Faculty of Engineering, including the Schools of Architecture and Urban Planning

Programs, Courses and University Regulations

2011-2012

The publication is produced in electronic form and the most recent version is the official university publication. Archival copies are available at www.mcgill.ca/study.

This publication provides guidance to prospects, applicants, students, f

1 About the Faculty of Engineering

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

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

Schools
Architecture
Urban Planning

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

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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 the *Graduate and Postdoctoral Studies Programs, Courses and University Regulations* publication at *www.mcgill.ca/study*.

Professional

Bachelor of Engineering

Bachelor of Software Engineering

The B.Eng. and B.S.E. programs are accredited by the Canadian Engineering Accreditation Board (CEAB) of Engineers Canada and 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*. All students are expected to seek professional registration after graduation.

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. As soon as you have accumulated 60 credits in a B.Eng. or B.S.E. program, you can join the student section of the OIQ. Registration is free. 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., B.S.E., and B.Sc.(Arch.). Enrolment in Engineering programs is limited.

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

8 Student Progress

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

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10 Degrees and Programs Offered

Engineering Internship Program

Co-op Programs

Materials Engineering (B.Eng.)

Mining Engineering (B.Eng.)

General Engineering Program

General Engineering – Undeclared major (Freshman year)

Major Programs

Architecture (B.Sc.(Arch.))

Chemical Engineering (B.Eng.)

Civil Engineering (B.Eng.)

Computer Engineering (B.Eng.)

Electrical Engineering (B.Eng.)

Mechanical Engineering (B.Eng.)

Software Engineering (B.S.E.)

Honours Programs

Electrical Engineering (B.Eng.)

Mechanical Engineering (B.Eng.)

Minors

Arts

Biomedical Engineering

Biotechnology

Chemistry

Computer Science

Construction Engineering and Management

Economics

Environment

Environmental Engineering

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

Materials Engineering

Mathematics

Mining Engineering

Physics

Software Engineering

Technological Entrepreneurship

11 Engineering Internship Program

Employers value experience. Internships (four, eight, twelve, or sixteen months) allow you to gain professional work experience during the course of your undergraduate studies while earning a salary within the av

12.1.1 Bachelor of Engineering (B.Eng.) - General Engineering - Undeclared (30 credits)

This is a 30-credit course of study for the first year of a Bachelor of Engineering degree for students who have not completed a Quebec CEGEP diploma. Upon successful completion of these requirements, students must apply for placement and continue in a B.Eng. or B.S.E. program.

Year 0 (Freshman) Courses

(30 credits)

CHEM 110	(4)	General Chemistry 1
CHEM 120	(4)	General Chemistry 2
FACC 100	(1)	Introduction to the Engineering Profession
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

* Students may take MATH 139 (Calculus) (4 credits) instead of MATH 140, but only with permission from the Department of Mathematics and Statistics.

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 217, ECON 227, and ECON 337)

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

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

Religious Studies (RELG)

School of Social Work (SWRK)

Sociology (excluding SOCI 350)

OR one of the following:

BUSA 465*	(3)	Technological Entrepreneurship
ENVR 203	(3)	Knowledge, Ethics and Environment
ENVR 400	(3)	Environmental Thought
FACC 220	(3)	Law for Architects and Engineers
FACC 500	(3)	Technology Business Plan Design
FACC 501	(3)	Technology Business Plan Project
INDR 294*	(3)	Introduction to Labour-Management Relations
MATH 338	(3)	History and Philosophy of Mathematics
MGCR 222*	(3)	Introduction to Organizational Behaviour
MGCR 352*	(3)	Marketing Management 1
MRKT 360*	(3)	Marketing of Technology
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/.

12.2.5 Ancillary Academic Facilities

Laboratories and Workshops

Architectural Workshops – David Speller, Technician

Communications Laboratory, including Photo Lab – Carrie Henzie, Media Technician

Computers in Architecture Laboratories – Professor Aaron Sprecher

Library

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

Collections

Visual Resources Collection, including slides, film, video and other materials – Dr. Annmarie Adams

The John Bland Canadian Architecture Collection, housed in the Blackader-Lauterman Library – Ann Marie Holland, Liaison Librarian

Orson Wheeler Architectural Model Collection – Professor Pieter Sijpkes

Materials Resource Centre – Dr. Avi Friedman

12.2.6 School of Architecture Faculty

Director

Michael Jemtrud

Emeritus Professors

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

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

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

Professors

Annmarie Adams; B.A.(McG.), M.Arch., Ph.D.(Calif., Berk.), M.R.A.I.C. (*William C. Macdonald Professor of Architecture*)

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

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

Alberto Pérez-Gómez; Dipl.Eng.(Nat. Pol. Inst., Mexico), M.A., Ph.D.(Essex) (*Saidye Rosner Bronfman Professor of Architectural History*)

Associate Professors

Martin Bressani; B.Sc.(Arch.), B.Arch.(McG.), M.Sc.Arch., Diplômes des Études approfondies, Docteur de l'Université de Paris-Sorbonne(Paris IV)

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

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

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

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

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

Assistant Professors

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

Aaron Sprecher; B.Arch.(Bezalel), M.Arch.(Calif.-LA)

Adjunct Professors

Howard Davies

The second part, for students with the McGill B.Sc.(Arch.) degree or equivalent non-professional undergraduate architecture degree, is either a three-term (Fall/Winter/Summer) or a two-year program leading to the Master of Architecture (Professional) degree. There are two options for the completion of M.Arch. (Professional) program: Design Studio (45 credits) and Design Studio-Directed Research (60 credits). 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 U.S.

For more information on program structure and courses, visit the School of Architecture website at http://www.mcgill.ca/architecture.

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.

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/student/sao/newstudents and select your term of admission.

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

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ARCH 324	(1)	Sketching School
ARCH 354	(3)	Architectural History 3
ARCH 355	(3)	Architectural History 4
ARCH 375	(2)	Landscape
ARCH 377	(3)	Energy, Environment and Buildings
ARCH 405	(6)	Design and Construction 3
ARCH 406	(6)	Design and Construction 4
ARCH 447	(2)	Lighting
ARCH 451	(2)	Building Regulations and Safety

Complementary Courses

9 credits from the following:

ARCH 318	(3)	Design Sketching
ARCH 319	(3)	The Camera and Perception
ARCH 352	(3)	Art and Theory of House Design
ARCH 363	(2)	Structure, Organization and Form
ARCH 378	(3)	Site Usage
ARCH 379	(3)	Summer Course Abroad
ARCH 383	(3)	Geometry and Architecture
ARCH 461	(1)	Freehand Drawing and Sketching
ARCH 471	(2)	Computer-Aided Building Design
ARCH 490	(2)	Selected Topics in Design
ARCH 512	(3)	Architectural Modelling
ARCH 514	(4)	Community Design Workshop
ARCH 515	(3)	Sustainable Design
ARCH 517	(3)	Sustainable Residential Development
ARCH 520	(3)	Montreal: Urban Morphology
ARCH 521	(3)	Structure of Cities
ARCH 522	(3)	History of Domestic Architecture in Quebec
ARCH 523	(3)	Significant Texts and Buildings
ARCH 525	(3)	Seminar on Analysis and Theory
ARCH 526	(3)	Philosophy of Structure
ARCH 527	(3)	Civic Design
ARCH 528	(3)	History of Housing
ARCH 529	(3)	Housing Theory
ARCH 531	(3)	Architectural Intentions Vitruvius - Renaissance
ARCH 532	(3)	Origins of Modern Architecture
ARCH 533	(3)	New Approaches to Architectural History
ARCH 534	(3)	Architectural Archives
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

educational, and sporting events. For example, recent events have included student-professor banquets and Christmas parties, dances, speakers, broomball games, and joint meetings with the Montreal Section of the CSChE. The latter gives students a chance to mix with practising chemical engineers.

12.3.5 Department of Chemical Engineering Faculty

Chair

Dimitrios Berk

Emeritus Professors

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

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

Juan H. Vera; B.Mat.(Chile), Ing.Quim.(U.T.E.), M.S.(Calif., Berk.), Dr.Ing.(Santa Maria), Ing.

Professors

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

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

Alejandro D. Rey; B.Ch.Eng.(CCNY), Ph.D.(Calif., Berk.) (*James McGill Professor*)

Associate Professors

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

Sylvain Coulombe; B.Sc., M.Sc.A.(Sher.), Ph.D.(McG.), Ing.

Reghan James Hill; B.Eng., Ph.D.(C'nell)

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

Milan Maric; B.Sc., B.Eng. & Mgmt(McM.), Ph.D.(Minn.), P.Eng.

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

Adjunct Professors

R. Campeau

M. Davidovsky

M. Fokas

B. McNicoll

N. Peters

B.E. Sarkis

B. Théorét

R.C. Urquhart

L. Yerushalmi

12.3.6 Bachelor of Engineering (B.Eng.) - Chemical Engineering (141 credits)

Program credit weight: 141-144 credits

Program credit weight for CEGEP students: 115 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 which 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 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 complementary courses (departmental).

Note to CEGEP students

If you have successfully completed a course at CEGEP that is equivalent to CHEM 212 or CHEM 234, you may request exemption for either or both courses. However, you must replace each course with another university-level course of an equal number of credits or more - McGill courses beginning with subject codes ATOC, BIOL, CHEM, EPSC, ESYS, PHYS are acceptable substitutes.

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-credit program.

For information on transfer credit for French Baccalaureate, International Baccalaureate exams, Advanced Placement exams, Advanced Lev

24 credits

CHEM 212	(4)	Introductory Organic Chemistry 1
CHEM 234	(3)	Topics in Organic Chemistry
COMP 208	(3)	Computers in Engineering
FACC 100*	(1)	Introduction to the Engineering Profession
FACC 400	(1)	Engineering Professional Practice
MATH 262	(3)	Intermediate Calculus
MATH 263	(3)	Ordinary Differential Equations for Engineers
MATH 264	(3)	Advanced Calculus for Engineers
MIME 310	(3)	Engineering Economy

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

Required Chemical Engineering Courses

73 credits

CHEE 200	(4)	Introduction to Chemical Engineering
CHEE 204	(3)	Chemical Manufacturing Processes
CHEE 220	(3)	Chemical Engineering Thermodynamics
CHEE 291	(4)	Instrumental Measurement Laboratory
CHEE 310	(3)	Physical Chemistry for Engineers
CHEE 314	(4)	Fluid Mechanics
CHEE 315	(4)	Heat and Mass Transfer
CHEE 340	(3)	Process Modelling
CHEE 351	(3)	Separation Processes
CHEE 360	(1)	Technical Paper 1
CHEE 370	(3)	Elements of Biotechnology
CHEE 380	(3)	Materials Science
CHEE 392	(4)	Project Laboratory 1
CHEE 393	(5)	Project Laboratory 2
CHEE 423	(4)	Chemical Reaction Engineering
CHEE 453	(4)	Process Design
CHEE 455	(4)	Process Control
CHEE 456	(2)	Design Project 1
CHEE 457	(5)	Design Project 2
CHEE 462	(1)	Technical Paper 2
CHEE 474	(3)	Biochemical Engineering
CHEE 484	(3)	Materials Engineering

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, some students use the technical complementaries to increase the breadth of their chemical engineering training.

At least two courses (4-7 credits) must be chosen from the list below. The remaining course(s) (2-5 credits) may be taken from other suitable undergraduate courses in the Faculty of Engineering, with departmental permission.

BIOT 505*	(3)	Selected Topics in Biotechnology

CHEE 363	(2)	Projects Chemical Engineering 1
CHEE 438	(3)	Engineering Principles in Pulp and Paper Processes
CHEE 452	(3)	Particulate Systems
CHEE 458	(3)	Computer Applications
CHEE 464	(2)	Projects Chemical Engineering 2
CHEE 487	(3)	Chemical Processing: Electronics Industry
CHEE 494**	(3)	Research Project and Seminar 1
CHEE 495**	(4)	Research Project and Seminar 2
CHEE 496**	(3)	Environmental Research Project
CHEE 541	(3)	Electrochemical Engineering
CHEE 543	(3)	Plasma Engineering
CHEE 561	(3)	Introduction to Soft Tissue Biophysics
CHEE 562	(3)	Engineering Principles in Physiological Systems
CHEE 563***	(3)	Biofluids and Cardiovascular Mechanics
CHEE 571	(3)	Small Computer Applications: Chemical Engineering
CHEE 582	(3)	Polymer Science & Engineering
CHEE 584	(3)	Polymer Processing
CHEE 585	(3)	Foundations of Soft Matter
CHEE 591	(3)	Environmental Bioremediation
CHEE 592+	(3)	Industrial Air Pollution Control
CHEE 593+	(3)	Industrial Water Pollution Control
CHEE 594	(3)	Biocolloids in Environmental Systems
CHEE 595	(3)	Energy Recovery, Use, & Impact
		Water

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

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

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

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

Anthropology (ANTH)

Economics (any 200- or 300-level course excluding ECON 217, ECON 227, and ECON 337)

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

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

Religious Studies (RELG)

School of Social Work (SWRK)

Sociology (excluding SOCI 350)

OR one of the following:

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

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

Language Courses

12.4.4 Department of Civil Engineering and Applied Mechanics Faculty

Chair

Van-Thanh-Van Nguyen

Emeritus Professors

Philip J. Harris; B.Sc.(Manit.), M.Eng., Ph.D.(McG.), F.E.I.C., F.C.S.C.E., Eng.

M. Saeed Mirza; B.Eng.(Karachi), M.Eng., Ph.D.(McG.), F.A.C.I., F.E.I.C., F.C.S.C.E., Hon. F.I.E.P., Eng.

Richard G. Redwood; B.Sc.(Eng.)(Brist.), M.A.Sc.(Tor.), Ph.D.(Brist.), F.C.S.C.E., F.I.Struct.Eng., Eng.

Stuart B. Savage; B.Eng.(McG.), M.S.Eng.(Cal. Tech.), Ph.D.(McG.), F.R.S.C.

Professors

Vincent H. Chu; B.S.Eng.(Taiwan), M.A.Sc.(Tor.), Ph.D.(MIT), Eng.

Denis Mitchell; B.A.Sc., M.A.Sc., Ph.D.(Tor.), F.A.C.I., F.C.A.E., F.C.S.C.E., Eng. (*James McGill Professor*)

Van-Thanh-Van Nguyen; B.M.E.(Vietnam), M.C.E.(A.I.T.), D.A.Sc.(Montr.), Eng.

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

Adjunct Professors

Zoubir Lounis

Pierre Lundahl

Patrick Maillard

Charles Manatakos

Thanh Son Nguyen

Paul Rodrigue

Sandro Scola

William Taylor

Marc Villeneuve

Jan Vrana

Bac

EPSC 221	(3)	General Geology
FACC 100*	(1)	Introduction to the Engineering Profession
FACC 400	(1)	Engineering Professional Practice
MATH 262	(3)	Intermediate Calculus
MATH 263	(3)	Ordinary Differential Equations for Engineers
MATH 264	(3)	Advanced Calculus for Engineers
MECH 261	(2)	Measurement Laboratory
MECH 289	(3)	Design Graphics
MIME 310	(3)	Engineering Economy

* 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)	Construction 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
TYoy 221	(3)	Municipal Systems

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:

CIVE 433	(3)	Urban Planning
CIVE 440	(3)	Traffic Engineering
CIVE 446	(3)	Construction Engineering
CIVE 451	(3)	Geoenvironmental Engineering
CIVE 460	(3)	Matrix Structural Analysis
CIVE 470	(3)	Undergraduate Research Project
CIVE 512	(3)	Advanced Civil Engineering Materials
CIVE 527	(3)	Renovation and Preservation: Infrastructure
CIVE 540	(3)	Urban Transportation Planning
CIVE 550	(3)	Water Resources Management
CIVE 551	(3)	Environmental Transport Processes
CIVE 553	(3)	Stream Pollution and Control
CIVE 555	(3)	Environmental Data Analysis
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)	Groundwater Engineering
CIVE 587	(3)	Pavement Design

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
CHEE 430	(3)	Technology Impact Assessment
CIVE 469	(3)	Infrastructure and Society
ECON 225	(3)	Economics of the Environment
ECON 347	(3)	Economics of Climate Change
ENVR 201	(3)	Society, Environment and Sustainability
GEOG 200	(3)	Geographical Perspectives: World Environmental Problems
GEOG 203	(3)	Environmental Systems
GEOG 205	(3)	Global Change: Past, Present and Future
GEOG 302	(3)	Environmental Management 1
MECH 526	(3)	Manufacturing and the Environment
MGPO 440*	(3)	Strategies for Sustainability
MIME 308	(3)	Social Impact of Technology

PHIL 343	(3)	Biomedical Ethics
RELG 270	(3)	Religious Ethics and the Environment
SOCI 235	(3)	Technology and Society
SOCI 312	(3)	Sociology of Work and Industry
URBP 201	(3)	Planning the 21st Century City

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

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

3 credits at the 200- level or higher from the follo

Undergraduate Programs Office
Lorne Trottier Building, Room 2060
3630 University Street
Montreal, Quebec H3A 2B2

Telephone: 514-398-3943
Fax: 514-398-4653
Website: *wwwcece*ce

Professors

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

Andrew Kirk; B.Sc.(Brist.), Ph.D.(Lond.), *Associate Dean, Research and Graduate Education* (*William Dawson Scholar*)

Harry Leib; B.Sc.(Technion), Ph.D.(Tor.)

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

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

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

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

David V. Plant; M.S., Ph.D.(Brown), P.Eng., F.I.E.E.E., F.O.S.A., F.C.A.E. (*James McGill Professor*)

Gordon Roberts; B.A.Sc.(Wat.), M.A.Sc., Ph.D.(Tor.), Eng., F.I.E.E.E. (*James McGill Professor*)

Jonathan Webb; B.A., Ph.D.(Cant.)

Associate Professors

Ramesh Abhari; M.A.Sc.(Tehran), Ph.D.(Tor.)

Tal Arbel; M.Eng., Ph.D.(McG.)

Jan Bajcsy; B.Sc.(Harv.), M.Eng., Ph.D.(Princ.)

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

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

Mark Coates; B.Eng.(Adel.), Ph.D.(Camb.)

Jeremy R. Cooperstock; B.Ap.Sc.(Br. Col.), M.Sc., Ph.D.(Tor.)

Mourad El-Gamal; B.Sc.(Cairo), M.Sc.(Nashville), Ph.D.(McG.) (*William Dawson Scholar*)

Dennis Giannacopoulos; M.Eng., Ph.D.(McG.)

Warren Gross; B.A.Sc.(Wat.), M.A.Sc., Ph.D.(Tor.)

Roni Khazaka; M.Eng., Ph.D.(Car.)

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

Steve McFee; B.Eng., Ph.D.(McG.)

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

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

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

Richard Rose; B.Sc., M.S.(Ill.), Ph.D.(GIT)

Ishiang Shih; M.Eng., Ph.D.(McG.)

Zeljko Zilic; B.Eng.(Zagreb), M.Sc., Ph.D.(Tor.)

Assistant Professors

Francois Bouffard; Ph.D.(McG.)

Vamsy Chodavarapu; B.Eng.(India), M.S., Ph.D.(NYU)

Anas Hamoui; M.Eng.(McG.), Ph.D.(Tor.)

Odile Liboiron-Ladouceur; M.Sc., Ph.D.(Col.)

Aditya Mahajan; Ph.D.(Mich.)

Zetian Mi; B.A.Sc.(China), M.Sc.(Iowa), Ph.D.(Mich.)

Sam Musallam; B.Sc., M.Sc., Ph.D.(Tor.)

Michael Rabbat; B.S.(Ill.), M.S.(Texas), Ph.D.(Wisc.)

Martin Rochette; B.A., M.Eng., Ph.D.(Laval)

Assistant Professors

Thomas Szkopek; B.A.Sc., M.A.Sc.(Tor.), Ph.D.(Calif.-LA)

Mai Vu; M.S., Ph.D.(Stan.)

Associate Members

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

Alan C. Evans; M.Sc.(Surrey), Ph.D.(Leeds)

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

Henrietta L. Galiana; M.Eng., Ph.D.(McG.)

Jean Gotman; M.E.(Dart.), Ph.D.(McG.)

David Juncker; Ph.D.(Neuchatel)

Robert E. Kearney; M.Eng., Ph.D.(McG.)

Xue Liu; B.S., M.Eng.(Tsinghua), Ph.D.(Ill.)

Nathaniel J. Quitoriano; B.S.(Calif.), Ph.D.(MIT)

Adjunct Professors

Ray Bartnikas

Robert DiRaddo

Danny Grant

Cedric Guss

Ricardo Izquierdo

Cheng K. Jen

Michael A. Kaplan

Irene Leszkowicz

Shie Mannor

Miguel Marin

Douglas O'Shaughnessy

Katarzyna Radecka

Anthony Rodolakis

Robert Sabourin

Joshua D. Schwartz

Andraws Swidan

Leszek Szczecinski

Kenneth D. Wagner

Lucan Wegrowicz

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

Program credit weight: 138-139 credits

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

The 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, say, 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 dev

ECSE 303	(3)	Signals and Systems 1
ECSE 304	(3)	Signals and Systems 2
ECSE 305	(3)	Probability and Random Signals 1
ECSE 322	(3)	Computer Engineering
ECSE 323	(5)	Digital System Design
ECSE 330	(3)	Introduction to Electronics
ECSE 334	(3)	Introduction to Microelectronics
ECSE 351	(3)	Electromagnetic Fields
ECSE 352	(3)	Electromagnetic Waves
ECSE 361	(3)	Power Engineering
ECSE 434	(2)	Microelectronics Laboratory
ECSE 443	(3)	Introduction to Numerical Methods in Electrical Engineering
ECSE 456	(3)	ECSE Design Project 1
ECSE 457	(3)	ECSE Design Project 2

Complementary Courses

17-18 credits

Technical Complementaries

9 credits from the following:

ECSE 404	(3)	Control Systems
ECSE 405	(3)	Antennas
ECSE 411	(3)	Communications Systems 1
ECSE 412	(3)	Discrete Time Signal Processing
ECSE 413	(3)	Communications Systems 2
ECSE 414	(3)	Introduction to Telecommunication Networks
ECSE 420	(3)	Parallel Computing
ECSE 421	(3)	Embedded Systems
ECSE 422	(3)	Fault Tolerant Computing
ECSE 423	(3)	Fundamentals of Photonics
ECSE 424	(3)	Human-Computer Interaction
ECSE 425	(3)	Computer Organization and Architecture
ECSE 426	(3)	Microprocessor Systems
ECSE 427	(3)	Operating Systems
ECSE 430	(3)	Photonic Devices and Systems
ECSE 431	(3)	Introduction to VLSI CAD
ECSE 432	(3)	Physical Basis: Transistor Devices
ECSE 435	(3)	Mixed-Signal Test Techniques
ECSE 436	(3)	Signal Processing Hardware
ECSE 450	(3)	Electromagnetic Compatibility
ECSE 451	(3)	EM Transmission and Radiation
ECSE 460*	(3)	Appareillage électrique (Electrical Power Equipment)
ECSE 462	(3)	Electromechanical Energy Conversion

ECSE 464	(3)	Power Systems Analysis 1
ECSE 465	(3)	Power Electronic Systems
ECSE 467*	(3)	Comportement des réseaux électriques
ECSE 468*	(3)	Electricité industrielle (Industrial Power Systems)
ECSE 469*	(3)	Protection des réseaux électriques

* Courses taught in French

Laboratory Complementaries

2-3 credits from the following:

ECSE 426	(3)	Microprocessor Systems
ECSE 431	(3)	Introduction to VLSI CAD

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 217, 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)

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

To be considered in September 2011, the applicant must:

- be registered in the B.Eng. program (regular Electrical Engineering);

- have a cumulative GPA of at least 2.4

- have completed or be registered in ECSE 361 (Power Engineering);

- be able to complete the degree requirements by December 2012;

- 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 the subject of a specific agreement between the University and the Institute. Selection criteria to the Institute will be based on CGPA and on the curriculum vitae. The selection process for the scholarship may involve an interview with the committee presided by Hydro-Québec. 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 publication with the following specifications:

Technical Complementaries and Laboratories (15 credits)

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

Required Courses

9 credits

ECSE 462	(3)	Electromechanical Energy Conversion
ECSE 464	(3)	Power Systems Analysis 1
ECSE 465	(3)	Power Electronic Systems

Students must also complete ECSE 474 and 475 (Electrical Engineering Design Projects 1 and 2) on a practical project in power engineering, preferably at the Institute or with a company sponsoring the Institute.

Complementary Courses

6 credits from the following:

ECSE 404	(3)	Control Systems
ECSE 460*	(3)	Appareillage électrique (Electrical Power Equipment)
ECSE 467*	(3)	Comportement des réseaux électriques
ECSE 468*	(3)	Electricité industrielle (Industrial Power Systems)
ECSE 469*	(3)	Protection des réseaux électriques

* Courses taught in French

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

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

Program credit weight: 138-139 credits

Entry into the Electrical Engineering Honours Program

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

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

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

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

Required Year 0 (Freshman) Courses

29 credits

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

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

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

35 credits

CCOM 206	(3)	Communication in Engineering
CIVE 281	(3)	Analytical Mechanics
COMP 202	(3)	Introduction to Computing 1
FACC 100*	(1)	Introduction to the Engineering Profession
FACC 400	(1)	Engineering Professional Practice
MATH 262	(3)	Intermediate Calculus
MATH 263	(3)	Ordinary Differential Equations for Engineers
MATH 264	(3)	Advanced Calculus for Engineers
MATH 270	(3)	Applied Linear Algebra
MATH 381	(3)	Complex Variables and Transforms
MIME 262	(3)	Properties of Materials in Electrical Engineering
MIME 310	(3)	Engineering Economy
PHYS 271	(3)	Introduction to Quantum Physics

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

Required Electrical Engineering Courses

57 credits

ECSE 200	(3)	Electric Circuits 1
ECSE 210	(3)	Electric Circuits 2
ECSE 211	(3)	Design Principles and Methods
ECSE 221	(3)	Introduction to Computer Engineering

ECSE 291	(2)	Electrical Measurements Laboratory
ECSE 303	(3)	Signals and Systems 1
ECSE 304	(3)	Signals and Systems 2
ECSE 305	(3)	Probability and Random Signals 1
ECSE 322	(3)	Computer Engineering
ECSE 323	(5)	Digital System Design
ECSE 330	(3)	Introduction to Electronics
ECSE 334	(3)	Introduction to Microelectronics
ECSE 351	(3)	Electromagnetic Fields
ECSE 352	(3)	Electromagnetic Waves
ECSE 361	(3)	Power Engineering
ECSE 434	(2)	Microelectronics Laboratory
ECSE 498	(3)	Honours Thesis 1
ECSE 499	(3)	Honours Thesis 2
ECSE 543	(3)	Numerical Methods in Electrical Engineering

Complementary Courses

17-18 credits

Technical Complementaries

9 credits chosen from 500-level ECSE e90 0 1s OfL.6edits chosen from 500-le

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
CHEE 430	(3)	Technology Impact Assessment
CIVE 469	(3)	Infrastructure and Society
ECON 225	(3)	Economics of the Environment
ECON 347	(3)	Economics of Climate Change
ENVR 201	(3)	Society, Environment and Sustainability
GEOG 200	(3)	Geographical Perspectives: World Environmental Problems
GEOG 203	(3)	Environmental Systems
GEOG 205	(3)	Global Change: Past, Present and Future
GEOG 302	(3)	Environmental Management 1

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FACC 501	(3)	Technology Business Plan Project
INDR 294*	(3)	Introduction to Labour-Management Relations
MATH 338	(3)	History and Philosophy of Mathematics
MGCR 222*	(3)	Introduction to Organizational Behaviour
MGCR 352*	(3)	Marketing Management 1
ORGB 321*	(3)	Leadership
ORGB 423*	(3)	Human Resources Management

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

Language Courses

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

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

12.5.6 Bachelor of Engineering (B.Eng.) - Computer Engineering (139 credits)

Program credit weight: 139-143 credits

Program credit weight for CEGEP students: 113-114 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

29 credits

Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credit for these Year 0 (Freshman) courses and enter a 113- to 114-credit program.

For information on transfer credit for French Baccalaureate, International Baccalaureate exams, Advanced Placement exams, Advanced Levels and Science Placement Exams, see

http://www.mcgill.ca/engineering/student/sao/newstudents/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 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

35 credits

CCOM 206	(3)	Communication in Engineering
CIVE 281	(3)	Analytical Mechanics
COMP 202	(3)	Introduction to Computing 1

COMP 250	(3)	Introduction to Computer Science
COMP 251	(3)	Data Structures and Algorithms
FACC 100*	(1)	Introduction to the Engineering Profession
FACC 400	(1)	Engineering Professional Practice
MATH 262	(3)	Intermediate Calculus
MATH 263	(3)	Ordinary Differential Equations for Engineers
MATH 264	(3)	Advanced Calculus for Engineers
MATH 270	(3)	Applied Linear Algebra
	(3)	Discrete Mathematics

Earth and Planetary Sciences (EPSC)

Earth System Science (ESYS)

Physics (PHYS)

Technical Complementaries

9 credits

The course chosen from List A is meant to enhance the body of knowledge; the courses chosen from List B are to provide breadth.

List A

3 credits from the following:

ECSE 424	(3)	Human-Computer Interaction
ECSE 428	(3)	Software Engineering Practice
ECSE 431	(3)	Introduction to VLSI CAD

List B

6 credits from the following:

COMP 424	(3)	Artificial Intelligence
ECSE 404	(3)	Control Systems
ECSE 411	(3)	Communications Systems 1
ECSE 412	(3)	Discrete Time Signal Processing
ECSE 420	(3)	Parallel Computing
ECSE 421	(3)	Embedded Systems
ECSE 422	(3)	Fault Tolerant Computing
ECSE 429	(3)	Software Validation
ECSE 436	(3)	Signal Processing Hardware
ECSE 443	(3)	Introduction to Numerical Methods in Electrical Engineering
ECSE 450	(3)	Electromagnetic Compatibility
ECSE 530	(3)	Logic Synthesis
ECSE 532	(3)	Computer Graphics
ECSE 548	(3)	Introduction to VLSI Systems

Laboratory Complementaries

2-3 credits from the following:

ECSE 434	(2)	Microelectronics Laboratory
ECSE 436	(3)	Signal Processing Hardware
ECSE 487	(2)	Computer Architecture Laboratory
ECSE 489	(2)	Telecommunication Network Laboratory
ECSE 490	(2)	Digital Signal Processing Laboratory
ECSE 491	(2)	Communication Systems Laboratory
ECSE 493	(2)	Control and Robotics Laboratory

Complementary Studies

6 credits

Group A - Impact of Technology on Society

3 credits from the following:

ANTH 212	(3)	Anthropology of Development
BTEC 502	(3)	Biotechnology Ethics and Society
CHEE 430	(3)	Technology Impact Assessment
CIVE 469	(3)	Infrastructure and Society
ECON 225	(3)	Economics of the Environment
ECON 347	(3)	Economics of Climate Change
ENVR 201	(3)	Society, Environment and Sustainability
GEOG 200	(3)	Geographical Perspectives: World Environmental Problems
GEOG 203	(3)	Environmental Systems
GEOG 205	(3)	Global Change: Past, Present and Future
GEOG 302	(3)	Environmental Management 1
MECH 526	(3)	Manufacturing and the Environment
MGPO 440*	(3)	Strategies for Sustainability
MIME 308	(3)	Social Impact of Technology
PHIL 343	(3)	Biomedical Ethics
RELG 270	(3)	Religious Ethics and the Environment
SOCI 235	(3)	Technology and Society
SOCI 312	(3)	Sociology of Work and Industry
URBP 201	(3)	Planning the 21st Century City

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

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

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

Anthropology (ANTH)

Economics (any 200- or 300-level course excluding ECON 217, ECON 227, and ECON 337)

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

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

Religious Studies (RELG)

School of Social Work (SWRK)

Sociology (excluding SOCI 350)

OR one of the following:

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

MGCR 352*	(3)	Marketing Management 1
ORGB 321*	(3)	Leadership
ORGB 423*	(3)	Human Resources Management

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

Language Courses

If you are not proficient in a certain language, no more than 3 credits will be given for one 6-credit course at the 100- le

ECSE 221	(3)	Introduction to Computer Engineering
ECSE 321	(3)	Introduction to Software Engineering
ECSE 322	(3)	Computer Engineering
ECSE 420	(3)	Parallel Computing
ECSE 427	(3)	Operating Systems
ECSE 428	(3)	Software Engineering Practice
ECSE 429	(3)	Software Validation
ECSE 456	(3)	ECSE Design Project 1
ECSE 457	(3)	ECSE Design Project 2
FACC 100*	(1)	Introduction to the Engineering Profession
FACC 400	(1)	Engineering Professional Practice
MATH 262	(3)	Intermediate Calculus
MATH 263	(3)	Ordinary Differential Equations for Engineers
MATH 264	(3)	Advanced Calculus for Engineers
MATH 270	(3)	Applied Linear Algebra
MATH 363	(3)	Discrete Mathematics

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

Engineering Breadth Required Courses

23 credits

CCOM 206	(3)	Communication in Engineering
ECSE 200	(3)	Electric Circuits 1
ECSE 210	(3)	Electric Circuits 2
ECSE 291	(2)	Electrical Measurements Laboratory
		Probabilit91

Not all courses listed are offered in a given year. See the "Courses" section of this publication to know if a course is offered.

List A

3-4 credits from the following:

COMP 330	(3)	Theoretical Aspects: Computer Science
COMP 350	(3)	Numerical Computing
COMP 409	(3)	Concurrent Programming
COMP 424	(3)	Artificial Intelligence
COMP 520	(4)	Compiler Design
COMP 535*	(3)	Computer Networks 1
COMP 557**	(3)	Fundamentals of Computer Graphics
COMP 566	(3)	Discrete Optimization 1
COMP 575	(3)	Fundamentals of Distributed Algorithms
ECSE 404	(3)	Control Systems
ECSE 413	(3)	Communications Systems 2
ECSE 414*	(3)	Introduction to Telecommunication Networks
ECSE 421	(3)	Embedded Systems
ECSE 422	(3)	Fault Tolerant Computing
ECSE 504	(3)	Sampled Data Control
ECSE 529	(3)	Computer and Biological Vision
ECSE 532**	(3)	Computer Graphics

* Students choose either COMP 535 or ECSE 414.

** Students choose either COMP 557 or ECSE 532.

List B

6-8 credits from the following:

ECSE 323	(5)	Digital System Design
ECSE 411	(3)	Communications Systems 1
ECSE 412	(3)	Discrete Time Signal Processing
ECSE 424	(3)	Human-Computer Interaction
ECSE 425	(3)	Computer Organization and Architecture
ECSE 426	(3)	Microprocessor Systems
ECSE 530	(3)	Logic Synthesis

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
CHEE 430	(3)	Technology Impact Assessment
CIVE 469	(3)	Infrastructure and Society
ECON 225	(3)	Economics of the Environment

ECON 347	(3)	Economics of Climate Change
ENVR 201	(3)	Society, Environment and Sustainability
GEOG 200	(3)	Geographical Perspectives: World Environmental Problems
GEOG 203	(3)	Environmental Systems
GEOG 205	(3)	Global Change: Past, Present and Future
GEOG 302	(3)	Environmental Management 1
MECH 526	(3)	Manufacturing and the Environment
MGPO 440*	(3)	Strategies for Sustainability
MIME 308	(3)	Social Impact of Technology
PHIL 343	(3)	Biomedical Ethics
RELG 270	(3)	Religious Ethics and the Environment
SOCI 235	(3)	Technology and Society
SOCI 312	(3)	Sociology of Work and Industry
URBP 201	(3)	Planning the 21st Century City

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

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

3 courses at the 200- level or higher from the following departments:

Anthropology (ANTH)

Economics (any 200- or 300-level course excluding ECON 217, ECON 227, and ECON 337)

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

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

Religious Studies (RELG)

School of Social Work (SWRK)

Sociology (excluding SOCI 350)

OR one of the following:

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

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

Language Courses

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

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

12.6 Department of Mechanical Engineering

Post-Retirement

P

Adjunct Professors/Course Lecturers

O.F. Bertrand

A. Segall

R. Sumner

12.6.4 Bachelor of Engineering (B.Eng.) - Mechanical Engineering (141 credits)

Program credit weight: 141-147 credits

Program credit weight for CEGEP students: 118 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 118-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/student/sao/newstudents and select your term of admission.

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

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

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

Required Non-Departmental Courses

33 credits

CCOM 206	(3)	Communication in Engineering
CIVE 207	(4)	Solid Mechanics
COMP 208	(3)	Computers in Engineering
ECSE 461	(3)	Electric Machinery
FACC 100	(1)	Introduction to the Engineering Profession
FACC 400	(1)	Engineering Professional Practice
MATH 262	(3)	Intermediate Calculus
MATH 263	(3)	Ordinary Differential Equations for Engineers
MATH 264	(3)	Advanced Calculus for Engineers
MATH 271	(3)	Linear Algebra and Partial Differential Equations
MIME 260	(3)	Materials Science and Engineering
MIME 310	(3)	Engineering Economy

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

Required Mechanical Engineering Courses

64 credits

MECH 201	(2)	Introduction to Mechanical Engineering
MECH 210	(2)	Mechanics 1
MECH 220	(4)	Mechanics 2
MECH 240	(3)	Thermodynamics 1
MECH 260	(2)	Machine Tool Laboratory
MECH 262	(3)	Statistics and Measurement Laboratory
MECH 289	(3)	Design Graphics
MECH 292	(3)	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 362	(2)	Mechanical Laboratory 1
MECH 383	(3)	Applied Electronics and Instrumentation
MECH 393	(3)	Machine Element Design
MECH 412	(3)	Dynamics of Systems
MECH 430	(3)	Fluid Mechanics 2
MECH 463D1	(3)	Mechanical Engineering Project
MECH 463D2	(3)	Mechanical Engineering Project

Complementary Courses

15 credits

6 credits at the 300- level or higher, chosen from Mechanical Engineering courses (subject code MECH). One of these tw

MECH 563*	(3)	Biofluids and Cardiovascular Mechanics
MECH 573	(3)	Mechanics of Robotic Systems
MECH 577	(3)	Optimum Design
MECH 593	(3)	Design Theory and Methodology

* 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
CHEE 430	(3)	Technology Impact Assessment
CIVE 469	(3)	Infrastructure and Society
ECON 225	(3)	Economics of the Environment
ECON 347	(3)	Economics of Climate Change
ENVR 201	(3)	Society, Environment and Sustainability
GEOG 200	(3)	Geographical Perspectives: World Environmental Problems
GEOG 203	(3)	Environmental Systems
GEOG 205	(3)	Global Change: Past, Present and Future
GEOG 302	(3)	Environmental Management 1
MECH 526	(3)	Manufacturing and the Environment
MGPO 440*	(3)	Strategies for Sustainability
MIME 308	(3)	Social Impact of Technology
PHIL 343	(3)	Biomedical Ethics
RELG 270	(3)	Religious Ethics and the Environment
SOCI 235	(3)	Technology and Society
SOCI 312	(3)	Sociology of Work and Industry
URBP 201	(3)	Planning the 21st Century City

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

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

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

Anthropology (ANTH)

Economics (any 200- or 300-level course excluding ECON 217, ECON 227 and ECON 337)

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

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

Religious Studies (RELG)

School of Social Work (SWRK)

Sociology (excluding SOCI 350)

OR one of the following:

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

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

Language Courses

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

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

Elective Courses

0-6 credits

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

Desautels Faculty of Management

Faculty of Agricultural and Environmental Sciences

Faculty of Arts

Faculty of Engineering

Faculty of Religious Studies

Faculty of Science

Schulich School of Music

Typical Program of Study

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

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

For all minors and concentrations, students should complete a Course Authorization Form, available from the Student Affairs Office (Engineering Student Centre) 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 (112 credits)

Program credit weight: 141-147 credits

Program credit weight for CEGEP students: 118 credits

To prepare the mechanical engineer for a wide range of career possibil7lTjvr1j143the mechanicr 94c0g12credits)

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 118-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/student/sao/newstudents and select your term of admission.

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

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

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

Required Non-Departmental Courses

27 credits

CCOM 206	(3)	Communication in Engineering
CIVE 207	(4)	Solid Mechanics
COMP 208	(3)	Computers in Engineering
FACC 100*	(1)	Introduction to the Engineering Profession
FACC 400	(1)	Engineering Professional Practice
MATH 262	(3)	Intermediate Calculus
MATH 263	(3)	Ordinary Differential Equations for Engineers
MATH 264	(3)	Advanced Calculus for Engineers
MATH 271	(3)	Linear Algebra and Partial Differential Equations
MIME 310	(3)	Engineering Economy

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

Required Mechanical Engineering Courses

61 credits

MECH 201	(2)	Introduction to Mechanical Engineering
MECH 210	(2)	Mechanics 1
MECH 220	(4)	Mechanics 2
MECH 240	(3)	Thermodynamics 1
MECH 260	(2)	Machine Tool Laboratory
MECH 262	(3)	Statistics and Measurement Laboratory
MECH 289	(3)	Design Graphics
MECH 292	(3)	Conceptual Design
MECH 309	(3)	Numerical Methods in Mechanical Engineering

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

* Note: Management courses have limited enrolment and reggg

Required Courses

6 credits

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

Complementary Courses

9-10 credits from the following:

ARCH 515	(3)	Sustainable Design
CHEE 453	(4)	Process Design
MECH 497	(3)	Value Engineering
MECH 526	(3)	Manufacturing and the Environment
MECH 528	(3)	Product Design
MECH 530	(3)	Mechanics of Composite Materials
MECH 541	(3)	Kinematic Synthesis
MECH 543	(3)	Design with Composite Materials
MECH 554	(3)	Microprocessors for Mechanical Systems
MECH 557	(3)	Mechatronic Design
MECH 565	(3)	Fluid Flow and Heat Transfer Equipment
MECH 576	(3)	Geometry in Mechanics
MECH 577	(3)	Optimum Design
MECH 579	(3)	Multidisciplinary Design Optimization
		Design

MECH 541	(3)	Kinematic Synthesis
MECH 543	(3)	Design with Composite Materials
MECH 554	(3)	Microprocessors for Mechanical Systems
MECH 557	(3)	Mechatronic Design
MECH 565	(3)	Fluid Flow and Heat Transfer Equipment
MECH 576	(3)	Geometry in Mechanics
MECH 577	(3)	Optimum Design
MECH 579	(3)	Multidisciplinary Design Optimization
MECH 593	(3)	Design Theory and Methodology

12.6.10 Bachelor of Engineering (B.Eng.) - Mechanical Engineering - Mechatronics (18 credits)

Not offered until further notice.

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

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

Required Courses

12 credits

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

Complementary Courses

6 credits from the following:

MECH 528	(3)	Product Design
MECH 541	(3)	Kinematic Synthesis
MECH 573	(3)	Mechanics of Robotic Systems
MECH 576	(3)	Geometry in Mechanics

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

Not offered until further notice.

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

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

Required Courses

12 credits

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

Complementary Courses

6 credits from the following:

MECH 528	(3)	Product Design
MECH 541	(3)	Kinematic Synthesis
MECH 573	(3)	Mechanics of Robotic Systems
MECH 576	(3)	Geometry in Mechanics

12.7 Department of Mining and Materials Engineering

12.7.1 Location

General Office:
Wong Building, Room 2140
3610 University Street
Montreal, Quebec H3A 2B2

Website: *www.mcgill.ca/minmat*

Materials

Wong Building, Room 2140
3610 University Street
Montreal, Quebec H3A 2B2
Telephone: 514-398-1040
Fax: 514-398-4492
Email: *coordinator.minmat@mcgill.ca*

Mining

Frank Dawson Adams Building, Room 125
3450 University Street
Montreal, Quebec H3A 2A7
Telephone: 514-398-2215
Fax: 514-398-7099
Email: *admin.mining@mcgill.ca*

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:

section 12.7.3.1.3: Bachelor of Engineering (B.Eng.) - Materials Engineering CO-OP (147 credits)
section 12.7.3.2.3: Bachelor of Engineering (B.Eng.) - Mining Engineering CO-OP (149 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.

12.7.3 Department of Mining and Materials Engineering Faculty

Chair

Stephen Yue

Associate Chair, Student Affairs

Frank Mucciardi6 0.8431 rg0.9804 0.9216 0.8431 RGET67.52 646.828 m67.52 6T67.52 646. 6T67.52 646. 6T67.52 646. 6T67.52oh4r1.10/F3 8.1 Tf1r1.10/F3 8.1 Tf

Senior Associate and Adviser

Michael Avedesian; B.Eng.(McG.), Ph.D.(Camb.), Eng.

Faculty Lecturer

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

Course Lecturers

Raad Jassim

John Mossop

Adjunct Professors

Martin Bureau

Robin A.L. Drew

Daryoush Emadi

Elhachmi Essadiqi

Carlton Fuerst

Bryn Harris

Ahmad Hemami

Eric Lifshin

Serge Vézina

Affiliated Member

Angelina Mehta

Co-op Program Liaison Officers

Teresa Barrett (Mining)

Genevieve Snider (Materials)

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

Students entering this program must plan their schedule of studies in consultation with the 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 118- to 119-credit program.

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

29 credits

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

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

Required Materials Engineering Courses

70-71 credits

ECSE 461*	(3)	Electric Machinery
MIME 209	(3)	Mathematical Applications
MIME 212	(3)	Engineering Thermodynamics
MIME 250	(3)	Introduction to Extractive Metallurgy
MIME 261	(3)	Structure of Materials
MIME 280	(2)	Industrial Training 1
MIME 310	(3)	Engineering Economy

MIME 3113) (3) Modelling and Automatic Control

MIME 564	(3)	X-Ray Diffraction Analysis of Materials
MIME 565	(3)	Aerospace Metallic-Materials and Manufacturing Processes
MIME 566	(3)	Texture, Structure & Properties of Polycrystalline Materials
MIME 568	(3)	Topics in Advanced Materials
MIME 569	(3)	Electron Beam Analysis of Materials
MIME 571	(3)	Surface Engineering
MIME 572	(3)	Computational Thermodynamics

0-3 credits from the following:

BMDE 504	(3)	Biomaterials and Bioperformance
CHEM 574	(3)	Introductory Polymer Chemistry
CHEM 585	(3)	Colloid Chemistry
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
CHEE 430	(3)	Technology Impact Assessment
CIVE 469	(3)	Infrastructure and Society
ECON 225	(3)	Economics of the Environment
ECON 347	(3)	Economics of Climate Change
ENVR 201	(3)	Society, Environment and Sustainability
GEOG 200	(3)	Geographical Perspectives: World Environmental Problems
GEOG 203	(3)	Environmental Systems
GEOG 205	(3)	Global Change: Past, Present and Future
GEOG 302	(3)	Environmental Management 1
MECH 526	(3)	Manufacturing and the Environment
	(3)	Strategies for Sustainability

Economics (any 200- or 300-level course excluding ECON 217, ECON 227, and ECON 337)

History (HIST)

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

Psychology (e

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

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

Required Year 0 (Freshman) Courses

29 credits

Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credit for these Year 0 (Freshman) courses and enter a 120- to 122-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/student/sao/newstudents 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

31 credits

CCOM 206	(3)	Communication in Engineering
CIVE 205	(3)	Statics
CIVE 207	(4)	Solid Mechanics
COMP 208	(3)	Computers in Engineering
EPSC 221	(3)	General Geology
EPSC 225	(1)	Properties of Minerals
FACC 100*	(1)	Introduction to the Engineering Profession
FACC 400	(1)	Engineering Professional Practice
MATH 262	(3)	Intermediate Calculus
MATH 263	(3)	Ordinary Differential Equations for Engineers
MATH 264	(3)	Advanced Calculus for Engineers
MECH 289	(3)	Design Graphics

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

Required Mining Engineering Courses

72-73 credits

ECSE 461*	(3)	Electric Machinery
MIME 200	(3)	Introduction to the Minerals Industry
MIME 203	(2)	Mine Surveying
MIME 209	(3)	Mathematical Applications
MIME 260	(3)	Materials Science and Engineering
MIME 290	(2)	Industrial Work Period 1

MIME 291	(2)	Industrial Work Period 2
MIME 310	(3)	Engineering Economy
MIME 322	(3)	Rock Fragmentation
MIME 323	(3)	Rock and Soil Mass Characterization
MIME 325	(3)	Mineral Industry Economics
MIME 333	(3)	Materials Handling
MIME 337*	(2)	Electrotechnology
MIME 340	(3)	Applied Fluid Dynamics
MIME 341	(3)	Introduction to Mineral Processing
MIME 392	(2)	Industrial Work Period 3
MIME 419	(3)	Surface Mining
MIME 420	(3)	Feasibility Study
MIME 422	(3)	Mine Ventilation
MIME 426	(3)	Development and Services
MIME 484	(3)	Mining Project
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

* Students choose either MIME 337 or ECSE 461

** Mining courses taken at École Polytechnique

Complementary Courses

11-12 credits of departmental complementary courses, selected from Stream A or Stream B, as described below.

Stream A

11 credits

MIME 494	(2)	Industrial Work Period 4

and 9 credits from the Technical Complementaries list below

OR

Stream B

6 credits

MIME 350	(3)	Extractive Metallurgical Engineering
MIME 544	(3)	Analysis: Mineral Processing Systems 1

and 6 credits from the Technical Complementaries list below

Technical Complementaries

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

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

MIME 320	(3)	Extraction of Energy Resources
MIME 442	(3)	Analysis, Modelling and Optimization in Mineral Processing

MIME 513	(3)	Mine Planning Optimization Under Uncertainty
MIME 520	(3)	Stability of Rock Slopes
MIME 521	(3)	Stability of Underground Openings
MIME 525	(3)	Stochastic Orebody Modelling
MIME 526	(3)	Mineral Economics
MIME 527	(3)	Selected Topics in Mineral Resource Engineering
MIME 528	(3)	Mining Automation
MIME 544	(3)	Analysis: Mineral Processing Systems 1
MIME 545	(3)	Analysis: Mineral Processing Systems 2
MPMC 320*	(3)	CAO et informatique pour les mines
MPMC 327*	(3)	Hydrogéologie appliquée

* Mining courses taken at École Polytechnique

Complementary Studies

6 credits

Group A - Impact of Technology on Society

3 credits from the following:

ANTH 212	(3)	Anthropology of Development
BTEC 502	(3)	Biotechnology Ethics and Society
CHEE 430	(3)	Technology Impact Assessment
CIVE 469	(3)	Infrastructure and Society
ECON 225	(3)	Economics of the Environment
ECON 347	(3)	Economics of Climate Change
ENVR 201	(3)	Society, Environment and Sustainability
GEOG 200	(3)	Geographical Perspectives: World Environmental Problems
GEOG 203	(3)	Environmental Systems
GEOG 205	(3)	Global Change: Past, Present and Future

Philosophy (excluding PHIL 210 and PHIL 310)

Political Science (POLI)

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

Religious Studies (RELG)

School of Social Work (SWRK)

Sociology (e

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

McGill University was the first institution in Canada to offer a full-time planning program. An interdisciplinary program was established in 1947, in which students combined a Master's degree in Urban Planning with one in a related field. An autonomous program was established in 1972. It became the School of Urban Planning in 1976, a unit within the Faculty of Engineering. It has strong links with the School of Architecture, which is housed in the same building.

Students come to the School from diverse backgrounds, the physical sciences, the traditional professions, such as architecture and engineering, and the social sciences. Alumni of the School work as planners and designers at various levels of government, in non-profit organizations, and with private consulting

Emerita Professor

Jane Matthews-Glenn; B.A., LL.B.(Qu.), D. en droit(Strasbourg)

Associate Professors

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

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

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

Raphaël Fischler; B.Eng.(V. Tech. Eindhoven), M.S. Arch.S., M.C.P.(MIT), Ph.D.(Calif., Berk.)

Assistant Professors

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

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

Instructors

Heather Braiden; B.E.S.(Wat.), M.L.Arch.(Tor.)

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

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Fax: 514-398-8387
Website: *www.mcgill.ca/bioeng*

12.9.2 Department of Biomedical Engineering

Lyman Duff Medical Sciences Building
3775 University Street
Montreal, Quebec H3A 2B4
Telephone: 514-398-6736
Website: *www.bmed.mcgill.ca*

Some of the courses offered by the Department of Biomedical Engineering (subject code BMDE) may be of interest to Engineering students, and may be approved as complementary courses. The Faculty of Engineering also offers a Minor in Biomedical Engineering; for more information, see *section 12.10.2.1: Bachelor of Engineering (B.Eng.) - Minor Biomedical Engineering (21 credits)*.

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., B.S.E., or B.Sc.(Arch.) degree. Minors normally consist of 18-24 credits, allowing 9-12 credits of overlap with the degree program. The real credit cost to the student is typically 9-15 credits, representing one term beyond the B.Eng., B.S.E., 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 department adviser. Departments also publish information regarding the choice of courses in this publication and in separate documents.

Note: Students are also permitted to register for minor concentrations offered by departments in the Faculty of Arts. Students must obtain approval from both the department in the Faculty of Arts and from the Engineering Student Centre Student Affairs Office (Frank Dawson Adams, Room 22), before registering in one of these minors.

Minor Programs:

- *section 12.10.1: Arts Minor*
- *section 12.10.2: Biomedical Engineering Minor*
- *section 12.10.3: Biotechnology Minor*
- *section 12.10.4: Chemistry Minor*
- *section 12.10.5: Computer Science Courses and Minor Program*
- *section 12.10.6: Construction Engineering and Management Minor*
- *section 12.10.7: Economics Minor*
- *section 12.10.8: Environmental Engineering Minor*
- *section 12.10.9: Minor in Environment*
- *section 12.10.10: Minor Programs in Finance, Management, Marketing, and Operations Management*
- *section 12.10.11: Materials Engineering Minor*
- *section 12.10.12: Mathematics Minor*
- *section 12.10.13: Mining Engineering Minor*
- *section 12.10.14: Physics Minor*
- *section 12.10.15: Software Engineering Minor*
- *section 12.10.16: Technological Entrepreneurship Minor*

12.10.1 Arts Minor

The Arts Minor is open to B.Sc.(Arch.), B.Eng., and B.S.E. students. In this Minor, students choose courses from two areas of concentration in the Faculty of Arts, approved by a Faculty Adviser in the Student Affairs Office, Engineering Student Centre, or by the Senior Faculty Adviser in the Faculty of Arts. B.Eng. and B.S.E. students may count some of their Complementary Studies courses toward this Minor.

Minor Adviser: Faculty Student Adviser in the Engineering Student Centre (Frank Dawson Adams, Room 22) OR Donald Sedgwick (Senior Faculty Adviser, Faculty of Arts)

12.10.1.1 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) OR Donald Sedgwick (Senior Faculty Adviser, Faculty of Arts)

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

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

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

Requirements

24 credits as follows:

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

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

In general, B.Eng. and B.S.E. 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.

12.10.2 Biomedical Engineering Minor

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; and neural systems and biosignal processing).

Minor Adviser: Prof. R. Leask (Wong Building, Room 4120) or Prof. R. Mongrain (Macdonald Engineering Building, Room 369)

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

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

Note: Open to all students in the Faculty of Engineering (including B.S.E. students).

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

Artificial Cells and Organs

BMDE 505	(3)	Cell and Tissue Engineering
CHEE 562	(3)	Engineering Principles in Physiological Systems
PHGY 311	(3)	Channels, Synapses & Hormones
PHGY 312	(3)	Respiratory, Renal, & Cardiovascular Physiology
PHGY 313	(3)	Blood, Gastrointestinal, & Immune Systems Physiology
PHGY 517	(3)	Artificial Internal Organs
PHGY 518	(3)	Artificial Cells

Bioinformatics, Genomics and Proteomics

ANAT 365*	(3)	Cellular Trafficking
ANAT 458	(3)	Membranes and Cellular Signaling
BIOC 311	(3)	Metabolic Biochemistry
BIOC 312	(3)	Biochemistry of Macromolecules
BIOC 458*	(3)	Membranes and Cellular Signaling
BMDE 506	(3)	Molecular Biology Techniques
COMP 302	(3)	Programming Languages and Paradigms
COMP 360	(3)	Algorithm Design Techniques
COMP 421	(3)	Database Systems
COMP 424	(3)	Artificial Intelligence
COMP 462	(3)	Computational Biology Methods
COMP 526	(3)	Probabilistic Reasoning and AI

* Students choose either ANAT 365 or BIOC 458

Biomaterials, Biosensors, and Nanotechnology

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

BMDE 503	(3)	Biomedical Instrumentation
CHEE 561	(3)	Introduction to Soft Tissue Biophysics
CHEE 563*	(3)	Biofluids and Cardiovascular Mechanics

MECH 315	(4)	Mechanics 3
MECH 321	(3)	Mechanics of Deformable Solids
MECH 530	(3)	Mechanics of Composite Materials
MECH 561	(3)	Biomechanics of Musculoskeletal Systems
MECH 563*	(3)	Biofluids and Cardiovascular Mechanics
MIME 360	(3)	Phase Transformations: Solids
MIME 362	(3)	Mechanical Properties

* Students choose either CHEE 563 or MECH 563.

Medical Physics and Imaging

BMDE 519	(3)	Biomedical Signals and Systems
COMP 302	(3)	Programming Languages and Paradigms
COMP 360	(3)	Algorithm Design Techniques
COMP 423	(3)	Data Compression
COMP 424	(3)	Artificial Intelligence
COMP 558	(3)	Fundamentals of Computer Vision
ECSE 303	(3)	Signals and Systems 1
ECSE 304	(3)	Signals and Systems 2
ECSE 412	(3)	Discrete Time Signal Processing
PHYS 557	(3)	Nuclear Physics

Neural Systems and Biosignal Processing

BMDE 501	(3)	Selected Topics in Biomedical Engineering
BMDE 502	(3)	BME Modelling and Identification
BMDE 503	(3)	Biomedical Instrumentation
BMDE 519	(3)	Biomedical Signals and Systems
ECSE 526	(3)	Artificial Intelligence
PHYS 413	(3)	Physical Basis of Physiology

Complementary Courses

0-6 credits

Up to 6 credits in the B.Eng., B.S.E., or B.Sc.(Arch.) program can also be credited to the Minor, with the permission of the Departmental Adviser and approval of the Minor Adviser. In particular, courses at the 200- level or higher that are prerequisites for certain specialization courses would be eligible, with permission of the Minor Adviser. By careful selection of complementary courses, the Minor can be satisfied with 9 additional credits in the student's major program or a maximum of 12 credits of overlap with the major program.

12.10.3 Biotechnology Minor

Biotechnology can be defined as the science of understanding, selecting, and promoting useful organisms and specific gene products for therapeutic purposes. It requires a broad comprehension of biology and engineering and detailed knowledge of at least one basic subject such as molecular genetics, protein chemistry, microbiology, or chemical engineering.

The Minor in Biotechnology, offered by the Faculties of Engineering and of Science, emphasizes an area relevant to biotechnology that is complementary to the student's main program. It is designed specifically for Chemical Engineering students; other Engineering students interested in taking this Minor should contact the Program Supervisor, Dr. Hugh Bennett (see below for contact information).

Students who are interested in this Minor should inform their academic adviser and the Program Supervisor in Year 1 and at the time of registration in Year 2. With the agreement of their academic adviser, students should submit their course list to the Program Supervisor, who will certify that the proposed program conforms to the requirements for the Minor.

The Biotechnology Minor is administered by the Faculty of Engineering Student Affairs Office, Engineering Student Centre, and by the Faculty of Science by Dr. Hugh Bennett, Program Supervisor.

Minor Adviser: Faculty Student Adviser in the Engineering Student Centre (Frank Dawson Adams Building, Room 22) OR Dr. Hugh Bennett (contact information below).

Dr. Hugh Bennett
Sheldon Biotechnology Centre
3773 University Street
Montreal, Quebec H3A 2B4
Telephone: 512-398-8083
Email: *hugh.bennett@mcgill.ca*

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

Minor Adviser: Prof. Hugh Bennett, Program Supervisor (Sheldon Biotechnology Centre, Lyman Duff Building) OR a faculty student adviser in the Engineering Student Centre (Frank Dawson Adams Building, Room 22).

This Minor is offered by the Faculties of Engineering and 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 one of the Minor advisers indicated above.

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	(4)	Introduction to Chemical Engineering
CHEE 204	(3)	Chemical Manufacturing Processes
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 MIME 310.

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

General

MIME 310	(3)	Engineering Economy

Immunology

ANAT 261	(4)	Introduction to Dynamic Histology
BIOC 503	(3)	Immunochemistry
MIMM 314	(3)	Immunology
MIMM 414	(3)	Advanced Immunology
PHGY 513	(3)	Cellular Immunology

Management

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

ECON 208	(3)	Microeconomic Analysis and Applications
MGCR 211	(3)	Introduction to Financial Accounting
MGCR 341	(3)	Finance 1
MGCR 352	(3)	Marketing Management 1
MGCR 472	(3)	Operations Management

Microbiology

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

Molecular Biology (Biology)

BIOL 300	(3)	Molecular Biology of the Gene
BIOL 314	(3)	Molecular Biology of Oncogenes
BIOL 520	(3)	Gene Activity in Development
BIOL 524	(3)	Topics in Molecular Biology
BIOL 551	(3)	Molecular Biology: Cell Cycle

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
BIOC 455	(3)	Neurochemistry

Physiology

EXMD 401	(3)	Physiology and Biochemistry Endocrine Systems
EXMD 502	(3)	Advanced Endocrinology 01
EXMD 503	(3)	Advanced Endocrinology 02
PHAR 562	(3)	General Pharmacology 1
PHAR 563	(3)	General Pharmacology 2
PHGY 517	(3)	Artificial Internal Organs
PHGY 518	(3)	Artificial Cells

Pollution

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

CIVE 225	(4)	Environmental Engineering
CIVE 430	(3)	Water Treatment and Pollution Control
CIVE 553	(3)	Stream Pollution and Control

12.10.4 Chemistry Minor

The Departments of Chemistry and Chemical Engineering offer this Chemistry Minor, of particular interest to Chemical Engineering students, and a Chemical Engineering Minor, of interest to Chemistry students (described in the *Faculty of Science* section of this publication (see Chemistry programs)). Students taking the Chemistry Minor complete 10 credits of required courses in physical and organic chemistry, and choose an additional 15 credits of complementary courses from the areas of inorganic, analytical, organic, and physical chemistry.

Minor Adviser (program coordinator): Dr. Gonzalo Cosa (Chemistry)

For more information about the Chemical Engineering Minor, see Prof. David Cooper (Chemical Engineering).

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

Minor Adviser (program coordinator): Dr. Gonzalo Cosa (Department of Chemistry)

Program credit weight: 25 credits

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

Required Courses

Inorganic Chemistry

Minor Adviser: Students interested in this Minor should see Liette Chin, Undergraduate Program Coordinator, in the School of Computer Science (Lorne Trottier Building, Room 2070) to obtain the appropriate forms, and should see both the Minor Adviser in Computer Science and their department adviser for approval of their course selection. Forms must be submitted and approved before the end of the Course Change (drop/add) period of the student's final term.

Note: This Minor is open to B.Eng., B.S.E., and B.Sc.(Arch.) students in Engineering.

12.10.6 Construction Engineering and Management Minor

Students taking the Minor in Construction Engineering and Management complete 15 credits of required courses in management and law. Students choose complementary courses from the areas of either building structures or heavy construction, and from other construction- and management-related courses.

This Minor is particularly designed for Civil Engineering students.

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

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

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

Minor program credit weight: 24-25 credits

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

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

Prerequisites

CIVE 208	(3)	Civil Engineering System Analysis
CIVE 302	(3)	Probabilistic Systems
COMP 208	(3)	Computers in Engineering
MIME 310	(3)	Engineering Economy

Required Courses: Management and Law

15 credits

CIVE 324	(3)	Construction 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)	Finance 1

Complementary Courses

3-4 credits (4 credits from List A OR 3 credits from List B)

List A - Building Structures

4 credits from the following:

ARCH 447	(2)	Lighting
ARCH 451	(2)	Building Regulations and Safety
ARCH 554	(2)	Mechanical Services
CIVE 492	(2)	Structures

OR

List B84 36AS0 0 1 2j1.195..52 167.724 vyinor Construc(OR)Tj1 0 0 1 67.53.133.744 3m(4 credits from the follo)Tj1 0 0 1 142..53.133.744 Tm(wing:)Tj1 0 0 1 221.1

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

* Course offered in French at École Polytechnique in Montreal

12.10.7 Economics 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 publication, unless they have obtained permission from the Faculty of Engineering.

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

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

Minor Adviser: Faculty Student Adviser in the Engineering Student Centre (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, MIME 310, 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 publication, unless they have obtained permission from the Faculty of Engineering.

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

Required Courses

9 credits

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

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

** Students may, with consent of 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 305	(3)	Industrial Organization
ECON 308	(3)	Governmental Policy Towards Business
ECON 311	(3)	United States Economic Development
ECON 313	(3)	Economic Development 1
ECON 314	(3)	Economic Development 2
ECON 316	(3)	The Underground Economy
ECON 326	(3)	Ecological Economics
ECON 329	(3)	Economics of Confederation

ECON 330D1	(3)	Macroeconomic Theory
ECON 330D2	(3)	Macroeconomic Theory
ECON 331	(3)	Economic Development: Russia and USSR
ECON 335	(3)	The Japanese Economy
ECON 337	(3)	Introductory Econometrics 1
ECON 344	(3)	The International Economy 1830-1914
ECON 345	(3)	The International Economy since 1914
ECON 347	(3)	Economics of Climate Change
ECON 348	(3)	Urban Economics
ECON 404	(3)	Transportation
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 447	(3)	Economics of Information and Uncertainty
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.

12.10.8 Environmental Engineering Minor

The Environmental Engineering Minor is offered for students in Engineering and in the Department of Bioresource Engineering wishing to pursue studies in this area. Students completing this Minor take an introductory course in environmental engineering, bio-environmental engineering, or environmental aspects of technology, then choose from a wide v1 8.1 Tf1 0 0 (e1 sEmester1 8.0Tc01 67.52 262.221m(78)Tj1 0103h 0 0 1 165.86 477.041m(78)Tj1 0 0 1 226.769(E5

To complete the Minor in Environmental Engineering, students must obtain a grade of C or better in all approved courses in the Minor

AEBI 427	(6)	Barbados Interdisciplinary Project

AND

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

Engineering Course List

Courses offered at the Macdonald campus:

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

Courses offered at the Downtown campus:

ARCH 377	(3)	Energy, Environment and Buildings
CHEE 351	(3)	Separation Processes
CHEE 370	(3)	Elements of Biotechnology
CHEE 496	(3)	Environmental Research Project
CHEE 591	(3)	Environmental Bioremediation
CHEE 592	(3)	Industrial Air Pollution Control
CHEE 593	(3)	Industrial Water Pollution Control
CIVE 225	(4)	Environmental Engineering
CIVE 323	(3)	Hydrology and Water Resources
CIVE 421	(3)	Municipal Systems
CIVE 428	(3)	Water Resources and Hydraulic Engineering
CIVE 430	(3)	Water Treatment and Pollution Control
CIVE 451	(3)	Geoenvironmental Engineering
CIVE 550	(3)	Water Resources Management
CIVE 555	(3)	Environmental Data Analysis
CIVE 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)	Groundwater Engineering
MECH 447	(3)	Combustion
MECH 526	(3)	Manufacturing and the Environment
MECH 534	(3)	Air Pollution Engineering
MECH 535	(3)	Turbomachinery and Propulsion
MIME 422	(3)	Mine Ventilation
MIME 512	(3)	Corrosion and Degradation of Materials
MPMC 328	(3)	Environnement et gestion des rejets miniers
URBP 506	(3)	Environmental Policy and Planning

Non-Engineering Course List

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

Prerequisite: None

Management Minors Adviser: Students considering one of these minor programs should consult a Faculty Student Adviser in the Engineering Student Centre (Frank Dawson Adams Building, Room 22) or an adviser in 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.

Courses are available, subject to timetable requirements, from the core program of the Desautels Faculty of Management. Some courses from the Management core program have considerable overlap with Engineering courses and thus are not available to Engineering students.

A student embarking on a minor must be prepared to take credits additional to their Engineering program. Students in a B.Eng. or B.S.E. 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 the B.Eng./B.S.E. program section.

Students must have a CGPA of 3.0 or better to be considered for one of these Minor programs.

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.

Detailed information on these Minor programs can be found in the *Desautels Faculty of Management* section of this publication (see *Minors for Non-Management Students*).

Further information can also be found at

MIME 560	(3)	Joining Processes
MIME 561	(3)	Advanced Materials Design
MIME 563	(3)	Hot Deformation of Metals
MIME 566	(3)	Texture, Structure & Properties of Polycrystalline Materials
MIME 569	(3)	Electron Beam Analysis of Materials

12.10.12 Mathematics Minor

Students in the Minor in Mathematics for Engineering students complete 18 credits of Mathematics courses (subject code MATH), not including Mathematics courses that are required in their Engineering program (or equivalent courses), and choose 6 credits from other Mathematics-related courses.

Minor Adviser: Faculty Student Adviser in the Engineering Student Centre (Frank Dawson Adams Building, Room 22) AND an adviser designated by the Department of Mathematics and Statistics, normally beginning in Year 2 (please consult the Department of Mathematics and Statistics for this adviser). Course selection for this Minor must be done in conjunction with the Minor advisers.

12.10.12.1 Bachelor of Engineering (B.Eng.) - Minor Mathematics (24 credits)

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

Note: The Mathematics Minor is open to all students in the Faculty of Engineering (B.Eng., B.S.E., and B.Sc.(Arch.)).

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

Course Selection

At least 18 credits must be chosen from the Mathematics and Statistics courses approved for the Mathematics Major or Honours program, or from the following courses:

MATH 249	(3)	Honours Complex Variables
MATH 363	(3)	Discrete Mathematics
MATH 381	(3)	Complex Variables and Transforms

The remaining credits may be chosen from mathematically-allied courses.

The following courses cannot be used toward the Minor:

MATH 222	(3)	Calculus 3
MATH 223	(3)	Linear Algebra
MATH 247	(3)	Honours Applied Linear Algebra
MATH 248	(3)	Honours Advanced Calculus
MATH 262	(3)	Intermediate Calculus
MATH 263	(3)	Ordinary Differential Equations for Engineers
MATH 264	(3)	Advanced Calculus for Engineers
MATH 270	(3)	Applied Linear Algebra
MATH 271	(3)	Linear Algebra and Partial Differential Equations
MATH 314	(3)	Advanced Calculus
MATH 315	(3)	Ordinary Differential Equations
MATH 319	(3)	Introduction to Partial Differential Equations
MATH 325	(3)	Honours Ordinary Differential Equations

12.10.13 Mining Engineering Minor

Students taking the Mining Engineering Minor complete 12 credits of required courses in mining engineering, including an introduction to the minerals industry, courses in mining science and technology, rock fragmentation and materials handling, and an industrial work term. Students choose 12 credits from mining-related courses within the Departments of Mining and Materials Engineering, Mechanical Engineering, Ci

MECH 577	(3)	Optimum Design

List C: Civil Engineering

0-6 credits from the following:

CIVE 416	(3)	Geotechnical Engineering
CIVE 451	(3)	Geoenvironmental Engineering
CIVE 462	(3)	Design of Steel Structures
CIVE 463	(3)	Design of Concrete Structures
		Renovation and Preserv

PHYS 567	(3)	Particle Physics

12.10.15 Software Engineering Minor

This Minor will prepare an engineering student for a career in software engineering. It will provide a foundation in basic computer science, computer programming, and software engineering practice.

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

12.10.15.1 Bachelor of Engineering (B.Eng.) - Minor Software Engineering (24 credits)

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

The Software Engineering Minor will prepare an engineering student for a career in software engineering. It will provide a foundation in basic computer

MECH 539	(3)	Computational Aerodynamics
MECH 545	(3)	Advanced Stress Analysis
MECH 576	(3)	Geometry in Mechanics

Computer Science Courses

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

COMP 302	(3)	Programming Languages and Paradigms
COMP 335	(3)	Software Engineering Methods
COMP 421	(3)	Database Systems
	(3)	Artificial Intelligence