificial Intelligence
ECSE 539*+	(4)	Advanced Software Language Engineering
ECSE 546*+	(4)	Advanced Image Synthesis

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

- COMP 424 and ECSE 526
- ECSE 439 and ECSE 539
- ECSE 446 and ECSE 546

+ Restricted to Honours students or Computer Engineering or Electrical Engineering students with CGP

INTG 201	(3)	Integrated Management Essentials 1
INTG 202	(3)	Integrated Management Essentials 2
MGPO 362	(3)	Fundamentals of Entrepreneurship

Complementary Courses (6 credits)

3-6 credits from the following:

FACC 501	(3)	Technology Business Plan Project
MGPO 364	(3)	Entrepreneurship in Practice

0-3 credits from the following:

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