



**Faculty of Engineering, including Peter Guo-hua
Fu School of Architecture and School of Urban
Planning
Programs, Courses and University Regulations
2023-2024**

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

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

Publication Information

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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 elsewhere. The professional degrees in Architecture and Urban Planning are offered at the master's level and are described at [Faculty of Engineering > Graduate](#).

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

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

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

2 History of the Faculty

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

For a detailed history of the Faculty from 1811 to 2003, see mcgill.ca/engineering/about-us/our-history.

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

Location

Macdonald-Stewart Library Building (re-opening in summer 2023)

809 Sherbrooke St. West

Montreal QC H3A 0C9

Contact the Library:

mcgill.ca/library/contact/askus

Website: mcgill.ca/library



Note: After four years of extensive restoration, the Macdonald-Stewart Library Building is re-opening in summer 2023.

The Schulich Library of Physical Sciences, Life Sciences, and Engineering provides resources and services to support research and teaching programs in engineering, physical sciences, health sciences, medicine, and dentistry. The collection provides access to thousands of electronic resources (books, journal, and databases), accessible anytime, anywhere through EZproxy, using a McGill username and password. The library's physical collection, including course reserves, is available in the McLennan-Redpath Library Complex. Subject-specialized liaison librarians offer one-on-one research consultations, as well as a range of workshops designed to help users effectively find, assess, and use information.

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

- [Blackader-Lauterman Library of Architecture and Art](#)
- [Macdonald Campus Library](#)

Contact us by phone or email or visit the website to learn more about the Library's services, collections, and facilities. We look forward to seeing you in the Library.

5 About Engineering (Undergraduate)

5.1 Location

Faculty of Engineering

Macdonald Engineering Building

817 Sherbrooke Street West

Montreal QC H3A 0C3

Canada

Telephone: 514-398-7250

Faculty website: mcgill.ca/engineering

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

3450 University Street
 Montreal QC H3A 0E8
 Frank Dawson Adams Building, Suite 22
 Telephone: 514-398-7257
 McGill Engineering Student Centre website: mcgill.ca/engineering/students/undergraduate/mesc

5.2 About the Faculty of Engineering

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

Goals:

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

In this section, you will find up-to-date information about the Faculty and about the undergraduate programs and courses it offers. For information about graduate studies in the Faculty of Engineering, see [Faculty of Engineering > Graduate](#).

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

- [section 1: About the Faculty of Engineering](#)
- [section 2: History of the Faculty](#)
- [section 3: Engineering Microcomputing Facility](#)
- [section 4: Schulich Library of Physical Sciences, Life Sciences, and Engineering](#)
- [section 6: Degrees and Requirements for Professional Registration](#)
- [section 9: Student Activities](#)
- [section 11: Engineering Internship Program \(EIP\)](#)
- Undergraduate [Programs](#) and [Courses](#)
- [section 12.10: Minor Programs](#) for students in the Faculty of Engineering

For regulations that are specific to undergraduate studies in the Faculty of Engineering, see [University Regulations and Resources \(Undergraduate\)](#) and watch for sections and notes that are specific to the Faculty of Engineering.

5.3 Administrative Officers

Dean

Viviane Yargeau

Associate Deans

Michael Kokkoularas, *Faculty Affairs*; Anne Kietzig, *Student Affairs*; Roni Khazaka, *Academic Programs*; Milica Popovich, *Research and Innovation*

Department Chairs

Richard Chromik, *Mining & Materials Engineering*; Warren Gross, *Electrical and Computer Engineering*; Mohamed Meguid, *Civil Engineering*; Rosaire Mongrain, *Mechanical Engineering*; Dan V. Nicolau, *Bioengineering*; Richard L. Leask (interim), *Chemical Engineering*

Director, The Peter Guo-hua Fu School of Architecture

David Theodore

Director, School of Urban Planning

Lisa Bornstein

Director of Administration

Kaila Folinsbee

Associate Director, Engineering Career Centre

Julie Godin

Associate Director, Student Affairs

Nancy Lewis

6 Degrees and Requirements for Professional Registration

Non-Professional

Bachelor of Science (Architecture)

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

Professional

Bachelor of Engineering

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

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

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

7 Admission Requirements

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

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

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 program (e.g., on account of Advanced Standing). Extensions may be granted by the Committee on Standing in cases of serious medical problems or where other similarly uncontrollable factors have affected your progress, or your program is lengthened (e.g., participation in the Engineering Internship Program).

9 Student Activities

The campus offers a wide variety of extracurricular activities for students. All are encouraged to participate. Many of these are organized within the Faculty under the auspices of the Engineering Undergraduate Society (EUS). EUS publishes a handbook describing their operations and the activities of various

Faculty clubs and societies; you can also find these on their website (see below). All undergraduate students automatically become members of the EUS. Each department and school also has a student association.

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

10 Degrees and Programs Offered

Internship Program

Engineering Internship Program

Co-op Programs

Materials Engineering (B.Eng.)

Mining Engineering (B.Eng.)

Software Engineering (B.Eng.)

Major Programs

Architecture (B.Sc.(Arch.))

Bioengineering (B.Eng.)

Chemical Engineering (B.Eng.)

Civil Engineering (B.Eng.)

Computer Engineering (B.Eng.)

Electrical Engineering (B.Eng.)

Materials Engineering (B.Eng.)

Mechanical Engineering (B.Eng.)

Mining Engineering (B.Eng.)

Honours Programs

Electrical Engineering (B.Eng.)

Mechanical Engineering (B.Eng.)

Minors

Aerospace Engineering

Applied Artificial Intelligence

Arts

Biomedical Engineering

Biotechnology

Chemistry

Computer Science

Construction Engineering and Management

Economics

Environment

Environmental Engineering

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

Materials Engineering

Minors

Mathematics

Mining Engineering

Musical Science and Technology

Nanotechnology

Physics

Software Engineering

Technological Entrepreneurship

11 Engineering Internship Program

Real world experiences await.

What is the EIP?

The McGill Engineering Internship Program (EIP) offers full-time undergraduate engineering students in non co-op degree programs the possibility of participating in industry-related internships and having their experiences formally recognized. With an increasing number of employers requiring applicants to be part of a formal university coop/internship program, the EIP enables non co-op students to be eligible and apply to those internship opportunities.

11.1 Eligibility Criteria

- Students must be registered full-time in their degree program before the proposed internship term and must be returning to full-time studies following the completion of the internship.
- Internships must meet a standard durational requirement of 4, 8, 12, or 16 months.
- Internships must be considered full-time (at least 35 hours per week).
- Internships must be a paid position with a salary based on the student's experience and level of study; unpaid internships are not eligible.
- Internships must be related to the student's degree program.
- International students are also eligible, but will require a co-op work permit to participate.
- Students cannot miss more than two academic terms for internships.
- Students may be eligible to pursue one academic course (maximum of 4 credits) while on an approved internship term, pending certain conditions.

12 Browse Academic Units & Programs

The programs and courses in the following sections have been approved for the 2023-2024 session as listed.

12.1 Architecture

12.1.1 Location

Macdonald-Harrington Building, Room 201
815 Sherbrooke Street West
Montreal QC H3A 0C2
Telephone: 514-398-6700
Fax: 514-398-7372
Website: mcgill.ca/architecture

12.1.2 About the Peter Guo-hua Fu School of Architecture

Founded in 1896, the Peter Guo-hua Fu School of Architecture at McGill University offers professional programs, including B.Sc. (Arch.) and M.Arch. (Professional), and post-professional research programs, including M.Arch. (Post-professional) and Ph.D.

Vision

To advance professional architectural education that flourishes through research, critical practice, and community engagement.

Mission

The Peter Guo-hua Fu School of Architecture educates professionals who contribute to the global community through the design, construction, and interpretation of the built environment. The School:

- encourages a diverse environment for teaching, learning, and research, supported by both traditional and state-of-the-art digital resources;
- develops professional and post-professional research-based Masters and Ph.D. programs that enable graduates to contribute responsibly to the profession, to research, and to careers in related fields;
- enriches multidisciplinary teaching and research within the University and in connection with other local and international universities; and
- engages citizens' groups, local, provincial, and national governments, the private sector, and the profession toward the improvement of the built environment.

12.1.3 Architectural Certification in Canada

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

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

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

12.1.4 Programs of Study

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

- complete the B.Sc.(Arch.) degree, including the series of required and complementary courses stipulated for professional studies, with a minimum CGPA of 3.00. Please note that the minimum CGPA requirement does not guarantee entry into M.Arch program;
- submit a portfolio of work executed in the sequence of six design studios, as well as samples of professional and personal work; and
- complete the minimum period of relevant work experience according to the current Work Experience Guidelines (see <http://www.mcgill.ca/architecture/programs/professional/workexperience>).

Further information on the M.Arch. (Professional) program and application procedures is available at mcgill.ca/architecture/programs/professional/prospective-students/application-procedures.

12.1.4.1 Student Exchanges

A limited number of qualified students may participate in an exchange with schools of architecture at other universities that have agreements with the McGill School of Architecture, for a maximum of one term in the second year of the B.Sc.(Arch.) program. These include the following:

- Università Iuav di Venezia (Venice, Italy);
- Fakultät für Architektur und Raumplanung;
- Université Catholique de Louvain (Louvain, Brussels, and Tournai, Belgium);
- Scuola di Architettura Civile Politecnico di Milano (Leonardo) (Milan, Italy);
- College of Architecture and Urban Planning, Tongji University (Shanghai, China);
- École nationale supérieure d'architecture de Paris-Belleville (Paris, France);
- École nationale supérieure d'architecture de Grenoble (Grenoble, France).

12.1.5 Ancillary Academic Facilities

Laboratories and Workshops

Media Centre – Juan Osorio, Media Technician

Laboratories and Workshops

Workshop Facilities – Athanasia Blounas, Technician; David Speller, Technician

Library

Blackader-Lauterman Collection of Architecture and Art, located in the Redpath Library – Emily Jaeger-McEnroe, Liaison Librarian

Collections

The John Bland Canadian Architecture Collection – Jennifer Garland, Assistant Head Librarian, Rare Books and Special Collections

12.1.6 Architecture Faculty

Director

David Theodore

Undergraduate Program Director

Naomi Keena

Graduate Program Director

Theodora Vardouli

Emeritus Professors

Bruce Anderson, Vikram Bhatt, Derek Drummond, Alberto Pérez-Gómez, Adrian Sheppard, Radoslav Zuk

Associate Professor (Post-Retirement)

Ricardo L. Castro

Professors

Annmarie Adams, Martin Bressani, Avi Friedman

Associate Professors

David Covo, Michael Jemtrud, Nik Luka, David Theodore, Ipek Türeli

Assistant Professors

Alan Dunyo Avorgbedor, Salmaan Craig, Naomi Keena, Theodora Vardouli

Professors of Practice

Howard Davies, Peter Guo-hua Fu, Julia Gersovitz, Andrew King

Adjunct Professor

Conor Sampson

Course Lecturers

Vedanta Balbahadur, Ewan Branda, Evelyne Bouchard, Gregory Caicco, Morgan Carter, Nancy Dunton, Tom Egli, Aniel Guxholli, Charles Gregoire, Olga Karpova, Shane Laptiste, Daniela Leon, Julia Manacas, Sybil McKenna, Samiha Meem, Marc-André Plourde, Cailen Pybus, Sophie Robitaille, Rebecca Taylor, Jennifer Thorogood

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 (Canadian Studies), CATH (Catholic Studies), CLAS (Classics), COMS (Communication Studies), EAST (East Asian Studies), ECON (Economics), ENGL (English), FREN (French), FSCI (Faculty of Science), GEOG (Geography), GSFS (Gender, Sexuality, Feminist, and Social Justice), GERM (German), HISP (Hispanic Studies), HIST (History), INDG (Indigenous Studies), ISLA (Islamic Studies), ITAL (Italian), JWST (Jewish Studies), LING (Linguistics), LLCU (Languages, Literatures, and Cultures), MUAR (Music - Arts Faculty), PHIL (Philosophy), POLI (Political Science), PSYC (Psychology), RELG (Religious Studies), RUSS (Russian), SOCI (Sociology).

* A PHYS course equivalent to Mechanics with labs may be substituted upon approval of the department.

Required Courses (85 credits)

Architectural Courses

Note: ARCH 250 and ARCH 378 should be taken in the first year of studies.

ARCH 201	(6)	Communication, Behaviour and Architecture
ARCH 202	(6)	Architectural Graphics and Elements of Design
ARCH 221	(2)	Architectural Drawing
ARCH 240	(3)	Organization of Materials in Buildings
ARCH 241	(3)	Architectural Structures 1
ARCH 250	(3)	Architectural History 1
ARCH 251	(3)	Architectural History 2
ARCH 303	(6)	Design and Construction 1
ARCH 304	(6)	Design and Construction 2
ARCH 325	(2)	Architectural Sketching
ARCH 342	(3)	Digital Representation
ARCH 354	(3)	Architectural History 3
ARCH 355	(3)	Architectural History 4
ARCH 375	(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	(3)	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 562	(3)	Innovative Homes and Communities
ARCH 564	(3)	Design for Development
ARCH 566	(3)	Cultural Landscapes Seminar

Elective Courses (9 credits)

9 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, Mechanics, and Sensing
- Biomolecular, Cellular, and Tissue Engineering
- Biological Information and Computational Bioengineering

12.2.3 Bioengineering Faculty

Chair

Dan V. Nicolau

Professors

Dan V. Nicolau; Amine Kamen; Sebastian Wachsmann-Hogiu; Yu (Brandon) Xia

Associate Professors

Allen Ehrlicher; Adam Hendricks; J. Matt Kinsella; Georgios Mitsis

Assistant Professors

Codruta Ignea; Sara Mahshid; Natalie Reznikov; Caroline Wagner

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

Program credit weight: 142-152 credits

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

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

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

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

32 credits

CHEM 212**	(4)	Introductory Organic Chemistry 1
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
WCOM 206	(3)	Communication in Engineering

* 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

48 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 267	(3)	Bioanalytical Methods in Bioengineering.
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 414	(3)	Fundamentals and Rheology of Biological Fluids
BIEN 450	(3)	Biological Structures and Assemblies
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
BIEN 585	(3)	Metabolic Engineering
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
CIVE 281	(3)	Analytical 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
MIME 473	(3)	Introduction to Computational Materials Design
SEAD 515	(3)	Climate Change Adaptation and Engineering Infrastructure
SEAD 520	(3)	Life Cycle-Based Environmental Footprinting
SEAD 540	(3)	Industrial Ecology and Systems
SEAD 550	(3)	Decision-Making for Sustainability in Engineering and Design

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

NOTE: Maximum 6 credits of SEAD courses are allowed.

Stream 2: Biomolecular and Cellular Engineering (24-25 credits)

12 credits from List A

12-13 credits from List B

List A

BIEN 310	(3)	Introduction to Biomolecular Engineering
BIEN 320	(3)	Molecular, Cellular and Tissue Biomechanics
BIEN 550	(3)	Biomolecular Devices
BIEN 590	(3)	Cell Culture Engineering

List B

BIEN 330	(3)	Tissue Engineering and Regenerative Medicine
BIEN 410	(3)	Computational Methods in Biomolecular Engineering
BIEN 414	(3)	Fundamentals and Rheology of Biological Fluids
BIEN 450	(3)	Biological Structures and Assemblies
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 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
BIEN 585	(3)	Metabolic Engineering
BMDE 503	(3)	Biomedical Instrumentation
BMDE 508	(3)	Introduction to Micro and Nano-Bioengineering
CIVE 281	(3)	Analytical Mechanics
CIVE 557	(3)	Microbiology for Environmental Engineering
PHYS 534	(3)	Nanoscience and Nanotechnology
SEAD 510	(4)	Energy Analysis
SEAD 515	(3)	Climate Change Adaptation and Engineering Infrastructure

SEAD 520	(3)	Life Cycle-Based Environmental Footprinting
SEAD 540	(3)	Industrial Ecology and Systems
SEAD 550	(3)	Decision-Making for Sustainability in Engineering and Design

NOTE: Maximum 6 credits of SEAD courses are allowed.

Stream 3: Biological Information and Computation (24-25 credits)

12 credits from List A

12-13 credits from List B

List A

BIEN 310	(3)	Introduction to Biomolecular Engineering
BIEN 410	(3)	Computational Methods in Biomolecular Engineering
BIEN 530	(3)	Imaging and Bioanalytical Instrumentation
BIEN 540	(3)	Information Storage and Processing in Biological Systems

List B

BIEN 414	(3)	Fundamentals and Rheology of Biological Fluids
BIEN 450	(3)	Biological Structures and Assemblies
BIEN 462	(3)	Engineering Principles in Physiological Systems
BIEN 500	(3)	Special Topics in Bioengineering 1
BIEN 515	(3)	Special Topics in Bioengineering 2
BIEN 525	(3)	Special Topics in Bioengineering 3
BIEN 535	(3)	Electron Microscopy and 3D Imaging for Biological Materials
BIEN 545	(3)	Diagnostic Devices at the Point-of-Care
BIEN 580	(3)	Synthetic Biology
BIEN 585	(3)	Metabolic Engineering
BMDE 502	(3)	BME Modelling and Identification
BMDE 503	(3)	Biomedical Instrumentation
BMDE 512	(3)	Finite-Element Modelling in Biomedical Engineering
BMDE 519	(3)	Biomedical Signals and Systems
CIVE 281	(3)	Analytical Mechanics
COMP 250	(3)	Introduction to Computer Science
COMP 251	(3)	Algorithms and Data Structures
COMP 462	(3)	Computational Biology Methods
COMP 551	(4)	Applied Machine Learning
ECSE 415	(3)	Introduction to Computer Vision
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 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
ECON 225	(3)	Economics of the Environment
ECON 347	(3)	Economics of Climate Change
ENVR 201	(3)	Society, Environment and Sustainability
GEOG 200	(3)	Geographical Perspectives: World Environmental Problems
GEOG 203	(3)	Environmental Systems
GEOG 205	(3)	Global Change: Past, Present and Future
GEOG 302	(3)	Environmental Management 1
MGPO 440*	(3)	Strategies for Sustainability
PHIL 343	(3)	Biomedical Ethics
RELG 270	(3)	Religious Ethics and the Environment
SOCI 235	(3)	Technology and Society
SOCI 312	(3)	Sociology of Work and Industry
URBP 201	(3)	Planning the 21st Century City

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

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

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

6 credits of courses at the 200-level or higher from the following departments:

Anthropology (ANTH)

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

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

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

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

School of Social Work (SWRK)

Sociology (excluding SOCI 350)

OR from the following courses:

ARCH 528	(3)	History of Housing
BUSA 465*	(3)	Technological Entrepreneurship
CLAS 203	(3)	Greek Mythology
ENVR 203	(3)	Knowledge, Ethics and Environment
ENVR 400	(3)	Environmental Thought
FACC 220	(3)	Law for Architects and Engineers
FACC 500	(3)	Technology Business Plan Design

FACC 501	(3)	Technology Business Plan Project
HISP 225	(3)	Hispanic Civilization 1
HISP 226	(3)	Hispanic Civilization 2
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: www.mcgill.ca/importantdates.

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

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

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

Elective Courses

0-9 credits

Students from Quebec CEGEPs must take 9 credits of elective courses. These can be chosen from any course at the 200-level or higher offered by the University, subject to permission of the offering department.

12.3 Chemical Engineering

12.3.1 Location

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

12.3.2 About the Department of Chemical Engineering

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

- 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.

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

The solution to many environmental problems requires an understanding of technological principles; a Chemical Engineering degree provides an ideal background. In addition to relevant material learned in the core program, a selection of environmental complementary courses and minor programs is available. The involvement of many Chemical Engineering faculty members in environmental research provides the opportunity for undergraduate students to carry out research projects in this area.

The **B.Eng.** curriculum also provides the preparation necessary to undertake postgraduate studies leading to **M.Eng.**, **M.Sc.**, or **Ph.D.** degrees in Chemical Engineering. Students completing this curriculum acquire a broad, balanced education in the natural sciences with the accent on application. Thus, for those who do not continue in Chemical Engineering, it provides an exceptionally balanced education in applied science. For others, it will form the basis of an educational program that may continue with a variety of studies such as business administration, medicine, or law. Versatility is, therefore, one of the most valuable characteristics of Chemical Engineering program graduates.

12.3.3 Academic Programs

The Chemical Engineering program comprises 143 credits (114 credits for those who completed the Quebec CEGEP program in Pure and Applied Sciences).

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

12.3.4 Canadian Society for Chemical Engineering

The [Chemical Engineering Student Society](#) has for many years been affiliated with both the [CSChE](#) (Canadian Society for Chemical Engineering) which is one of the member societies of the Chemical Institute of Canada (CIC) and with the [AIChE](#) (American Institute of Chemical Engineers). CSChE membership is free for all full-time undergraduate students at McGill (www.cheminst.ca/membership/fees). CSChE and AIChE members gain access to a range of benefits, including registration rates at the Canadian Chemical Engineering Conference, as well as member rates in the American Chemical Society (ACS) and affiliated events. The student chapter also organizes a series of local social, educational, and sporting events. Recent events have included student–professor banquets, parties, speakers, broomball games, and joint events with the Montreal Section of the CIC (www.cicmontrealsection.ca), which gives students a chance to network with practising chemical engineers in the Montreal region.

12.3.5 Chemical Engineering Faculty

Chair

Richard L. Leask (interim)

Emeritus Professors

David G. Cooper; John M. Dealy; Richard J. Munz; W.J. Murray Douglas; Juan H. Vera

Associate Professor (Post-Retirement)

Dimitrios Berk

Professors

Sylvain Coulombe; Richard L. Leask; Milan Maric; Sasha Omanovic; Alejandro D. Rey; Phillip Servio; Nathalie Tufenkji; Viviane Yargeau

Associate Professors

Noémie Dorval Courchesne; Corinne Hoesli; Jan Kopyscinski; Pierre-Luc Girard-Lauriault; Reghan James Hill; Anne-Marie Kietzig; Christopher Moraes

Assistant Professors

Samuel Huberman; Ali Seifitokaldani

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 quantitative understanding of the process industries. Those with an interest in the fourth fundamental science, biology, will find several courses in the chemical engineering curriculum that integrate aspects of the biological sciences relevant to process industries such as food processing, fermentation, biomedical, and water pollution control. Courses on the technical operations and economics of the process industries are added to this foundation. The core curriculum concludes with process design courses taught by practising design engineers. Problem-solving, experimenting, planning, and communication skills are emphasized in courses throughout the core curriculum.

Certain students who take advantage of Summer session courses can complete the departmental program in three calendar years.

In some cases, students from university science disciplines have sufficient credits to complete the requirements for the B.Eng. (Chemical) program in two and a half years. Those concerned should discuss this with their adviser.

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

Note to CEGEP students

If you have successfully completed a course at CEGEP that is equivalent to CHEM 212 or CHEM 234, you may 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/new-students> and select your term of admission.

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

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

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

Required Non-Departmental Courses

24 credits

CHEM 212	(4)	Introductory Organic Chemistry 1
CHEM 234	(3)	Topics in Organic Chemistry
COMP 208	(3)	Computer Programming for Physical Sciences and Engineering

FACC 100*	(1)	Introduction to the Engineering Profession
FACC 250	(0)	Responsibilities of the Professional Engineer
FACC 300	(3)	Engineering Economy
FACC 400	(1)	Engineering Professional Practice
MATH 262	(3)	Intermediate Calculus
MATH 263	(3)	Ordinary Differential Equations for Engineers
MATH 264	(3)	Advanced Calculus for Engineers

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

Required Chemical Engineering Courses

75 credits

CHEE 200	(3)	Chemical Engineering Principles 1
CHEE 204	(3)	Chemical Engineering Principles 2
CHEE 220	(3)	Chemical Engineering Thermodynamics
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 456D1	(4.5)	Design Project
CHEE 456D2	(4.5)	Design Project
CHEE 474	(3)	Biochemical Engineering
CHEE 484	(3)	Materials Engineering
CHEE 491	(4)	Instrumentation and Measurement 2

Technical Complementaries

9 credits

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

List A

3-9 credits from the following:

CHEE 301	(3)	Resource Recovery and Circular Use
CHEE 511	(3)	Catalysis for Sustainable Fuels and Chemicals

CHEE 512	(3)	Stem Cell Bioprocess Engineering
CHEE 515	(3)	Interface Design: Biomimetic Approach
CHEE 521+	(3)	Nanomaterials and the Aquatic Environment
CHEE 541	(3)	Electrochemical Engineering
CHEE 543	(3)	Plasma Engineering
CHEE 563+	(3)	Biofluids and Cardiovascular Mechanics
CHEE 582	(3)	Polymer Science and Engineering
CHEE 584	(3)	Polymer Processing
CHEE 585	(3)	Foundations of Soft Matter
CHEE 591	(3)	Environmental Bioremediation
CHEE 593+	(3)	Industrial Water Pollution Control
CIVE 430+	(3)	Water Treatment and Pollution Control
CIVE 521+	(3)	Nanomaterials and the Aquatic Environment
MECH 534+	(3)	Air Pollution Engineering
MECH 563+	(3)	Biofluids and Cardiovascular Mechanics

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

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

List B

0-6 credits from the following:

BIEN 550	(3)	Biomolecular Devices
BIOT 505*	(3)	Selected Topics in Biotechnology
BREE 325	(3)	Food Process Engineering
BREE 522	(3)	Bio-Based Polymers
CHEE 363**	(2)	Projects Chemical Engineering 1
CHEE 494**	(3)	Research Project and Seminar 1
CHEE 495**	(4)	Research Project and Seminar 2
CHEE 496**	(3)	Environmental Research Project
CIVE 557	(3)	Microbiology for Environmental Engineering
MIME 470	(3)	Engineering Biomaterials
MIME 515	(3)	(Bio)material Surface Analysis and Modification
MIME 558	(3)	Engineering Nanomaterials

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

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

List C

0-3 credits

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

Complementary Studies

6 credits

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
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.

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 495
 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. 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 (Student Affairs)

Jinxia Liu

Emeritus Professors

M. Saeed Mirza, Ghyslaine McClure, Denis Mitchell, Yixin Shao, Suresh C. Shrivastava

Professors

Vincent H. Chu, Luc E. Chouinard, Susan J. Gaskin, Subhasis Ghoshal, Mohamed A. Meguid, Van-Thanh-Van Nguyen, James Nicell, Colin Rogers, A. Patrick S. Selvadurai, Laxmi Sushama

Associate Professors

Andrew J. Boyd, Dominic Frigon (*on sabbatical*), Sarah Jordaan, Jinxia Liu, Luis Miranda-Moreno

Assistant Professor

Matiyas Bezabeh, Mary Kang, Stephanie Loeb, Daniele Malomo, Yi Shao, Lijun Sun, Yazhou (Tim) Xie

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

Program credit weight: 139 credits

Program credit weight for Quebec CEGEP students: 110 credits

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

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

By a suitable choice of complementary courses, students can attain advanced levels of technical knowledge in the specialized areas mentioned above. Alternatively, students may choose to develop their interests in a more general way by combining complementary courses within the Department with several from other departments or faculties.

Required Year 0 (Freshman) Courses

29 credits

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

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

28 credits

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
WCOM 206	(3)	Communication in Engineering

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

Required Civil Engineering Courses

61 credits

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

Complementary Courses

21 credits

List A - Design Technical Complementaries

6-15 credits from the following:

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

List B - General Technical Complementaries

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

CHEE 521*	(3)	Nanomaterials and the Aquatic Environment
CIVE 446	(3)	Construction Engineering
CIVE 460	(3)	Matrix Structural Analysis
CIVE 470	(3)	Undergraduate Research Project
CIVE 512	(3)	Advanced Civil Engineering Materials

CIVE 520	(3)	Groundwater Hydrology
CIVE 521*	(3)	Nanomaterials and the Aquatic Environment
CIVE 527	(3)	Renovation and Preservation: Infrastructure
CIVE 528	(3)	Design of Wood Structures
CIVE 540	(3)	Urban Transportation Planning
CIVE 542	(3)	Transportation Network Analysis
CIVE 546	(3)	Selected Topics in Civil Engineering 1
CIVE 550	(3)	Water Resources Management
CIVE 555	(3)	Environmental Data Analysis
CIVE 557	(3)	Microbiology for Environmental Engineering
CIVE 560	(3)	Transportation Safety and Design
CIVE 561	(3)	Greenhouse Gas Emissions
CIVE 572	(3)	Computational Hydraulics
CIVE 573	(3)	Hydraulic Structures
CIVE 574	(3)	Fluid Mechanics of Water Pollution
CIVE 577	(3)	River Engineering
CIVE 584	(3)	Mechanics of Groundwater Flow
URBP 551	(3)	Urban Design and Planning

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

Complementary Studies

6 credits

Group A - Impact of Technology on Society

3 credits from the following:

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

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

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

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

Anthropology (ANTH)

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

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

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

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

School of Social Work (SWRK)

Sociology (excluding SOCI 350)

OR one of the following:

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

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

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

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

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

12.5 Electrical and Computer Engineering

12.5.1 Location

Department of Electrical and Computer Engineering
Undergraduate Programs Office
McConnell Engineering Building, Room 602
3480 University Street
Montreal QC H3A 0E9

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, Undergraduate Programs

François Bouffard

Associate Chair, Graduate Programs

Benoit Champagne

Associate Chair, Operations

Dennis Giannacopoulos

Emeritus Professors

Pierre R. Bélanger; Maier L. Blostein; Frank Ferrie; Peter Kabal; Martin D. Levine; Boon-Teck Ooi; Tomas J.F. Pavlasek; Nicholas C. Rumin; Jonathan P. Webb

Professors

Tal Arbel; Benoit Boulet; Peter E. Caines; Benoit Champagne; Lawrence Chen; James Clark; Mark Coates; Jeremy R. Cooperstock; Warren Gross; Geza Joos; Andrew G. Kirk; Fabrice Labeau; Harry Leib; Tho Le-Ngoc; David V. Plant; Gordon Roberts; Martin Rochette; Thomas Szkopek; Zeljko Zilic

Associate Professors

François Bouffard; Christophe Dubach; Mourad El-Gamal; Dennis Giannacopoulos; Roni Khazaka; Odile Liboiron-Ladouceur; Aditya Mahajan; Muthucumaru Maheswaran; Brett Meyer; Hannah Michalska; Gunter Mussbacher; Derek Nowrouzezahrai; Milica Popovich; Ioannis Psaromiligkos; Xiaozhe Wang

Assistant Professors

Narges Armanfard; Sharmistha Bhadra; Amin Emad; Hsiu-Chin Lin; AJung Moon; Boris Vaisband; Songrui Zhao; Lili Wei

Faculty Lecturer

Marwan Kanaan

Associate Members

Maxime Cohen; Samira A. Rahimi

Adjunct Professors

Rhys Allan Adams; Donald Davis; Tiago H. Falk; Marthe Kassouf; Shane McIntosh; Douglas O'Shaughnessy; Michael Rabbat; Joseph J. Schlesinger; Dániel Varró; Di Wu

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

Program credit weight: 134-137 credits

Program credit weight for Quebec CEGEP students: 109-112 credits

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

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

Required Year 0 (Freshman) Courses

25 credits

Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credit for these Year 0 (Freshman) courses and enter a 109- to 112 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

26 credits

CIVE 281	(3)	Analytical Mechanics
COMP 202	(3)	Foundations of Programming
COMP 206	(3)	Introduction to Software Systems
FACC 100*	(1)	Introduction to the Engineering Profession
FACC 250	(0)	Responsibilities of the Professional Engineer
FACC 300	(3)	Engineering Economy
FACC 400	(1)	Engineering Professional Practice
MATH 262	(3)	Intermediate Calculus
MATH 263	(3)	Ordinary Differential Equations for Engineers
MIME 262	(3)	Properties of Materials in Electrical Engineering
WCOM 206	(3)	Communication in Engineering

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

Required Electrical Engineering Courses

57 credits

ECSE 200	(3)	Electric Circuits 1
ECSE 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 250	(3)	Fundamentals of Software Development
ECSE 251	(3)	Electric and Magnetic Fields
ECSE 307	(4)	Linear Systems and Control
ECSE 308	(4)	Introduction to Communication Systems and Networks
ECSE 324	(4)	Computer Organization
ECSE 331	(4)	Electronics
ECSE 343	(3)	Numerical Methods in Engineering
ECSE 354	(4)	Electromagnetic Wave Propagation
ECSE 362	(4)	Fundamentals of Power Engineering
ECSE 458D1	(3)	Capstone Design Project
ECSE 458D2	(3)	Capstone Design Project

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

Complementary Courses (23-26 credits)

Technical Complementaries

17-20 credits (5 courses) must be taken, chosen as follows:

8 credits (2 courses) from List A

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

List A: Technical Complementaries with Laboratory Experience

8-20 credits

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

List B: Technical Complementaries

0-12 credits

COMP 549	(3)	Brain-Inspired Artificial Intelligence
COMP 551^	(4)	Applied Machine Learning
COMP 559	(4)	Fundamentals of Computer Animation
COMP 562	(4)	Theory of Machine Learning
ECSE 310	(3)	Thermodynamics of Computing

ECSE 325	(3)	Digital Systems
ECSE 405	(3)	Antennas
ECSE 412	(3)	Discrete Time Signal Processing
ECSE 415	(3)	Introduction to Computer Vision
ECSE 420	(3)	Parallel Computing
ECSE 421	(3)	Embedded Systems
ECSE 422	(3)	Fault Tolerant Computing
ECSE 423	(3)	Fundamentals of Photonics
ECSE 424	(3)	Human-Computer Interaction
ECSE 425	(3)	Computer Architecture
ECSE 427	(3)	Operating Systems
ECSE 430	(3)	Photonic Devices and Systems
ECSE 435	(3)	Mixed-Signal Test Techniques
ECSE 446	(3)	Realistic Image Synthesis
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 525	(4)	Satellite Navigation Systems
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 554	(4)	Applied Robotics
ECSE 556	(4)	Machine Learning in Network Biology
ECSE 557	(3)	Introduction to Ethics of Intelligent Systems

ECSE 562**	(4)	Low-Carbon Power Generation Engineering
ECSE 563	(3)	Power Systems Operation and Planning
ECSE 565***	(3)	Introduction to Power Electronics
ECSE 575	(3)	Heterogeneous Integration Systems
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
ECON 225	(3)	Economics of the Environment
ECON 347	(3)	Economics of Climate Change
ENVR 201	(3)	Society, Environment and Sustainability
GEOG 200	(3)	Geographical Perspectives: World Environmental Problems
GEOG 203	(3)	Environmental Systems
GEOG 205	(3)	Global Change: Past, Present and Future
GEOG 302	(3)	Environmental Management 1
MGPO 440*	(3)	Strategies for Sustainability
PHIL 343	(3)	Biomedical Ethics
RELG 270	(3)	Religious Ethics and the Environment
SOCI 235	(3)	Technology and Society
SOCI 312	(3)	Sociology of Work and Industry
URBP 201	(3)	Planning the 21st Century City

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

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

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

Anthropology (ANTH)

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

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

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

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

School of Social Work (SWRK)

Sociology (excluding SOCI 350)

OR 3 credits from the following:

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

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

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

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

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

Elective Course

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

Enhanced Power Concentration

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

The Institute for Electrical Power Engineering was recently established as a province-wide centre for electrical power engineering education. It is funded by industry, mostly Hydro-Québec, and provides a comprehensive program, state-of-the-art laboratory facilities, and a point of contact between industry and universities involved in power engineering.

Note: This program is open to students in the regular Electrical Engineering program only.

Here are some benefits of the concentration:

A complete and up-to-date final-year program in electrical power engineering, with industry-sponsored and supported courses

Access to industry-sponsored projects, internships, and new employment opportunities

ELIGIBILITY CRITERIA

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

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

SELECTION CRITERIA

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

CURRICULUM REQUIREMENTS FOR SELECTED STUDENTS

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

Technical Complementaries and Laboratories (16 credits)

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

Required Courses

10 credits

ECSE 464	(3)	Power Systems Analysis
ECSE 465***	(3)	Power Electronic Systems
ECSE 470	(4)	Electromechanical and Static Conversion Systems

Students must also complete ECSE 458 (Capstone Design Project) on a practical project in power engineering, preferably at the Institute or with a company sponsoring the Institute.

Complementary Courses

6-7 credits from the following:

ECSE 403	(4)	Control
ECSE 460*	(3)	Appareillage électrique (Electrical Power Equipment)
ECSE 463**	(3)	Electric Power Generation
ECSE 466*	(3)	Réseaux de distribution
ECSE 467*	(3)	Comportement des réseaux électriques
ECSE 468*	(3)	Electricité industrielle (Industrial Power Systems)
ECSE 469*	(3)	Protection des réseaux électriques

* Courses taught in French.

Note: ECSE 460, ECSE 463, ECSE 464, ECSE 465, ECSE 467, ECSE 468, and ECSE 469 are courses sponsored by the Institute and taught at Polytechnique Montréal.

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

Program credit weight: 138-141 credits

Program credit weight for Quebec CEGEP students: 113-116 credits

Entry into the Electrical Engineering Honours Program

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

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

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

Required Year 0 (Freshman) Courses (25 credits)

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

Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credit for these Year 0 (Freshman) courses and enter a 113- to 116-credit program.

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

CHEM 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

26 credits

CIVE 281	(3)	Analytical Mechanics
COMP 202	(3)	Foundations of Programming
COMP 206	(3)	Introduction to Software Systems
FACC 100*	(1)	Introduction to the Engineering Profession
FACC 250	(0)	Responsibilities of the Professional Engineer
FACC 300	(3)	Engineering Economy
FACC 400	(1)	Engineering Professional Practice
MATH 262	(3)	Intermediate Calculus
MATH 263	(3)	Ordinary Differential Equations for Engineers
MIME 262	(3)	Properties of Materials in Electrical Engineering
WCOM 206	(3)	Communication in Engineering

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

Required Electrical Engineering Courses

61 credits

ECSE 200	(3)	Electric Circuits 1
ECSE 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 250	(3)	Fundamentals of Software Development
ECSE 251	(3)	Electric and Magnetic Fields
ECSE 307	(4)	Linear Systems and Control
ECSE 308	(4)	Introduction to Communication Systems and Networks
ECSE 324	(4)	Computer Organization
ECSE 331	(4)	Electronics
ECSE 343	(3)	Numerical Methods in Engineering
ECSE 354	(4)	Electromagnetic Wave Propagation
ECSE 362	(4)	Fundamentals of Power Engineering

ECSE 396	(1)	Honours Research Laboratory Rotation 1
ECSE 397	(1)	Honours Research Laboratory Rotation 2
ECSE 478D1	(3)	Electrical Engineering Honours Thesis
ECSE 478D2	(3)	Electrical Engineering Honours Thesis
ECSE 496	(1)	Honours Research Laboratory Rotation 3
ECSE 497	(1)	Honours Research Laboratory Rotation 4

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

Complementary Courses (23-26 credits)

Technical Complementaries

17-20 credits (5 courses) must be taken, chosen as follows:

8 credits (2 courses) from List A

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

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

List A: Technical Complementaries with Laboratory Experience

8-12 credits from the following:

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

* ECSE 403 and ECSE 501 cannot both be taken.

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

List B: Technical Complementaries

0-3 credits

ECSE 310	(3)	Thermodynamics of Computing
ECSE 325	(3)	Digital Systems
ECSE 415	(3)	Introduction to Computer Vision
ECSE 420	(3)	Parallel Computing
ECSE 421	(3)	Embedded Systems
ECSE 422	(3)	Fault Tolerant Computing
ECSE 424	(3)	Human-Computer Interaction
ECSE 425	(3)	Computer Architecture
ECSE 427	(3)	Operating Systems
ECSE 435	(3)	Mixed-Signal Test Techniques
ECSE 446	(3)	Realistic Image Synthesis
ECSE 451	(3)	EM Transmission and Radiation
ECSE 460*	(3)	Appareillage électrique (Electrical Power Equipment)
ECSE 464	(3)	Power Systems Analysis

ECSE 467*	(3)	Comportement des réseaux électriques
ECSE 468*	(3)	Electricité industrielle (Industrial Power Systems)
ECSE 469*	(3)	Protection des réseaux électriques

* Courses taught in French.

List C: Non-departmental Complementary Courses

0-4 credits

COMP 445	(3)	Computational Linguistics
COMP 549	(3)	Brain-Inspired Artificial Intelligence
COMP 550	(3)	Natural Language Processing
COMP 551	(4)	Applied Machine Learning
COMP 562	(4)	Theory of Machine Learning
COMP 579	(4)	Reinforcement Learning
MATH 247	(3)	Honours Applied Linear Algebra
MATH 249	(3)	Honours Complex Variables
MATH 547	(4)	Stochastic Processes
PHYS 357	(3)	Honours Quantum Physics 1
PHYS 434	(3)	Optics
PHYS 457	(3)	Honours Quantum Physics 2
PHYS 558	(3)	Solid State Physics

Complementary Studies

6 credits

Group A - Impact of Technology on Society

3 credits from the following:

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

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: 133-136 credits

Program credit weight for Quebec CEGEP students: 108-111 credits

Program credit weight for out-of-province students: 133-136 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 111 credit program.

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

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

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

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

Required Non-Departmental Courses

26 credits

COMP 202	(3)	Foundations of Programming
COMP 206	(3)	Introduction to Software Systems
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
WCOM 206	(3)	Communication in Engineering

* 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 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 250	(3)	Fundamentals of Software Development
ECSE 308	(4)	Introduction to Communication Systems and Networks
ECSE 310	(3)	Thermodynamics of Computing
ECSE 321	(3)	Introduction to Software Engineering
ECSE 324	(4)	Computer Organization
ECSE 325	(3)	Digital Systems
ECSE 331	(4)	Electronics
ECSE 353	(3)	Electromagnetic Fields and Waves
ECSE 425	(3)	Computer Architecture
ECSE 427	(3)	Operating Systems
ECSE 444	(4)	Microprocessors
ECSE 458D1	(3)	Capstone Design Project
ECSE 458D2	(3)	Capstone Design Project

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

Complementary Courses

15-18 credits

Technical Complementaries

9-12 credits (3 courses) must be taken, chosen as follows:

3-4 credits (1 course) from List A

6-8credits (2 courses) from List A or List B

List A

3-12 credits from the following:

ECSE 307	(4)	Linear Systems and Control
ECSE 335	(4)	Microelectronics
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 428	(3)	Software Engineering Practice
ECSE 435	(3)	Mixed-Signal Test Techniques
ECSE 439	(3)	Software Language Engineering
ECSE 508	(3)	Multi-Agent Systems
ECSE 510	(3)	Filtering and Prediction for Stochastic Systems
ECSE 544	(4)	Computational Photography

List B

0-12 credits from the following:

COMP 307	(3)	Principles of Web Development
COMP 421	(3)	Database Systems
COMP 424**	(3)	Artificial Intelligence
COMP 445	(3)	Computational Linguistics
COMP 512	(4)	Distributed Systems
COMP 520	(4)	Compiler Design
COMP 549	(3)	Brain-Inspired Artificial Intelligence
COMP 550	(3)	Natural Language Processing
COMP 551*	(4)	Applied Machine Learning
COMP 559	(4)	Fundamentals of Computer Animation
COMP 562	(4)	Theory of Machine Learning
COMP 579	(4)	Reinforcement Learning
COMP 588	(4)	Probabilistic Graphical Models
ECSE 343	(3)	Numerical Methods in Engineering
ECSE 421	(3)	Embedded Systems
ECSE 422	(3)	Fault Tolerant Computing
ECSE 424	(3)	Human-Computer Interaction
ECSE 429	(3)	Software Validation
ECSE 437	(3)	Software Delivery
ECSE 446	(3)	Realistic Image Synthesis
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 509	(3)	Probability and Random Signals 2
ECSE 516	(3)	Nonlinear and Hybrid Control Systems
ECSE 521	(3)	Digital Communications 1
ECSE 525	(4)	Satellite Navigation Systems
ECSE 526**	(3)	Artificial Intelligence
ECSE 532	(4)	Computer Graphics
ECSE 551	(4)	Machine Learning for Engineers
ECSE 552	(4)	Deep Learning
ECSE 554	(4)	Applied Robotics
ECSE 556	(4)	Machine Learning in Network Biology
ECSE 557	(3)	Introduction to Ethics of Intelligent Systems
ECSE 575	(3)	Heterogeneous Integration Systems
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

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
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 (3 credits)

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.

12.5.7 Bachelor Engineering (B.Eng.) - Co-op in Software Engineering (141 credits)

Program credit weight: 141-144 credits

Program credit weight for Quebec CEGEP students: 113-116 credits

Program credit weight for out-of-province students: 141-144 credits

Required Year 0 (Freshman) Courses

28 credits

Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credit for these Year 0 (Freshman) courses and enter a 113- to 116-credit program.

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

CHEM 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).

AND 3 credits Natural Science complementary courses chosen from courses from the following science departments, approved by the Undergraduate Programs Office in the Department of Electrical and Computer Engineering:

Atmospheric and Oceanic Sciences (ATOC)

Biology (BIOL)

Chemistry (CHEM)

Earth and Planetary Sciences (EPSC)

Earth System Science (ESYS)

Physics (PHYS)

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

Required Non-Departmental Courses

35 credits

COMP 202	(3)	Foundations of Programming
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COMP 206	(3)	Introduction to Software Systems
COMP 251	(3)	Algorithms and Data Structures
COMP 302	(3)	Programming Languages and Paradigms
COMP 360	(3)	Algorithm Design
COMP 421	(3)	Database Systems
FACC 100**	(1)	Introduction to the Engineering Profession
FACC 250	(0)	Responsibilities of the Professional Engineer
FACC 300	(3)	Engineering Economy
FACC 400	(1)	Engineering Professional Practice
MATH 240	(3)	Discrete Structures
MATH 262	(3)	Intermediate Calculus
MATH 263	(3)	Ordinary Differential Equations for Engineers
WCOM 206	(3)	Communication in Engineering

* Note: *CCOM 206 must be passed two terms prior to ECSE 201.

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

Required Software Engineering Courses

60 credits

ECSE 200	(3)	Electric Circuits 1
ECSE 201	(2)	Co-operative Work Term 1
ECSE 205	(3)	Probability and Statistics for Engineers
ECSE 211	(3)	Design Principles and Methods
ECSE 222	(3)	Digital Logic
ECSE 223	(3)	Model-Based Programming
ECSE 250	(3)	Fundamentals of Software Development
ECSE 301	(2)	Co-operative Work Term 2
ECSE 310	(3)	Thermodynamics of Computing
ECSE 316	(3)	Signals and Networks
ECSE 321	(3)	Introduction to Software Engineering
ECSE 324	(4)	Computer Organization
ECSE 326	(3)	Software Requirements Engineering
ECSE 401	(2)	Co-operative Work Term 3
ECSE 402	(2)	Co-operative Work Term 4
ECSE 420	(3)	Parallel Computing
ECSE 427	(3)	Operating Systems
ECSE 428	(3)	Software Engineering Practice
ECSE 429	(3)	Software Validation
ECSE 458D1	(3)	Capstone Design Project
ECSE 458D2	(3)	Capstone Design Project

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

Complementary Courses

15-18 credits

Technical Complementaries

9-12 credits (3 courses) must be taken, chosen as follows:

3-4 credits (1 course) from List A

6-8 credits (2 courses) from List A or List B

* COMP 350 and ECSE 343 cannot both be taken

** ECSE 551 and COMP 551 cannot both be taken

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

List A

3-12 credits from the following:

ECSE 325	(3)	Digital Systems
ECSE 415	(3)	Introduction to Computer Vision
ECSE 416	(4)	Telecommunication Networks
ECSE 439	(3)	Software Language Engineering
ECSE 444	(4)	Microprocessors
ECSE 544	(4)	Computational Photography

List B

0-8 credits from the following:

COMP 307	(3)	Principles of Web Development
COMP 330	(3)	Theory of Computation
COMP 350*	(3)	Numerical Computing
COMP 409	(3)	Concurrent Programming
COMP 417	(3)	Introduction Robotics and Intelligent Systems
COMP 424***	(3)	Artificial Intelligence
COMP 512	(4)	Distributed Systems
COMP 520	(4)	Compiler Design
COMP 521	(4)	Modern Computer Games
COMP 525	(3)	Formal Verification
COMP 529	(4)	Software Architecture
COMP 533	(3)	Model-Driven Software Development
COMP 547	(4)	Cryptography and Data Security
COMP 549	(3)	Brain-Inspired Artificial Intelligence
COMP 550	(3)	Natural Language Processing
COMP 551*	(4)	Applied Machine Learning
COMP 559	(4)	Fundamentals of Computer Animation
COMP 562	(4)	Theory of Machine Learning
COMP 588	(4)	Probabilistic Graphical Models
ECSE 343*	(3)	Numerical Methods in Engineering
ECSE 421	(3)	Embedded Systems
ECSE 422	(3)	Fault Tolerant Computing
ECSE 424	(3)	Human-Computer Interaction
ECSE 425	(3)	Computer Architecture

ECSE 437	(3)	Software Delivery
ECSE 446	(3)	Realistic Image Synthesis
ECSE 507	(3)	Optimization and Optimal Control
ECSE 509	(3)	Probability and Random Signals 2
ECSE 525	(4)	Satellite Navigation Systems
ECSE 526***	(3)	Artificial Intelligence
ECSE 532	(4)	Computer Graphics
ECSE 551**	(4)	Machine Learning for Engineers
ECSE 552	(4)	Deep Learning
ECSE 554	(4)	Applied Robotics
ECSE 556	(4)	Machine Learning in Network Biology
ECSE 557	(3)	Introduction to Ethics of Intelligent Systems
MATH 247	(3)	Honours Applied Linear Algebra

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
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 (3 credits)

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.

12.6 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-curricular 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.

12.6.3 Mechanical Engineering Faculty

Chair

Rosaire Mongrain

Associate Chair (Curriculum Affairs)

Yaoyao Fiona Zhao

Associate Chair (Undergraduate Affairs)

Tim Lee

Associate Chair (Graduate Affairs)

Mathias Legrand

Director, M.Eng. Aerospace Program

Pascal Hubert

Emeritus Professors

Abdul M. Ahmed; Jorge Angeles; John H.S. Lee; Dan F. Mateescu; Michael P. Païdoussis; Stuart J. Price.

Associate Professors (Post-Retirement)

Vince Thomson; Paul J. Zsombor-Murray

Professors

Bantwal R. Baliga; Jeffrey M. Bergthorson; David L. Frost; Wagdi G. Habashi; Andrew J. Higgins; Pascal Hubert; Michael Kokkolaras; Jozsef Kovacs; Larry B. Lessard; Arun K. Misra; Luc Mongeau; Rosaire Mongrain; Laurent Mydlarski; Siva Nadarajah; Meyer Nahon; Damiano Pasini; Inna Sharf

Associate Professors

Mark Driscoll; James R. Forbes; Mathieu Francoeur; Tim Lee; Mathias Legrand; Evgeny V. Timofeev; Yaoyao Fiona Zhao

Assistant Professors

Changhong Cao; Guillaume Durandau; Jianyu Li; Jovan Nedic; Audrey A. Sedal

Adjunct Professors

Marco Amabili; Helmi Attia; François Barthelat; Gilles Bourque; Mouhab Meshreki; Mélanie Tétreault-Friend; Alireza Najafi-Yazdi

Senior Academic Associate

Amar Sabih

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 approved list of courses in Humanities and Social Sciences, Management Studies, and Law, listed below under Complementary Studies (Group B).

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

Required Non-Departmental Courses

33 credits

CIVE 207	(4)	Solid Mechanics
COMP 208	(3)	Computer Programming for Physical Sciences and Engineering
ECSE 461	(3)	Electric Machinery
FACC 100	(1)	Introduction to the Engineering Profession
FACC 250	(0)	Responsibilities of the Professional Engineer
FACC 300	(3)	Engineering Economy
FACC 400	(1)	Engineering Professional Practice
MATH 262	(3)	Intermediate Calculus
MATH 263	(3)	Ordinary Differential Equations for Engineers
MATH 264	(3)	Advanced Calculus for Engineers
MATH 271	(3)	Linear Algebra and Partial Differential Equations
MIME 260	(3)	Materials Science and Engineering
WCOM 206	(3)	Communication in Engineering

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

Required Mechanical Engineering Courses

65 credits

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

Technical Complementary Courses

9 credits

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

CHEE 563*	(3)	Biofluids and Cardiovascular Mechanics
MECH 497	(3)	Value Engineering
MECH 498	(3)	Interdisciplinary Design Project 1
MECH 499	(3)	Interdisciplinary Design Project 2
MECH 513	(3)	Control Systems
MECH 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 543	(3)	Design with Composite Materials
MECH 544	(3)	Processing of Composite Materials
MECH 553	(3)	Design and Manufacture of Microdevices
MECH 559	(3)	Engineering Systems Optimization
MECH 560	(3)	Eco-design and Product Life Cycle Assessment
MECH 563*	(3)	Biofluids and Cardiovascular Mechanics

MECH 564	(3)	Thermal Radiation and Solar Energy Systems
MECH 565	(3)	Fluid Flow and Heat Transfer Equipment
MECH 573	(3)	Mechanics of Robotic Systems

* Students select either CHEE 563 or MECH 563.

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

Complementary Studies

6 credits

Group A - Impact of Technology on Society

3 credits from the following:

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

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

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

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

Anthropology (ANTH)

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

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

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

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

School of Social Work (SWRK)

Sociology (excluding SOCI 350)

OR one of the following:

ARCH 528	(3)	History of Housing
BUSA 465*	(3)	Technological Entrepreneurship
CLAS 203	(3)	Greek Mythology

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

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

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

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

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

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

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

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

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

Required Year 0 (Freshman) Courses

29 credits

Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credit for these Year 0 (Freshman) courses and enter a 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 approved list of courses in Humanities and Social Sciences, Management Studies and Law, listed below under Complementary Studies (Group B).

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

Required Non-Departmental Courses

27 credits

CIVE 207	(4)	Solid 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 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
WCOM 206	(3)	Communication in Engineering

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

Required Mechanical Engineering Courses

62 credits

MECH 201	(2)	Introduction to Mechanical Engineering
MECH 210	(2)	Mechanics 1
MECH 220	(4)	Mechanics 2
MECH 240	(3)	Thermodynamics 1
MECH 262	(3)	Statistics and Measurement Laboratory
MECH 290	(3)	Design Graphics for Mechanical Engineering
MECH 292	(3)	Design 1: Conceptual Design
MECH 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 316	(3)	Complex Variables
MATH 323	(3)	Probability
MATH 326	(3)	Nonlinear Dynamics and Chaos
MATH 327	(3)	Matrix Numerical Analysis
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 559*	(3)	Engineering Systems Optimization
MECH 562	(3)	Advanced Fluid Mechanics
MECH 578	(3)	Advanced Thermodynamics
MECH 579*	(3)	Multidisciplinary Design Optimization

*Note: Students select either MECH 559 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 543	(3)	Design with Composite Materials
MECH 544	(3)	Processing of Composite Materials
MECH 553	(3)	Design and Manufacture of Microdevices
MECH 559	(3)	Engineering Systems Optimization
MECH 560	(3)	Eco-design and Product Life Cycle Assessment

MECH 563*	(3)	Biofluids and Cardiovascular Mechanics
MECH 564	(3)	Thermal Radiation and Solar Energy Systems
MECH 565	(3)	Fluid Flow and Heat Transfer Equipment
MECH 573	(3)	Mechanics of Robotic Systems

*Students choose either CHEE 563 or MECH 563

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

Complementary Studies

6 credits

Group A - Impact of Technology on Society

3 credits from the following:

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

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

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

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

Anthropology (ANTH)

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

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

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

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

School of Social Work (SWRK)

Sociology (excluding SOCI 350)

OR one of the following:

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

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

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

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

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

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

Typical Program of Study

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

For a detailed curriculum, please see

<http://www.mcgill.ca/mecheng/undergrad/curriculum>.

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

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

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

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

Total concentration credit weight: 15-16 credits

Required Courses

6 credits

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

Complementary Courses

9-10 credits from the following:

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

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

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

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

Total concentration credit weight: 15-16 credits

Required Courses

6 credits

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

Complementary Courses

9-10 credits from the following:

ARCH 515	(3)	Sustainable Design
CHEE 453	(4)	Process Design
MECH 497	(3)	Value Engineering
MECH 528	(3)	Product Design
MECH 530	(3)	Mechanics of Composite Materials
MECH 543	(3)	Design with Composite Materials
MECH 565	(3)	Fluid Flow and Heat Transfer Equipment
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
Telephone: 514-398-1040
Fax: 514-398-4492
Email: coordinator.minmat@mcgill.ca

Website: mcgill.ca/materials

Mining:

Frank Dawson Adams Building, Room 125

3450 University Street

Montreal QC H3A 0E8

Telephone: 514-398-2215

Fax: 514-398-7099

Email: admin.mining@mcgill.ca

Website: mcgill.ca/mining

12.7.2 About the Department of Mining and Materials Engineering

The Department of Mining and Materials Engineering offers programs leading to the Bachelor of Engineering degree in Materials Engineering or Mining Engineering. In addition to regular courses and laboratories, the curriculum includes seminars, colloquia, and student projects reinforced by field trips to industrial operations.

For more information, refer to:

- Materials Engineering – [section 12.7.4.3: Bachelor of Engineering \(B.Eng.\) - Materials Engineering \(148 credits\)](#) and [section 12.7.4.4: Bachelor of Engineering \(B.Eng.\) - Co-op in Materials Engineering \(148 credits\)](#)
- Mining Engineering – and [section 12.7.5.3: Bachelor of Engineering \(B.Eng.\) - Mining Engineering \(144 credits\)](#) and [section 12.7.5.4: Bachelor of Engineering \(B.Eng.\) - Co-op in Mining Engineering \(150 credits\)](#)

12.7.2.1 Scholarships

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

Associate Chair, Materials Engineering

Jun Song

Associate Chair and Graduate Program Director

Mathieu Brochu

Graduate Program Coordinator

Barbara Hanley

Emeritus Professors

James A. Finch; John E. Gruzleski; John J. Jonas; Gordon W. Smith

Professors

Marta Cerruti; Richard Chromik; George P. Demopoulos; Roussos Dimitrakopoulos; Raynald Gauvin; Roderick I.L. Guthrie; Faramarz (Ferri) P. Hassani; Hani S. Mitri; Mihriban Pekgulerlyuz; Stephen Yue

Associate Professors

Kirk Bevan; Mathieu Brochu; Mustafa Kumral; Showan Nazhat; Sidney Omelon; Nathaniel Quitorian; Agus Pulung Sasmito; Jun Song; Kristian Waters

Assistant Professor

Jinhyuk Lee; Alessandro Navarra; Philippe Ouzilleau

Adjunct Professors

Behnam Ashrafi; Salim Brahim; Michel Gamache; Alice Jarry; Luis Javier Montiel Petro; Amina Lamghari; Priti Wanjara; Karim Zaghib

Senior Faculty Lecturer

Florence Paray

Faculty Lecturer

Shahe Shnorhokian (*Mining*)

Co-op Program Liaison Officers

Genevieve Snider (*Materials*); Lisa Thiess (*Mining*)

12.7.4 About Materials Engineering

12.7.4.1 Co-op in Materials Engineering

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

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

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

Regarding the Co-op **program fees**, an amount of \$258.05 will be billed during ten consecutive terms for a total amount of \$2,580.50 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

CHEM 233	(3)	Topics in Physical Chemistry
CIVE 205	(3)	Statics
CIVE 207	(4)	Solid Mechanics
COMP 208	(3)	Computer Programming for Physical Sciences and Engineering
ECSE 209	(3)	Electrotechnology
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
WCOM 206	(3)	Communication in Engineering

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

Required Materials Engineering Courses

62 credits

MIME 209	(3)	Mathematical Applications
MIME 212	(3)	Engineering Thermodynamics
MIME 250	(3)	Introduction to Extractive Metallurgy
MIME 261	(3)	Structure of Materials
MIME 311	(3)	Modelling and Automatic Control
MIME 317	(3)	Analytical and Characterization Techniques
MIME 341	(3)	Introduction to Mineral Processing
MIME 345	(3)	Applications of Polymers
MIME 350	(3)	Extractive Metallurgical Engineering
MIME 352	(3)	Hydrochemical Processing
MIME 356	(4)	Heat, Mass and Fluid Flow
MIME 360	(3)	Phase Transformations: Solids

MIME 362	(3)	Mechanical Properties
MIME 452	(4)	Process and Materials Design
MIME 455	(3)	Advanced Process Engineering
MIME 456	(3)	Steelmaking and Steel Processing
MIME 465	(3)	Metallic and Ceramic Powders Processing
MIME 467	(3)	Electronic Properties of Materials
MIME 470	(3)	Engineering Biomaterials
MIME 473	(3)	Introduction to Computational Materials Design

Complementary Courses (21 credits)

Technical Complementaries

15 credits

9-15 credits from the following:

CHEE 515*	(3)	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
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
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

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

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

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

Anthropology (ANTH)

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

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

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

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

School of Social Work (SWRK)

Sociology (excluding SOCI 350)

OR 3 credits from the following:

ARCH 528	(3)	History of Housing
BUSA 465*	(3)	Technological Entrepreneurship
CLAS 203	(3)	Greek Mythology
ENVR 203	(3)	Knowledge, Ethics and Environment
ENVR 400	(3)	Environmental Thought
FACC 220	(3)	Law for Architects and Engineers
FACC 500	(3)	Technology Business Plan Design
FACC 501	(3)	Technology Business Plan Project
HISP 225	(3)	Hispanic Civilization 1
HISP 226	(3)	Hispanic Civilization 2
INDR 294*	(3)	Introduction to Labour-Management Relations

INTG 201**	(3)	Integrated Management Essentials 1
INTG 202**	(3)	Integrated Management Essentials 2
MATH 338	(3)	History and Philosophy of Mathematics
MGCR 222*	(3)	Introduction to Organizational Behaviour
MGCR 352*	(3)	Principles of Marketing
ORGB 321*	(3)	Leadership
ORGB 423*	(3)	Human Resources Management

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

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

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

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

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 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

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

COMP 208	(3)	Computer Programming for Physical Sciences and Engineering
ECSE 209	(3)	Electrotechnology
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
WCOM 206	(3)	Communication in Engineering

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

Required Materials Engineering Courses

68 credits

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

Complementary Courses

15 credits

Technical Complementaries

9 credits

6-9 credits from the following:

CHEE 515*	(3)	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
MIME 542	(3)	Transmission Electron Microscopy
MIME 544	(3)	Analysis: Mineral Processing Systems 1
MIME 545	(3)	Analysis: Mineral Processing Systems 2
MIME 551	(3)	Electrochemical Processing
MIME 553	(3)	Impact of Materials Production
MIME 556	(3)	Sustainable Materials Processing
MIME 558	(3)	Engineering Nanomaterials
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.

0-3 credits may be taken from courses outside of the Department of Mining and Materials Engineering, with departmental 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
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

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

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

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

Anthropology (ANTH)

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

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

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

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

School of Social Work (SWRK)

Sociology (excluding SOCI 350)

OR 3 credits from the following:

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

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

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

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

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

12.7.5 About Mining Engineering

12.7.5.1 Co-op in Mining Engineering

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

The Department offers a co-operative program leading to an accredited **B.Eng.** degree in Mining Engineering. It includes three paid industrial work terms. The Department has a dedicated Mining Co-op Liaison Officer to help the students find jobs in industry. The program is offered in one of two streams: English Stream for high school students and Bilingual Stream for CEGEP students, in collaboration with the mining engineering program at *Polytechnique Montréal* in Montreal. Students in the Bilingual Stream take six mining courses at Polytechnique Montréal at the latter part of the program. The teaching and learning style in mining courses is one that permits the students to sharpen their communication skills—both written and oral—and develop their team working skills.

A wide range of scholarships are available to new and continuing students from the Department, Faculty of Engineering, as well as from industry. The Department provides financial support to students who are willing to participate in mining competitions, such as the Canadian Mining Games and World Mining Competition.

When taking a co-op work term, students must register for MIME 290, MIME 291, and MIME 392; thus, co-op work terms appear on the student transcript. Interested students may also take a fourth work term as a complementary course and a fifth one as an extra course.

12.7.5.2 Student Advising

The Department gives priority to their academic advising service. Each student in the mining engineering program is assigned an academic adviser at the start of their study at McGill and for the duration of their undergraduate degree. Our academic advising service ensures quality and individual guidance to each student in the program. Students will meet with their adviser at least once a year to discuss their progress and interest in exchange with other mining schools or taking a minor in their areas of interest among other things.

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

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

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

The Department offers a Major in Mining Engineering Program leading to an accredited B.Eng. degree in Mining Engineering. The program focuses on the science and engineering of sustainable extraction of mineral resources. It contains two streams: English for non-CEGEP students and Bilingual (six courses in French) for CEGEP students, in collaboration with the mining engineering program at Polytechnique Montreal. The program includes projects that are reinforced by field trips to industrial operations.

B.Eng.; Major in Mining Engineering

Program credit weight: 144-145 credits

Program credit weight for CEGEP students: 115-116 credits

Entry into the Major in Mining Engineering

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

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

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

Required Year 0 (Freshman) Courses

29 credits

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

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

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

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

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

Required Non-Departmental Courses (37 credits)

CIVE 205	(3)	Statics
CIVE 207	(4)	Solid Mechanics
COMP 208	(3)	Computer Programming for Physical Sciences and Engineering
ECSE 209	(3)	Electrotechnology
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
WCOM 206	(3)	Communication in Engineering

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

Required Mining Engineering Courses (47 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 322	(3)	Fragmentation and Comminution
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 413	(3)	Strategic Mine Planning With Uncertainty
MIME 419	(3)	Surface Mining
MIME 422	(3)	Mine Ventilation
MIME 425	(3)	Applied Stochastic Orebody Modelling
MIME 426	(6)	Mine Design and Prefeasibility Study

Complementary Courses

31-32 credits

17 credits from one of Stream A or Stream B

Stream A - CEGEP Students

CEGEP students must take the following courses:

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

* Mining courses taken at Polytechnique Montréal

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 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 Polytechnique Montréal

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
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.

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

Program credit weight: 150-151 credits

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

The Department offers a Co-op in Mining Engineering Program leading to an accredited B.Eng. degree in Mining Engineering. The program focuses on the science and engineering of sustainable extraction of mineral resources. It contains two streams: English for non-CEGEP students and Bilingual (six courses in French) for CEGEP students, in collaboration with the mining engineering program at Polytechnique Montreal. The program includes projects that are reinforced by field trips to industrial operations as well as three industrial work terms. Students must register for each work term (MIME 290, MIME 291, MIME 392) and pay associated fees by the Course Change (add/drop) registration deadline. Before registering for any work term course, students must contact the Mining Co-op Liaison Officer for approval.

Required Year 0 (Freshman) Courses

29 credits

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

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

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

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

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

Required Non-Departmental Courses

37 credits

CIVE 205	(3)	Statics
CIVE 207	(4)	Solid Mechanics
COMP 208	(3)	Computer Programming for Physical Sciences and Engineering
ECSE 209	(3)	Electrotechnology
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
WCOM 206	(3)	Communication in Engineering

* 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)	Fragmentation and Comminution
MIME 323	(3)	Rock and Soil Mass Characterization
MIME 325	(3)	Mineral Industry Economics
MIME 333	(3)	Materials Handling
MIME 340	(3)	Applied Fluid Dynamics
MIME 341	(3)	Introduction to Mineral Processing
MIME 392	(2)	Industrial Work Period 3
MIME 413	(3)	Strategic Mine Planning With Uncertainty
MIME 419	(3)	Surface Mining
MIME 422	(3)	Mine Ventilation
MIME 425	(3)	Applied Stochastic Orebody Modelling
MIME 426	(6)	Mine Design and Prefeasibility Study

Complementary Courses

31-32 credits

17 credits from one of Stream A or Stream B

Stream A - CEGEP Students

CEGEP students must take the following courses:

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

* Mining courses taken at Polytechnique Montréal

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 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 Polytechnique Montréal

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
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.

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 welfare of communities, control of how land is accessed and used by private parties, design of the built environment (including transportation and communication networks), and conservation and enhancement of healthy ecosystems. Contemporary preoccupations include addressing the climate emergency, embracing interculturalism in planning and governance, enhancing public health, and striving for just sustainabilities. It is at once a technical and a political process that brings together actors from the public, private, and community spheres. Planners participate in that process in a variety of ways—as designers and analysts, advocates, and mediators—facilitating the search for equitable and efficient solutions to problems of urban change and development.

The School of Urban Planning offers three graduate degrees; a professionally accredited M.U.P., a thesis-based M.Sc., and a Ph.D. For more information, please see the graduate e-calendar.

12.8.3 Undergraduate Courses in Urban Planning

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

Undergraduate Courses in Urban Planning

ARCH 520	(3)	Montreal: Urban Morphology
URBP 201	(3)	Planning the 21st Century City
URBP 501	(2)	Principles and Practice 1
URBP 503	(3)	Public Transport: Planning and Operations
URBP 504	(3)	Planning for Active Transportation

Undergraduate Courses in Urban Planning

URBP 505	(3)	Geographic Information Systems
URBP 506	(3)	Environmental Policy and Planning
URBP 507	(3)	Planning and Infrastructure
URBP 514	(4)	Community Design Workshop
URBP 519	(6)	Sustainable Development Plans
URBP 520	(3)	Globalization: Planning and Change
URBP 530	(3)	Urban Environmental Planning
URBP 536	(2)	Current Issues in Transportation 1
URBP 537	(2)	Current Issues in Transportation 2
URBP 541	(1)	Selected Topics in Planning
URBP 542	(1)	Selected Topics in Visual Analysis
URBP 543	(1)	Selected Topics
URBP 551	(3)	Urban Design and Planning
URBP 553	(3)	Urban Governance
URBP 555	(3)	Real Estate and Planning
URBP 556	(3)	Urban Economy: A Spatial Perspective
URBP 557	(3)	Rethinking Zoning

12.8.4 Urban Planning Faculty**Director**

Richard Shearmur

Emeritus Professor

Jane Matthews-Glenn

Professor (Post-Retirement)

David Brown

Professors

Ahmed El-Geneidy; Richard Shearmur

Associate Professors

Madhav G. Badami; Lisa Bornstein; Nik Luka; David Wachsmuth

Assistant Professor

Anna Kramer

Adjunct Professors

Jayne Engle; Gorka Espiau; Nilson Espino; Marc-André LeChasseur

Associate Members

Kevin Manaugh; Sarah Moser

12.9 Other Engineering Programs

12.9.1 Bioresource Engineering

The Faculty of Engineering cooperates with the Faculty of Agricultural and Environmental Sciences in providing courses of instruction for a fully accredited curriculum in bioresource engineering to meet requirements for a professional engineering degree awarded in the Faculty of Agricultural and Environmental Sciences. For details, refer to the B.Eng.(Bioresource) program requirements in [Faculty of Agricultural & Environmental Sciences > Undergraduate > Browse Academic Programs > : Bachelor of Engineering \(Bioresource\) – B.Eng.\(Bioresource\)](#).

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

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

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

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 beyond the B.Eng. or B.Sc.(Arch.) degree program. All courses in a minor must be passed with a grade of C or better.

Engineering students choose from a considerable variety of complementary courses under the categories of technical and complementary studies. Students should refer to their department for information concerning selection of complementary courses, and should see their departmental adviser. Departments also publish information regarding the choice of courses in this publication and in separate documents.

For enrolment in any other minors available at the University which is not listed below, please consult an adviser at MESC.



Note: Students are also permitted to register for minor concentrations offered by departments in the Faculty of Arts. To register in one of these minor concentrations, students must submit a request through the [Minor Webform](#) to obtain approval from the Faculty of Engineering. The Faculty of Engineering allows up to nine credits of overlap with the degree program for Engineering students taking Arts minor concentrations.

Minor Programs:

- [section 12.10.1: Bachelor of Engineering \(B.Eng.\) - Minor Aerospace Engineering \(24 credits\)](#)
- [section 12.10.2: Bachelor of Engineering \(B.Eng.\) - Minor Applied Artificial Intelligence \(22-25 credits\) \(25 credits\)](#)
- [section 12.10.3: Bachelor of Engineering \(B.Eng.\) - Minor Arts \(24 credits\)](#)
- [section 12.10.4: Bachelor of Engineering \(B.Eng.\) - Minor Biomedical Engineering \(21 credits\)](#)
- [section 12.10.5: Bachelor of Engineering \(B.Eng.\) - Minor Biotechnology \(for Engineering Students\) \(24 credits\)](#)
- [section 12.10.6: Bachelor of Engineering \(B.Eng.\) - Minor Chemistry \(25 credits\)](#)
- [section 12.10.7: Computer Science Courses and Minor Program](#)
- [section 12.10.8: Bachelor of Engineering \(B.Eng.\) - Minor Construction Engineering and Management \(24 credits\)](#)
- [section 12.10.9: Bachelor of Engineering \(B.Eng.\) - Minor Economics \(18 credits\)](#)
- [section 12.10.10: Minor in Environment](#)
- [section 12.10.11: Bachelor of Engineering \(B.Eng.\) - Minor Environmental Engineering \(21 credits\)](#)
- [section 12.10.12: Minor Program in Management](#)
- [section 12.10.13: Bachelor of Engineering \(B.Eng.\) - Minor Materials Engineering \(24 credits\)](#)
- [section 12.10.14: Bachelor of Engineering \(B.Eng.\) - Minor Mathematics \(18 credits\)](#)
- [section 12.10.15: Bachelor of Engineering \(B.Eng.\) - Minor Mining Engineering \(23 credits\)](#)
- [section 12.10.16: Minor in Musical Science and Technology](#)
- [section 12.10.17: Bachelor of Engineering \(B.Eng.\) - Minor Nanotechnology \(21 credits\)](#)
- [section 12.10.18: Bachelor of Engineering \(B.Eng.\) - Minor Physics \(18 credits\)](#)

- [section 12.10.19: Bachelor of Engineering \(B.Eng.\) - Minor Software Engineering \(18 credits\)](#)
- [section 12.10.20: Bachelor of Engineering \(B.Eng.\) - Minor Technological Entrepreneurship \(18 credits\)](#)

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
ECSE 478D1*	(3)	Electrical Engineering Honours Thesis
ECSE 478D2*	(3)	Electrical Engineering Honours Thesis
MECH 403D1*	(3)	Thesis (Honours)
MECH 403D2*	(3)	Thesis (Honours)
MECH 463D1*	(3)	Design 3: Mechanical Engineering Project
MECH 463D2*	(3)	Design 3: Mechanical Engineering Project

* An aerospace engineering project or honours thesis will be defined for students enrolled in the Minor and approved by the Minor Adviser.

And

12 credits from one of the following streams:

Students may take one complementary course outside of their stream, but their selection must be approved by the Minor Adviser prior to the registration for the course.

Aerodynamics and Propulsion Stream

MECH 447	(3)	Combustion
MECH 516	(3)	Computational Gasdynamics
MECH 532	(3)	Aircraft Performance, Stability and Control
MECH 533	(3)	Subsonic Aerodynamics
MECH 535	(3)	Turbomachinery and Propulsion
MECH 539	(3)	Computational Aerodynamics
MECH 562	(3)	Advanced Fluid Mechanics
MECH 566	(3)	Fluid-Structure Interactions
MECH 579	(3)	Multidisciplinary Design Optimization

Aircraft Structures Stream

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

Spacecraft and Systems Stream

GEOG 308	(3)	Remote Sensing for Earth Observation
MECH 513	(3)	Control Systems
MECH 536	(3)	Aerospace Structures
MECH 542	(3)	Spacecraft Dynamics
MECH 546	(3)	Finite Element Methods in Solid Mechanics
MECH 550	(3)	Vibrations of Continuous Systems
MECH 559	(3)	Engineering Systems Optimization
MIME 565	(3)	Aerospace Metallic-Materials and Manufacturing Processes
PHYS 320	(3)	Introductory Astrophysics

Material and Processes Stream

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

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

Avionics Stream

ECSE 403	(4)	Control
ECSE 408	(4)	Communication Systems
ECSE 412	(3)	Discrete Time Signal Processing
ECSE 420	(3)	Parallel Computing

ECSE 421	(3)	Embedded Systems
ECSE 422	(3)	Fault Tolerant Computing
ECSE 425	(3)	Computer Architecture
ECSE 427	(3)	Operating Systems
ECSE 429	(3)	Software Validation
ECSE 444	(4)	Microprocessors
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 (22-25 credits) (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.

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

Complementary Courses (22-25)

Group A

3 credits from the following:

COMP 250*	(3)	Introduction to Computer Science
ECSE 250*	(3)	Fundamentals of Software Development

* COMP 250 and ECSE 250 cannot both be taken.

Group B

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 C

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 D

3 credits from the following:

AEMA 310	(3)	Statistical Methods 1
CIVE 302	(3)	Probabilistic Systems
ECSE 205	(3)	Probability and Statistics for Engineers
MATH 203	(3)	Principles of Statistics 1
MATH 323	(3)	Probability
MECH 262	(3)	Statistics and Measurement Laboratory
MIME 209	(3)	Mathematical Applications

Group E

9-12 credits from the following:

COMP 417	(3)	Introduction Robotics and Intelligent Systems
COMP 424***	(3)	Artificial Intelligence
COMP 445	(3)	Computational Linguistics
COMP 549	(3)	Brain-Inspired Artificial Intelligence
COMP 550	(3)	Natural Language Processing
COMP 562	(4)	Theory of Machine Learning
COMP 565	(4)	Machine Learning in Genomics and Healthcare
COMP 579	(4)	Reinforcement Learning
COMP 588	(4)	Probabilistic Graphical Models
ECSE 415	(3)	Introduction to Computer Vision
ECSE 446	(3)	Realistic Image Synthesis
ECSE 507	(3)	Optimization and Optimal Control
ECSE 526***	(3)	Artificial Intelligence
ECSE 544	(4)	Computational Photography
ECSE 552	(4)	Deep Learning
ECSE 554	(4)	Applied Robotics
ECSE 556	(4)	Machine Learning in Network Biology
ECSE 557	(3)	Introduction to Ethics of Intelligent Systems
MECH 559	(3)	Engineering Systems Optimization

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

Or any 400 or 500 level special topics courses in the area of artificial intelligence with the approval of the Electrical and Computer Engineering department.

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

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

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

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

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

Requirements

24 credits as follows:

- At least two areas of concentration in the Faculty of Arts must be chosen, with a minimum of 6 credits in any one area.
- At least 12 credits must be at the 300 level or higher.

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

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

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

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

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

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

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

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

Complementary Courses

(21-25 credits)

Introductory Life Sciences

Minimum of 3 credits from the courses below:

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

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

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

*** Cannot be taken by Chemical Engineering students.

Specialization Courses

Minimum of 12 credits from courses below:

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

Physiological Systems, Artificial Cells and Organs

BIEN 340	(3)	Transport Phenomena in Biological Systems 2
BIEN 360	(3)	Physical Chemistry in Bioengineering
BIEN 462	(3)	Engineering Principles in Physiological Systems
BIEN 540	(3)	Information Storage and Processing in Biological Systems
BMDE 505	(3)	Cell and Tissue Engineering
PHGY 311	(3)	Channels, Synapses and Hormones
PHGY 312	(3)	Respiratory, Renal, and Cardiovascular Physiology

PHGY 313	(3)	Blood, Gastrointestinal, and Immune Systems Physiology
PHGY 518	(3)	Artificial Cells

Bioinformatics, Genomics and Proteomics

ANAT 365	(3)	Cellular Trafficking
ANAT 458*	(3)	Membranes and Cellular Signaling
BIEN 310	(3)	Introduction to Biomolecular Engineering
BIEN 410	(3)	Computational Methods in Biomolecular Engineering
BIEN 420	(3)	Biodevices Design for Diagnostics and Screening
BIEN 540	(3)	Information Storage and Processing in Biological Systems
BIEN 590	(3)	Cell Culture Engineering
BIOC 311	(3)	Metabolic Biochemistry
BIOC 312	(3)	Biochemistry of Macromolecules
BIOC 458*	(3)	Membranes and Cellular Signaling
BMDE 508	(3)	Introduction to Micro and Nano-Bioengineering
COMP 424	(3)	Artificial Intelligence
COMP 462	(3)	Computational Biology Methods

* Students select either ANAT 458 or BIOC 458.

Biomaterials, Biosensors and Nanotechnology

BIEN 330	(3)	Tissue Engineering and Regenerative Medicine
BIEN 510	(3)	Engineered Nanomaterials for Biomedical Applications
BIEN 550	(3)	Biomolecular Devices
BIEN 560	(3)	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
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Immunology

ANAT 261	(4)	Introduction to Dynamic Histology
BIOC 503	(3)	Biochemistry of Immune Diseases
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 toward a Management minor, nor toward the Complementary Studies requirement.

ECON 208	(3)	Microeconomic Analysis and Applications
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MGCR 211	(3)	Introduction to Financial Accounting
MGCR 341	(3)	Introduction to Finance
MGCR 352	(3)	Principles of Marketing
MGCR 372	(3)	Operations Management.

Microbiology

MIMM 323	(3)	Microbial Physiology
MIMM 324	(3)	Fundamental Virology
MIMM 413	(3)	Parasitology
MIMM 465	(3)	Bacterial Pathogenesis
MIMM 466	(3)	Viral Pathogenesis

Molecular Biology (Biology)

BIOL 300	(3)	Molecular Biology of the Gene
BIOL 314	(3)	Molecular Biology of 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 518	(3)	Artificial Cells

Pollution

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

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

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

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

Program credit weight: 25 credits

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

Required Courses

10 credits

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

* Students choose either CHEM 233 or CHEE 310

** or CEGEP equivalent

Complementary Courses

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

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

Inorganic Chemistry

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

Analytical Chemistry

CHEM 267	(3)	Introductory Chemical Analysis
CHEM 367	(3)	Instrumental Analysis 1
CHEM 377	(3)	Instrumental Analysis 2

Organic Chemistry

CHEM 302	(3)	Introductory Organic Chemistry 3
CHEM 362*	(2)	Advanced Organic Chemistry Laboratory
CHEM 482	(3)	Organic Chemistry: Natural Products

Physical Chemistry

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

12.10.7 Computer Science Courses and Minor Program

The School of Computer Science offers an extensive range of courses for students in the Faculty of Engineering who are interested in computers. Students in the Faculty of Engineering may obtain a **Computer Science Minor** by completing 24 credits of courses, passed with a grade of C or better.

Students interested in this Minor should contact:

Liette Chin
Undergraduate Program Coordinator
School of Computer Science
McConnell Engineering Building, Room 320
Telephone: 514-398-7071, ext. 00118
Email: liette.chin@mcgill.ca

and the Minor Adviser in the [School of Computer Science](#).

12.10.7.1 Computer Science Courses in Engineering Programs

The School of Computer Science offers an extensive range of courses for students in the Faculty of Engineering who are interested in computers. The course taken by students in most B.Eng. programs (COMP 208) and other courses included in the core of the various B.Eng. programs are listed below.

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

Computer Science Courses in Engineering Programs

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

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

24-26 credits

This program gives students in Engineering an introduction to core computer science concepts. The Minor is open to B.Eng. and B.Sc.(Arch.) students in Engineering who have already taken ECSE 202, COMP 202, or COMP 208. This program is not open to students in the B.Eng.; Co-op in Software Engineering program. All courses in the Minor must be passed with a grade of C or better. The Minor program may be completed in 24-26 credits, of which no more than 6 credits may overlap with the primary program. Students who are interested in this Minor should consult with the Undergraduate Program Coordinator. This program gives students in Engineering an introduction to core computer science concepts. The Minor is open to B.Eng. and B.Sc.(Arch.) students in Engineering who have already taken ECSE 202, COMP 202, or COMP 208. This program is not open to students in the B.Eng.; Co-op in Software Engineering program. All courses in the Minor must be passed with a grade of C or better. The Minor program may be completed in 24-26 credits, of which no more than 6 credits may overlap with the primary program. Students who are interested in this Minor should consult with the Undergraduate Program Coordinator in the School of Computer Science for administrative matters, and should consult with both the Minor Adviser in Computer Science and with their department adviser for approval of their course selection. Forms must be submitted and approved before the end of the drop/add period of the student's final term

Required Courses

3 credits

COMP 206	(3)	Introduction to Software Systems
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Complementary Courses (21-23 credits)

3 credits from the following:

COMP 250	(3)	Introduction to Computer Science
ECSE 250	(3)	Fundamentals of Software Development

3 credits from the following:

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

3-4 credits from the following:

COMP 273	(3)	Introduction to Computer Systems
ECSE 324	(4)	Computer Organization

3-4 credits from the following:

CHEE 390	(3)	Computational Methods in Chemical Engineering
CIVE 320	(4)	Numerical Methods
COMP 350	(3)	Numerical Computing
ECSE 343	(3)	Numerical Methods in Engineering
MATH 317	(3)	Numerical Analysis
MECH 309	(3)	Numerical Methods in Mechanical Engineering

9 credits from:

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

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

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

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)	Fragmentation and Comminution
MIME 333	(3)	Materials Handling

List B:

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 the 6 credit combination of ECON 332 and ECON 333 from the list of complementary courses. Students may not take both ECON 209 and ECON 332 and ECON 333.

** 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 332	(3)	Macroeconomic Theory: Majors 1
ECON 333	(3)	Macroeconomic Theory - Majors 2
ECON 335	(3)	The Japanese Economy
ECON 336	(3)	The Chinese Economy
ECON 337	(3)	Introductory Econometrics 1
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](#).

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)

The Minor program is designed to focus on the principles of environmental engineering in all engineering disciplines providing a specialization at the undergraduate level.

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

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

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

Complementary Courses

21-22 credits

3-4 credits from the following list:

BREE 327	(3)	Bio-Environmental Engineering
CIVE 225	(4)	Environmental Engineering

18 credits from Stream A or Stream B:

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

9 credits of courses specified from the "Barbados Interdisciplinary Tropical Studies (BITS)" field semester below, provided the project has sufficient environmental engineering content (project requires approval of the Coordinator of the Minor):

AEBI 425	(3)	Tropical Energy and Food
AEBI 427	(6)	Barbados Interdisciplinary Project

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

Engineering Course List

Courses offered at the MacDonald campus:

BREE 217	(3)	Hydrology and Water Resources
BREE 322*	(3)	Organic Waste Management
BREE 416	(3)	Engineering for Land Development
BREE 518	(3)	Ecological Engineering
BREE 533	(3)	Water Quality Management

* Not open to students who have passed CIVE 323.

Courses offered at the Downtown campus:

ARCH 377	(3)	Energy, Environment, and Buildings 1
ARCH 515	(3)	Sustainable Design
CHEE 351	(3)	Separation Processes
CHEE 370	(3)	Elements of Biotechnology
CHEE 496	(3)	Environmental Research Project
CHEE 591	(3)	Environmental Bioremediation
CHEE 593	(3)	Industrial Water Pollution Control
CIVE 225	(4)	Environmental Engineering
CIVE 323**	(3)	Hydrology and Water Resources
CIVE 421	(3)	Municipal Systems
CIVE 428	(3)	Water Resources and Hydraulic Engineering

CIVE 430	(3)	Water Treatment and Pollution Control
CIVE 520	(3)	Groundwater Hydrology
CIVE 550	(3)	Water Resources Management
CIVE 555	(3)	Environmental Data Analysis
CIVE 557	(3)	Microbiology for Environmental Engineering
CIVE 561	(3)	Greenhouse Gas Emissions
CIVE 572	(3)	Computational Hydraulics
CIVE 573	(3)	Hydraulic Structures
CIVE 574	(3)	Fluid Mechanics of Water Pollution
CIVE 577	(3)	River Engineering
CIVE 584	(3)	Mechanics of Groundwater Flow
MECH 447	(3)	Combustion
MECH 534	(3)	Air Pollution Engineering
MECH 535	(3)	Turbomachinery and Propulsion
MECH 560	(3)	Eco-design and Product Life Cycle Assessment
MIME 422	(3)	Mine Ventilation
MIME 428	(3)	Environmental Mining Engineering
MIME 512	(3)	Corrosion and Degradation of Materials
MIME 556	(3)	Sustainable Materials Processing
MPMC 328	(3)	Environnement et gestion des rejets miniers
SEAD 515	(3)	Climate Change Adaptation and Engineering Infrastructure
SEAD 520	(3)	Life Cycle-Based Environmental Footprinting
SEAD 550	(3)	Decision-Making for Sustainability in Engineering and Design
URBP 506	(3)	Environmental Policy and Planning

** Not open to students who have passed BREE 217.

Non-Engineering Course List

Courses offered at the MacDonald campus:

ENVB 210	(3)	The Biophysical Environment
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 331	(3)	Environmental Soil Physics
WILD 370	()	

+ Not open to students who have passed CHEE 370.

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 Program in Management

Prerequisites: None

Minor for Non-Management Students: Students considering this minor program 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.

A 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 minor 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 program can be found in [Desautels Faculty of Management > Undergraduate > Overview of Programs Offered by the Desautels Faculty of Management > : Minor in Management for Non-Management Students](#):

- [: Bachelor of Commerce \(B.Com.\) - Minor Management \(For Non-Management Students\) \(18 credits\)](#)

Further information can also be found at mcgill.ca/engineering/students/undergraduate/advising-programs/minor-programs.

12.10.13 Bachelor of Engineering (B.Eng.) - Minor Materials Engineering (24 credits)

Minor Adviser: Prof. Richard Chromik (Minor Coordinator), Wong Building, Room 2620

Engineering students may obtain a Materials Engineering Minor by completing 24 credits chosen from the required and complementary courses listed below. By a careful selection of complementary courses, Engineering students may obtain this Minor with a minimum of 15 additional credits.

Required Courses

15 credits

CHEE 380*	(3)	Materials Science
CHEE 484	(3)	Materials Engineering
MIME 260*	(3)	Materials Science and Engineering
MIME 345	(3)	Applications of Polymers

MIME 465	(3)	Metallic and Ceramic Powders Processing
MIME 467	(3)	Electronic Properties of Materials

* Students choose either CHEE 380 or MIME 260.

Complementary Courses

9 credits from the following:

MECH 530	(3)	Mechanics of Composite Materials
MIME 360	(3)	Phase Transformations: Solids
MIME 512	(3)	Corrosion and Degradation of Materials
MIME 560	(3)	Joining Processes
MIME 561	(3)	Advanced Materials Design
MIME 563	(3)	Hot Deformation of Metals
MIME 569	(3)	Electron Beam Analysis of Materials

12.10.14 Bachelor of Engineering (B.Eng.) - Minor Mathematics (18 credits)

The B.Eng.; Minor in Mathematics provides students with an even stronger foundation in mathematics to further develop their knowledge of this subject. Students enrolled in the B.Eng.; Minor in Mathematics complete a series of mathematics courses offered by the Department of Mathematics and Statistics, or other units offering mathematics courses.

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

Note: The B.Eng.; Minor in Mathematics is open to all students in the Faculty of Engineering (including students registered in the B.Sc.(Arch.)). A maximum of 9 credits of overlap (double-counting) with the degree program is allowed.

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

Required Course (3 credits)

MATH 242	(3)	Analysis 1
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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)	Partial Differential Equations
MATH 323*	(3)	Probability
MATH 324*	(3)	Statistics

MATH 326	(3)	Nonlinear Dynamics and Chaos
MATH 340	(3)	Discrete Mathematics
MATH 378	(3)	Nonlinear Optimization
MATH 417	(3)	Linear Optimization
MATH 427	(3)	Statistical Quality Control
MATH 447	(3)	Introduction to Stochastic Processes
MATH 463	()	Convex Optimization
MATH 475	(3)	Honours Partial Differential Equations
MATH 478	(3)	Computational Methods in Applied Mathematics
MATH 563	()	Honours Convex 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)

Program credit weight: 23-25 credits

The Mining Engineering Minor covers fundamentals of mineral exploration, ore extraction, and mineral processing. The program includes an experiential learning component through an industrial work term for which enrolment may be limited.

Required Courses

17 credits

MIME 200	(3)	Introduction to the Minerals Industry
MIME 291	(2)	Industrial Work Period 2
MIME 322	(3)	Fragmentation and Comminution
MIME 325	(3)	Mineral Industry Economics
MIME 333	(3)	Materials Handling
MIME 341	(3)	Introduction to Mineral Processing

Complementary Courses (6-8 credits)

6-8 credits from one or more of the following groups:

List A: Mining Engineering

0-6 credits from the following:

MIME 320	(3)	Extraction of Energy Resources
MIME 323	(3)	Rock and Soil Mass Characterization
MIME 413	(3)	Strategic Mine Planning With Uncertainty
MIME 419	(3)	Surface Mining
MIME 421	(3)	Rock Mechanics
MIME 422	(3)	Mine Ventilation
MIME 424	(3)	Underground Mining Methods

MIME 425	(3)	Applied Stochastic Orebody Modelling
MIME 428	(3)	Environmental Mining Engineering
MIME 442	(3)	Analysis, Modelling and Optimization in Mineral Processing
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 544	(3)	Analysis: Mineral Processing Systems 1
MIME 545	(3)	Analysis: Mineral Processing Systems 2
MIME 588	(3)	Reliability Analysis of Mining Systems

List B: Mechanical Engineering

0-6 credits from the following:

MECH 497	(3)	Value Engineering
MECH 513	(3)	Control Systems
MECH 559	(3)	Engineering Systems Optimization
MECH 560	(3)	Eco-design and Product Life Cycle Assessment
MECH 572	(3)	Mechanics and Control of Robotic Manipulators
MECH 573	(3)	Mechanics of Robotic Systems

List C: Civil Engineering

0-6 credits from the following:

CIVE 416	(3)	Geotechnical 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 403	(4)	Control
ECSE 422	(3)	Fault Tolerant Computing
ECSE 428	(3)	Software Engineering Practice
ECSE 429	(3)	Software Validation
ECSE 444	(4)	Microprocessors
ECSE 464	(3)	Power Systems Analysis
ECSE 507	(3)	Optimization and Optimal Control

List F: Bioengineering

0-3 credits from the following:

BIEN 560	(3)	Design of Biosensors
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12.10.16 Minor in Musical Science and Technology

The Musical Science and Technology Minor focuses on interdisciplinary topics in science and technology applied to music. The goal of the program is to help prepare students for commercial jobs in the audio technology sector and/or for subsequent graduate research study. Enrolment in the MST Minor is limited to students with existing scientific backgrounds from all faculties at McGill University. Selection is based on prior experience in math, computer programming, and related sciences; expressed interest in the program; and Cumulative Grade Point Average (CGPA).

Detailed information on this program can be found in [Schulich School of Music > Undergraduate > Browse Academic Units & Programs > Department of Music Research: Composition; Music Education; Music History; Theory; Faculty Program > : Bachelor of Music \(B.Mus.\) - Minor Musical Science and Technology \(18 credits\)](#).

The online application form is available at mcgill.ca/music/programs/minor/mst and must be submitted by the application deadline.

For further information about this Minor, please visit website: mcgill.ca/music/programs/minor/mst

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

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

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

Minor program credit weight: 21-22 credits

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

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

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

Complementary Courses (21-22 credits)**Group A**

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

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

Group B

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

Bioengineering

BIEN 420	(3)	Biodevices Design for Diagnostics and Screening
BIEN 550	(3)	Biomolecular Devices

Chemical Engineering

CHEE 380*	(3)	Materials Science
CHEE 515*	(3)	Interface Design: Biomimetic Approach
CHEE 543	(3)	Plasma Engineering
CHEE 582	(3)	Polymer Science and Engineering
CHEE 585	(3)	Foundations of Soft Matter

Chemistry

CHEM 334	(3)	Advanced Materials
CHEM 531	(3)	Chemistry of Inorganic Materials
CHEM 582	(3)	Supramolecular Chemistry
CHEM 585	(3)	Colloid Chemistry

Electrical Engineering

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

Mechanical Engineering

MECH 500***	(3)	Selected Topics in Mechanical Engineering
MECH 553	(3)	Design and Manufacture of Microdevices
MECH 556	(3)	Microfluidics and BioMEMS
MIME 260*	(3)	Materials Science and Engineering

Materials Engineering

MIME 261*	(3)	Structure of Materials
MIME 467	(3)	Electronic Properties of Materials
MIME 515*	(3)	(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
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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 research-based course (maximum 4cr) with the focus on nanotechnology taken at McGill University may be considered for credits towards this Minor; students must obtain the approval of the research project from the Minor adviser prior to taking the course in order for the course to be counted as part of the Minor credits.

** 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)

The Software Engineering Minor provides a foundation in basic computer science, computer programming, and software engineering practice. The Minor program does not carry professional recognition.

Students must complete 18 credits (six courses) as follows. Up to 6 credits (two courses) may be double-counted towards a degree program.

Required Courses (9 credits)

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

Complementary Courses

3 credits from the following:

COMP 250*	(3)	Introduction to Computer Science
ECSE 250*	(3)	Fundamentals of Software Development

6 credits from the following:

COMP 302	(3)	Programming Languages and Paradigms
COMP 307	(3)	Principles of Web Development
COMP 409	(3)	Concurrent Programming
COMP 421	(3)	Database Systems
COMP 424*	(3)	Artificial Intelligence
COMP 512	(4)	Distributed Systems
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 437	(3)	Software Delivery
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 250 and ECSE 250

- 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

