
McGill

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 the Faculty of Engineering

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

Departments
Bioengineering
Chemical Engineering
Civil Engineering
Electrical and Computer Engineering
Mechanical Engineering
Mining and Materials Engineering

Schools
The Peter Guo-hua Fu School of Architecture
Urban Planning

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

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

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

The curricula are structured to provide suitable preparation for those who plan to continue their education in postgraduate studies either at McGill or else

3 Engineering Microcomputing Facility

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

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

Further information is available at *mcgill.ca/emf*.

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

Schulich Library of Physical Sciences, Life Sciences, and Engineering
Macdonald-Stewart Library Building *(closed for renovations)*

Temporary Location:
McLennan-Redpath Library Complex
3459 McTavish Street
Montreal QC H3A 0C9
Contact the Library:
mcgill.ca/library/contact/askus
Website: *mcgill.ca/library*

Note: Please note that the Macdonald-Stewart Library Building, which normally houses the collection and services, is temporarily closed for renovations. During the renovation project, most of the collections and services are available via the *McLennan-Redpath Library Complex*. Eleven subject-specialised liaison librarians continue to offer one-on-one research consultations, as well as a range of tours and workshops designed to help users effectively find, assess, and use information.

More information on the renovation project: *mcgill.ca/library/about/renovation-schulich-library*

Find your librarian: *mcgill.ca/library/contact/askus/liaison*

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

The Schulich Library is one of several McGill library branches. The following other branch libraries will also be of interest to students in the Faculty of Engineering:

- *Blackader*

Department Chairs

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*)

Rosaire Mongrain; B.Sc.(Montr.), M.Sc.(Montr.), Ph.D.(École Poly., Montr.) *(Mechanical Engineering)*

Dan

8 Student Progress

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

You are expected to complete the B.Eng. or B.Sc.(Arch.) program within six years of entry. However, this may vary if students are admitted to a shortened

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 *mcgill.ca/careers4engineers* or send an email to *intern.engineering@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 gov

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

12.1.4 Programs of Study

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

- complete the B.Sc.(Arch.) degree, including the series of required and complementary courses stipulated for professional studies, with a minimum CGPA of 3.00. P8 Tm(•)Tjlse no.Sc.aties oCGPof 3.00.Aments. Stude dolatno. guara pre udees o po (Prof who int;10 Tf1 0 0 1 67.52 656.638 T35.50Tj-0.496 TTf1 0 0 1

Emeritus Professors

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

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

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

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

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*)

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*)

Associate Professors

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

Rosetta S. Elkin; B.F.A.(Concordia), M.L.A.(Toronto), Ph.D.(Antwerp) F.A.A.R.

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

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

David Theodore; B.A., B.Sc.(Arch.), B.Arch., M.Arch.(McG.), Ph.D.(Harv.) (*Canadian Research Chair in Architecture, Health, and Computation*

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

Program credit weight: 126 credits

Program credit weight for CEGEP students: 100 credits

The B.Sc.(Arch.) program provides conceptual, technical, and procedural foundations for the professional M.Arch. program, which is accredited by the Canadian Architectural Certification Board and recognized as accredited by the National Council of Architectural Registration Boards in the US. Students entering the B.Sc.(Arch.) program complete first-year courses in general studies (including sciences, humanities, and social sciences), for which individuals entering with the Québec Diploma of Collegial Studies in Arts and Science or Pure and Applied Science (or equivalent) are generally granted transfer credits. All students then complete six terms of immersion in architecture, centered in studio courses exploring principles of design, norms of representation, cultures of construction, and the human experience of architecture. Studio-based learning is complemented by lecture courses on foundational knowledge. Complementary courses provide further opportunities to learn about how culture intersects with technology in the work of architecture, and students select electives to customize their learning experience.

Required Year 0 (Freshman) Courses

26 credits

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

Course choices must be made through consultation with the Student Adviser for the Professional Programs.

All Year 0 students must successfully complete 10 credits from the following:

MATH 133	(3)	Linear Algebra and Geometry
MATH 140	(3)	Calculus 1
PHYS 131	(4)	Mechanics and Waves

All Year 0 students must also successfully complete 16 credits as follows:

3 credits from among any 100- or 200-level courses with the subject codes of ATOC (Atmospheric and Oceanic Sciences), COMP (Computer Science), ENVR (Environment), and EPSC (Earth and Planetary Sciences).

13 credits from among any 100- or 200-level courses with the subject codes of AFRI (African Studies), ANTH (Anthropology), ARTH (Art History), CANS

ARCH 354	(3)	Architectural History 3
ARCH 355	(3)	Architectural History 4
ARCH 375	(3)	Landscape
ARCH 377	(3)	Energy, Environment, and Buildings 1
ARCH 378	(3)	Introduction to Building Environments
ARCH 405	(6)	Design and Construction 3
ARCH 406	(6)	Design and Construction 4
ARCH 445	(3)	Architectural Structures 2
ARCH 447	(3)	Energy, Environment, and Buildings 2
ARCH 451	(3)	Building Regulations and Safety
ARCH 512	(3)	Architectural Modelling
ARCH 551	(3)	Urban Design and Planning

Complementary Courses (6 credits)

6 credits from among the following:

ARCH 217	(1)	Freehand Drawing
ARCH 379	(3)	Summer Course Abroad
ARCH 383	(3)	Geometry and Architecture
ARCH 461	(1)	Freehand Drawing and Sketching
ARCH 490	(2)	Selected Topics in Design
ARCH 514	(4)	Community Design Workshop
ARCH 515	(3)	Sustainable Design
ARCH 517	(3)	Sustainable Residential Development
ARCH 519	(3)	Field Course Abroad
ARCH 520	(3)	Montreal: Urban Morphology
ARCH 523	(3)	Significant Texts and Buildings
ARCH 525	(3)	Seminar on Analysis and Theory
ARCH 526	(3)	Philosophy of Structure
ARCH 528	(3)	History of Housing
ARCH 531	(3)	Architectural Intentions Vitruvius - Renaissance
ARCH 532	(3)	Origins of Modern Architecture
ARCH 535	(3)	History of Architecture in Canada
ARCH 536	(3)	Heritage Conservation
ARCH 540	(3)	Selected Topics in Architecture 1
ARCH 541	(3)	Selected Topics in Architecture 2
ARCH 542	(3)	Selected Topics in Architecture 3
ARCH 543	(3)	Selected Topics in Architecture 4
ARCH 564	(3)	Design for Development
ARCH 566	(3)	Cultural Landscapes Seminar

Elective Courses (6 credits)

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

12.2 Bioengineering

12.2.1 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: *mcgill.ca/bioengineering*

12.2.2 About the Department of Bioengineering

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

- Biological materials and mechanics
- Biomolecular and cellular engineering
- Biological information and computation

12.2.3 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)

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

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

Codruta Ignea; B.Sc.(USAMVBT), Ph.D.(Crete)

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

Natalie Reznikov; M.Sc.(Hebrew), Ph.D.(Weiz6P.yrd.lant PrTUr.Eng.(Bj1cGBiomed..(Buc.)

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) biological information and computation

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

45 credits

BIEN 200	(2)	Introduction to Bioengineering
BIEN 210	(3)	Electrical and Optical Properties of Biological Systems
BIEN 219	(4)	Introduction to Physical Molecular and Cell Biology
BIEN 290	(3)	Bioengineering Measurement Laboratory
BIEN 300	(3)	Thermodynamics in Bioengineering
BIEN 314	(3)	Transport Phenomena in Biological Systems 1
BIEN 340	(3)	Transport Phenomena in Biological Systems 2
BIEN 350	(4)	Biosignals, Systems and Control
BIEN 360	(3)	Physical Chemistry in Bioengineering
BIEN 390	(3)	Bioengineering Laboratory
BIEN 420	(3)	Biodevices Design for Diagnostics and Screening
BIEN 470D1	(3)	Bioengineering Design Project
BIEN 470D2	(3)	Bioengineering Design Project
BIEN 471	(2)	Bioengineering Research Project
BIEN 560	(3)	Design of Biosensors

Complementary Courses

33-34 credits

Bioengineering Complementary Courses

24-25 credits

Starting in the third year (second year for CEGEP students) (Year 2), students will need to take 30-31 credits of courses to upgrade their general knowledge of Bioengineering. Students must register for the required Technical Complementary courses in one of the three streams of bioengineering knowledge and practice: 1) Biological Materials and Mechanics (25 credits); 2) Biomolecular and Cellular Engineering (24 credits); or 3) Biological Information and Computation (24 credits).

Stream 1: Biological Materials and Mechanics (25 credits)

13 credits from List A

12 credits from List B

List A:

BIEN 320	(3)	Molecular, Cellular and Tissue Biomechanics
BIEN 570	(3)	Active Mechanics in Biology
CIVE 207	(4)	Solid Mechanics
MIME 261	(3)	Structure of Materials

List B:

BIEN 330	(3)	Tissue Engineering and Regenerative Medicine
BIEN 462	(3)	Engineering Principles in Physiological Systems
BIEN 500	(3)	Special Topics in Bioengineering 1
BIEN 510	(3)	Engineered Nanomaterials for Biomedical Applications
BIEN 515	(3)	Special Topics in Bioengineering 2
BIEN 525	(3)	Special Topics in Bioengineering 3
BIEN 530	(3)	Imaging and Bioanalytical Instrumentation
BIEN 535	(3)	Electron Microscopy and 3D Imaging for Biological Materials

BIEN 545	(3)	Diagnostic Devices at the Point-of-Care
BIEN 550	(3)	Biomolecular Devices
BIEN 580	(3)	Synthetic Biology
BMDE 503	(3)	Biomedical Instrumentation
BMDE 504	(3)	Biomaterials and Bioperformance
BMDE 505	(3)	Cell and Tissue Engineering
BMDE 512	(3)	Finite-Element Modelling in Biomedical Engineering
CHEE 563*	(3)	Biofluids and Cardiovascular Mechanics
MECH 321	(3)	Mechanics of Deformable Solids
MECH 547	(3)	Mechanics of Biological Materials
MECH 561	(3)	Biomechanics of Musculoskeletal Systems
MECH 563*	(3)	Biofluids and Cardiovascular Mechanics
MECH 572	(3)	Mechanics and Control of Robotic Manipulators
MIME 470	(3)	Engineering Biomaterials

BIEN 540	(3)	Information Storage and Processing in Biological Systems
BIEN 545	(3)	Diagnostic Devices at the Point-of-Care
BIEN 570	(3)	Active Mechanics in Biology
BIEN 580	(3)	Synthetic Biology
BMDE 503	(3)	Biomedical Instrumentation
BMDE 508	(3)	Introduction to Micro and Nano-Bioengineering
CIVE 557	(3)	Microbiology for Environmental Engineering
PHYS 534	(3)	Nanoscience and Nanotechnology
SEAD 510	(4)	Energy Analysis
		Climate Change

MECH 513	(3)	Control Systems
MECH 572	(3)	Mechanics and Control of Robotic Manipulators
SEAD 510	(4)	Energy Analysis
SEAD 515	(3)	Climate Change Adaptation and Engineering Infrastructure
SEAD 520	(3)	Life Cycle-Based Environmental Footprinting
SEAD 530	(3)	Economics for Sustainability in Engineering and Design
SEAD 540	(3)	Industrial Ecology and Systems
SEAD 550	(3)	Decision-Making for Sustainability in Engineering and Design

NOTE: Students in Stream 3 may only take one of the two 4 credit list B TCs (either COMP 551 or SEAD 510 or another 3 credit list B TC)

NOTE: Maximum 6 credits of SEAD courses are allowed.

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 haveemsimR(T)Tj1 0 0 1 226.331 d eno - Impact of Torta1 0Dfors at wwt list B Torta1 dfors.(Gr)Tj1 0 0 1 77.04 517.608 219.829 A - Im

School of Social Work (SWRK)

12.3.2 About the Department of Chemical Engineering

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

- chemical manufacturing;
- plastics;
- water treatment;
- pulp and paper;
- petroleum refining;
- ceramics; and
- paint industries;

as well as substantial portions of the:

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

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

Emeritus Professors

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

John M. Dealy; B.S.(Kansas), M.S.E., Ph.D.(Mich.), Eng.

Musa R. Kamal; B.S.(Ill.), M.S., Ph.D.(Carn. Mell), Eng.

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

W.J. Murray Douglas; B.Sc.(Qu.), M.S.E., Ph.D.(Mich.)

Juan H. Vera; Ing.Quim.(UTE, Chile), M.Sc.(Calif., Berk.), Dr.Ing.(USM, Chile)

Professor (Post-Retirement)

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

Professors

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

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

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

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

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

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

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

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

Associate Professors

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

Corinne Hoesli; B.Sc., B.A.Sc.(Ott.), Ph.D.(Br. Col.), ing.

Jan Kopyscinski; Dipl.Ing.(BTU Cottbus), Dr.Sc.(ETH Zurich), P.Eng.

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

Reghan James Hill; B.E.(Auck.), Ph.D.(Cornell)

Anne-Marie Kietzig; Dipl.Ing.(TU Berlin), Ph.D.(Br. Col.), ing.

Assistant Professors

Noémie Dorval Courchesne; B.Sc., B.A.Sc.(Ott.), Ph.D.(MIT)

Samuel Huberman; B.A.Sc.(Wat.), Ph.D.(MIT)

Christopher Moraes; B.A.Sc., Ph.D.(Tor.), P.Eng.

Ali Seifitokaldani; B.Sc., M.Sc.(AUT, Iran), Ph.D.(Montr.)

12.3.6 Bachelor of Engineering (B.Eng.) - Chemical Engineering (143 credits)

Program credit weight: 143 credits

Program credit weight for Quebec CEGEP students: 114 credits

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

The discipline of chemical engineering is distinctive in being based equally on physics, mathematics, and chemistry. Application of these three fundamental sciences is basic to a quantitativ

Students must obtain a grade of C or better in all core courses. For the Department of Chemical Engineering, core courses include all required courses (departmental and non-departmental) as well as technical complementary courses.

Note to CEGEP students

If you have successfully completed a course at CEGEP that is equivalent to CHEM 212 or CHEM 234, you may obtain transfer credits for either or both courses by passing the McGill Science Placement Exam for the course(s). You must complete an application form available on the Science Placement Exam website and an application fee will be charged to your student account. Science placement exams take place in August and September before classes begin. If you pass the exam(s), transfer credits for the course(s) will be reflected on your transcript and your program credit requirements will be decreased to reflect these transfer credits. For information on Science Placement Exams, including application deadlines, the application form, application fee, dates, times, and location of the exams, see www.mcgill.ca/exams/dates/science. If you do not pass the placement exams, you must register for CHEM 212 and CHEM 234 during your studies at McGill as outlined in your program requirements.

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 114-credit program.

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

CHEE 231	(3)	Data Analysis and Design of Experiments
CHEE 291	(4)	Instrumentation and Measurement 1
CHEE 310	(3)	Physical Chemistry for Engineers
CHEE 314	(3)	Fluid Mechanics
CHEE 315	(3)	Heat and Mass Transfer
CHEE 351	(3)	Separation Processes
CHEE 370	(3)	Elements of Biotechnology
CHEE 380	(3)	Materials Science
CHEE 390	(3)	Computational Methods in Chemical Engineering
CHEE 400	(3)	Principles of Energy Conversion
CHEE 401	(3)	Energy Systems Engineering
CHEE 423	(3)	Chemical Reaction Engineering
CHEE 440	(3)	Process Modelling
CHEE 453	(4)	Process Design
CHEE 455	(3)	Process Control
CHEE 456	(4)	Design Project 1
CHEE 457	(5)	Design Project 2
CHEE 49	(3)	Biochemical Engineering

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.

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

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

12.3.6.1 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 12.2: Bioengineering* (Faculty of Engineering); by the *: Department of Food Science and Agricultural Chemistry* (*Faculty of Agricultural and Environmental Sciences*); and courses in biochemistry and microbiology. The food, beverage, and pharmaceutical industries are large industries in the Montreal area, and these courses are relevant to these industries and to the new high-technology applications of biotechnology.

A third sequence of courses is offered in **Energy**, comprising CHEE 400 Principles of Energy Conversion and CHEE 401 Energy Systems Engineering. Additional courses that offer topics related to energy are CHEE 511 Catalysis for Sustainable Fuels and Chemicals and CHEE 541 Electrochemical Engineering.

The fourth area in which there is a sequence of courses is **Pollution Control**. The Department offers three courses in this area: CHEE 521, CHEE 591, and CHEE 593. As some water pollution control problems are solved by microbial processes, course CHEE 474 is also relevant to the pollution control area. Additional courses in this area are listed in the *section 12.10.11: Bachelor of Engineering (B.Eng.) - Minor Environmental Engineering (21 credits)*.

A Minor in Biotechnology is also offered by the Faculties of Engineering and Science with emphasis on molecular biology and chemical engineering processes. A full description of the program appears in the *section 12.10.5: Bachelor of Engineering (B.Eng.) - Minor Biotechnology (for Engineering Students) (24 credits)*.

Note: Many of the technical complementaries are offered only in alternate years. Students should, therefore, plan their complementaries as far ahead as possible. With the approval of the instructor and Academic Adviser, students may take graduate (600-level) CHEE courses as technical complementaries.

12.4 Civil Engineering

12.4.1 Location

Macdonald Engineering Building, Room 492
817 Sherbrooke Street West
Montreal QC H3A 0C3
Telephone: 514-398-6860
Fax: 514-398-7361
Email: *ugradinfo.civil@mcgill.ca*
Website: *mcgill.ca/civil*

12.4.2 About the Department of Civil Engineering

Civil engineers have traditionally applied scientific and engineering knowledge to the task of providing the built environment, from its conception and planning to its design, construction, maintenance, rehabilitation, and sustainability. Examples include buildings; bridges; roads; railways; dams; facilities for water supply and treatment; waste disposal; and transportation system.

With the aging and deterioration of an already vast infrastructure, maintenance and rehabilitation have become increasingly important roles of the civil engineering professional. Also, in the midst of worldwide concern about the detrimental impact of human activities on the environment, civil engineers are now in the forefront of developing and providing the means for both prevention and remediation of environmental pollution.

Students who wish to extend their knowledge in certain areas beyond the range that the program's complementary courses allow can also take a **minor**. Minors are available in fields such as:

- Arts;
- Economics;
- Management;
- Environmental Engineering;
- Construction Engineering and Management;
- and others.

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

12.4.3 Academic Programs

Considerable freedom exists for students to influence the nature of the program of study which they follow in the Department of Civil Engineering. A variety of advanced **complementary courses** is offered in five main groupings:

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

Guidance on the sequence in which required core courses should be taken is provided for students in the form of a sample program which covers the entire period of study. The technical complementary courses selected, usually in the last two terms of the program, will depend upon the student's interests. All students must *meet with their adviser* each term to confirm the courses for which they are registered.

Courses taken in Term 3 or later will depend on a student's interests and ability. Information and advice concerning different possibilities are made available in the Department prior to registration. All programs require the approval of a staff adviser. Programs for students transferring into the Department with Advanced Standing will be dependent upon the academic credit previously achieved, and such a program will be established only after consultation with a staff adviser.

12.4.4 Civil Engineering Faculty

Chair

Mohamed A. Meguid

Associate Chair

Jinxia Liu (Student Affairs)

Colin Rogers (Academic Programs)

Emeritus Professors

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

6-15 credits from the following:

CIVE 416	(3)	Geotechnical Engineering
		Municipal Systems

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
		Groundw

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 ha

ORGB 321*	(3)	Leadership
ORGB 423*	(3)	Human Resources Management

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

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

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

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

12.5 Electrical and Computer Engineering

12.5.1 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: *mcgill.ca/ece*

12.5.2 About the Department of Electrical and Computer Engineering

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

- Electrical Engineering
- Electrical Engineering (Honours)
- Computer Engineering
- Software Engineering Co-op

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

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

12.5.3 Electrical and Computer Engineering Faculty

Chair

Warren Gross

Associate Chair, Academic

Ioannis Psaromiligkos

Associate Chair

Emeritus Professors

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

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

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

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

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

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

Associate Professors

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.

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

Derek Nowrouzezahrai; B.Sc.(Wat.), M.Sc., Ph.D.(Tor.) (*Endowed Chair*) (*Director of CIM*)

Milica Popovich; B.Sc.(Colo.), M.Sc., Ph.D.(N'western), LL *(Associate Dean (Research & Innovation))*

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.) (*EIT*)

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

Hsiu-Chin Lin; M.Sc.(UAlberta) Ph.D.(Edin.) (*Combined appointment with School of Computer Science*)

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), P.Eng

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

Faculty Lecturer

Marwan Kanaan; B.Sc. (Beirut), M.A.Sc. (Windsor), Ph.D.(*expected 2021*, McGill), P.Eng.

Associate Members

Maxime Cohen; B.S., M.S.(Technion), Ph.D.(MIT)

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

Gregory L. Dudek; B.Sc.(Qu.) M.Sc., Ph.D.(Tor.)

Alan C. Evans; Ph.D.(Leeds)

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

David Juncker; Ph.D.(Neuchâtel)

Samira A. Rahimi; B.Eng.(Tabriz) Ph.D. (Laval)

Adjunct Professors

Rhys Allan Adams, Donald Davis, T

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
PHYS 142	(4)	Electromagnetism and Optics

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

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

Required Non-Departmental Courses

23 credits

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

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

Required Electrical Engineering Courses

57 credits

ECSE 200	(3)	Electric Circuits 1
		Introduction to g67.52 294.202 Tm(57 credits)Tj1 dits

Fundamentals of Power Engineering

ECSE 451	(3)	EM Transmission and Radiation
ECSE 460*	(3)	Appareillage électrique (Electrical Power Equipment)
ECSE 463**	(3)	Electric Power Generation
ECSE 464	(3)	Power Systems Analysis
ECSE 465***	(3)	Power Electronic Systems
ECSE 466*	(3)	Réseaux de distribution
ECSE 467*	(3)	Comportement des réseaux électriques
ECSE 468*	(3)	Electricité industrielle (Industrial Power Systems)
ECSE 469*	(3)	Protection des réseaux électriques
ECSE 472	(3)	Fundamentals of Circuit Simulation and Modelling
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 552	(4)	Deep Learning
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
		Strate

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

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

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

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

Elective Course

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

Enhanced Power Concentration

Students following this program must complete 16-17 credits of technical complementary courses.

The Institute for Electrical Power Engineering was recently established as a province-wide centre for electrical power engineering education. It is funded by industry, mostly Hydro-Québec, and provides a comprehensive program, state-of-the-art laboratory facilities, and a point of contact between industry and universities in Tf1 0 0 1 67.52 .m01 .l Ee5.155 556.2d1kities h4A 6ps4.282 Tm(vince-wide0 0 1 81.599 536.842 Tmdce il po)Tj1 0 0 1567..669 536.842 Tm(wer engin

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

* Courses taught in French.

FACC 300	(3)	Engineering Economy
FACC 400	(1)	Engineering Professional Practice
MATH 262	(3)	Intermediate Calculus
MATH 263	(3)	Ordinary Differential Equations for Engineers
MIME 262	(3)	Properties of Materials in Electrical Engineering

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

Required Electrical Engineering Courses

61 credits

ECSE 200	(3)	Electric Circuits 1
		Introduction to Software De

ECSE 403	(4)	Control Communication Systems

PHYS 457	(3)	Honours Quantum Physics 2
PHYS 558	(3)	Solid State Physics

Complementary Studies

6 credits

Group A - Impact of Technology on Society

3 credits from the following:

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

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

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

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

Anthropology (ANTH)

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

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

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

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

School of Social Work (SWRK)

Sociology (excluding SOCI 350)

OR 3 credits from the following:

ARCH 528	(3)	History of Housing
BUSA 465*	(3)	Technological Entrepreneurship
CLAS 203	(3)	Greek Mythology
ENVR 203	(3)	Knowledge, Ethics and Environment
ENVR 400	(3)	Environmental Thought

FACC 220	(3)	Law for Architects and Engineers
FACC 500	(3)	Technology Business Plan Design
FACC 501	(3)	Technology Business Plan Project
HISP 225	(3)	Hispanic Civilization 1
HISP 226	(3)	Hispanic Civilization 2
INDR 294*	(3)	Introduction to Labour-Management Relations
INTG 201**	(3)	Integrated Management Essentials 1
INTG 202**	(3)	Integrated Management Essentials 2
MATH 338	(3)	History and Philosophy of Mathematics
MGCR 222*	(3)	Introduction to Organizational Behaviour
MGCR 352*	(3)	Principles of Marketing
ORGB 321*	(3)	Leadership
ORGB 423*	(3)	Human Resources Management

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

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

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

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

Elective Course

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

12.5.6 Bachelor of Engineering (B.Eng.) - Computer Engineering (133 credits)

Program credit weight: 133-137 credits

Program credit weight for Quebec CEGEP students: 108-112 credits

Program credit weight for out-of-province students: 133-137 credits

The Computer Engineering program provides students with greater depth and breadth of knowledge in the hardware and software aspects of computers. Students are exposed to both theoretical and practical issues of both hardware and software in well-equipped laboratories. Although the program is designed to meet the growing demands by industry for engineers with a strong background in modern computer technology, it also provides the underlying depth for graduate studies in all fields of Computer Engineering.

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

Required Year 0 (Freshman) Courses

25 credits

Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credit for these Year 0 (Freshman) courses and enter a 108- to 112-credit program.

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

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

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

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

Required Non-Departmental Courses

23 credits

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

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

Required Computer Engineering Courses

64 credits

ECSE 200	(3)	Electric Circuits 1
ECSE 202	(3)	Introduction to Software Development
ECSE 205	(3)	Probability and Statistics for Engineers
ECSE 206	(3)	Introduction to Signals and Systems
ECSE 210	(3)	Electric Circuits 2
ECSE 211	(3)	Design Principles and Methods
ECSE 222	(3)	Digital Logic
ECSE 223	(3)	Model-Based Programming
ECSE 308	(4)	Introduction to Communication Systems and Networks
ECSE 310	(3)	Thermodynamics of Computing
ECSE 321	(3)	Introduction to Software Engineering
ECSE 324	(4)	Computer Organization
ECSE 325	(3)	Digital Systems
		Electronics(1653ngFEC9.482.382 Tm(EComagne1 2 Field782 Tm Softw)Tj1 0 0 36gFEC9.482.382 W Softw

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)	Introduction 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
ECSE 552	(4)	Deep Learning

List B

0-12 credits from the following:

COMP 424**	(3)	Artificial Intelligence

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ECSE 421	(3)	Embedded Systems
ECSE 424	(3)	Human-Computer Interaction
ECSE 500	(3)	Mathematical Foundations of Systems
ECSE 507	(3)	Optimization and Optimal Control
ECSE 509	(3)	Probability and Random Signals 2
ECSE 521	(3)	Digital Communications 1
ECSE 526**	(3)	Artificial Intelligence
ECSE 532	(4)	Computer Graphics
MATH 247	(3)	Honours Applied Linear Algebra

* ECSE 551 and COMP 551 cannot both be taken.

** COMP 424 and ECSE 526 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
ECON2 T7f3)	(3)	Economics of the Environment

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).

AND 3 credits Natural Science complementary0 1 449.467 671.4 w

COMP 424***	(3)	Artificial Intelligence
COMP 445	(3)	Computational Linguistics
COMP 512	(4)	Distributed Systems
	(4)	Compiler Design

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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)

12.6 Mechanical Engineering

12.6.1 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: *mcgill.ca/mecheng*

12.6.2 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. A Minor in **Aerospace Engineering** and a Concentration in **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.

Mechanical Engineering Faculty

Adjunct Professors

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

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.)

Alireza Najafi-Yazdi; B.Sc, M.Sc.(Tehran), Ph.D.(McG.)

Senior Academic Associate

Amar Sabih

Course Lecturers

Farhang Daneshmand

Richard Klopp

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

Program credit weight: 142 credits

Program credit weight for Quebec CEGEP students: 113 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 113-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 approv

FACC 100	(1)	Introduction to the Engineering Profession
FACC 250	(0)	Responsibilities of the Professional Engineer
FACC 300	(3)	Engineering Economy
FACC 400	(1)	Engineering Professional Practice
MATH 262	(3)	Intermediate Calculus
MATH 263	(3)	Ordinary Differential Equations for Engineers
MATH 264	(3)	Advanced Calculus for Engineers
MATH 271	(3)	Linear Algebra and Partial Differential Equations
MIME 260	(3)	Materials Science and Engineering

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

Required Mechanical Engineering Courses

65 credits

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

Technical Complementary Courses

9 credits

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

CHEE 563*	(3)	Biofluids and Cardiovascular Mechanics
MECH 497	(3)	Value Engineering

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.

Typical Program of Study

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

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

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

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

Program credit weight: 142 credits

Program credit weight for Quebec CEGEP students: 113 credits

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

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

Technical Complementary Courses

18 credits

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

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

6 credits from the following:

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

* Note: Students select either MECH 577 or MECH 579

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

CHEE 563*	(3)	Biofluids and Cardiovascular Mechanics
MECH 497	(3)	Value Engineering
MECH 498	(3)	Interdisciplinary Design Project 1
MECH 499	(3)	Interdisciplinary Design Project 2
MECH 513	(3)	Control Systems
MECH 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 TechnM8.06 Tm(MECH 543)Tj1 8.3 Tf1 0 0206f(So370tyol)Tj1 0 0 1 165.864 591.9.3 Tf1 0 0206165.864 590O4Ri3u TVg4 5

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 (ane861ECONTj7nt StECONT337ogy (ANTH)ANTH)e861PHILann0nt StPHILa310ogy (ANTH)ANTH)e861PSYCTj04nt StPSYCT305, b Sciences,e861

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

12.7 Mining and Materials Engineering

12.7.1 Location

General Office:
Wong Building, Room 2140
3610 University Street
Montreal QC H3A 0C5
Website: *mcgill.ca/minmat*

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

12.7.2.1 Scholarships

The Department offers renewable Entrance Scholarships every year. A substantial number of other scholarships and bursaries are also awarded by the Department, as well as by the Canadian Mineral Industry Education Foundation, Canadian Institute of Mining Foundation, Quebec Mining Association, and others.

Please refer to the Faculty of Engineering website's *Scholarships and Financial Aid* section for more information.

12.7.3 Mining and Materials Engineering Faculty

Department Chair

Richard Chromik

Director, Mining Engineering

Mustafa Kumral

Associate Chair, Materials Engineering

Jun Song

Associate Chair & Graduate Program Director

Mathieu Brochu

Graduate Program Coordinator

Barbara Hanley

Emeritus Professors

James A. Finch; B.Sc.(Birm.), M.Eng., Ph.D.(McG.), Eng., F.C.I.M., F.R.S.C. (*Gerald G. Hatch Emeritus Professor*)

John E. Gruzleski; B.Sc., M.Sc.(Qu.), Ph.D.(Tor.), Eng., F.C.I.M., F.A.S.M. (*Gerald G. Hatch Emeritus Professor*)

John J. Jonas; B.Eng.(McG.), Ph.D.(Cant.), Eng., F.A.S.M., F.R.S.C. (*Henry Birks Emeritus Professor*)

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

Professors

Richard Chromik; B.Sc.(Penn. St.), M.Sc., Ph.D. (SUNY, Binghamton), P.Eng. (Hatch Faculty Fellow)

George P. Demopoulos; Dipl.Eng.(Nat. Tech., Athens), M.Sc., Ph.D.(McG.), Eng., F.C.I.M. (*Gerald G. Hatch Professor*)

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

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

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

Faramarz (Ferri) P. Hassani; B.Sc., Ph.D.(Nott.) (*George Boyd Webster Professor*)

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

Stephen Yue; B.Sc., Ph.D.(Leeds), P.Eng. (*James McGill Professor*) (*Lorne Trottier Chair in Aerospace Engineering*)

Associate Professors

Kirk Bevan; B.Eng.(UWO), Ph.D.(Purd.), P.Eng.

Mathieu Brochu; B.Eng.(Laval), Ph.D.(McG.), Eng. (*Hatch Faculty Fellow*)

Marta Cerruti; B.Sc., Ph.D., Laurea in Chemistry(Turin), P.Eng. (*Canada Research Chair II*)

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

Mustafa Kumral; B.Eng.(Hacettepe), M.Eng.(Çukurova), Ph.D.(Leeds), P.Eng.

Showan Nazhat; B.Eng., M.Sc., Ph.D.(Lond.), P.Eng.

Sidney Omelon; B.Eng., M.Eng., Ph.D.(McG.), Eng.

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

Associate Professors

Nathaniel Quitoriano; B.S.(Calif., Berk.), Ph.D.(MIT), P.Eng.

Agus Pulung Sasmito; B.Eng.(Gadjah Mada), Ph.D.(NUS)

Jun Song; B.Sc.(USTC), M.Sc., Ph.D.(Princ.), P.Eng.

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

Assistant Professor

Jinhyuk Lee; B.S.(Seoul), Ph.D.(MIT)

Alessandro Navarra; B.Eng., M.Sc. (McG.), Ph.D.(École Poly., Montr.)

Philippe Ouzilleau; B.Eng., M.Sc., Ph.D. (Ecole Poly., Montr.)

Professor of Practice

Karim Zaghib; Dipl., Ph.D. (Grenoble INP)

an), M.Sc., P

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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 $241.97 will be billed during ten consecutive terms for a total amount of $2,419.70 before graduation. These fees cover expenses directly related to the operation of the Co-op program. Students must register for each of their industrial training courses within the university registration period for returning students or late fees will apply. Before registering for any work term course, students must contact the Co-op in Materials Engineering Liaison Officer for approval.

12.7.4.2 Student Advising

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

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

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

Program credit weight: 148 credits

Program credit weight for Quebec CEGEP students: 119 credits

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

The department offers a Major in Materials Engineering leading to an accredited B.Eng. degree in Materials Engineering. Materials are used to enact every human technology and have shaped key eras in history. Major in Materials Engineering students will have the opportunity to learn the fundamental science and engineering of materials through the materials processing pipeline, including how to enrich mineral-poor ore, how to process the materials into the desired microstructures and compositions, and how to use these materials in various applications (aerospace, electronics, and biological systems). With the choice of technical complementary courses, students have an opportunity to specialize and strengthen key materials technologies or broaden their horizons and take courses from several interdisciplinary areas.

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

Required Year 0 (Freshman) Courses

29 credits

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

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

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

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

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

Required Non-Departmental Courses

36 credits

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

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MIME 410	(3)	Materials Research Project
MIME 442	(3)	Analysis, Modelling and Optimization in Mineral Processing
MIME 512	(3)	Corrosion and Degradation of Materials
MIME 515*	(3)	(Bio)material Surface Analysis and Modification
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
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)	(3)	Strategies for Sustainability

SOCI 235	(3)	Technology and Society
SOCI 312	(3)	Sociology of Work and Industry
URBP 201	(3)	Planning the 21st Century City

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

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

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

Anthropology (ANTH)

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

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

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

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

School of Social Work (SWRK)

Sociology (excluding SOCI 350)

OR 3 credits from the following:

ARCH 528	(3)	History of Housing
BUSA 465*	(3)	Technological Entrepreneurship
CLAS 203	(3)	Greek Mythology
ENVR 203	(3)	Knowledge, Ethics and Environment
ENVR 400	(3)	Environmental Thought
FACC 220	(3)	Law for Architects and Engineers
FACC 500	(3)	Technology Business Plan Design
FACC 501	(3)	Technology Business Plan Project
HISP 225	(3)	Hispanic Civilization 1
HISP 226	(3)	Hispanic Civilization 2
INDR 294*	(3)	Introduction to Labour-Management Relations
INTG 201**	(3)	Integrated Management Essentials 1
INTG 202**	(3)	Integrated Management Essentials 2
MATH 338	(3)	History and Philosophy of Mathematics
MGCR 222*	(3)	Introduction to Organizational Behaviour
MGCR 352*	(3)	Principles of Marketing
ORGB 321*	(3)	Leadership
ORGB 423*	(3)	Human Resources Management

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

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

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

Note regarding language courses: Language courses are not accepted to satisfy the Complementary Studies Group B requirement, effectiv

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

Program credit weight: 148 credits

Program credit weight for Quebec CEGEP students: 119 credits

The Department offers a Co-op in Materials Engineering program leading to an accredited B.Eng. degree in Materials Engineering. Materials are used to enact every human technology and have shaped key areas of history. In the Co-op in Materials Engineering, students will have the opportunity to learn the fundamental science and engineering of materials and complete three work-term semesters. The program spans the materials processing pipeline, teaching students how to enrich mineral-poor ore, then to process the materials into the desired microstructures and compositions and finally how to use these materials in various applications (aerospace, electronics and biological systems). With the choice of technical complementary courses, students have an opportunity to specialize and strengthen key materials technologies or broaden their horizons and take courses from several interdisciplinary areas.

Students pipeline, teaching

Required Materials Engineering Courses

68 credits

MIME 209	(3)	Mathematical Applications
MIME 212	(3)	Engineering Thermodynamics
MIME 250	(3)	Introduction to Extractive Metallurgy
MIME 261	(3)	Structure of Materials
MIME 280	(2)	Industrial Training 1
MIME 311	(3)	Modelling and Automatic Control
MIME 317	(3)	Analytical and Characterization Techniques
MIME 341	(3)	Introduction to Mineral Processing
MIME 345	(3)	Applications of Polymers
MIME 350	(3)	Extractive Metallurgical Engineering
MIME 352	(3)	Hydrochemical Processing
MIME 356	(4)	Heat, Mass and Fluid Flow
MIME 360	(3)	Phase Transformations: Solids
MIME 362	(3)	Mechanical Properties
MIME 380	(2)	Industrial Training 2
MIME 452	(4)	Process and Materials Design
MIME 455	(3)	Advanced Process Engineering
MIME 456	(3)	Steelmaking and Steel Processing
MIME 465	(3)	Metallic and Ceramic Powders Processing
MIME 467	(3)	Electronic Properties of Materials
MIME 470	(3)	Engineering Biomaterials
MIME 473	(3)	Introduction to Computational Materials Design
MIME 480	(2)	Industrial Training 3

Complementary Courses

15 credits

Technical Complementaries

9 credits

6-9 credits from the following:

CHEE 515*	(3)	Interface Design: Biomimetic Approach
CIVE 512	(3)	Advanced Civil Engineering Materials
MECH 530	(3)	Mechanics of Composite Materials
MIME 410	(3)	Materials Research Project
MIME 442	(3)	Analysis, Modelling and Optimization in Mineral Processing
MIME 512	(3)	Corrosion and Degradation of Materials
MIME 515*	(3)	(Bio)material Surface Analysis and Modification
MIME 526	(3)	Mineral Economics

T

Anthropology (ANTH)

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

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

CIVE 207	(4)	Solid Mechanics
COMP 208	(3)	Computer Programming for Physical Sciences and Engineering
ECSE 461	(3)	Electric Machinery
EPSC 221	(3)	General Geology
EPSC 225	(1)	Properties of Minerals
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 (Introduction to the Engineering Profession) must be taken during the first year of study.

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
	(3)	Hispanic Civilization 2

ECSE 461	(3)	Electric Machinery
EPSC 221	(3)	General Geology
EPSC 225	(1)	Properties of Minerals
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 Mining Engineering Courses

53 credits

MIME 200	(3)	Introduction to the Minerals Industry
MIME 203	(2)	Mine Surveying
MIME 209	(3)	Mathematical Applications
MIME 260	(3)	Materials Science and Engineering
MIME 290	(2)	Industrial Work Period 1
MIME 291	(2)	Industrial Work Period 2
MIME 322	(3)	Rock Fragmentation
MIME 323	(3)	Rock and Soil Mass Characterization
MIME 325	(3)	Mineral Industry Economics
MIME 333	(3)	Materials Handling
MIME 340	(3)	Applied Fluid Dynamics
MIME 341	(3)	Introduction to Mineral Processing
MIME 392	(2)	Industrial Work Period 3
		Strategic Mine Planning WCC 63Cology

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:

INTG 202**	(3)	Integrated Management Essentials 2
MATH 338	(3)	History and Philosophy of Mathematics
MGCR 222*	(3)	Introduction to Organizational Behaviour
MGCR 352*	(3)	Principles of Marketing
ORGB 321*	(3)	Leadership
ORGB 423*	(3)	Human Resources Management

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

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

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

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

12.8 Urban Planning

12.8.1 Location

Macdonald-Harrington Building, Room 400
815 Sherbrooke Street West
Montreal QC H3A 0C2
Telephone: 514-398-4075
Fax: 514-398-8376
Email: *admissions.planning@mcgill.ca*
Website: *mcgill.ca/urbanplanning*

12.8.2 About the School of Urban Planning

Urban planning can be described as the collective management of urban growth and development. It is concerned with the welf

Professor (Post-Retirement)

David Brown; B.A.(Bishop's), M.U.P.(McG.), Ph.D.(Sheff.)

Professors

Ahmed El-Geneidy; B.A.A., M.Arch.(AlexandriaU), Ph.D.(Port. St.)

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

Associate Professors

Madhav G. Badami; B.Tech., M.S.(IIT Madras) M.E.Des.(Calg.), Ph.D.(Br. Col.) (

Website: *mcgill.ca/bioeng*

12.9.2 Biomedical Engineering

The Faculty of Engineering cooperates with the Faculty of Medicine and Health Sciences in graduate degrees in biological and biomedical engineering. Some of the **(500-level)** courses offered by the Department of Biomedical Engineering (subject code BMDE) may be of interest to Engineering students, and may be approved as complementary courses. The Faculty of Engineering also offers a Minor in Biomedical Engineering; for more information, see *section 12.10.4: Bachelor of Engineering (B.Eng.) - Minor Biomedical Engineering (21 credits)*.

Lyman Duff Medical Sciences Building
3775 University Street, Room 316
Montreal QC H3A 2B4
Telephone: 514-398-6736
Website: *mcgill.ca/bme*

12.10 Minor Programs

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

Minors are coherent sequences of courses taken in addition to the courses required for the B.Eng. or B.Sc.(Arch.) degree. Minors normally consist of 18–24 credits, allowing 6–12 credits of overlap with the degree program (see individual minor program requirements for specific information regarding course overlap). The real credit cost to the student is typically 9–18 credits, representing one term be

12.10.1 Bachelor of Engineering (B.Eng.) - Minor Aerospace Engineering (24 credits)

The Minor is designed for engineering students wishing to pursue a career in aerospace engineering. The program covers fundamental aircraft and spacecraft design and the certification process. The program includes further specialization in the following streams: aerodynamics and propulsion, structural analysis, materials and processes, spacecraft engineering and systems and avionics. A capstone aerospace design project is offered in the last year of the program in collaboration with the local aerospace companies.

The Minor in Aerospace Engineering is offered by the McGill Institute of Aerospace Engineering and is open to all students in engineering programs.

A maximum of 15 credits of coursework in the student's major may double-count with the Minor.

Required Courses (6 credits)

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

Complementary Courses (18 credits)

6 credits from list below:

AERO 460D1	(3)	Aerospace Project
AERO 460D2	(3)	Aerospace Project
ECSE 458D1*	(3)	Capstone Design Project
ECSE 458D2*	(3)	Capstone Design Project

MECH 546	(3)	Finite Element Methods in Solid Mechanics
MECH 550	(3)	Vibrations of Continuous Systems
		Nonlinear Dynamics of Shell Structure

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

12.10.2 Bachelor of Engineering (B.Eng.) - Minor Applied Artificial Intelligence (25 credits)

The B.Eng.; Minor in Applied Artificial Intelligence, open to all engineering students, is designed to provide the foundation for applications of AI techniques in various fields of interest.

Advisor: Professor François Bouffard

(22-25 credits)

Students must complete 7 courses as follows. Up to three courses can be double counted with the major.

Required Course (3 credits)

COMP 250	(3)	Introduction to Computer Science

Complementary Courses (19-22 credits)

Group A

4 credits from the following:

COMP 551*	(4)	Applied Machine Learning
ECSE 551*	(4)	Machine Learning for Engineers

* ECSE 551 and COMP 551 cannot both be taken

Group B

3 credits from the following:

ECSE 343	(3)	Numerical Methods in Engineering
MATH 223	(3)	Linear Algebra
MATH 247	(3)	Honours Applied Linear Algebra
MATH 271	(3)	Linear Algebra and Partial Differential Equations

Group C

3 credits from the following:

AEMA 310	(3)	Statistical Methods 1

CIVE 302	(3)	Probabilistic Systems
		Probability and Stat 0 0 4

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

Complementary Courses

(21-25 credits)

Introductory Life Sciences

Minimum of 3 credits from the courses belo w:

BIEN 219**

BIOC 212*

BIOL 200

BIOL 201*

BIOL 219**

CHEM 212***

PHGY 210

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

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

*** Cannot be tak

Specialization Cour

Minimum of 12 credits from courses belo w:

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

Ph

BIEN 340

BIEN 360 ysical Chemistry in Bioengineering

BIEN 540

PHGY 311

PHGY 312 , Renal, and Cardio

PHGY 313

PHGY 517 gans

Bioinformatics, Genomics and Pr oteomics

ANAT 365

BIEN 310

BIEN 410

BIEN 420

BIEN 540

BIEN 590	(3)	Cell Culture Engineering
BIOC 311	(3)	Metabolic Biochemistry
BIOC 312	(3)	Biochemistry of Macromolecules
BIOC 458*	(3)	Membranes and Cellular Signaling
BMDE 508	(3)	Introduction to Micro and Nano-Bioengineering
COMP 424	(3)	Artificial Intelligence
COMP 462	(3)	Computational Biology Methods

* Students select either ANAT 458 or BIOC 458.

Biomaterials, Biosensors and Nanotechnology

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

Biomechanics and Prosthetics

BIEN 320	(3)	Molecular, Cellular and Tissue Biomechanics
BIEN 570	(3)	Active Mechanics in Biology
BMDE 512	(3)	Finite-Element Modelling in Biomedical Engineering
CHEE 563*	(3)	Biofluids and Cardiovascular Mechanics
MECH 315	(4)	Mechanics 3
MECH 321	(3)	Mechanics of Deformable Solids
MECH 530	(3)	Mechanics of Composite Materials
MECH 561	(3)	Biomechanics of Musculoskeletal Systems
MECH 563*	(3)	Biofluids and Cardiovascular Mechanics
MIME 360	(3)	Phase Transformations: Solids
MIME 362	(3)	Mechanical Properties

* Students choose either CHEE 563 or MECH 563.

Medical Physics and Imaging

BIEN 350*	(4)	Biosignals, Systems and Control
BIEN 530	(3)	Imaging and Bioanalytical Instrumentation

BMDE 512	(3)	Finite-Element Modelling in Biomedical Engineering
BMDE 519	(3)	Biomedical Signals and Systems
COMP 424	(3)	Artificial Intelligence
COMP 558	(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.

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

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

This Minor is offered by the Faculty of Engineering and the Faculty of Science for students who wish to take biotechnology courses that are complementary to their area. It has been designed specifically for Chemical Engineering students; other Engineering students who are interested in the Minor should contact a Faculty Student Adviser in the McGill Engineering Student Centre (Student Affairs Office) (Frank Dawson Adams Building, Room 22).

To obtain the Biotechnology Minor, students must complete 24 credits, 18 of which must be exclusively for the Minor. Approved substitutions must be made for any of the required courses that are part of the student's major program.

The Department of Chemical Engineering permits students taking this Minor to complete BIOT 505 (Selected Topics in Biotechnology) as one of their technical complementary courses. Chemical Engineering students complete 15 credits beyond their 141-credit (115-credit for CEGEP students) B.Eng. program to obtain this Minor.

Required Courses

12 credits

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

OR

Alternative Required Courses (for Chemical Engineering students)

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

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

Complementary Courses

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

Biomedicine

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

Chemistry

CHEM 482	(3)	Organic Chemistry: Natural Products
CHEM 502	(3)	Advanced Bio-Organic Chemistry
CHEM 552	(3)	Physical Organic Chemistry

General

FACC 300	(3)	Engineering Economy

Immunology

ANAT 261	(4)	Introduction to Dynamic Histology
BIOC 503	(3)	Immunochemistry
MIMM 214	(3)	Introductory Immunology: Elements of Immunity
MIMM 414	(3)	Advanced Immunology
PHGY 513	(3)	Translational Immunology

Management

Note: Engineering students may not use these courses to count tow

MIMM 465	(3)	Bacterial Pathogenesis
MIMM 466	(3)	Viral Pathogenesis

Molecular Biology (Biology)

BIOL 300	(3)	Molecular Biology of the Gene
BIOL 314	(3)	Molecular Biology of Cancer
BIOL 520	(3)	Gene Activity in Development
BIOL 524	(3)	Topics in Molecular Biology
BIOL 551	(3)	Principles of Cellular Control

Molecular Biology (Biochemistry)

BIOC 311	(3)	Metabolic Biochemistry
BIOC 312	(3)	Biochemistry of Macromolecules
BIOC 450	(3)	Protein Structure and Function
BIOC 454	(3)	Nucleic Acids
PSYT 455	(3)	Neurochemistry

Physiology

EXMD 401	(3)	Physiology and Biochemistry Endocrine Systems
EXMD 502	(3)	Advanced Endocrinology 1
EXMD 503	(3)	Advanced Endocrinology 02
PHAR 562	(3)	Neuropharmacology
PHAR 563	(3)	Endocrine Pharmacology
PHGY 517	(3)	Artificial Internal Organs
PHGY 518	(3)	Artificial Cells

Pollution

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

CIVE 225	(4)	Environmental Engineering
		Water T

MATH 317	(3)	Numerical Analysis
MECH 309	(3)	Numerical Methods in Mechanical Engineering

9 credits from:

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

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

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

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

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

This Minor covers construction project management, law related to construction, labour-management relations, financial accounting and project finance, in addition to topics in other construction-related fields, architecture or mining engineering.

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

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

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

Minor program credit weight: 24 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 (9 credits)

3 credits from List A

6 credits from List B

List A:

ARCH 447	(3)	Energy, Environment, and Buildings 2
ARCH 451	(3)	Building Regulations and Safety
MIME 322	(3)	Rock Fragmentation
MIME 333	(3)	Materials Handling

List B:

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

*Course offered in French at École Polytechnique in Montreal

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

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

Program credit weight: 18 credits

This Minor consists of 18 credits of required and complementary courses given in the Economics Department. In addition, it is presumed that all Engineering students will have a sufficient background in statistics. Engineering Economy, FACC 300, does not form part of this Minor. Engineering students who want to complete a minor in economics are required to complete the following program rather than one of the minor concentrations offered by the Department of Economics in the Faculty of Arts section of this eCalendar, unless they have obtained permission from the Faculty of Engineering.

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

Required Courses

9 credits

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

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

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

Complementary Courses

9 credits from:

ECON 225	(3)	Economics of the Environment
ECON 303	(3)	Canadian Economic Policy
ECON 304	(3)	Financial Instruments and 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 316Af

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.

12.10.10 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 Bieler School of Environment.

Since the program comprises a total of 18 credits for the Minor, additional credits beyond those needed for the B.Eng. degree are required. Students wishing to complete the Minor should prepare a program and have it approved by both their regular Engineering departmental adviser and the Minor program adviser. For program details, see *Bieler School of Environment* > *Undergraduate* > *Browse Academic Programs* > *: Minor in Environment*.

Note: Engineering students interested in this Minor must submit a completed Course Authorisation 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
Bieler School of Environment Program Adviser
Telephone: 514-398-4306
Email: *kathy.roulet@mcgill.ca*

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

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

Minor program credit weight: 21-22 credits

The Environmental Engineering Minor is administered by the Department of Civil Engineering and is offered for all students in Engineering and in the Department of Bioresource Engineering wishing to pursue studies in this area.

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

T

21-22 credits

18 credits from Stream A, B, or C below

and

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

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

Stream A

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

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

Stream B

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

AND

One course (3-4 credits) chosen from the Engineering Course List below, excluding CHEE 496.

Engineering Course List

Courses offered at the Macdonald campus:

BREE 217*	(3)	Hydrology and Water Resources
		Or

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

+ Not open to students who have passed CHEE 370.

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

Courses offered at the Downtown campus:

ANTH 206	(3)	Environment and Culture
BIOL 205	(3)	Functional Biology of Plants and Animals
BIOL 432	(3)	Limnology
CMPL 580	(3)	Environment and the Law
ECON 225	(3)	Economics of the Environment
ECON 326	(3)	Ecological Economics
ECON 347	(3)	Economics of Climate Change
EPSC 549	(3)	Hydrogeology
GEOG 200	(3)	Geographical Perspectives: World Environmental Problems
GEOG 201	(3)	Introductory Geo-Information Science
GEOG 203	(3)	Environmental Systems
GEOG 205	(3)	Global Change: Past, Present and Future
GEOG 302	(3)	Environmental Management 1
GEOG 308	(3)	Remote Sensing for Earth Observation
GEOG 321	(3)	Climatic Environments
GEOG 404	(3)	Environmental Management 2
MIMM 211	(3)	Introductory Microbiology

12.10.12 Minor Programs in Finance, Management, Marketing, and Operations Management

Prerequisite: None

Minors for Non-Management Students: Students considering one of these Minor programs should consult a Faculty Student Adviser in the *McGill Engineering Student Centre* (Student Affairs Office; Frank Dawson Adams Building, Room 22) before applying to the Desautels Faculty of Management.

Many engineers begin to assume management functions within a few years of graduation. They can, at this stage, take up the study of economics, behavioural science, and other management subjects. Students wishing to include such studies in their undergraduate program can take suitable courses from Engineering and Management.

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

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

Admission requirements for the Management Minors change annually. Please consult the *Desautels Faculty of Management website* for more details.

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

Application and Program Requirements

Detailed information on the following Minor programs can be found in *Desautels Faculty of Management*

Required Course (3 credits)

MATH 242	(3)	Analysis 1

Complementary Courses (15 credits)

3 credits selected from:

MATH 223	(3)	Linear Algebra
MATH 247	(3)	Honours Applied Linear Algebra

6-12 credits selected from:

ECSE 205*	(3)	Probability and Statistics for Engineers
MATH 204	(3)	Principles of Statistics 2
MATH 240	(3)	Discrete Structures
MATH 243	(3)	Analysis 2
MATH 264	(3)	Advanced Calculus for Engineers
MATH 271**	(3)	Linear Algebra and Partial Differential Equations
MATH 316	(3)	Complex Variables
MATH 319**	(3)	Introduction to Partial Differential Equations
MATH 323*	(3)	Probability
MATH 324*	(3)	Statistics
MATH 326	(3)	Nonlinear Dynamics and Chaos
MATH 340	(3)	Discrete Mathematics
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
MATH 560	(4)	Optimization

* Students who take ECSE 205 may not take MATH 323 or MATH 324.

** Students may take MATH 271 or MATH 319 but not both.

0-6 credits chosen from (200- to 500-level) Mathematics and Statistics courses approved for the B.Sc. Major Mathematics or B.Sc. Honours Mathematics programs, or from mathematics courses offered in other units. The courses in this category must be chosen in consultation with, and approved by, the Minor Adviser from the Department of Mathematics and Statistics.

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

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

Minor Adviser: Prof. Mustafa Kumral (Minor Coordinator)

Frank Dawson Adams Building, Room 119

Program credit weight: 23 credits

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

Required Courses

14 credits

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

Complementary Courses

9 credits

List A: Mining Engineering

3-9 credits from the following:

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

List B: Mechanical Engineering

0-6 credits from the following:

MECH 497	(3)	Value Engineering
MECH 557	(3)	Mechatronic Design
MECH 572	(3)	Mechanics and Control of Robotic Manipulators
MECH 573	(3)	Mechanics of Robotic Systems
MECH 577	(3)	Optimum Design

List C: Civil Engineering

0-6 credits from the following:

CIVE 416	(3)	Geotechnical Engineering
CIVE 451	(3)	Geoenvironmental Engineering
CIVE 462	(3)	Design of Steel Structures
CIVE 463	(3)	Design of Concrete Structures
CIVE 527	(3)	Renovation and Preservation: Infrastructure

List D: Chemical Engineering

0-6 credits from the following:

CHEE 453	(4)	Process Design
CHEE 455	(3)	Process Control
CHEE 484	(3)	Materials Engineering

List E: Electrical Engineering

0-6 credits from the following:

ECSE 404	(3)	Control Systems
ECSE 426	(3)	Microprocessor Systems
		Signal Processing Hardw

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)	(Bio)material Surface Analysis and Modification
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.

12.10.18 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

12.10.19 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 CGPA of at least 3.0 and B+ or better in prerequisites

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

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

This Minor is a collaboration of the Faculty of Engineering and Desautels Faculty of Management and is designed to provide Engineering (B.Eng. and B.Sc. (Arch.)) students with an understanding of how to conceptualize, develop, and manage successful new ventures – including for-profit private companies, social enterprises, and cooperatives as well as intrapreneurship initiatives. The program covers the essentials of management and is multidisciplinary and integrative. Many courses in the Minor will address a mix of students from across multiple McGill faculties.

B.Eng. students may double-count up to two courses (6 credits) of Complementary Studies (Group B., Humanities, and Social Science courses) toward the Minor. B.Eng. Mechanical Engineering students may double-count up to 6 credits of Complementary Studies Group B courses and/or Elective courses (for Mechanical Engineering students from a CEGEP background) toward the Minor.

This Minor is restricted to students in Year 2 or higher. Students in this Minor are not permitted to take the Desautels Minors in Management, Marketing, Finance or Operations Management (for non-Management students).

Required Courses (12 credits)

FACC 500	(3)	Technology Business Plan Design
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