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

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8.1 The Faculty

8.1.1 Location

Macdonald Engineering Building
817 Sherbrooke Street West
Montreal, QC H3A 2K6
Canada

Website: www.mcgill.ca/engineering

Faculty of Engineering Student Affairs Office:
Macdonald Engineering Building, Room 378
Telephone: (514)398-7257

8.1.2 Administrative Officers

John E. Gruzleskl; B.Sc., M.Sc.(Queen's), Ph.D.(Tor.), Eng. **Dean**

Jim Nicell; B.A.Sc., M.A.Sc., Ph.D.(Windsor), P.Eng. **Associate Dean (Student Affairs)**

David L. Frost; B.A.Sc.(U.B.C.), M.S., Ph.D.(Caltech), P.Eng. **Associate Dean (Academic)**

Frank Ferrie; B.Eng., Ph.D.(McG.) **Associate Dean (Research)**

David Covo; B.Sc.(Arch.), B.Arch.(McG.), M.R.A.I.C., O.A.Q. **Director, School of Architecture**

David F. Brown; B.A.(Bishop's), M.U.P.(McG.), Ph.D. (Sheffield) **Director, School of Urban Planning**

Dimitrios Berk; B.Sc.(Bosphorus), M.E.Sc.(W.Ont.), Ph.D.(Calg.), P.Eng. **Chair, Department of Chemical Engineering**

Denis Mitchell; B.A.Sc., M.A.Sc., Ph.D.(Tor.), F.A.C.I., Eng. **Chair, Department of Civil Engineering and AppliedMechanics**

David A. Lowther; B.Sc.(London), Ph.D.(C.N.A.A.), P.Eng. **Chair, Department of Electrical and ComputerEngineering**

Arun K. Misra; B.Tech.(I.I.T., Kharagpur), Ph.D.(U.B.C.), P. Eng. **Chair, Department of Mechanical Engineering**

Robin A.L. Drew; B.Tech.(Bradford), Ph.D.(Newcastle) **Chair, Department of Mining, Metals and MaterialsEngineering**

Jonathan Rousham **BuildingAdministrator**

Steve Yue; B.Sc., Ph.D.(Leeds) **Secretary of Faculty**

Tania Chomyk **Assistant to the Dean**

Enza De Martinis **Financial Officer**

Judy Pharo **Senior Faculty Student Adviser**

Lesley Morin **Records Student Affairs Officer**

Debbie Morzajew **Manager, EMF**

Susie Vodopivec **Banner SIS Trainer**

8.1.3 Historical Note

The Faculty of Engineering began in 1871 as the Department of Practical and Applied Science in the Faculty of Arts with degree programs in Civil Engineering and Surveying, Mining Engineering and Assaying, and Practical Chemistry.

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

8.1.4 The Faculty Today

The Faculty currently includes five engineering departments and two schools:

The Departments

Chemical Engineering
Civil Engineering and Applied Mechanics
Electrical and Computer Engineering
Mechanical Engineering
Mining, Metals and Materials Engineering

The Schools

Architecture
Urban Planning

The Faculty serves approximately 2,300 undergraduate students and 700 graduate students in a wide variety of academic programs.

Undergraduate programs leading to professional bachelor degrees are offered in all Engineering Departments. These programs are designed to qualify the graduates for immediate employment in a wide range of industries and for membership in the appropriate professional bodies. Additionally, a non-professional undergraduate degree is offered in the School of Architecture for those who plan to work in related fields not requiring professional qualification. The curricula are structured to provide suitable preparation for those who plan to continue their education in postgraduate studies either at McGill or elsewhere. The professional degrees in Architecture and Urban Planning are offered at the Master's level and are described in the *Graduate and Postdoctoral Studies Calendar*.

The academic programs are divided into required and complementary sections. The required courses emphasize those basic principles which permit graduates to keep abreast of progress in technology throughout their careers. Exposure to current technology is provided by the wide variety of complementary courses which allow students to pursue in depth a particular interest. For program details refer to section 8.4 "Academic Programs".

An internship program involving a paid 8- to 16-month industrial work experience is available to Engineering and Science students. Generally, students will enter the internship program before starting their final year of undergraduate studies. Details can be found in see section 8.2.8 "IYES: Internship Year for Engineering and Science". In addition, CO-OP programs are offered in Mining Engineering and in Metals and Materials Engineering.

Postgraduate programs leading to Master's and doctoral degrees are offered in all sectors of the Faculty. Numerous areas of specialization are available in each of the departments and schools. All postgraduate programs, including the professional degree programs in Architecture and in Urban Planning are described in the *Graduate and Postdoctoral Studies Calendar*.

8.1.5 Special Facilities and Related Programs

8.1.5.1 Engineering Microcomputing Facility

In addition to the services provided by the Computing Centre, the Faculty, in conjunction with its departments and schools, maintains specialized computing and information resources in support of teaching and research. These vary from desktop PCs distributed throughout the Engineering complex to very high performance scientific workstations found in the research laboratories. Each unit organizes and maintains facilities that are designed around specific roles, e.g., CAD/CAM, microelectronic design, software engineering, circuit simulation, process control, polymers, structural mechanics, metal processing, etc., in addition to systems dedicated to administrative support.

The role of the Faculty is to provide access to computing resources on a 24-hour basis and to provide services that are not covered by individual units. The Faculty works in close cooperation with the McGill Computing Centre, which provides remote access to the Faculty network.

8.1.5.2 Bioresource Engineering

The Faculty of Engineering cooperates with the Faculty of Agricultural and Environmental Sciences in providing courses of instruction for a curriculum in agricultural and biosystems engineering to meet requirements for a professional degree awarded in the Faculty of Agricultural and Environmental Sciences. The second term of the penultimate year of the program is given by the Faculty of Engineering on the downtown campus. For details of the curriculum, see section 13.6.3 "Department of Bioresource Engineering".

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

8.1.5.3 Department of Biomedical Engineering

Lyman Duff Medical Sciences Building
3775 University Street
Montreal, QC H3A 2B4

Telephone: (514) 398-8278

Engineering undergraduates who are interested in the biomedical applications of engineering techniques should contact the Chair of their department or the graduate Chair of Biomedical Engineering. Some of the courses offered by the Department (Subject Code BMDE) may be of interest to Engineering students, and may be approved as complementary courses. For more information, students should see section 16 "Course Information, Regulations and Descriptions".

8.1.6 Library Facilities

The University has numerous libraries. Specifically serving Engineering, Architecture, and Urban Planning is the Schulich Library of Science and Engineering. Other McGill libraries of interest to students in the Faculty of Engineering are: Blackader-Lauterman Library of Architecture and Art, Walter Hitschfeld Geographic Information Centre, Edward Rosenthall Mathematics and Statistics Library, and the Howard Ross Management Library. Further information is available on the Web at www.library.mcgill.ca.

8.2 General Information

8.2.1 Admission Requirements

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

Specific information on admissions requirements for Quebec students, students from provinces of Canada other than Quebec, and applicants from outside of Canada can be found in section 3.6.1 "Admission Requirements and Deadlines".

8.2.2 Exchange Programs

The Faculty of Engineering participates in a number of bilateral exchange programs that provide undergraduates with an opportunity to study in Australia, Austria, Canada, Denmark, France, Germany, Hong Kong, Mexico, New Zealand, Singapore, Sweden, United Kingdom, and US. Applicants must have completed at least one year of study and have maintained an average of 3.00 or better. Further information may be obtained from the Faculty of Engineering Student Affairs Office, or the Exchange Officer, Admissions, Recruitment and Registrar's Office.

8.2.3 Transfer Credits

In certain cases, credit may be granted for courses passed with a grade of C or better at other universities, up to a maximum of 45 credits for Engineering and 42 credits for Architecture. For further information, please see see section 4.6.5 "Transfer Credits".

8.2.4 Registration

Students who are currently registered and intend to return to the same degree program in the following academic session are required to register following procedures outlined in this Calendar, see section 4.3 "Registration". **It is mandatory for all returning students to see a Departmental Academic adviser in their department for course confirmation during the first two weeks of the Fall term and, if changes are being made, during the first two weeks of the Winter term.**

Information regarding course registration is sent to new students at the time of admission. **All new students must see a Departmental Academic adviser during the advising period.**

8.2.4.1 Registration for Continuing Education Courses

Students may register for Continuing Education courses through Minerva. Students must refer to the Centre for Continuing Education Calendar and Schedule for course information and deadlines. Language courses given through Continuing Education will not count for credits. For further information, contact the Student Affairs Office.

8.2.4.2 Course Withdrawal

Students may withdraw from a course without academic penalty provided they do so within the appropriate deadlines of the term. Beyond this time their names will appear on the mark reports and, in the event that they do not take the examination, they will be given a J grade.

8.2.5 Advising

All students are required to seek academic advising about their programs from the department in which they study. Additional information may be obtained by calling:

Student Affairs Office	(514) 398-7257
Architecture	(514) 398-6702
Chemical Engineering	(514) 398-4494
Civil Engineering	(514) 398-6860
Electrical and Computer Engineering	(514) 398-3943
Mechanical Engineering	(514) 398-8070
Metals and Materials Engineering	(514) 398-4755 ext. 4365
Mining Engineering	(514) 398-4755 ext. 0573
Urban Planning	(514) 398-4075

8.2.6 Student Activities

The campus offers a wide variety of extracurricular activities for students. All are encouraged to participate. Many of these are organized within the Faculty under the auspices of the Engineering Undergraduate Society (EUS), or the Architectural Student Association (ASA). Both of these organizations publish handbooks describing their operations and the activities of various Faculty clubs and societies. All undergraduate students automatically become members of the EUS or the ASA, as appropriate.

8.2.7 Scholarships and Bursaries

Scholarships, bursaries and loans are open to students in the Faculty of Engineering. Students should consult the *Undergraduate Scholarships and Awards Calendar* available on the Web at www.mcgill.ca or from the Admissions, Recruitment and Registrar's Office. Specific information concerning these awards may be obtained from the Student Affairs Office, Faculty of Engineering. (www.mcgill.ca.engineering/student/scholarships)

8.2.8 IYES: Internship Year for Engineering and Science

Employers value experience. The IYES Program allows students to gain professional work experience during the course of their undergraduate studies while at the same time earning a salary within the average range of those for entry-level professional positions. Other benefits include:

- improved chance of obtaining a job upon graduation and at a higher starting salary;
- the opportunity to test a choice of career and assess the pertinence of postgraduate study before making a long-term commitment;
- the opportunity to develop communication skills and to acquire a business perspective that cannot be learned in school and is unlikely to be gained from a summer job.

Employment through the IYES Program typically begins in January or May and continues for 8, 12 or 16 months, including a 4-month probationary training period. Employers choose the most suitable students for their organization through the application, interview and ranking process. While employed by the participating companies, students work on assignments related to their field of study. Students switch to the Internship Program from the regular program when they accept an Internship placement. Successful completion of an 8 to 16-month internship will qualify the student to graduate with the Internship Program designation, which will be noted on the student's permanent record.

STUDENT ELIGIBILITY

All students participating in this program must:

- have a good academic record (satisfactory standing),
- be registered full time in their program,
- have between 15 and 45 credits remaining to complete their undergraduate studies in the following areas of Engineering or Science:

Atmospheric Science	Computer Science
Biotechnology	Electrical Engineering
Chemical Engineering	Environmental Studies
Chemistry	Mathematics and Statistics
Civil Engineering	Mechanical Engineering
Computer Engineering	Physics

- remain a degree candidate while on internship,
- return to complete studies at McGill (internship students will receive an automatic extension for the completion of their studies). Students are not allowed to complete their undergraduate degree during the internship period.

In addition, it is recommended that the student be able to demonstrate strong leadership and communication skills.

COST

- There is no application fee.
- Every student hired through the Program will be assessed a fee of $800. Students will be billed this amount approximately one month after starting their internship.
- Participating companies are invited to match the student's contribution in the form of a tax deductible donation to IYES.

Further information can be obtained from the Website www.mecc.mcgill.ca or by sending an e-mail to info@mecc.mcgill.ca.

8.2.9 Calculators in Faculty Tests and Examinations

The use of calculators during tests and examinations is at the discretion of the course instructor. If a calculator is permitted in the examination, the Faculty requires that the students use a Faculty Standard Calculator, i.e., the CASIO fx-991 or the Sharp EL-546L, R, V(VB) and G only. These calculators are non-programmable, inexpensive, available through local dealers, e.g., EUS General Store in McConnell Engineering Building, and have many features of interest to Engineering students. Any model fx-991 or EL-546 is acceptable, regardless of the letter suffix which appears after the

model number. All Engineering students are expected to own one of the two Faculty Standard Calculators.

8.3 Academic Requirements

8.3.1 Degree Requirements

In order to obtain a Bachelor's degree, students must complete one of the departmental programs described in section 8.4 "Academic Programs".

8.3.1.1 Entrance Requirements

The degree programs in the Faculty of Engineering are designed for students who have completed a general and basic science program. This basic science requirement consists of two terms of calculus, chemistry, physics, one term of vectors, matrices and analytical geometry and one term of humanities or social sciences.

Students entering the Faculty of Engineering from Quebec complete these courses at CEGEP and enter a seven-term program.

Students entering from outside Quebec with a high school diploma generally enter an eight-term program and complete the basic science requirements at McGill.

Students who have completed Advanced Placement Exams, Advanced Levels, the International Baccalaureate, the French Baccalaureate, or McGill placement and/or advanced credit examinations may receive exemptions and/or credits for all or part of the basic science requirements. Similarly, students who have completed courses at other universities or colleges may receive exemptions and/or credits. Please see www.mcgill.ca/engineering/newstudents/credit for specific information on transfer credits.

8.3.1.2 Basic Science Requirements for Students Entering from Outside Quebec

Generally, students admitted to Engineering from outside Quebec are required to complete the basic science requirements outlined below, in addition to the departmental programs described in section 8.4 "Academic Programs".

CHEM110	(4 credits)	General Chemistry 1
CHEM120	(4 credits)	General Chemistry 2
MATH140	(3 credits)	Calculus 1
or MATH139	(4 credits)	Calculus
or MATH150	(4 credits)	Calculus A
MATH141	(4 credits)	Calculus 2
or MATH152	(4 credits)	Calculus E
MATH133	(3 credits)	Vectors, Matrices and Geometry
PHYS131	(4 credits)	Mechanics and Waves
PHYS142	(4 credits)	Electromagnetism and Optics
xxxx xxx	(3 credits)	Humanities/Social Sciences course

Calculus courses MATH150/MATH152 are designed for students who have completed a course in high school calculus. Students who complete the Calculus sequence MATH150/MATH152 will receive exemption with credit from MATH262 (Intermediate Calculus), in the regular Engineering program.

In the event that the student has some prior calculus, but is not sufficiently confident to proceed with MATH150/MATH152, the appropriate sequence is MATH140/MATH141.

If a student has no previous calculus exposure, MATH150/MATH152 may be replaced with MATH139/MATH141.

Students who are uncertain as to which calculus course sequence is appropriate for them should contact Ms.Pharo, Faculty Student adviser in the Faculty of Engineering Student Affairs Office, (514)398-7256.

Students who successfully complete one, or more, McGill Placement Tests will obtain credit for the equivalent(s), i.e., CHEM110, CHEM120, MATH140, MATH141, MATH133, PHYS131, PHYS142. Details are provided on the Faculty Website at www.mcgill.ca/engineering.

Students entering with advanced standing credits (Advanced Placements, Advanced Levels, International Baccalaureate examinations, McGill Placement Tests) are required to meet with the Faculty Student adviser, Faculty of Engineering Student Affairs Office, to finalize their program of studies. (This must be done prior to meeting with the Departmental adviser.) An information session will be held prior to the advising sessions to process these advanced credits. Information is available on the Faculty Website at www.mcgill.ca/engineering.

8.3.1.3 Architecture – Basic Science Requirements for Students Entering from Outside Quebec

Generally, students admitted to Architecture from outside Quebec are required to complete the following courses:

CHEM110	(4 credits)	General Chemistry 1
CHEM120	(4 credits)	General Chemistry 2
MATH139	(4 credits)	Calculus
or MATH140	(3 credits)	Calculus 1
MATH141	(4 credits)	Calculus 2
MATH133	(3 credits)	Vectors, Matrices and Geometry
PHYS131	(4 credits)	Mechanics and Waves
PHYS142	(4 credits)	Electromagnetism and Optics

Students may write McGill Placement Tests to obtain credit for CHEM110, CHEM120, MATH140, MATH141, MATH133, PHYS131 and PHYS142, in the event that they have studied similar material previously. Details on the advanced placement examinations are provided in *Welcome to McGill*. Information is also available on the Faculty Website at www.mcgill.ca/engineering/newstudents.

8.3.2 Degrees and Requirements for Professional Registration

Non-Professional:

Bachelor of Science (Architecture)

The first professional degree in architecture is the Master of Architecture I. The description of the M.Arch. I program can be found in the *Graduate and Postdoctoral Studies Calendar*.

Professional:

Bachelor of Engineering
Bachelor of Engineering (Honours)
Bachelor of Software Engineering

The B.Eng. programs are accredited by the Accreditation Board of the Canadian Council of Professional Engineers and fulfill the academic requirements for admission to the provincial engineering professional organizations. All students are encouraged to seek professional registration after graduation. To become a Professional Engineer in Canada, a graduate must pass an examination on legal aspects as well as 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 of "engineer" and perform the professional activities reserved for engineers by the provincial laws and regulations.

Graduates of the Bachelor of Software Engineering program should be eligible for accreditation (once accreditation standards for Software Engineers have been adopted).

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 students have accumulated 60 credits in a B.Eng. program, they can join the Student Section of the OIQ. Registration is free.

For more information, visit the Websites of the Ordre des ingénieurs du Québec, www.oiq.qc.ca, and of the Canadian Council of Professional Engineers, www.ccpe.ca.

8.3.3 Prerequisites and/or Corequisites

Prerequisites and/or corequisites must be completed prior to course registration, if applicable. If a student has registered for a course and did not satisfy the prerequisites and/or corequisites, the course may be dropped from his/her record automatically by Minerva.

Those students who have received advance credits/exemptions or passed a placement exam, and are blocked from registration in a course due to a prerequisite and/or corequisite block, must complete a Course Authorization Form and submit it to the Faculty of Engineering Student Affairs Office. A Departmental adviser must sign and make a notation on the Course Authorization Form indicating that the prerequisite and/or corequisite has been satisfied.

Further information may be obtained from the Faculty of Engineering Student Affairs Office, Macdonald Engineering Building, Room 378.

8.3.4 Complementary Studies

Engineering students must complete 6 credits of additional complementary courses as follows:

I) Three credits on the impact of technology on society are to be chosen from the following list of courses:

CHEE230	Environmental Aspects of Technology
CHEE430	Technology Impact Assessment
CIVE469	Infrastructure and Society
ECON225	Economics of the Environment
ENVR201	Society and Environment
ENVR 480	Topics in Environment 2
GEOG200	Geographical Perspectives: World Environmental Problems
GEOG203	Environmental Systems
GEOG205	Global Change: Past, Present and Future
GEOG302	Environmental Management 1
MIME308	Social Impact of Technology
PHIL343	Biomedical Ethics
SOCI235	Technology and Society
SOCI312	Industrial Sociology

II) Three credits in the humanities and social sciences, administrative studies and law are to be chosen from the following list of courses:

A. Humanities and Social Sciences

Any course at the 200 level or above from the departments of:

- Anthropology (Subject Code ANTH)
- Economics (any 200- or 300-level course excluding ECON208, ECON217, ECON227, ECON259 and ECON337)
- History (Subject Code HIST)
- Philosophy (excluding PHIL210)
- Political Science (Subject Code POLI)
- Psychology (excluding PSYC204, PSYC305 and PSYC435 but including PSYC100)
- Religious Studies (Subject Code RELG)
- School of Social Work (Subject Code SWRK)
- Sociology (excluding SOCI350)

or ARCH350 The Material Culture of Canada
or ENVR203 Knowledge, Ethics and Environment
or ENVR400 Environmental Thought
or MATH338 History and Philosophy of Mathematics

B. Administrative Studies and Law

Faculty of Engineering

FACC220	Law for Architects and Engineers
FACC 500	Technology Business Plan Design
FACC 501	Technology Business Plan Project

Faculty of Management

(Management courses have limited enrolment and registration dates, see Calendar of Dates.)

BUSA465	Technological Entrepreneurship
INDR294	Introduction to Labour-Management Relations
MGCR222	Introduction to Organizational Behaviour
MGCR320	Managing Human Resources
MGCR352	Marketing Management 1
MGCR360	Social Context of Business
MRKT360	Marketing of Technology
ORGB321	Leadership

C. Language Courses

Any language course which is deemed by the academic adviser to have a sufficient cultural component or, in the case of a student who was not already proficient in a specific language, program credit will be given for the second of two successfully completed, academically approved 3-credit language courses.

8.3.5 Student Progress

The B.Eng. programs may be completed in seven terms. The B.Sc.(Arch.) program may be completed in six or eight terms, depending upon point of entry.

A student must successfully complete the B.Eng. or B.Sc.(Arch.) programs within six years of entry. Candidates admitted to a lengthened program, or to a shortened program because of advanced standing, or who are participating in the IYES program, will have a correspondingly greater or lesser period in which to complete their program. Extensions may be granted by the Committee on Standing in cases of serious medical problems or where other similarly uncontrollable factors have affected a student's progress.

8.3.5.1 Letter Grades

In the Faculty of Engineering, letter grades are assigned according to the grading scheme adopted by the professor in charge of a particular course. They have the designations:

A, A-	Very Good	J	Unexcused Absence
B+, B, B-	Good	K	Incomplete
C+, C	Satisfactory	KF	Incomplete Failed
D	Conditional Pass	L	Deferred
F	Failed	T	Credit by examination only

Grades A, B and C indicate satisfactory results. Grade D indicates marginal results which may be acceptable for peripheral courses but not for core courses required by the program. The classification of a course as core or peripheral depends on the individual student's program and will be decided by the department concerned. Grade F is a permanent grade indicating unsatisfactory results. Grade J indicates an unexcused failure to submit assignments or an unexcused absence from an examination. It is equivalent to an F grade.

8.3.5.2 Incomplete Course Deadlines

Those students with a K grade (incomplete) MUST complete the course within three (3) months, after which the student will be given a grade of KF (incomplete/failed). The deadline for Fall term courses is March 31 (January 15 for Winter graduation); for Winter term courses it is August 15 (May 15 for Spring graduation) and for Summer term courses it is December 1 (October1 for Fall graduation).

If the student is unable to complete the course within the given deadlines, a request for an extension must be forwarded to the Associate Dean (Student Affairs). If an extension has already been permitted, the Faculty will make the necessary corrections.

8.3.5.3 Satisfactory/Unsatisfactory Option

The Satisfactory/Unsatisfactory Option (S/U) may be used for elective courses only.

Students **must** specify courses as S/U at the time of registration. The option **will not** be manually added or removed from a student's record after the Add/Drop deadline. Once a mark has been submitted, this option will not be reversed.

1. "Elective" refers to that category of the complementary studies component of the program involving a Social Science/Humanities course, or a course dealing with the impact of technology on society; or to elective courses taken outside the School of Architecture by architecture students. It does not apply to the "technical complementaries" or "architectural complementaries", or to any other category of the Engineering or Architecture programs.
2. A C grade is considered a pass under the University Satisfactory/Unsatisfactory option. (Students should note that the Faculty of Engineering accepts a D grade as a pass when courses

eligible for the S/U option are taken in the conventional manner.)

3. Only students in satisfactory standing will be permitted to take a course under the Satisfactory/Unsatisfactory option. Only one course (3 credits) per term, to a maximum of 10% of a student's credits taken at McGill, may be taken this way. Grades will be reported in the normal fashion by the instructor and the grades of C and above will be converted to Satisfactory(S) and grades of D and F will be converted to Unsatisfactory(U).
4. The courses taken under this option will be excluded from the GPA, but will be included in the number of credits.
5. Note For Faculty of Engineering Students Only: If the S/U option is selected for a core course and not removed by the Course Change deadline, the Student Affairs Office will remove the option and notify the student of the change.

Note: To be considered for scholarships/renewal of awards, students must complete at least 27 credits in the regular academic session exclusive of courses completed under this option.

8.3.5.4 Course Credits

The credit assigned to a particular course reflects the amount of effort it demands of the student. One credit normally represents three hours total work per week. This is, in general, a combination of lecture hours and other contact hours such as laboratory periods, tutorials and problem periods as well as personal study hours. As a guide, the average division of time for a course is indicated in hours in the course listing after the course credit. For example, (3)(3-0-6) indicates a three-credit course consisting of three lecture hours per week, no other contact hours and six hours of personal study per week.

8.3.5.5 Extra Courses

Courses that a student elects to take which lie outside their program may be classified as "extra", provided the student chooses this option at the time of registration. Extra courses are indicated on the student's transcript and grades earned in those courses do not affect the grade point average. The option will not be added to a student's record after the Add/Drop deadline. Courses that are taken to satisfy the student's engineering program or a Minor cannot be designated as extra.

8.3.5.6 Academic Standing Decisions

In the Faculty of Engineering, a decision on the student's academic standing is based on the CGPA (Cumulative Grade Point Average) according to the criteria listed below.

- Satisfactory standing - CGPA equal to 2.00 or greater.
- Probationary standing - CGPA less than or equal to 1.99 or equal to or greater than 1.20.
- Unsatisfactory standing - CGPA less than 1.20 (if this is the student's first term, the student is normally readmitted to Probationary Standing by Faculty decision).

Note: The Faculty makes academic standing decisions after the completion of each term (Fall, Winter, Summer) based on academic results to date. Thus, if a student has been granted permission to defer one or more examinations, the standing decision will be made regardless of such deferrals.

Please see below for further information about academic standing decisions.

Satisfactory Standing
Students in satisfactory standing may proceed, with the following conditions:

All core courses in which D or F grades were obtained must either be repeated successfully (grade C or better) or be replaced by an alternative approved course which is completed successfully.

All other courses in which F grades were obtained must either be repeated successfully at some point before graduation or be replaced by some alternative approved course which is completed successfully before graduation.

Students in poor academic standing are strongly urged to contact the Student Affairs Office to discuss their situation. Office staff are available to help guide students and to provide useful advice to help students achieve their goals. Helpful workshops are provided by Student Services, e.g., study skills, stress management, test anxiety. Students who are experiencing difficulties are encouraged to explore these avenues.

Probationary Standing
Students placed on Probationary Standing may proceed with their studies under the following conditions.

Students must reduce their credit load to a maximum of 13 credits per term and must achieve at the end of the term either a CGPA of 2.00 or better, or a term GPA (TGPA) of 2.50 or better in order to continue.

A student whose TGPA is 2.50 or better, but whose CGPA is less than 2.00, may continue on with his/her studies but will remain on Probationary Standing.

Failure to achieve either the TGPA or CGPA requirements noted above will result in the student being placed on “Unsatisfactory Standing” (see below). Students will remain on probationary standing until they achieve a CGPA equal to or exceeding 2.00, at which time their standing will be changed to “satisfactory”.

Students placed on Probationary Standing who need to reduce their credit load but are unable to drop course(s) must complete a Course Authorization Form and submit it to the Student Affairs Office. The course(s) will then be deleted manually from the student's record.

Unsatisfactory Standing
Students who have been placed on Unsatisfactory Standing will be asked to withdraw from the Faculty of Engineering for a minimum of one term. Courses for which the student is currently registered will be deleted automatically from the student's record by the Faculty.

After a minimum of one term away, the student can apply for readtission no later than November 1 (Winter term) and June 1 (Fall term). A request for readmission must be made in writing in a letter addressed to the Associate Dean, Student Affairs in the Student Affairs Office. Upon readmission, the student will be placed back on Probationary Standing. Students will remain on probationary standing until they achieve a CGPA greater than or equal to 2.00, at which time their standing will be changed to “satisfactory”.

While on probation during that term and subsequent terms, the student must reduce his/her credit load to a maximum of 13 credits per term, and must meet or exceed the minimum TGPA specified by the department or a CGPA greater than or equal to 2.00. The minimum TGPA requirement for each department is as follows:

- Department of Chemical Engineering:
  TGPA greater than or equal to 2.50
- Department of Civil Engineering and Applied Mechanics:
  TGPA greater than or equal to 2.50
- Department of Electrical and Computer Engineering:
  TGPA greater than or equal to 3.00
- Department of Mechanical Engineering:
  TGPA greater than or equal to 2.50
- Department of Mining, Metals and Materials Engineering:
  TGPA greater than or equal to 2.50
- School of Architecture:
  TGPA greater than or equal to 2.50

Students who fail to achieve the minimum TGPA required by their department will be required to permanently withdraw from the program with no chance of readmission. In addition, students who have returned to satisfactory standing, but whose CGPA falls below 2.00 in a subsequent term, will be required to permanently withdraw from the program with no chance of readmission.

8.3.5.7 Repeated Courses

Students who fail to achieve the required results in a course must either repeat it successfully or complete a substitute course approved by their department. For students who fail prerequisite courses which are offered only in the Fall or Winter, the depart-

ment responsible may, in appropriate cases, arrange "reading courses" during the other term or during the Summer months. Such courses taken during a Fall or Winter term constitute a normal part of the candidate's work load. If the student is on probation, these courses must be included in the workload reduction.

8.3.5.8 Reassessment and Reread of a Grade

In accordance with the Charter of Student Rights, and subject to the conditions stated therein, students have the right to consult any written submission for which they have received a mark and the right to discuss this submission with the examiner. If, after discussion with the instructor, a student decides to request a formal reread of a final exam, the student must apply in writing, complete the Reread form and submit it to the Faculty of Engineering Student Affairs Office.

The following conditions apply:

– requests for rereads in more than one course per term will not be accepted, unless permission is given by the Faculty of Engineering;
– grades may be either raised or lowered as the result of a reread;
– rereads in courses not in the Faculty of Engineering are subject to the deadlines, rules and regulations of the relevant faculty;
– any request to have term work re-evaluated must be made directly to the instructor concerned.

The deadlines to make an application for a formal reread of a final exam are:
the last working day of March for Fall courses,
the last working day of July for Winter courses, and
the last working day of November for Summer courses.

A $35 fee for each reread will be assessed directly to the student's McGill account if the result remains the same or is lowered. If the grade is increased, no charge is made.

For further information, students may consult the Faculty of Engineering Student Affairs Office.

8.3.5.9 Examination Regulations

For information regarding examination regulations and procedures in the Faculty of Engineering, please refer to the Engineering Website at www.mcgill.ca/engineering.

8.3.5.10 Supplemental Examinations

Courses administered by the Faculty of Engineering do not have supplemental examinations; however, Engineering students may be eligible to write supplemental examinations in courses administered by the Faculties of Arts and Science (i.e., typically Humanities and Social Science courses and freshman (U0) courses).

The following conditions apply:

– students must be in satisfactory or probationary standing; those with an unsatisfactory standing are not permitted to write supplementals;
– students are permitted to write a supplemental for courses in which they have received a mark of D, F, J or U;
– students must write the supplemental exam at the time of the next supplemental examination period;
– special permission of the Associate Dean (Student Affairs), Faculty of Engineering, is required if a student wishes to write supplemental exams totalling more than seven (7) credits.
– only one supplemental examination is allowed in a course;
– the supplemental result may or may not include the same proportion of class work as did the original grade. The instructor will announce the arrangements to be used for the course by the end of the course change period;
– the supplemental result will not erase the grade originally obtained; both the original mark and the supplemental result will be calculated in the CGPA;
– additional credit will not be given for a supplemental exam where the original grade for the course was a D and the student already received credit for the course.

The supplemental examination period for Fall courses is during the months of April and May, and for Winter courses and courses spanning Fall/Winter during the last week of August. It is the student's responsibility to confirm the date and time of the supplemental exam (www.mcgill.ca/engineering/student/policies/exam/supplementals). Supplemental exam applications are available from the Faculty of Engineering Student Affairs Office. Alternately, students may print out the Supplemental Examination Request Form from the Faculty Website and return it by mail or submit it to the Student Affairs Office.

The deadline for submission of applications is March 1 for Fall courses and July 15 for Winter courses and courses spanning Fall/Winter terms.

There is a $35 non-refundable fee per each supplemental exam, which is charged directly to the student's McGill student account.

Students should consult the Faculty of Engineering Student Affairs Office for more information.

8.3.5.11 Deferred Examinations

Students who have missed a final examination due to illness or family affliction **must** submit the following documentation to the Faculty of Engineering Student Affairs Office, Room 378, Macdonald Building:

- an original medical certificate or other documentation that covers the date of the missed examination, and the nature and duration of the illness;
- a completed Deferral Request Form;
- a detailed letter justifying the request for a deferral.

Students **must** also attest that they have completed all coursework up to date, which will be verified with the instructor(s). The Student Affairs Office **must** be informed of the reasons for absences from final examination **no later than one week** after the date of the final examination that was missed.

A student's signature on the Deferral Request Form will allow the Faculty to verify the authenticity of the medical certificate and the nature of the illness, or any other documentation provided. If the form is not signed, it will result in the assignment of a J grade in the course.

If a student becomes ill during a formal examination, he/she must inform the invigilator as soon as possible. If necessary, the student will be escorted to the Health Services. As stated above, the student must return to the Faculty of Engineering Student Affairs Office with medical certification **within one week of the exam.** IMPORTANT: If a student completes the exam in routine fashion, the grade received CANNOT be changed.

Students are advised that deferrals are granted ONLY for compelling reasons. If the request for deferral is denied by the Associate Dean (Student Affairs) the student will receive a "J" grade (absent) in the course. For the purpose of calculating GPAs and CGPAs, the grade of "J" is treated as an "F" (failed, 0%). Students will be contacted regarding the approval of a deferral initially via e-mail approximately two weeks after the end of examination period. A formal letter will be mailed at a later date.

Students granted a deferral will be given an "L" grade which will be replaced by a "J" should the students miss the next deferred or regular examination in the course, whichever occurs first. Please note that you are ONLY allowed to write the final exam for the course in which you have been granted a deferral. You are NOT allowed to redo any portion of the coursework such as assignments, projects, labs, midterms, quizzes, etc. without the prior explicit permission of the Associate Dean, Student Affairs. Such permission is ONLY granted in exceptional circumstances, which you can request by providing a detailed justification of your reasons in a letter to the Associate Dean.

If a deferral is granted, the maximum number of courses that a student may register for will be limited to ensure that no more than 18 credits of course work are to be satisfied in a single term or no more than 6 exams are to be written, whichever is greater. This will provide a student with sufficient time during the term and the exam period to properly prepare for deferred examinations.

For *Engineering* and *Management* courses, students granted a deferral MUST write the final exam the NEXT time it is offered. Students should be aware that a deferred examination might not be available until the next time the course is given (one year or longer).

For *Arts* and *Science* courses, students MUST write the supplemental examination offered during either May (for Fall courses) or August (for Winter courses). Consult the Calendar of Dates for the dates set for supplemental exams, and the supplemental examination schedule posted on the Web for the exact date and time of a specific exam. Please note, deferrals are not permitted for Summer courses. Students may be permitted to withdraw from a course without refund instead.

For *Continuing Education* courses, students granted a deferral should contact the Centre for Continuing Education directly for more information.

For further information, refer to section 4.7.2.2 "Deferred Examinations".

8.4 Academic Programs

The curricula described in the following pages, and the courses listed under section 16 "Course Information, Regulations and Descriptions", have been approved for the 2005-06 session, but the Faculty reserves the right to introduce changes as may be deemed necessary or desirable.

8.4.1 School of Architecture

Macdonald-Harrington Building, Room 201
815 Sherbrooke Street West
Montreal, QC H3A 2K6

Telephone: (514) 398-6700
Fax: (514) 398-7372
Website: www.mcgill.ca/architecture

Director — David Covo

Emeritus Professors
Radoslav Zuk; B.Arch.(McG.), M.Arch.(M.I.T.), 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
Vikram Bhatt; N.Dip.Arch.(Ahmedabad), M.Arch.(McG.), M.R.A.I.C.
Derek Drummond; B.Arch.(McG.), F.R.A.I.C., O.A.A. *(William C. Macdonald Professor of Architecture)*
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)*
Adrian Sheppard; B.Arch.(McG.), M.Arch.(Yale), F.R.A.I.C., O.A.Q., A.A.P.P.Q.

Associate Professors
Annmarie Adams; B.A.(McG.), M.Arch., Ph.D.(Berkeley), M.R.A.I.C. *(William Dawson Scholar)*
Martin Bressani; B.Sc.(Arch.), B.Arch.(McG.), M.Sc.Arch., Diplomes des études approfondies, Docteur de l'Université de Paris-Sorbonne(Paris IV)
Ricardo Castro; B.Arch.(Los Andes), M.Arch., M.A.(Art History) (Ore.), M.R.A.I.C.
David Covo; B.Sc.(Arch.), B.Arch.(McG.), F.R.A.I.C., O.A.Q.
Robert Mellin; B.Arch., M.Sc.(Arch.)(Penn.State), M.Arch.(McG.), M.Sc., Ph.D.(U.Penn.), M.R.A.I.C., N.A.A.
Pieter Sijpkes; B.Sc.(Arch.), B.Arch.(McG.)

Faculty Lecturer
Julia Bourke

Course Lecturers
Cameron Charlebois, Robert Claiborne, Odile Henault, Emmanuelle Lapointe, Nadia Meratla, Carole Scheffer, DavidTheodore

Adjunct Professors
Cécile Baird, Ewa Bieniecka, LawrenceBird, MichaelCarroll, Howard Davies, Georges Drolet, GordonEdwards, FrançoisÉmond, JuliaGersovitz, DanHanganu, Pierre Jampen, Richard Klopp, PhyllisLambert, SeymourLevine, AnnaMainella, SergeMelanson, Rosanne Moss, JoannaNash, HarryParnass, LouisePelletier, MarkPoddubiuk, Louis Pretty, Jacques Rousseau, RichardRussell, SheilaTheophanides, SamsonYip, JozefZorko

Research Associates
Jim Donaldson, Rafik Salama

Associate Members
Clarence Epstein, Tania Martin, Howard Shubert

Visiting Critics and Lecturers
Each year visitors are involved in the teaching of certain courses as critics and lecturers. These visitors change from year to year. In2004, they were:
Gavin Affleck, James Aitken, Bruce Allan, Wil Alsop, Amale Andraos, Steve Badanes, Tom Balaban, Sandra Barone, Jean Beaudoin, Thierry Beaudoin, Émilie Bédard, Marc Bertrand, Gabriel Bodson, Bruce Bolton, Raouf Boutros, Gaëlle Breton-Marot, Louis Brillant, Frank Carter, Mathieu Casavant, Roch Cayouette, Yvan Cazabon, Stephane Chevalier, Lily Chi, Ella Chmielewska, Rob Claiborne, Henri Cleinge, Anne Cormier, Lise Anne Couture, Michael Cunningham, Franc D'Ambrosio, Renée Daoust, Janine Debanné, Jack Diamond, Georges Drolet, Frédéric Dubé, André Dupras, Wade Eide, Patrick Evans, Andrew Forster, Marco Frascari, Maxime Gagné, Mark J. Ginocchio, Mitchell Hall, Bob Hamilton, Dan Hanganu, Pat Harrop, Michael Hoeschen, Mario Iannuzzi, Robert Jutra, Rob Kostelic, Alan Knight, Jean-Kristian Koch, Magda Kuskowski, Anick La Bissonière, Jacques Lachapelle, Lucie Lafontaine, Louis Laperrière, Katherine Lapierre, Michel Langevin, Irena Latek, Martin Leblanc, Robert Lecoste, François Lemoine, David Letherbarow, Daniel Libeskind, Ian MacBurnie, Marie-Paul MacDonald, Frank McMahon, Robert Magne, Eric Marosi, Louis Martin, Gilles Marty, Paula Meijerink, Hilary Sample Meredith, Marc Neveu, Steve Parcell, Claude Pasquin, Juliette Patterson, Danny Pearl, Cameron Petkau, Marc-André Plasse, Marc-André Plourde, Celine Poisson, Patrick Quinn, Anna Radici, Tudor Radulescu, Marc Redwood, Nicholas Reeves, Jacques Rousseau, Barry Sampson, Conor Sampson, Patricia Sarrazin-Sullivan, Gilles Saucier, Murray Schafer, John Schnier, Anik Schooner, Tom Schweitzer, Elizabeth Shapiro, Steve Smith, Sudhir Suri, Georges Teyssot, Pierre Thibault, James Timberlake, Vladimir Topouzanov, Eric Turcotte, Ivonne Valencia, René Welter, Betsy Williamson, Shane Williamson, Dan Wood, George Yu.

ARCHITECTURAL CERTIFICATION IN CANADA

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

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

Since all provincial associations in Canada recommend any applicant for licensure to have graduated from a CACB-accredited program, obtaining such a degree is an essential aspect of preparing for the professional practice of architecture. While graduation from a CACB-accredited program does not assure registration, the accrediting process is intended to verify that each accredited program substantially meets those standards that, as a whole, comprise an appropriate education for an architect.

PROGRAMS OF STUDY

McGill's professional program in architecture is structured as a four-and-a-half-year, or nine-term, course of study divided into two parts.

The first part, for students entering with the Diploma of Collegial Studies in Pure and Applied Science or the equivalent, is a six-term design program leading to a non-professional degree, Bachelor of Science (Architecture). [Most students from outside Quebec are admitted to an eight-term B.Sc.(Arch.) program and enter a first year which includes courses outlined in section 8.3.1.3 "Architecture – Basic Science Requirements for Students Entering from Outside Quebec".]

The second part, for students with the B.Sc.(Arch.) degree, is a one-and-a-half-year, or three-term, program leading to the professional Master of Architecture I degree. The professional M.Arch.I 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 USA.

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

1. complete the B.Sc.(Arch.) degree, including the series of required and complementary courses stipulated for professional studies, with a minimum CGPA of 3.00;
2. submit a portfolio of work executed in the sequence of six design studios, as well as samples of professional and personal work;
3. complete the minimum period of relevant work experience according to the current Work Experience Guidelines.

Further information on the professional M.Arch.I program is available on the Web at www.mcgill.ca/architecture.

Student Exchanges

A limited number of qualified students may participate in an exchange with schools of architecture at other universities which have agreements with the McGill School of Architecture, for a maximum of one term in the second year of the B.Sc.(Arch.) program. These include: Facultad de Arquitectura, Universidad de Los Andes, Bogotá, Colombia; Istituto Universitario di Architettura di Venezia, Venice, Italy; Fakultät für Raumplanung und Architektur, Technische Universität Wien, Vienna, Austria; The Technion - Israel Institute of Technology, Haifa, Israel; Institut Supérieur d'Architecture, Saint-Luc Bruxelles, Brussels, Belgium; École d'architecture de Grenoble, Grenoble, France; École d'architecture Clermont-Ferrand, Clermont-Ferrand, France; Facolta di Architettura Civile Politecnico di Milano (Boviso); Virginia Polytechnic Institute and State University, Faculty of Architecture; Alexandria Centre for Architecture and Urban Studies (M.Arch. only), Universidad Nacional Autonoma de Mexico, Facultad de Arquitectura; Technologico de Monterrey (Campus Queretero), Departamento de Arquitectura; University of Florida, School of Architecture.

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 Robert Mellin

Building Science Resource Centre – Dr. Avi Friedman

Library

Blackader-Lauterman Library of Architecture and Art, located in the Redpath Library – Marilyn Berger

Collections

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

Canadian Architecture Collection, housed in the Blackader-Lauterman Library – David McKnight (Acting Chief Curator – 2004-2005)

Orson Wheeler Architectural Model Collection – ProfessorPieterSijpkes

Materials Resource Centre – Dr. Avi Friedman

CURRICULUM FOR THE B.Sc.(Arch.) DEGREE

Current information on program structure and courses is posted on the School of Architecture Website at www.mcgill.ca/architecture.

REQUIRED COURSES		COURSE CREDIT	
Non-Departmental Subjects			
CIVE205	Statics	3	
CIVE283	Strength of Materials	4	
CIVE385*	Structural Steel and Timber Design	3	
CIVE388*	Foundations and Concrete Design	3	
CIVE492*	Structures	2	
FACC220	Law for Architects and Engineers	3	**18**

* Candidates intending not to proceed to the M.Arch. I degree may substitute other courses of equal total weight for any of these.

Architectural Subjects			
ARCH201	Communication, Behaviour and Architecture	6	
ARCH202	Architectural Graphics and Design Elements	6	
ARCH217	Freehand Drawing 1	1	
ARCH218	Freehand Drawing 2	1	
ARCH240	Organization of Materials in Building	3	
ARCH250	Architectural History 1	3	
ARCH251	Architectural History 2	3	
ARCH303	Design and Construction 1	6	
ARCH304	Design and Construction 2	6	
ARCH321	Freehand Drawing 3	1	
ARCH322	Freehand Drawing 4	1	
ARCH324	Sketching School 1	1	
ARCH354	Architectural History 3	3	
ARCH355	Architectural History 4	3	
ARCH375	Landscape	2	
ARCH377	Energy, Environment and Buildings	2	
ARCH405	Design and Construction 3	6	
ARCH406	Design and Construction 4	6	
ARCH447	Electrical Services	2	
ARCH451	Building Regulations and Safety	2	**64**

COMPLEMENTARY COURSES **12**

Students must complete 12 credits of architectural complementaries, which must include at least one course from each of the areas of concentration listed below in order to qualify for the B.Sc.(Arch.) degree.

A. History	B. Theory	C. Environmental Design	D. Technics
ARCH372	ARCH352	ARCH350	ARCH318
ARCH379	ARCH363	ARCH378	ARCH319
ARCH388	ARCH383	ARCH379	ARCH377
ARCH522	ARCH524	ARCH520	ARCH461
ARCH523	ARCH525	ARCH521	ARCH471
ARCH528	ARCH529	ARCH527	ARCH490
ARCH531		OCC1442	ARCH512
ARCH532			ARCH526
ARCH533			
ARCH534			

OUTSIDE ELECTIVES **3**

3 credits must be completed outside the School of Architecture, subject to approval by the Student adviser.

TOTAL CREDITS **97**

Architectural Complementaries

ARCH252	(3)	Introduction to Architectural History 1
ARCH253	(3)	Introduction to Architectural History 2
ARCH318	(3)	Design Sketching
ARCH319	(3)	The Camera and Perception
ARCH350	(3)	The Material Culture of Canada
ARCH352	(3)	Art and Theory of House Design
ARCH363	(2)	Structure, Organization and Form
ARCH364	(2)	Architectural Modeling
ARCH372	(2)	History of Architecture in Canada
ARCH377	(2)	Energy, Environment and Buildings
ARCH378	(3)	Site Usage
ARCH379	(4)	Summer Course Abroad
ARCH383	(3)	Geometry/Architecture/Environment
ARCH388	(2)	Introduction to Historic Preservation
ARCH461	(1)	Freehand Drawing and Sketching
ARCH471	(2)	Computer-Aided Building Design
ARCH490	(2)	Selected Topics in Design
ARCH512	(3)	Architectural Modelling
ARCH520	(3)	Montreal: Urban Morphology
ARCH521	(3)	Structure of Cities
ARCH522	(3)	History of Domestic Architecture in Quebec
ARCH523	(3)	Significant Texts and Buildings
ARCH524	(3)	Seminar on Architectural Criticism
ARCH525	(3)	Seminar on Analysis and Theory
ARCH526	(3)	Philosophy of Structure
ARCH527	(3)	Civic Design
ARCH528	(3)	History of Housing
ARCH529	(3)	Housing Theory
ARCH531	(3)	Architectural Intentions Vitruvius - Renaissance
ARCH532	(3)	Origins of Modern Architecture
ARCH533	(3)	New Approaches to Architectural History
ARCH534	(3)	Architectural Archives
ARCH540	(3)	Selected Topics in Architecture 1
ARCH541	(3)	Selected Topics in Architecture 2
OCC1442	(2)	Enabling Environments

8.4.2 Department of Chemical Engineering

M.H. Wong Building, Room 3060
3610 University Street
Montreal, QC H3A 2B2

Telephone: (514) 398-4494
Fax: (514) 398-6678
Website: www.mcgill.ca/chemeng

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.(Carnegie Mellon), Eng.
Martin E. Weber; B.S.E.(Prin.), Sc.D.(M.I.T.), P.Eng.
Juan H. Vera; B.Mat.(Chile), Ing.Quim.(U.T.E.), M.S.(Berkeley), 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.(Berkeley) *(James McGill Professor)*

Associate Professors
Dimitrios Berk; B.Sc.(Bosphorus), M.E.Sc.(W.Ont.), Ph.D.(Calg.), P.Eng.
Jean-Luc Meunier; Dipl. Ing., EPFL(Lausanne), M.Sc., Ph.D., INRS(Varennes), Ing.

Assistant Professors
Sylvain Coulombe; B.Sc., M.Sc.A.(Sherb.), Ph.D.(McG.)
Reghan James Hill; B.Eng., Ph.D.(Cornell)
Richard L. Leask; B.A.Sc., M.A.Sc.(Wat.), Ph.D.(Tor.)
Corey Leclerc; B.Sc., Ph.D.(Minnesota)
Milan Maric; B.Sc., B.Eng.& Mgmt(McMaster), Ph.D.(Minnesota)
Sasha Omanovic; B.Sc., Ph.D.(Zagreb)
Phillip Servio; B.Sc., Ph.D.(Minnesota)
Nathalie Tufenkji; B.Eng.(McG.), M.Sc., Ph.D.(Yale)
Viviane Yargeau; B.Eng., M.Sc.A., Ph.D.(Sherbrooke)

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

PAPRICAN Adjunct Professor
George J. Kubes; B.Eng., M.Eng.(Prague), Ph.D.(Bratislava)

Adjunct Professors
PierreBisaillon, WayneBrown, Mario Davidovsky, Andrea De Mori, Denis Dionne, DavidJ.McKeagan, NormanPeters, Bassam Sarkis, JanaSimandl, Roger C. Urquhart, Paula Wood-Adams

The central purpose of engineering is to pursue solutions to technological problems in order to satisfy the needs and desires of society. Chemical engineers are trained to solve the kinds of problems that are typically found in the "chemical process industries", which include the chemical manufacturing, plastics, water treatment, pulp and paper, petroleum refining, ceramics, and paint industries as well as substantial portions of the food processing, textile, nuclear energy, biochemical and pharmaceutical industries. The technological problems and opportunities in these industries are often closely linked to social, economic and environmental concerns. For this reason, practitioners of chemical engineering often deal with these questions when they are working in management, pollution abatement, product development, marketing and equipment design.

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 major 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 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 practicing design engineers. Problem-solving, experimenting, planning and communication skills are emphasized in courses throughout the core curriculum.

By means of complementary courses, students can also obtain further depth in technical areas and breadth in non-technical subjects. Some students elect to complete a minor in biotechnology, management, materials engineering, computer science, environmental engineering or chemistry.

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

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

ACADEMIC PROGRAM

For those who have completed the Quebec CEGEP-level program in Pure and Applied Sciences, the Chemical Engineering Program comprises 111 credits as outlined below. Certain students who take advantage of summer session courses can complete the departmental programs in three calendar years. Students who have passed Chemistry 202 or 302 at the CEGEP level may be

exempt from course CHEM212 or CHEM234, respectively (Introductory Organic Chemistry 1 and Selected Topics in Organic Chemistry), the corresponding courses are transferred from required courses to electives.

For appropriately qualified high school graduates from outside Quebec, an extended credit program is available, as described in section 8.3.1.2 "Basic Science Requirements for Students Entering from Outside Quebec".

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 C grade 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). A grade of "D" is a passing grade in other complementary courses and in any elective courses taken.

CURRICULUM FOR THE B.ENG. DEGREE IN CHEMICAL ENGINEERING

REQUIRED COURSES		COURSE CREDIT	
Non-Departmental Courses			
CHEM212	Introductory Organic Chemistry 1	4	
CHEM233	Topics in Physical Chemistry	3	
CHEM234	Topics in Organic Chemistry	3	
COMP208	Computers in Engineering	3	
MATH262	Intermediate Calculus	3	
MATH263	Ordinary Differential Equations and Linear Algebra	3	
MATH264	Advanced Calculus	3	
MIME221	Engineering Professional Practice	2	
MIME310	Engineering Economy	3	**27**
Chemical Engineering Courses			
CHEE200	Introduction to Chemical Engineering	4	
CHEE204	Chemical Manufacturing Processes	3	
CHEE220	Chemical EngineeringThermodynamics	3	
CHEE291	Instrumental Measurements Laboratory	4	
CHEE314	Fluid Mechanics	4	
CHEE315	Heat and Mass Transfer	4	
CHEE340	Process Modelling	3	
CHEE351	Separation Processes	3	
CHEE360	Technical Paper 1	1	
CHEE370	Elements of Biotechnology	3	
CHEE380	Materials Science	3	
CHEE392	Project Laboratory 1	4	
CHEE393	Project Laboratory 2	5	
CHEE423	Chemical Reaction Engineering	4	
CHEE453	Process Design	4	
CHEE455	Process Control	4	
CHEE456	Design Project 1	1	
CHEE457	Design Project 2	5	
CHEE462	Technical Paper 2	1	
CHEE474	Biochemical Engineering	3	
CHEE484	Materials Engineering	3	**69**
COMPLEMENTARY COURSES			
Courses to be selected from those approved by the Department (see list of technical complementaries below)			**9**
Two courses (6 credits), selected from an approved list: one course on the impact of technology on society and one in the humanities and social sciences, administrative studies and law. See section 8.3.4 "Complementary Studies" for further information.			**6**
TOTAL			**111**

For students starting their B.Eng. studies in September who have completed the Quebec Diploma of Collegial Studies, a program for the first two terms of study is given below:

Term 1		**Credits**	
CHEE200	Introduction to Chemical Engineering	4	
CHEE291	Instrumental Measurement Laboratory	4	
CHEM212	Introductory Organic Chemistry 1	4	
MATH262	Intermediate Calculus	3	
MIME221	Engineering Professional Practice	2	**17**
Term 2			
CHEE204	Chemical Manufacturing Processes	3	
CHEE220	Chemical EngineeringThermodynamics	3	
CHEM234	Topics in Organic Chemistry	3	
COMP208	Computers in Engineering	3	
MATH263	Ordinary Differential Equations and Linear Algebra	3	**15**

Students entering their second year of study or who are starting in January must plan their program of studies in consultation with their Departmental adviser.

Additional information can be found on the Faculty Website at www.mcgill.ca/engineering, as well as in section 8.3.1.2 "Basic Science Requirements for Students Entering from Outside Quebec".

TECHNICAL COMPLEMENTARIES

A minimum of 9 credits of complementary courses must be chosen from a list of technical complementaries approved by the Department. 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 (2) technical complementary courses are to be selected from those offered by the Department (list below). Permission is given to take the third complementary course from other suitable undergraduate courses in the Faculty of Engineering.

The Technical Complementary courses currently approved by the Department are as follows:

BIOT505	Selected Topics in Biotechnology (Biotechnology Minor students only)
CHEE363	Projects Chemical Engineering 1
CHEE438	Engineering Principles in Pulp and Paper Processes
CHEE452	Particulate Systems
CHEE458	Computer Applications
CHEE464	Projects in Chemical Engineering 2
CHEE471	Industrial Water Pollution Control (or CIVE430)
CHEE472	Industrial Air Pollution Control (or MECH534)
CHEE481	Polymer Engineering
CHEE487	Chemical Processing Electronics Industry
CHEE489	Electrochemical Engineering
CHEE494	Research Project and Seminar
CHEE495	Research Project and Seminar
CHEE571	Small Computer Applications: Chemical Engineering
CHEE581	Polymer Composites Engineering

Courses CHEE481 and CHEE581 comprise a Polymeric Materials sequence. Additional courses in this area are available in the Chemistry Department (e.g., CHEM455) or at the graduate level (CHEE681 to CHEE684). The Department has considerable expertise in the polymer area.

Courses CHEE370 and CHEE474 make up a sequence in Biochemical Engineering-Biotechnology. Students interested in this area may take additional courses, particularly those offered by the Department of Food Science and Agricultural Chemistry, Faculty of Agricultural and Environmental Sciences, and courses in biochemistry and microbiology. The food, beverage and pharmaceutical industries are large industries in the Montreal area and these courses are relevant to these industries and to the new high-technology applications of biotechnology.

The third area in which there is a sequence of courses is Pollution Control. The Department offers two courses in this area: CHEE471 and CHEE472. As some water pollution control problems are solved by microbial processes, course CHEE474 is also relevant to the pollution control area. Likewise, as the solution to pollution problems frequently involves removal of particulate matter from gaseous or liquid streams, course CHEE452 is also rele-

vant. Additional courses in this area are listed under section 8.5.7 "Environmental Engineering Minor".

A Minor in Biotechnology is also offered in the Faculties of Engineering and of Science with emphasis on Molecular Biology and Chemical Engineering Processes. A full description of the program appears in section 8.5.2 "Biotechnology Minor".

Note that many of the technical complementaries are offered only in alternate years. Students should, therefore, plan their complementaries as far ahead as possible. With the approval of the instructor and academic adviser, students may also take graduate (CHEE500-level) courses as technical complementaries.

ELECTIVE COURSES

Students who have obtained exemptions for courses, i.e., for CEGEP courses equivalent to CHEM212 or CHEM234, or who take more than the minimum requirements for the degree, may choose university-level courses in any field. Approval of an elective course requires only that no timetable conflicts are created and that it not be a repetition of material already covered in the curriculum or already mastered by the student.

CURRICULUM COMMITTEE

The Curriculum Committee is composed of three students, elected by their classes, and two staff members. This Committee provides a forum for all matters involving undergraduate student/staff interactions. While the primary concern is with matters of curriculum and courses (their content, evaluation, scheduling, etc.), the Committee has also taken up a number of other matters in recent years, e.g., working space, facilities (equipment and libraries), etc.

CANADIAN SOCIETY FOR CHEMICAL ENGINEERING

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

8.4.3 Department of Civil Engineering and AppliedMechanics

Macdonald Engineering Building, Room 492
817 Sherbrooke Street West
Montreal, QC H3A 2K6

Telephone: (514) 398-6860
Fax: (514) 398-7361
Website: www.mcgill.ca/civil

Chair — Denis Mitchell

Emeritus Professors

Philip J. Harris; B.Sc.(Man.), M.Eng., Ph.D.(McG.), F.E.I.C., F.C.S.C.E., Eng.
RichardG.Redwood; B.Sc.(Eng.)(Bristol), M.A.Sc.(Tor.), Ph.D.(Bristol), 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.(M.I.T.), 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.
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. (*William Dawson Scholar*)
A. Patrick S. Selvadurai; M.S.(Stan.), Ph.D., D.Sc.(Nott.), F.E.I.C., F.I.M.A., F.C.S.C.E., P.Eng. (*William Scott Professor of Civil Engineering*)
Suresh C. Shrivastava; B.Sc.(Eng.) (Vikram), M.C.E.(Del.), Sc.D.(Col.), Eng.

Associate Professors

Luc E. Chouinard; B.Ing., M.Ing.(Montr.), B.C.L.(McG.), Sc.D.(M.I.T.), Eng.
Susan J. Gaskin; B.Sc.(Queen's), Ph.D.(Canterbury)
Ronald Gehr; B.Sc.(Eng.)(Rand), M.A.Sc., Ph.D.(Tor.), P.Eng.
Subhasis Ghoshal; B.C.E.(Jadavpur), M.S.(Missouri), Ph.D.(Carnegie Mellon)
Ghyslaine McClure; B.Ing.(Montr.), S.M.C.E.(M.I.T.), Ph.D.(Montr.), Eng.
Yixin Shao; B.S., M.S.(Tongji), Ph.D.(N'western)

Assistant Professors

Mohamed Abdel-Meguid; B.Sc(Azhar), M.Sc., Ph.D.(Western)
Murtaza Haider; B.Sc.(Peshawar), M.A.Sc., Ph.D.(Tor.) *(joint appoint. with School of Urban Planning)*
Colin Rogers; B.A.Sc., M.A.Sc.(Waterloo), Ph.D.(Sydney), P.Eng.

Adjunct Professors

Sofia Babarutsi, Jean Pierre Desmarais, Serge Guiot, JohnHadjinicolaou, JalalHawari, Paul Henshaw, GrahamHolder, Emmanuel Le Colletter, Zoubir Lounis, Pierre Lundahl, KennethMacKenzie, Charles Manatakos, Thanh Son Nguyen, Paul Rodrigue, SandroScola, WilliamTaylor, JanVrana, MonicaWagner, RonaldZaloum

Civil engineers have traditionally applied scientific and engineering knowledge to the task of providing the built environment, from its conception and planning to its design, construction, maintenance and rehabilitation. Examples include buildings, bridges, roads, railways, dams, and facilities for water supply and treatment, and waste disposal. With the aging and deterioration of an already vast infrastructure, its maintenance and rehabilitation has become an increasingly important role of the civil engineering profession. Also, with worldwide concern about the detrimental impact of human activities on the environment, civil engineers are now in the forefront of developing and providing the means for both prevention and remediation of many aspects of environmental pollution.

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

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

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

Students who wish to extend their knowledge in certain areas beyond the range that the program complementary courses allow can also take a Minor program. Minors are available in fields such as Arts, Economics, Management, Environmental Engineering, and Construction Engineering and Management. These require additional credits to be taken from a specified list of topics relating to the chosen field. Further information on the various Minor programs may be found in section 8.5 "Minor Programs and Choice of Electives or Complementary Courses". Details of how the Minors

can be accommodated within the Civil Engineering program will be made available at the time of preregistration counselling.

ACADEMIC PROGRAMS

Considerable freedom exists for students to influence the nature of the program of study which they follow in the Department of Civil Engineering and Applied Mechanics. A variety of advanced complementary courses is offered in five main groupings: Environmental Engineering, Geotechnical and Geoenvironmental Engineering, Water Resources and Hydraulic Engineering, Structural Engineering, and Transportation Engineering.

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

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

CURRICULUM FOR THE B.ENG. DEGREE IN CIVIL ENGINEERING

REQUIRED COURSES		COURSE CREDIT	
Non-departmental courses			
COMP208	Computers in Engineering	3	
EDEC206	Communication in Engineering	3	
EPSC221	General Geology	3	
MATH262	Intermediate Calculus	3	
MATH263	Ordinary Differential Equations and Linear Algebra	3	
MATH264	Advanced Calculus	3	
MECH261	Measurement Laboratory	2	
MECH289	Design Graphics	3	
MIME221	Engineering Professional Practice	2	
MIME310	Engineering Economy	3	**28**
Departmental courses			
CIVE202	Construction Materials	4	
CIVE205	Statics	3	
CIVE206	Dynamics	3	
CIVE207	Solid Mechanics	4	
CIVE208	Civil Engineering Systems Analysis	3	
CIVE210	Surveying	2	
CIVE225	Environmental Engineering	4	
CIVE290	Thermodynamics and Heat Transfer	3	
CIVE302	Probabilistic Systems	3	
CIVE311	Geotechnical Mechanics	4	
CIVE317	Structural Engineering 1	3	
CIVE318	Structural Engineering 2	3	
CIVE319	Transportation Engineering	3	
CIVE320	Numerical Methods	4	
CIVE323	Hydrology and Water Resources	3	
CIVE324	Construction Project Management	3	
CIVE327	Fluid Mechanics and Hydraulics 1	4	
CIVE418	Design Project	3	
CIVE432	Technical Paper	1	**60**
COMPLEMENTARY COURSES			
A minimum of six credits to be selected from list (a) and the remaining nine credits to be selected from lists (a) or (b) or from other suitable undergraduate or 500-level courses.			**15**
(a) Design Technical Complementaries			
CIVE416	(3) Geotechnical Engineering		
CIVE421	(3) Municipal Systems		
CIVE428	(3) Water Resources and Hydraulic Engineering		
CIVE430	(3) Water Treatment and Pollution Control		
CIVE462	(3) Design of Steel Structures		
CIVE463	(3) Design of Concrete Structures		
(b) General Technical Complementaries			
CIVE433	(3) Urban Planning		
CIVE440	(3) Traffic Engineering		
CIVE446	(3) Construction Engineering		
CIVE451	(3) Geoenvironmental Engineering		
CIVE460	(3) Matrix Structural Analysis		
CIVE470	(3) Research Project		
CIVE512	(3) Advanced Civil Engineering Materials		
CIVE514	(3) Structural Mechanics		
CIVE526	(3) Solid Waste Management		
CIVE527	(3) Renovation and Preservation: Infrastructure		
CIVE540	(3) Urban Transportation Planning		
CIVE541	(3) Rail Engineering		
CIVE550	(3) Water Resources Management		
CIVE553	(3) Stream Pollution and Control		
CIVE555	(3) Environmental Data Analysis		
CIVE570	(3) Waves and Coastal Engineering		
CIVE572	(3) Computational Hydraulics		
CIVE573	(3) Hydraulic Structures		
CIVE574	(3) Fluid Mechanics of Water Pollution		
CIVE576	(3) Hydrodynamics		
CIVE577	(3) River Engineering		
CIVE579	(3) Water Power Engineering		
CIVE585	(3) Groundwater Hydrology		
CIVE586	(3) Earthwork Engineering		
CIVE587	(3) Pavement Design		
Two courses (6 credits), selected from an approved list: one course on the impact of technology on society and one in the humanities and social sciences, administrative studies and law. See section 8.3.4 "Complementary Studies" for further information.			**6**
TOTAL CREDITS			**109**

8.4.4 Department of Electrical and Computer Engineering

Department of Electrical & Computer Engineering
Undergraduate Programs Office
Lorne Trottier Building, Room 2060
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Website: www.mcgill.ca/ece

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Associate Chair, Undergraduate Studies — Jonathan P. Webb
Associate Chair, Graduate Studies — Benoit Champagne

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Pierre R. Bélanger; B.Eng.(McG.), S.M., Ph.D.(M.I.T.), F.I.E.E.E., Eng.
Maier L. Blostein; B.Eng., M.Eng.(McG.), Ph.D.(Ill.), F.I.E.E.E., Eng.
Gerry W. Farnell; B.A.Sc.(Tor.), S.M.(M.I.T.), Ph.D.(McG.), F.I.E.E.E., Eng.
Tomas J.F. Pavlasek; B.Eng., M.Eng., Ph.D.(McG.), Eng.
Nicholas C. Rumin; B.Eng., M.Sc., Ph.D.(McG.), Eng.

Post-Retirement
Clifford H. Champness; M.Sc.(Lond.), Ph.D.(McG.)

Professors
Peter E. Caines; B.A.(Oxon.), D.I.C., Ph.D.(Lond.), F.R.S.C., F.I.E.E.E., F.C.I.A.R. *(James McGill Professor)* and *(Macdonald Professor)*
James Clark; B.Sc., Ph.D.(Br.Col.)
Frank D. Galiana; B.Eng.(McG.), S.M., Ph.D.(M.I.T.), F.I.E.E.E., Eng.
Geza Joos; B.Sc.(C'dia), M.Eng., Ph.D.(McG.) *(CRC Chair)*
Peter Kabal; B.A.Sc., M.A.Sc., Ph.D.(Tor.)
Tho Le-Ngoc; M.Eng.(McG.), Ph.D.(Ott.), F.I.E.E.E.
Harry Leib; B.Sc.(Technion), Ph.D.(Tor.)
Martin D. Levine; B.Eng., M.Eng.(McG.), Ph.D.(Lond.), F.C.I.A.R., F.I.E.E.E., Eng.
Boon-Teck Ooi; B.E.(Adel.), S.M.(M.I.T.), Ph.D.(McG.), Eng.
David A. Lowther; B.Sc.(Lond.), Ph.D.(C.N.A.A.), F.C.A.E., Eng.
David V. Plant; M.S., Ph.D.(Brown) (*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.(Cantab.)

Associate Professors
Benoit Boulet; B.Sc.(Laval), M.Eng.(McG.), Ph.D.(Tor.) (*William Dawson Scholar*)
Benoit Champagne; B.Eng., M.Eng.(Montr.), Ph.D.(Tor.)
Jeremy R. Cooperstock; A.Sc.(U.B.C.), M.Sc., Ph.D.(Tor.)
Mourad El-Gamal; B.Sc.(Cairo), M.Sc.(Nashville), Ph.D.(McG.) (*William Dawson Scholar*)
Frank Ferrie; B.Eng., Ph.D.(McG.)
Vincent Hayward; Dip.d'Ing.(ENSM, Nantes), Doc.Ing.(Orsay), Eng.
Andrew Kirk; B.Sc.(Brist.), Ph.D.(London) (*William Dawson Scholar*)
Steve McFee; B.Eng., Ph.D.(McG.)
Hanna Michalska; B.Sc., M.Sc.(Warsaw), Ph.D.(Lond.)
Richard Rose; B.Sc.,M.S.(Illinois), Ph.D.(GIT)
Ishiang Shih; M.Eng., Ph.D.(McG.)
Zilic Zeljko; B.Eng.(Zagreb), M.S.c, Ph.D.(Tor.)

Assistant 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.(Prin.)
Lawrence Chen; B.Eng.(McG.), M.A.Sc., Ph.D.(Tor.)
Mark Coates; B.Eng.(Australia), Ph.D.(Cambridge)
Dennis Giannacopoulos; M.Eng., Ph.D.(McG.)
Warren Gross; B.A.Sc.(Wat.), M.A.Sc., Ph.D.(Tor.)
Anas Hamoui; M.Eng.(McG.), Ph.D.(Tor.)
Roni Khazaka; M.Eng., Ph.D.(Carlton)
Fabrice Labeau, M.S., Ph.D.(Louvain)
Shie Mannor; B.A., B.Sc., Ph.D.(Haifa)
Milica Popovich; B.Sc.(Colo.), M.Sc., Ph.D.(Northwestern)
Ioannis Psaromiligkos; B.Sc.(Patras), M.Sc., Ph.D.(Buffalo)

Visiting Professor
Lorne Mason; B.Eng., Ph.D.(Sask.)
Richard Vickers; B.Sc.(Wales)

Lecturers
Kenneth L. Fraser; B.Eng., M.Eng.(McG.)
Danny Grant; M.Eng., Ph.D.(McG.)

Associate Members
Martin Buehler; M.Sc., Ph.D.(Yale)
Philipe Depalle; D.E.A.(Le Mans & ENS Cachan, Ph.D.(Le Mans & IRCAM)
Gregory Dudek; B.Sc.(Queen's), 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.(Dartmouth, N.S.), Ph.D.(McG.)
Robert E. Kearney; M.Eng., Ph.D.(McG.)
Bernard Segal; B.Sc., B.Eng., M.Eng., Ph.D.(McG.)

Adjunct Professors
Ray Bartnikas, EduardCerny, Charalambos Charalambous, Robert DiRaddo, Cedric Guss, ChengK.Jen, Michael Kaplan, IreneLeszkowicz, MiguelMarin, DonaldMcGillis, Radu Negulescu, DouglasO'Shaughnessy, NorbertPuetz, Farouk Rizk, Robert Sabourin, LucjanWegrowicz

The Department of Electrical and Computer Engineering offers undergraduate degree programs in Electrical Engineering, Electrical Engineering (Honours), Computer Engineering, and Software Engineering. All programs provide students with a strong background in mathematics, basic sciences, engineering science, engineering design and complementary studies, in conformity with the requirements of the Canadian Engineering Accreditation Board (CEAB).

The program in Electrical Engineering gives students a broad understanding of the key principles that are responsible for the extraordinary advances in the technology of computers, microelectronics, 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.

The program in Electrical Engineering (Honours) is designed for students who wish to pursue postgraduate work and look to a career in advanced research and development. The technical complementaries are selected from graduate courses, facilitating the transition to postgraduate studies. Students in this curriculum benefit from smaller classes and have more contact with professorial staff and graduate students. However, the program is quite demanding. Students are expected to register for at least 14 credits per term; they may register for a smaller number only with the permission of the Chair of this Department. Students in the Honours program must maintain a minimum GPA of 3.00. Those who fail to maintain this standard are transferred to the regular program.

The program in Computer Engineering 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.

The Department, jointly with the School of Computer Science, offers a Bachelor of Software Engineering program*. Graduates of this program should be eligible for accreditation (once accreditation standards for Software Engineers have been adopted). This program offers students the opportunity to focus their studies on the skills needed to design and develop complex software systems. This emerging field of engineering is a major component of the growing Information Technology (IT) sector of the economy, in which the demand for qualified personnel continues to outstrip supply. Graduates of this program will have a solid foundation for careers in the software industry. [*The School of Computer Science offers a B.Sc. Major program in Software Engineering, which **will not** lead to accreditation. For further information on the B.Sc. program see section 12.12.8 "Computer Science (COMP)".]

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

Entry into the 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.

Though not required to do so, students in the Honours program or wishing to enter the Honours program are encouraged to take the following advanced math and physics courses:

MATH325	Honours Ordinary Differential Equations	instead of MATH263
MATH247	Honours Linear Algebra	instead of MATH271
MATH248	Honours Advanced Calculus	instead of MATH264
MATH249	Honours Complex Variables	instead of MATH381
PHYS251	Classical Mechanics 1	instead of CIVE281

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)398-7344.

CURRICULUM FOR THE B.ENG. DEGREE IN ELECTRICAL ENGINEERING (HONOURS)

REQUIRED COURSES		COURSE CREDIT	
Non-Departmental Courses			
COMP202	Introduction to Computing 1	3	
EDEC206	Communication in Engineering	3	
MATH262	Intermediate Calculus	3	
MATH247*	Honours Applied Linear Algebra	3	
or MATH271	Linear Algebra and Partial Differential Equations (3)		
MATH248*	Honours Advanced Calculus	3	
or MATH264	Advanced Calculus (3)		
MATH249	Honours Complex Variables	3	
or MATH381	Complex Variables and Transforms (3)		
MATH325	Honours Ordinary Differential Equations	3	
or MATH263	Ordinary Differential Equations and Linear Algebra (3)		
MIME221	Engineering Professional Practice	2	
MIME310	Engineering Economy	3	
PHYS251	Classical Mechanics 1	3	
or CIVE281	Analytical Mechanics (3)		
PHYS271	Quantum Physics	3	**32**
** CGPA of 3.30 is required to register for MATH247 and MATH248.*			
Departmental Courses			
ECSE200	Fundamentals of Electrical Engineering	3	
ECSE210	Circuit Analysis	3	
ECSE221	Introduction to Computer Engineering	3	
ECSE291	Electrical Measurements Laboratory	2	
ECSE303	Signals and Systems 1	3	
ECSE304	Signals and Systems 2	3	
ECSE305	Probability and Random Sig. 1	3	
ECSE322	Computer Engineering	3	
ECSE323	Digital System Design	5	
ECSE330	Introduction to Electronics	3	
ECSE334	Introduction to Microelectronics	5	
ECSE351	Electromagnetic Fields	3	
ECSE352	EM Waves and Optics	3	
ECSE361	Power Engineering	3	
ECSE498	Honours Thesis 1	3	
ECSE499	Honours Thesis 2	3	**51**

COMPLEMENTARY COURSES

Technical Complementaries **15**

Five technical complementary courses (15 credits), which must be ECSE courses at the 500 level (or ECSE427, ECSE451). Students must choose their technical complementary courses so that they complete at least 9credits in one of the following specializations. However, with Departmental approval, the Honours Thesis 1 and 2 (ECSE498 and ECSE499) can count as 6 of the 9 credits. The remaining courses may be any at the 500 level offered by the Department. The choice is not restricted.

Computer Systems Technology

ECSE427	Operating Systems
ECSE525	Computer Architecture
ECSE532	Computer Graphics
ECSE548	Introduction to VLSI Systems

Control and Automation

ECSE501	Linear Systems
ECSE502	Control Engineering
ECSE503	Linear Stochastic Systems 1
ECSE504	Computer Control
ECSE505	Nonlinear Control Systems
ECSE507	Optimization and Optimal Control
ECSE509	Probability and Random Sig. 2
ECSE512	Digital Signal Processing 1
ECSE529	Image Processing and Communication
ECSE531	Real Time Systems

Integrated Circuits and Electronics

ECSE451	EM Transmission & Radiation
ECSE522	Asynchronous Circuits and Systems
ECSE527	Optical Engineering
ECSE530	Logic Synthesis
ECSE533	Physical Basis of Semiconductor Devices
ECSE534	Analog Microelectronics
ECSE536	RF Microelectronics
ECSE545	Microelectronics Technology
ECSE548	Introduction to VLSI Systems
ECSE571	Optoelectronic Devices
ECSE573	Microwave Electronics
ECSE597	Circuit Simulators

Power Engineering

ECSE502	Control Engineering
ECSE549	Expert Systems in Electrical Design
ECSE559	Flexible AC Transmission Systems
ECSE560	Power Systems Analysis 2
ECSE563	Power Systems Operation and Planning
ECSE565	Introduction to Power Electronics

Telecommunications

ECSE451	EM Transmission and Radiation
ECSE509	Probability and Random Sig. 2
ECSE511	Introduction to Digital Communication
ECSE512	Digital Signal Processing 1
ECSE521	Digital Communications 1
ECSE523	Speech Communications
ECSE527	Optical Engineering
ECSE528	Telecommunication Network Architecture
ECSE571	Optoelectronic Devices
ECSE593	Antennas and Propagation
ECSE596	Optical Waveguides

Laboratory Complementaries **4**

Two of the following eleven 400-level laboratory courses:

ECSE426	Microprocessor Systems
ECSE431	Introduction to VSLI CAD
ECSE435	Mixed-Signal Test Techniques
ECSE436	Signal Processing Hardware
ECSE485	IC Fabrication Laboratory
ECSE486	Power Laboratory
ECSE487	Computer Architecture Laboratory
ECSE488	High Frequency Laboratory
ECSE490	Digital Signal Processing Laboratory
ECSE491	Communication Systems Laboratory

ECSE492	Optical Communications Laboratory	
ECSE493	Control and Robotics Laboratory	

General Complementaries **6**

Two courses (6 credits), selected from an approved list: one course on the impact of technology on society and one in the humanities and social sciences, administrative studies and law. See section 8.3.4 "Complementary Studies" for further information.

TOTAL CREDITS **108**

CURRICULUM FOR THE B.ENG. DEGREE IN ELECTRICAL ENGINEERING (REGULAR)

REQUIRED COURSES		COURSE CREDIT	
Non-Departmental Courses			
CIVE281	Analytical Mechanics	3	
or PHYS251	Classical Mechanics 1 (3)		
COMP202	Introduction to Computing 1	3	
EDEC206	Communication in Engineering	3	
MATH262	Intermediate Calculus	3	
MATH263	Ordinary Differential Equations and Linear Algebra	3	
or MATH325	Honours Ordinary Differential Equations (3)		
MATH264	Advanced Calculus	3	
or MATH248*	Honours Advanced Calculus (3)		
MATH271	Linear Algebra and Partial Differential Equations	3	
or MATH247*	Honours Applied Linear Algebra (3)		
MATH381	Complex Variables and Transforms	3	
MIME221	Engineering Professional Practice	2	
MIME310	Engineering Economy	3	
PHYS271	Quantum Physics	3	**32**

** CGPA of 3.30 is required to register for MATH247 and MATH248.*

Departmental Courses			
ECSE200	Fundamentals of Electrical Engineering	3	
ECSE210	Circuit Analysis	3	
ECSE221	Introduction to Computer Engineering	3	
ECSE291	Electrical Measurements Laboratory	2	
ECSE303	Signals and Systems 1	3	
ECSE304	Signals and Systems 2	3	
ECSE305	Probability and Random Sig. 1	3	
ECSE322	Computer Engineering	3	
ECSE323	Digital System Design	5	
ECSE330	Introduction to Electronics	3	
ECSE334	Introduction to Microelectronics	5	
ECSE351	Electromagnetic Fields	3	
ECSE352	EM Waves and Optics	3	
ECSE361	Power Engineering	3	
ECSE494	Electrical Engineering Design Project	3	**48**

COMPLEMENTARY COURSES

Technical Complementaries **18**

Six courses (18 credits) from the list of 400-level courses in Electrical Engineering that must include 9 credits (3courses) from one of the areas of specialization listed below:

Computer Systems Technology

ECSE421	Embedded Systems
ECSE424	Human-Computer Interaction
ECSE425	Computer Organization and Architecture
ECSE427	Operating Systems

Control and Automation

ECSE404	Control Systems
ECSE412	Discrete Time Signal Processing
ECSE426	Microprocessor Systems
ECSE436	Signal Processing Hardware

Integrated Circuits and Electronics

ECSE425	Computer Organization and Architecture
ECSE431	Introduction to VSLI CAD
ECSE432	Physical Basis: Transistor Devices
ECSE435	Mixed-Signal Test Techniques
ECSE451	EM Transmission & Radiation

Phototonics

ECSE423	Fundamentals of Photonics
ECSE430	Photonic Devices and Systems
ECSE432	Physical Basis: Transistor Devices

Power Engineering*

ECSE404	Control Systems
ECSE460	Appareillage électrique (Electrical Power Equipment)
ECSE462	Electromechanical Energy Conversion
ECSE464	Power System Analysis 1
ECSE465	Power Electronic Systems
ECSE468	Electricité industrielle (Industrial Power Systems)

Telecommunications**

ECSE411	Communications Systems 1
ECSE414	Introduction to Telecommunication Networks

and any one of the following:

ECSE405	Antennas
ECSE412	Discrete Time Signal Processing
ECSE413	Communications Systems 2
ECSE423	Fundamentals of Photonics
ECSE436	Signal Processing Hardware
ECSE451	EM Transmission and Radiation

Laboratory Complementaries **4**

Two of the following eleven 400-level laboratory courses:

ECSE426	Microprocessor Systems
ECSE431	Introduction to VSLI CAD
ECSE435	Mixed-Signal Test Techniques
ECSE436	Signal Processing Hardware
ECSE485	IC Fabrication Laboratory
ECSE486	Power Laboratory
ECSE487	Computer Architecture Laboratory
ECSE488	High Frequency Laboratory
ECSE489	Telecommunication Network Lab
ECSE490	Digital Signal Processing Laboratory
ECSE491	Communication Systems Laboratory
ECSE492	Optical Communications Laboratory
ECSE493	Control and Robotics Laboratory

General Complementaries **6**

Two courses (6 credits), selected from an approved list: one course on the impact of technology on society and one in the humanities and social sciences, administrative studies and law. See section 8.3.4 "Complementary Studies" for further information.

TOTAL CREDITS **108**

*** Enhanced Power Concentration**

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

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

The benefits of the Concentration are:

- 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 2005, the applicant must:

- be registered in the B.Eng. program (regular Electrical Engineering);
- have a cumulative GPA of at least 2.70;

– have completed or be registered in ECSE361 (Power Engineering);
– be able to complete the degree requirements by Spring 2006;
– agree to follow the curriculum requirements set out below.

Selection criteria: The number of students selected, expected to be between 5 and 10, 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 the 2005-06 *Undergraduate Programs Calendar* with the following specifications:

Technical Electives and Laboratories: All students must take (or have taken) the following courses (18 credits):

ECSE404 Control Systems
ECSE460 Appareillage électrique (Electrical Power Equipment)
ECSE462 Electromechanical Energy Conversion
ECSE464 Power Systems Analysis 1
ECSE465 Power Electronic Systems
ECSE468 Electricité industrielle (Industrial Power Systems)

Courses ECSE460 and ECSE468 are taught in French. ECSE460, ECSE464, ECSE465 and ECSE468 are courses sponsored by the Institute and taught at École Polytechnique de Montréal.

In addition, students must complete ECSE494 (Electrical Engineering Design Project) on a practical project in power engineering, preferably at the Institute or with a company sponsoring the Institute.

**** Enhanced ITT Specialization in Telecommunications**

The International Institute of Telecommunications (IIT) was established in Montreal as a centre for telecommunications education. Funded by government and industry, it provides state-of-the-art laboratory facilities and a point of contact between local telecommunications industries and universities.

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

The benefits of the specialization are:
– a guaranteed project lab (ECSE494) in telecommunications, at IIT or with an IIT company; and
– permission to take ECSE496 at IIT.

To complete the specialization, students must take six courses as Technical Complementaries:

ECSE411 Communications Systems 1
ECSE414 Introduction to Telecommunication Networks
ECSE496 Telecommuniations Systems and Services

and any three courses selected from the following list:

ECSE412 Discrete Time Signal Processing
ECSE413 Communications Systems 2
ECSE423 Fundamentals of Photonics
ECSE451 EM Transmission and Radiation

In addition, students must take ECSE491 (Communications Systems Lab) and complete ECSE494 (Electrical Engineering Design Project) in telecommunications, at IIT or with an IIT company.

There may be an enrolment limitation in this specialization in any given term.

CURRICULUM FOR THE B.ENG. DEGREE IN COMPUTER ENGINEERING

REQUIRED COURSES		COURSE CREDIT	
Non-Departmental Courses			
MATH262	Intermediate Calculus	3	
MATH263	Ordinary Differential Equations and Linear Algebra	3	
or MATH325	Honours Ordinary Differential Equations (3)		
MATH264	Advanced Calculus	3	
or MATH248*	Honours Advanced Calculus (3)		
MATH270	Applied Linear Algebra	3	
or MATH247*	Honours Applied Linear Algebra (3)		
MATH363	Discrete Mathematics	3	
MATH381	Complex Variables and Transforms	3	
CIVE281	Analytical Mechanics	3	
or PHYS251	Classical Mechanics 1 (3)		
MIME221	Engineering Professional Practice	2	
MIME310	Engineering Economy	3	
COMP202	Introduction to Computing 1	3	
COMP250	Introduction to Computer Science	3	
COMP302	Programming Languages and Paradigms	3	
EDEC206	Communication in Engineering	3	**38**

** CGPA of 3.30 is required to register for MATH247 and MATH248.*

Departmental Courses			
ECSE200	Fundamentals of Electrical Engineering	3	
ECSE210	Circuit Analysis	3	
ECSE221	Introduction to Computer Engineering	3	
ECSE291	Electrical Measurements Laboratory	2	
ECSE303	Signals and Systems 1	3	
ECSE304	Signals and Systems 2	3	
ECSE305	Probability and Random Sig. 1	3	
ECSE321	Introduction to Software Engineering	3	
ECSE322	Computer Engineering	3	
ECSE323	Digital System Design	5	
ECSE330	Introduction to Electronics	3	
ECSE334	Introduction to Microelectronics	5	
ECSE353	Electromagnetic Fields and Waves	3	
ECSE425	Computer Organization and Architecture	3	
ECSE427	Operating Systems	3	
ECSE494	Electrical Engineering Design Project	3	**51**

COMPLEMENTARY COURSES

Technical Complementaries **9**

Three courses (9 credits) selected from:

ECSE404 Control Systems
ECSE411 Communications Systems 1
ECSE412 Discrete Time Signal Processing
ECSE414 Introduction to Telecommunication Networks
or COMP535 Computer Networks 1
ECSE421 Embedded Systems
ECSE424 Human-Computer Interaction
ECSE426 Microprocessor Systems
ECSE428 Software Engineering Practice
ECSE431 Introduction to VSLI CAD
ECSE436 Signal Processing Hardware
ECSE530 Logic Synthesis
ECSE526 Artificial Intelligence
ECSE531 Real Time Systems
ECSE532 Computer Graphics
ECSE548 Introduction to VLSI Systems
COMP420 Files and Databases
COMP431 Algorithms for Engineers
COMP575 Fundamentals of Distributed Algorithms

Laboratory Complementaries **4**

Two of the following 400-level laboratory courses:

ECSE426 Microprocessor Systems
ECSE431 Introduction to VSLI CAD
ECSE435 Mixed-Signal Test Techniques
ECSE436 Signal Processing Hardware
ECSE487 Computer Architecture Laboratory
ECSE489 Telecommunication Network Lab
ECSE490 Digital Signal Processing Laboratory
ECSE491 Communication Systems Laboratory

ECSE493	Control and Robotics Laboratory	
General Complementaries		**6**
Two courses (6 credits), selected from an approved list: one course on the impact of technology on society and one in the humanities and social sciences, administrative studies and law. See section 8.3.4 "Complementary Studies" for further information.		
TOTAL CREDITS		**108**

CURRICULUM FOR THE BACHELOR OF SOFTWARE ENGINEERING (B.S.E.)

		COURSE CREDIT	
REQUIRED COURSES			
COMP202	Introduction to Computing 1	3	
COMP206	Introduction to Software Systems	3	
COMP250	Introduction to Computer Science	3	
COMP251	Data Structures and Algorithms	3	
COMP302	Programming Languages and Paradigms	3	
COMP330	Theoretical Aspects: Computer Science	3	
COMP360	Algorithm Design Techniques	3	
COMP361	Systems Development Project	3	
COMP420	Files and Databases	3	
ECSE221	Introduction to Computer Engineering	3	
ECSE321	Introduction to Software Engineering	3	
ECSE322	Computer Engineering	3	
ECSE427	Operating Systems	3	
ECSE428	Software Engineering Practice	3	
ECSE429	Software Validation	3	
ECSE495	Software Engineering Design Project	3	
MATH262	Intermediate Calculus	3	
MATH263	Ordinary Differential Equations and Linear Algebra	3	
MATH264	Advanced Calculus	3	
MATH270	Applied Linear Algebra	3	
MATH363	Discrete Mathematics	3	
MATH381	Complex Variables and Transforms	3	**66**
Engineering Breadth Required Courses			
ECSE200	Fundamentals of Electrical Engineering	3	
ECSE210	Circuit Analysis	3	
ECSE291	Electrical Measurements Laboratory	2	
ECSE303	Signals and Systems 1	3	
ECSE305	Probability and Random Sig. 1	3	
ECSE330	Introduction to Electronics	3	
EDEC206	Communication in Engineering	3	
MIME310	Engineering Economy	3	
MIME221	Engineering Professional Practice	2	**25**
Technical Complementaries			**11 - 12**
Students must take 11-12 credits of technical complementaries from the following list, of which at least 6 credits must be taken from list A and the remainder from list B.			
Group A Technical Complementaries			
COMP350	Numerical Computing		
COMP409	Concurrent Programming		
COMP424	Topics: Artificial Intelligence 1		
COMP433	Personal Software Engineering		
COMP524	Theoretical Foundations of Programming Languages		
COMP575	Fundamentals of Distributed Algorithms		
Group B Technical Complementaries			
ECSE304	Signals and Systems 2		
ECSE323	Digital Systems Design		
ECSE404	Control Systems		
ECSE411	Communications Systems 1		
ECSE412	Discrete Time Signal Processing		
ECSE413	Communications Systems 2		
ECSE414	Introduction to Telecommunication Networks		
or COMP535	Computer Networks 1		
ECSE421	Embedded Systems		
ECSE422	Fault Tolerant Computing		
ECSE420	Parallel Computing		
ECSE424	Human-Computer Interaction		
ECSE425	Computer Organization and Architecture		
ECSE426	Microprocessor Systems		
or COMP573	Microcomputers		
ECSE504	Computer Control		
ECSE522	Asynchronous Circuits and Systems		
ECSE526	Artificial Intelligence		
ECSE529	Image Processing and Communication		
ECSE530	Logic Synthesis		
ECSE531	Real Time Systems		
ECSE532	Computer Graphics		
or COMP557	Fundamentals of Computer Graphics		
COMP410	Mobile Computing		
COMP412	Software for E-commerce		
COMP505	Advanced Computer Architecture		
COMP520	Compiler Design		
COMP566	Discrete Optimization 1		
General Complementaries			**6**
Two courses (6 credits), selected from an approved list: one course on the impact of technology on society and one in the humanities and social sciences, administrative studies and law. See section 8.3.4 "Complementary Studies" for further information.			
TOTAL CREDITS			**108/109**

8.4.5 Department of Mechanical Engineering

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Chair — Arun K. Misra

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Romuald Knystautas; B.Eng., M.Eng., Ph.D.(McG.), Eng.
Michael P. Paidoussis; B.Eng.(McG.), Ph.D.(Cantab.), Eng., F.I.Mech.E., F.A.S.M.E., F.A.A.M., F.C.S.M.E., F.R.S.C., F.C.A.E. *(Thomas Workman Emeritus Professor of Mechanical Engineering)*

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Lucjan Kops; B.Eng., M.Eng., D.Sc. Eng.(Krakow Tech.U.), Eng., M.C.I.R.P., F.A.S.M.E., F.C.S.M.E., M.S.M.E.

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Mechanical engineers are traditionally concerned with the conception, design, implementation and operation of mechanical systems. Typical fields of work are aerospace, energy, manufacturing, machinery, and transportation. Because of the very broad nature of the discipline there is usually a high demand for mechanical engineers.

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

To prepare the mechanical engineer for a wide range of career possibilities, there is a heavy stress 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, manufacture and experimentation. In these courses students learn how to apply their analytical groundwork to the solution of practical problems.

Specialist 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.

The Department offers an Honours Program which is particularly suitable for those with a high aptitude in mathematics and physics and which gives a thorough grounding in the basic engineering sciences. The complementary courses in this program can be utilized to take courses with applied engineering orientation, such as those offered in the regular program, or if preferred, to obtain an even more advanced education in engineering science.

Concentrations in Aeronautical Engineering, Mechatronics and Design are available for students in either the Regular or Honours programs who wish to specialize in these areas.

While the program is demanding, there is time for many extracurricular activities. Students are active in such professional societies as CASI (Canadian Aeronautics and Space Institute), SAE (Society of Automotive Engineers), and ASME (American Society of Mechanical Engineers) and in various campus organizations.

Relations between faculty and students are extremely close. Social functions, at which students and professors meet to exchange views and get to know each other better, are organized frequently.

CURRICULUM FOR THE B.ENG. DEGREE IN MECHANICAL ENGINEERING (REGULAR)

REQUIRED COURSES			COURSE CREDIT
Non-Departmental Subjects			
CIVE207	Solid Mechanics	4	
COMP208	Computers in Engineering	3	
ECSE461	Electric Machinery	3	
EDEC206	Communication in Engineering	3	
MATH262	Intermediate Calculus	3	
MATH263	Ordinary Differential Equations and Linear Algebra	3	
MATH264	Advanced Calculus	3	
MATH271	Linear Algebra and Partial Differential Equations	3	
MIME221	Engineering Professional Practice	2	
MIME260	Materials Science and Engineering	3	
MIME310	Engineering Economy	3	**33**
Departmental Courses			
MECH201	Introduction to Mechanical Engineering	2	
MECH210	Mechanics 1	2	
MECH220	Mechanics 2	4	
MECH240	Thermodynamics 1	3	
MECH260	Machine Tool Laboratory	2	
MECH262	Statistics and Measurement Laboratory	3	
MECH289	Design Graphics	3	
MECH292	Design 1	3	
MECH309	Numerical Methods in Mechanical Engineering	3	
MECH314	Dynamics of Mechanisms	3	
MECH315	Mechanics 3	4	
MECH321	Mechanics of Deformable Solids	3	
MECH331	Fluid Mechanics 1	3	
MECH341	Thermodynamics 2	3	
MECH346	Heat Transfer	3	
MECH362	Mechanical Laboratory 1	2	
MECH383	Applied Electronics and Instrumentation	3	
MECH393	Design 2	3	
MECH412	Dynamics of Systems	3	
MECH430	Fluid Mechanics 2	3	
MECH463D1	Mechanical Engineering Project	3	
MECH463D2	Mechanical Engineering Project	3	**64**
COMPLEMENTARY COURSES			**15**

2 courses (6 credits) at the 300 level or higher to be selected from Mechanical Engineering. For students who entered in September 2004 or later, one of these two courses must be chosen from the following list:

MECH497	Value Engineering
MECH513	Control Engineering
MECH524	Computer Integrated Manufacturing
MECH526	Manufacturing and the Environment
MECH528	Product Design
MECH541	Kinematic Synthesis
MECH543	Design with Composite Materials
MECH554	Microprocessors for Mechanical Systems
MECH557	Mechatronic Design
MECH565	Fluid Flow and Heat Transfer Equipment
MECH573	Mechanics of Robotic Systems
MECH577	Optimum Design

1 course (3 credits) at the 300 level or higher from the Faculty of Engineering or an approved course in the Faculty of Science, including Mathematics.

Two courses (6 credits), selected from an approved list: one course on the impact of technology on society and one in the humanities and social sciences, administrative studies and law. See section 8.3.4 "Complementary Studies" for further information.

TOTAL CREDITS **112**

Students entering in September or January must plan their program of studies in accordance with the regulations posted on the Faculty Website at www.mcgill.ca/engineering. After registering, students must consult with their academic adviser.

Additional information can be found in section 8.3.1.2 "Basic Science Requirements for Students Entering from Outside Quebec".

CURRICULUM FOR THE B.ENG. DEGREE IN MECHANICAL ENGINEERING (HONOURS)

REQUIRED COURSES		COURSE CREDIT	
Non-Departmental Subjects			
CIVE207	Solid Mechanics	4	
EDEC206	Communication in Engineering	3	
COMP208	Computers in Engineering	3	
MATH262	Intermediate Calculus	3	
MATH263	Ordinary Differential Equations and Linear Algebra	3	
MATH264	Advanced Calculus	3	
MATH271	Linear Algebra and Partial Differential Equations	3	
MIME221	Engineering Professional Practice	2	
MIME310	Engineering Economy	3	**27**
Departmental Courses			
MECH201	Introduction to Mechanical Engineering	2	
MECH210	Mechanics 1	2	
MECH220	Mechanics 2	4	
MECH240	Thermodynamics 1	3	
MECH260	Machine Tool Laboratory	2	
MECH262	Statistics and Measurement Laboratory	3	
MECH289	Design Graphics	3	
MECH292	Design 1	3	
MECH309	Numerical Methods in Mechanical Engineering	3	
MECH321	Mechanics of Deformable Solids	3	
MECH331	Fluid Mechanics 1	3	
MECH341	Thermodynamics 2	3	
MECH346	Heat Transfer	3	
MECH362	Mechanical Laboratory 1	2	
MECH383	Applied Electronics and Instrumentation	3	
MECH403D1	Thesis (Honours)	3	
MECH403D2	Thesis (Honours)	3	
MECH404	Honours Thesis 2	3	
MECH419	Advanced Mechanics of Systems	4	
MECH430	Fluid Mechanics 2	3	
MECH452	Mathematical Methods in Engineering 1	3	
MECH494	Honours Design Project	3	**64**
COMPLEMENTARY COURSES			**21**

2 of the following three courses (6 credits):

MECH545 Advanced Stress Analysis
MECH562 Advanced Fluid Mechanics
MECH578 Advanced Thermodynamics

2 courses (6 credits) at the 300 level or higher to be selected from Mechanical Engineering. For students who entered in September 2004 or later, one of these two courses must be chosen from the following list:

MECH497 Value Engineering
MECH 513 Control Systems
MECH524 Computer Integrated Manufacturing
MECH526 Manufacturing and the Environment
MECH528 Product Design
MECH541 Kinematic Synthesis
MECH543 Design with Composite Materials
MECH554 Microprocessors for Mechanical Systems
MECH557 Mechatronic Design
MECH565 Fluid Flow and Heat Transfer Equipment
MECH573 Mechanics of Robotic Systems
MECH577 Optimum Design

1 course (3 credits) at the 300 level or higher from the Faculty of Engineering or an approved course in the Faculty of Science, including Mathematics.

Two courses (6 credits), selected from an approved list: one course on the impact of technology on society and one in the humanities and social sciences, administrative studies and law. See section 8.3.4 "Complementary Studies" for further information.

TOTAL CREDITS **112**

Students entering in September or January must plan their program of studies in accordance with the regulations posted on the Faculty Website at www.mcgill.ca/engineering. After registering, students must consult with their academic adviser.

Additional information can be found in section 8.3.1.2 "Basic Science Requirements for Students Entering from Outside Quebec".

LIST OF COMPLEMENTARY COURSES (DEPARTMENTAL)
(Each is 3 credits)

MECH343 Energy Conversion
MECH413 Control Systems
MECH432 Aircraft Structures
MECH434 Turbomachinery
MECH447 Combustion
MECH471 Industrial Engineering
MECH472 Case Studies in Project Mgmt
MECH474 Selected Topics in Operations Research
MECH495 Design 3
MECH496 Design 4
MECH497 Value Engineering
MECH500 Selected Topics in Mechanical Engineering
MECH501 Special Topics: Mechanical Engineering
MECH522 Production Systems
MECH524 Computer Integrated Manufacturing
MECH526 Manufacturing and the Environment
MECH528 Product Design
MECH529 Discrete Manufacturing Systems
MECH530 Mechanics of Composite Materials
MECH531 Aeroelasticity
MECH532 Aircraft Performance, Stability and Control
MECH533 Subsonic Aerodynamics
MECH534 Air Pollution Engineering
MECH537 High-Speed Aerodynamics
MECH538 Unsteady Aerodynamics
MECH539 Computational Aerodynamics
MECH540 Design: Modelling and Decision
MECH541 Kinematic Synthesis
MECH542 Spacecraft Dynamics
MECH543 Design with Composite Materials
MECH545 Advanced Stress Analysis
MECH552 Advanced Applied Mathematics
MECH554 Microprocessors for Mechanical Systems
MECH555 Applied Process Control
MECH557 Mechatronic Design
MECH561 Biomechanics of Musculoskeletal Systems
MECH562 Advanced Fluid Mechanics
MECH565 Fluid Flow and Heat Transfer Equipment
MECH572 Introduction to Robotics
MECH573 Mechanics of Robotic Systems
MECH576 Computer Graphics and Geometrical Modelling
MECH577 Optimum Design
MECH578 Advanced Thermodynamics
MECH581 Nonlinear Dynamics and Chaos

TYPICAL PROGRAM OF STUDIES FOR REGULAR OR HONOURS

For students starting their B.Eng. studies in September 2004 who have completed the Quebec Diploma of Collegial Studies, a program for the first two terms of study is given below. Students will be advised by the Department whether they should follow StreamA or Stream B.

STREAM A:
Term 1 (Fall)
COMP208 Computers in Engineering
MATH262 Intermediate Calculus
MECH201 Introduction to Mechanical Engineering
MECH210 Mechanics 1
MECH260 Machine Tool Laboratory
MIME221 Engineering Professional Practice
Term 2 (Winter)
MATH263 Differential Equations
MATH264 Advanced Calculus
MECH220 Mechanics 2
MECH262 Statistics and Measurement Laboratory
MECH291 Graphics

STREAM B:
Term 1 (Fall)
COMP208 Computers in Engineering
MATH262 Intermediate Calculus
MECH201 Introduction to Mechanical Engineering
MECH260 Machine Tool Laboratory
MECH291 Graphics
MIME221 Engineering Professional Practice

Term 2 (Winter)
MATH263 Differential Equations
MATH264 Advanced Calculus
MECH210 Mechanics 1
MECH262 Statistics and Measurement Laboratory
MIME260 Materials Science and Engineering

For all Minors and Concentrations, students should complete a special form available from the Undergraduate Program Secretary indicating their intention to take the Minor or the Concentration.

AERONAUTICAL ENGINEERING CONCENTRATION
Students in this Concentration should take five courses in the area of Aeronautical Engineering.

Required Courses (6 credits):
MECH532 (3) Aircraft Performance, Stability and Control
MECH533 (3) Subsonic Aerodynamics

Complementary Courses (9 credits)
at least one of the following two courses:
MECH432 (3) Aircraft Structures
MECH434 (3) Turbomachinery

the remaining two courses may be chosen from the above or from the following courses:
MECH531 (3) Aeroelasticity
MECH537 (3) High-Speed Aerodynamics
MECH538 (3) Unsteady Aerodynamics
MECH539 (3) Computational Aerodynamics
MECH565 (3) Fluid Flow and Heat Transfer Equipment

All courses must be passed at a level C or better.

Students should also discuss the matter with their adviser and complete a special form indicating their intention to take this Concentration.

DESIGN CONCENTRATION

Students in this Concentration should take five courses in the area of Design, including the completion of an interdisciplinary design project.
Of the five courses, two are required::
MECH498 Interdisciplinary Design Project 1
MECH499 Interdisciplinary Design Project 2

The remaining three courses are to be chosen from the list below:
ABEN412 Machinery Systems Engineering
ARCH515 Systainable Design
CHEE453 Process Design
MECH497 Value Engineering
MECH526 Manufacturing and the Environment
MECH528 Product Design
MECH530 Mechanics of Composite Materials
MECH541 Kinematic Systhesis
MECH453 Design with Composite Materials
MECH554 Microprocessors for Mechanical Systems
MECH557 Mechatronics Design
MECH565 Fluid Flow and Heat Transfer Equipment
MECH576 Computer Graphics and Geometric Modeling
MECH577 Optimum Design
MECH583 Design Principles

MECHATRONICS CONCENTRATION
Students in this Concentration should take six courses in the area of Control, Robotics and/or CAD/CAM. They must take the following four required courses:

MECH513 Control Systems
MECH554 Microprocessors for Mechanical Systems
MECH557 Mechatronic Design
MECH572 Introduction to Robotics

and two of the following:
MECH528 Product Design
MECH541 Kinematic Synthesis
MECH573 Mechanics of Robotic Systems
MECH576 Computer Graphics and Geometrical Modelling

8.4.6 Department of Mining, Metals and Materials Engineering

Wong Building, Room 2160
3610 University Street
Montreal, QC H3A 2B2

Website: www.mcgill.ca/minmet

Metals and Materials –
Telephone: (514) 398-1040 Fax: (514) 398-4492

Mining –
Telephone: (514) 398-2215 Fax: (514) 398-7099

Chair — Robin A.L. Drew

Emeritus Professors
John E. Gruzleski; B.Sc., M.Sc.(Qu.), Ph.D.(Tor.), Eng. *(Gerald G. Hatch Emeritus Professor of Mining and Metallurgy)*
Gordon W. Smith; B.Eng., M.Eng., Ph.D.(McG.), Eng.
William M. Williams; B.Sc., M.Sc.(Brist.), Ph.D.(Tor.), Eng. *(HenryBirks Emeritus Professor of Metallurgy)*

Professors
Roussos Dimitrakopoulos; B.Sc.m M.Sc.(Alta.), Ph.D.(Ecole Poly., Montr.)
George P. Demopoulos; Dipl. Eng.(NTU Athens), M.Sc., Ph.D.(McG.), Eng.
Robin A.L. Drew; B.Tech.(Bradford), Ph.D.(Newcastle)
James A. Finch; B.Sc.(Birm.), M.Eng., Ph.D.(McG.), Eng. *(Industry Professor of Mineral Processing)*
Raynald Gauvin; B.Ing., Ph.D.(Montr.), Eng.
Rod I.L. Guthrie; B.Sc., Ph.D.(Lond.), D.I.C., A.R.S.M., Eng. *(William C. Macdonald Professor of Mining and Metallurgy)*
Ralph Harris; B.Sc.(Qld), M.Eng., Ph.D.(McG.)
Faramarz (Ferri) P. Hassani; Ph.D.(Nott.), MIMMM *(George Boyd Webster Professor of Mining Engineering)* (*Director, Mining Engineering Program*)
Hani S. Mitri; B.Sc.(Cairo), M.Eng., Ph.D.(McMaster), Eng.
Jerzy Szpunar; B.Sc., M.Sc., Ph.D., D.Sc.(Krakow)
Steve Yue; B.Sc., Ph.D.(Leeds)

Associate Professors
Michel L. Bilodeau; B.A.Sc.(Montr.), M.Sc.App., Ph.D.(McG.), Eng.
Mainul Hasan; B.Eng.(Dhaka), M.Sc.(Dhahran), Ph.D.(McG.)
Janusz A. Kozinski; B.A., M.Eng., D.Sc.(Krakow) *(William Dawson Scholar)*
André Laplante; B.A.Sc., M.A.Sc.(Montr.), Ph.D.(Tor.), Eng.
Frank Mucciardi; B.Eng., M.Eng., Ph.D.(McG.), Eng.
Jacques Ouellet; B.A.Sc.(Laval), M.A.Sc, Ph.D.(Montr.), Eng.
Mihriban Pekguleryuz; B.Eng., M.Eng.(U of Florida), Ph.D. (McG.)

Assistant Professor
Mathieu Brochu; B.Eng.(Laval), Ph.D.(McG.)

Post-Retirement Professor — John J. Jonas; B.Eng.(McG.), Ph.D.(Cantab.), F.A.S.M., Eng.

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

Adjunct Professors
MarcBétournay, WilliamCaley, CarlFuerst, BrynHarris, AhmadHemami, MohamadJahazi, RaadJassim, EricLifshin, MartinPugh, JohnRoot

CO-OP Program Liaison Officers
Genevieve Snider (Materials)
Michel Vachon (Mining)

The Department of Mining, Metals 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.

The equipment operated by the Department is the best available. On the materials side there is a full range of laboratory facilities for extractive and process metallurgy as well as excellent materials characterization and processing facilities. In mining engineering the Department has rock engineering laboratories to test the mechanical properties of both rock and backfill materials and computer-aided mine design facilities.

Materials Engineering (CO-OP). The Materials Engineering degree is a cooperative program leading to a B.Eng. and includes formal industrial work periods. It is built around a strong background of mathematics, basic sciences, computer skills and applications, and specific engineering and design courses to provide up-to-date training in materials engineering. Students take core courses covering processing, fabrication, applications and performance of materials, namely metals, ceramics, polymers and composites. The program conforms to requirements of the Canadian Engineering Accreditation Board (CEAB) and is designed to offer students the best training for employment in the field. The basic courses are supplemented by complementary courses which provide a diverse selection of specialties for the graduating engineer. The course structure is reinforced with laboratory exercises. Graduates find employment in a wide range of industries which include the resource and manufacturing sectors. Students in the CO-OP program benefit from the practical learning experience arising from work-term employment in meaningful engineering jobs. Students also benefit from the non-tangible learning experience arising from the increased responsibilities required to obtain and successfully complete the work terms.

Students pay a two-credit course fee for each of the following work terms: MIME 280, MIME 380 and MIME 480. (Students who entered the program prior to September 2005 will also pay a 2-credit course fee for MIME 481.) An amount of $200.00 will be billed during 10 consecutive terms for a total amount of $2,000.00 before graduation. This latter amount covers expenses directly related to the operation of the CO-OP program. Students must register for each of the above-mentioned industrial training courses and pay the above-mentioned fees by the Minerva course registration deadlines or else late fees will apply.

Mining Engineering (CO-OP). McGill, which has the oldest mining engineering program in Canada, has always been noted for the excellence of its courses and for the training it provides in mining technology, mineral economics and mining practice. Graduates in mining engineering are in demand not only in Canada but throughout the world. Technical developments have been rapid in recent years. These offer a challenge to the imaginative student with a strong engineering interest. The Department offers a cooperative program leading to the B.Eng. degree in Mining Engineering. The CO-OP program is offered in collaboration with the Département des génies civil, géologique et des mines at École Polytechnique in Montreal, and includes formal industrial work periods. Students registered at McGill are required to take a series of technical mining courses at École Polytechnique in the latter part of the program. These courses are designated as such in the program outline (Subject Code MPMC).

Scholarships
The Department offers Entrance Scholarships each year, valued at $3,000; these scholarships are renewable. A substantial number of other scholarships and bursaries are awarded by the Department as well as by the Canadian Mineral Industry Education Foundation.

Student Advising
Students entering the Mining or Materials Engineering programs must plan their schedule of studies in consultation with one of the departmental advisers: Professors Laplante and Yue (Materials) or Mr. J. Mossop (Mining).

CURRICULUM FOR THE B.ENG. DEGREE IN MATERIALS ENGINEERING – CO-OP PROGRAM

REQUIRED COURSES			COURSE CREDITS
Non-Departmental Courses			
CHEE481	Polymer Engineering	3	
CHEM233	Topics in Physical Chemistry	3	
CIVE205	Statics	3	
CIVE207	Solid Mechanics	4	
COMP208	Computers in Engineering	3	
MATH262	Intermediate Calculus	3	
MATH263	Ordinary Differential Equations and Linear Algebra	3	
MATH264	Advanced Calculus	3	**28**
MATH289	Design Graphics	3	
Departmental Courses			
MIME200	Introduction to the Minerals Industry	3	
MIME202	Engineering Communication Skills	2	
MIME209	Mathematical Applications	3	
MIME212	Engineering Thermodynamics	3	
MIME221	Engineering Professional Practice	2	
MIME261	Structure of Materials	3	
MIME280	Industrial Training 1	2	
MIME310	Engineering Economy	3	
MIME311	Modelling and Automatic Control	3	
MIME317	Analytical and Characterization Techniques	3	
MIME337	Electrotechnology	2	
MIME341	Introduction to Mineral Processing	3	
MIME350	Extractive Metallurgical Engineering	3	
MIME352	Hydrochemical Processing	3	
MIME356	Heat, Mass and Fluid Flow	4	
MIME360	Phase Transformations: Solids	3	
MIME362	Mechanical Properties	3	
MIME367	Electronic Properties of Materials	3	
MIME380	Industrial Training 2	2	
MIME442	Modelling and Control: Mineral Processing	3	
MIME452	Process and Materials Design	4	
MIME455	Advanced Process Engineering	3	
MIME456	Steelmaking and Steel Processing	3	
MIME465	Ceramic Engineering	3	
MIME480	Industrial Training 3	2	**71**

COMPLEMENTARY COURSES

Technical Courses **12**

9 - 12 credits from the following:

CHEE581	(3)	Polymer Composites Engineering
CIVE512	(3)	Advanced Civil Engineering Materials
MECH530	(3)	Mechanics of Composite Materials
MIME410	(3)	Research Project
MIME412	(3)	Corrosion and Degradation
MIME451	(3)	Environmental Controls: Met'l Plants
MIME456	(3)	Steelmaking & Steel Processing
MIME457	(3)	Light Metals Extraction and Processing
MIME463	(3)	Deformation Processing of Metals
MIME515	(3)	Advanced Metallurgical and Materials Thermodynamics
MIME544	(3)	Analysis: Mineral Processing Systems 1
MIME545	(3)	Analysis: Mineral Processing Systems 2
MIME551	(3)	Electrochemical Processing
MIME555	(3)	Thermal Remediation of Wastes
MIME556	(3)	Sustainable Materials Processing
MIME560	(3)	Joining Processes
MIME561	(3)	Advanced Materials Design
MIME563	(3)	Hot Deformation of Metals
MIME564	(3)	X-ray Diffraction Analysis of Materials
MIME565	(3)	Aerospace Metallic-Materials and Manufacturing Processes
MIME566	(3)	Texture, Structure & Properties of Polycrystalline Materials
MIME567	(3)	Aluminum Casting Alloys
MIME568	(3)	Topics in Advanced Materials
MIME569	(3)	Electron Beam Analysis of Materials

0 - 3 credits from the following:

BMDE504	(3)	Biomaterials and Bioperformance
CHEM455	(3)	Introductory Polymer Chemistry
CHEM585	(3)	Colloid Chemistry
PHYS558	(3)	Solid State Physics

General Complementaries **6**

Two courses (6 credits), selected from an approved list: one course on the impact of technology on society and one in the humanities and social sciences, administrative studies and law. See section 8.3.4 "Complementary Studies" for further information.

TOTAL **117**

CURRICULUM FOR THE B.ENG. DEGREE IN MINING ENGINEERING – CO-OP PROGRAM

REQUIRED COURSES		**COURSE CREDITS**	
Non-Departmental Courses			
CIVE205	Statics	3	
CIVE207	Solid Mechanics	4	
COMP208	Computers in Engineering	3	
EPSC221	General Geology	3	
EPSC225	Properties of Minerals	1	
MATH262	Intermediate Calculus	3	
MATH263	Ordinary Differential Equations and Linear Algebra	3	
MATH264	Advanced Calculus	3	
MECH289	Design Graphics	3	**26**
Departmental Mining Courses			
MIME200	Introduction to the Minerals Industry	3	
MIME202	Engineering Communication Skills	2	
MIME203	Mine Surveying (2 weeks at beginning of summer)	2	
MIME209	Mathematical Applications	3	
MIME221	Engineering Professional Practice	2	
MIME260	Materials Science and Engineering	3	
MIME290	Industrial Work Period 1	2	
MIME291	Industrial Work Period 2	2	
MIME310	Engineering Economy	3	
MIME322	Rock Fragmentation	3	
MIME323	Rock and Soil Mass Characterization	3	
MIME325	Mineral Industry Economics	3	
MIME333	Materials Handling	3	
MIME337	Electrotechnology	2	
MIME340	Applied Fluid Dynamics	3	
MIME341	Introduction to Mineral Processing	3	
MIME392	Industrial Work Period 3	2	
MIME419	Surface Mining	3	
MIME420	Feasibility Study	3	
MIME426	Development and Services	3	
MIME484	Mining Project	3	**56**
École Polytechnique Mining Courses			
MPMC320	CAO et informatique pour les mines	3	
MPMC321	Mécanique des roches et contrôle des terrains	3	
MPMC326	Recherche opérationnelle I	3	
MPMC328	Environnement et gestion des rejets miniers	3	
MPMC329	Géologie minière	2	
MPMC330	Géotechnique minière	3	
MPMC421	Exploitation en souterrain	3	
MPMC422	Ventilation minière et hygiène du travail	3	**23**

COMPLEMENTARY COURSES

Either Choice I or II **8 or 9**

Choice I (8 credits)

MIME494	(2)	Industrial Work Period 4
and		two Technical Complementaries

or Choice II (9 credits)

MIME350	(3)	Extractive Metallurgical Engineering
MIME544	(3)	Analysis: Mineral Processing Systems 1
and		one Technical Complementary

General Complementaries **6**

Two courses (6 credits), selected from an approved list: one course on the impact of technology on society and one in the humanities and social sciences, administrative studies and law. See section 8.3.4 "Complementary Studies" for further information.

TOTAL **119/120**

Technical Courses

Courses selected from those listed below or any other approved technical course(s) in Engineering, Management or Science. Note: not all courses are given annually; verification with course instructor is advised.

MIME320	(3)	Extraction of Energy Resources
MIME442	(3)	Modelling and Control: Mineral Processing
MIME520	(3)	Stability of Rock Slopes
MIME521	(3)	Stability of Underground Openings
MIME526	(3)	Mineral Economics
MIME528	(3)	Mining Automation
MIME544	(3)	Analysis: Mineral Processing Systems 1
MIME545	(3)	Analysis: Mineral Processing Systems 2
MPMC327	(3)	Hydrogéologie appliquée
MPMC424	(2)	Gérance d'exploitation minière
MPMC525	(3)	Recherce opérationnelle minière II

A fee of $300 is assessed by the University for each Industrial Work Period course.

8.4.7 School of Urban Planning

Macdonald-Harrington Building
815 Sherbrooke Street West
Montreal, QC H3A 2K6

Telephone: (514) 398-4075
Fax: (514) 398-8376
E-mail: admissions.planning@mcgill.ca
Website: www.mcgill.ca/urbanplanning

Director — David F. Brown

Emerita Professor
Jeanne M. Wolfe; B.Sc.(Lond.), M.Sc.(W.Ont.), M.A.(McG.)

Professor
Jane M. Glenn; B.A., LL.B.(Qu.), D. en Droit(Stras.)

Associate Professors
David F. Brown; B.A.(Bishop's), M.U.P.(McG.), Ph.D.(Sheffield)
Raphaël Fischler; B.Eng. (V. Tech. Eindhoven), M.S. Arch.S., M.C.P.(MIT), Ph.D.(U.C. Berk.)

Assistant Professors
Madhav G. Badami; B.Tech., M.S.(I.I.T., Madras) M.E.Des.(Calg.), Ph.D.(UBC) *(joint appoint. with McGill School of Environment)*
Lisa Bornstein; B.Sc.(U.C.Berk.),M.R.P.(C'nell), Ph.D.(U.C.Berk.)
Murtaza Haider; B.Sc.(Peshawar), M.A.Sc., Ph.D.(Tor.) *(joint appoint. with Civil Engineering)*

Associate Member
Gordon O. Ewing; M.A.(Glas.), M.A., Ph.D.(McG.)

Instructor
François Dufaux; B.Arch.(Laval), M.U.P.(McG.)

Adjunct Professors
David Farley; B.Arch.(McG.), M.Arch., M.C.P.(Harv.)
Mario Polèse; B.A.(CUNY), M.A., Ph.D.(Penn.)
Ray Tomalty; B.A., M.P.A..(Queen's), Ph.D.(Wat.)

Guest Lecturers
CameronCharlebois, LucDanielse, MarcDenhez, AndrewHoffmann, BrendaLee, Damaris Rose, Alain Trudeau, MartinWexler

Modern urban planning developed into a profession in the early decades of the 20th century, largely as a response to the appalling sanitary, social and economic conditions of rapidly developing industrial cities. Initially, the disciplines of architecture, civil engineering and public health provided the nucleus of concerned professionals; beautification schemes and infrastructure works marked the early stages of public intervention in the 19th century. Architects, engineers and public health specialists were joined by economists, sociologists, lawyers and geographers as the complexities of the city's problems came to be more fully understood and public pressure mounted for their solution. Contemporary urban and regional planning techniques for survey, analysis, design and implementation developed from an interdisciplinary synthesis of these various fields.

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 which 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.

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.

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 firms. Their expertise ranges from historic preservation to transportation planning, from housing development to computer imaging. They devote their efforts in increasing numbers to environmental planning and sustainable development.

The School is a partner in the Montreal Interuniversity Group "Urbanization and Development", a consortium recognized by CIDA as a Centre of Excellence, which is devoted to the study of urban problems and the formulation of policies in developing regions. Faculty and students collaborate actively with members of other McGill departments, notably Architecture, Geography, Civil Engineering and Law, and with colleagues at other institutions in Canada and abroad.

The objective of the School is to produce qualified professional urban planners for the public, private and not-for-profit sectors. Training is provided at the postgraduate level; the degree offered is the Master of Urban Planning (M.U.P.). Upon completion of the two-year program of studies, graduates are expected to have acquired basic planning skills, a broad understanding of urban issues, and specialized knowledge in a field of their own choice.

The program of study offered by the School is fully recognized by the Ordre des Urbanistes du Québec (O.U.Q.) and the Canadian Institute of Planners (C.I.P.). Graduates can become full members of these professional organizations after meeting the O.U.Q.'s internship and examination requirements.

For details of the M.U.P. admission requirements and curriculum, consult the *Graduate and Postdoctoral Studies Calendar*, available on the Web at www.mcgill.ca.

The following 500-level courses are taught by the faculty of the School:

ARCH550 Urban Planning 1
ARCH551 Urban Planning 2
URBP 501 Principles and Practice 1
URBP 505 Geographic Information Systems
URBP 506 Environmental Policy and Planning
URBP 507 Planning and Infrastructure
URBP 519 Sustainable Development Plans

8.5 Minor Programs and Choice of Electives or Complementary Courses

Minors are coherent sequences of courses which may be taken in addition to the courses required for the B.Eng. degree. Minor programs 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 to 15 credits, representing one term beyond the B.Eng. degree program. All courses in a Minor program must be passed with a grade of C or better.

Students of the Faculty have a considerable variety of complementary course choices, which fall into the categories of technical and complementary studies. Students should refer to their respective departments for information concerning complementary course selections. Departments also publish, in this Calendar and in separate documents, information regarding the choice of courses. Students should also consult their course advisers.

General information concerning Minors that are designed for students registered in the Faculty of Engineering is listed below. In addition, students are also permitted to register for Minor Concentrations offered through the various departments in the Faculty of Arts. Students are advised to seek approval from the specific department in the Faculty of Arts as well as the Faculty of Engineering Student Affairs Office, Room 378, Macdonald Engineering Building, prior to embarking on these Minors.

8.5.1 Arts Minor

Engineering students may obtain a Minor in Arts as part of their B.Eng. degree by satisfying the 24-credit requirement described below. In general, complementary studies courses given in the Faculty of Arts and listed under: (i) – "3credits of studies of the

Impact of Technology on Society" and (ii) – "the remaining credits to be elective social science and humanities courses" (see section 8.3.4 "Complementary Studies") may be used to satisfy some of these requirements. In no case will more than 9credits taken from these complementary studies requirements be credited towards the Minor in Arts.

Requirements

1. The program must consist of 24 credits as follows:
   a) at least two areas of concentration from within the Faculty of Arts must be chosen, with the minimum number of credits in any one area being6;
   b) at least 12 credits must be at the 300 or above level.
2. All courses in the Minor program must be passed with a grade of C or better.
3. The selection of courses for the Minor is to be done in consultation with the Minor adviser, Ms.Judy Pharo, Faculty of Engineering Student Affairs Office.

For further information, contact ProfessorB.Haskel, Political Science, or Ms.J.Pharo, Student Affairs Office, Faculty of Engineering.

8.5.2 Biotechnology Minor

The Faculties of Engineering and of Science offer a Minor in Biotechnology for students interested in taking additional courses in this area. For Engineering students, the Minor has been designed specifically for students within the Chemical Engineering Department; however, other Engineering students are invited to contact the Minor program supervisor, Professor Bennett, or Ms.Judy Pharo, Faculty of Engineering Student Affairs Office, for further information.

Students should identify an interest in the Minor to their academic adviser and the supervisor of the program during the U1 year, and at the time of registration for the U2 year. With the agreement of the 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 Program is administered for the Faculties of Engineering and of Science by Prof. H. Bennett, Sheldon Biotechnology Centre (Lyman Duff Building), phone (514) 398-3998. A full description of the Minor program appears under the Faculty of Science, see section 12.12.5 "Biotechnology (BIOT)".

A Chemical Engineering student may complete the Biotechnology Minor by taking BIOL200, BIOL201, BIOL202, MIMM211, BIOT505, plus one course from the list of additional courses not including MIME310. The Department of Chemical Engineering permits students in the Minor program to complete BIOT505 as one of their technical complementary requirements. The total course credit required for the Chemical Engineering student is 15 credits beyond the 111-credit B.Eng. program.

8.5.3 Chemistry/Chemical Engineering Minor

The Departments of Chemistry and Chemical Engineering offer a Minor Program in Chemistry, of particular interest to Chemical Engineering students, and a Minor in Chemical Engineering, of interest to Chemistry students (described under the Faculty of Science). The Minor in Chemistry consists of 25 credits as follows:

1. Required courses, 10 credits: CHEM212, CHEM233 and CHEM234 (or CEGEP equivalent).
2. At least 15 credits from the following list, two of which must be laboratory courses (* indicates lab). Note that CHEM212 is a prerequisite for most of the courses listed below. If students take CHEM222* instead of CHEM234, they will receive credit for one of the two laboratories that are required but they must have a total of 25 Chemistry credits for the Minor.

Inorganic Chemistry

CHEM281	Inorganic Chemistry 1
CHEM371	Inorganic Chemistry Laboratory*
CHEM381	Inorganic Chemistry 2
CHEM591	Bioinorganic Chemistry

Analytical Chemistry

CHEM257D1	Introductory Analytical Chemistry*
CHEM257D2	Introductory Analytical Chemistry*
or CHEM277D1	Analytical Chemistry*
CHEM277D2	Analytical Chemistry*
CHEM307	Analytical Chemisty of Pollutants
CHEM367	Instrumental Analysis 1
CHEM377	Instrumental Analysis 2

Organic Chemistry

CHEM302	Introductory Organic Chemistry 3
CHEM352	Structural Organic Chemistry
CHEM362	Advanced Organic Chemistry Laboratory*
CHEM382	Organic Chemistry: Natural Products
CHEM402	Advanced Bio-organic Chemistry

Physical Chemistry

CHEM345	Molecular Properties and Structure 1
CHEM355	Molecular Properties and Structure 2
CHEM363	Physical Chemistry Laboratory 1*
CHEM393	Physical Chemistry Laboratory 2*
CHEM455	Introductory Polymer Chemistry

Please consult the program coordinators for more information: Professor D. Cooper (Chemical Engineering) and Dr. G.Wilczek (Chemistry). A passing grade for courses within the Minor is a C.

8.5.4 Computer Science Courses and Minor Program

The School of Computer Science offers an extensive range of courses for Engineering students interested in computers. The course explicitly for Engineering students (COMP208) and other courses in the core of the various Engineering programs are listed below. Descriptions of these and other Computer Science courses can be found on Class Schedule or in the Courses section.

COMP202 Introduction to Computing 1
COMP208 Computers in Engineering
COMP250 Introduction to Computer Science
COMP302 Programming Languages and Paradigms

Engineering students may obtain a Minor in Computer Science as part of their B.Eng. degree by satisfying the 24-credit requirement described below. In general, some complementary courses within Engineering departmental programs may be used to satisfy some of these requirements, but the Minor in Computer Science will require at least 12 extra credits from Computer Science (COMP) courses beyond those needed for the B.Eng. degree. Students should consult their departments about the use of complementaries, and credits that can be double counted.

Students should see the Undergraduate Secretary in the Lorne Trottier Building, Room 2060, to obtain the appropriate forms and to make an appointment to see the Minor adviser for approval of their course selection. Forms must be approved before the end of the Add/Drop period of the student's final term.

For further information, please check the School of Computer Science Website, www.cs.mcgill.ca/acadpages/undergrad.

Minor in Computer Science for Engineering Students

The program must consist of 24 credits, from courses passed with a grade of C or better, as follows:

Required Course (3 credits)

COMP302 (3) Programming Languages and Paradigms

Complementary Courses (21 credits)

3 credits – one of the following courses:

COMP203 (3) Introduction to Computing 2
COMP250 (3) Introduction to Computer Science

3 credits – one of the following courses:

COMP206 (3) Introduction to Software Systems
ECSE221 (3) Introduction to Computer Engineering

3 credits – one of the following course s:

COMP273 (3) Introduction to Computer Systems
ECSE222 (3) Introduction to Computer Engineering 2

3 credits – one of the following courses:
COMP350 (3) Numerical Computing
MECH409 (3) Numerical Methods in Mechanical Engineering

9 credits chosen from Computer Science courses numbered 251 or at the 300 level or higher. Courses from other departments making considerable use of computing and approved by the School of Computer Science may also be selected. Students should consult with their advisers about counting specific courses.

Note:
A. COMP202 and COMP208 (compulsory for some Engineering students) do not form part of the Minor.
B. COMP203 and COMP250 are considered to be equivalent from a prerequisite point of view, and cannot both be taken for credit. Students with a substantial high-level language programming course may forego this prerequisite. Some additional make-up effort may be needed at the start of the course.
C. COMP208 cannot be taken for credit with or after COMP250.

8.5.5 Construction Engineering and Management Minor

Students in the Faculty of Engineering may obtain a Minor in Construction Engineering and Management by completing 24 to 25credits chosen from the required and complementary courses listed below. By a careful selection of complementary courses, a Civil Engineering student may obtain this Minor by completing as few as 9 additional credits. Students in other departments would typically require 12 to 15 additional credits to complete the Minor. For further information, contact Professor L. Chouinard at (514) 398-6446, Room 488, Macdonald Engineering Building.

Prerequisites:
CIVE208 Civil Engineering Systems Analysis
or an equivalent course in Operations Research
CIVE302 Probabilistic Systems or equivalent
COMP208 Computers in Engineering or equivalent
MIME310 Engineering Economy

Requirements:
The 24 to 25credits listed below must be completed with a grade of C or higher in order to fulfill the requirements of the Minor.

1. Management and Law: 15 credits, as follows:

FACC220 (3) Law for Architects and Engineers
INDR294 (3) Introduction to Labour-Management Relations
MGCR211 (3) Introduction to Financial Accounting
MGCR341 (3) Finance 1

and one of:
CIVE324 (3) Construction Project Management
MECH472 (3) Case Studies in Project Mgmt

2. Either 3 or 4 credits, as follows:
a) 4 credits - Any two of the following relating to Building Structures:
ARCH447 (2) Electrical Services
ARCH451 (2) Building Regulations and Safety
ARCH554 (2) Mechanical Services
CIVE492 (2) Structures

or
b) 3 credits - One of the following relating to Heavy Construction:
MIME322 (3) Rock Fragmentation
MIME333 (3) Materials Handling

3. Other Construction-Related Complementaries: 6 credits
Any two of the following:
BREE411 (3) Off-Road Power Machinery
BUSA462 (3) Management of New Enterprises
CIVE446 (3) Construction Engineering
CIVE527 (3 Renovation and Preservation: Infrastructure
CIVE586 (3) Earthwork Engineering
ECSE461 (3) Electric Machinery
FINE445 (3) Real Estate Finance
MIME520 (3) Stability of Rock Slopes
MIME521 (3 Stability of Underground Openings
MPMC321 (3) Mécanique des roches et contrôle des terrains

Total requirement: 24 or 25 credits

8.5.6 Economics Minor

The Minor consists of 18 credits in courses given in the Economics Department. It consists of required courses and complementaries. In addition, it is presumed that all Engineering students will have a sufficient background in statistics. Engineering Economy, MIME310, does not form part of this Minor. For more information see the Department of Economics, Room 443, Leacock Building.

Required Courses (9 credits)
ECON230D1* Microeconomic Theory
ECON230D2* Microeconomic Theory
ECON209** Macroeconomic Analysis and Applications

Complementary Courses (9 credits) from:
ECON225 Economics of the Environment
ECON302D1 Money and Banking
ECON302D2 Money and Banking
ECON303D1 Canadian Economic Policy
ECON303D2 Canadian Economic Policy
ECON305 Industrial Organization
ECON306D1 Labour Economics and Institutions
ECON306D2 Labour Economics and Institutions
ECON308 Public Policies Toward Business
ECON311 United States Economic Development
ECON313 Economic Development 1
ECON314 Economic Development 2
ECON316 The Underground Economy
ECON321 The Quebec Economy
ECON326 Ecological Economics
ECON329 Economics of Confederation
ECON330D1 Macroeconomic Theory
ECON330D2 Macroeconomic Theory
ECON331 Economic Development: Russia and USSR
ECON332 Comparative Economic Systems
ECON333 Comparative Economic Systems
ECON335 The Japanese Economy
ECON337 Introductory Econometrics 1
ECON344 The International Economy, 1830 - 1914
ECON345 The International Economy Since 1914
ECON347 Economics of Climate Change
ECON404 Transportation
ECON405 Natural Resource Economics
ECON406 Topics in Economic Policy
ECON408D1 Public Sector Economics
ECON408D2 Public Sector Economics
ECON411 Economic Development: A World Area
ECON416 Topics in Economic Development 2
ECON420 Topics in Economic Theory
ECON423D1 International Trade and Finance
ECON423D2 International Trade and Finance
ECON426 Labour Economics
ECON434 Current Economic Problems
ECON440 Health Economics
ECON447 Economics of Information and Uncertainty
ECON467D1 Econometrics - Honours
ECON467D2 Econometrics - Honours
ECON525 Project Analysis
ECON534 Pensions Crisis
ECON546 Game Theory

Mining Engineering students will be permitted to include Mineral Economics (MIME526) among these 18 credits.

* Students may, with consent of instructor, take ECON250D1/ ECON250D2 Introduction to Economic Theory: Honours, in place of ECON230D1/ECON230D2.

** This requirement is waived for students who choose ECON330D1/ECON330D2 from the list of complementaries. Students may **not** take both ECON209 and ECON330D1/ECON330D2.

8.5.7 Environmental Engineering Minor

The Environmental Engineering Minor is offered for students of Engineering and the Department of Bioresource Engineering (formerly Agricultural and Biosystems Engineering) wishing to pursue studies in this area.

The Minor program consists of 21 credits in courses. Up to a maximum of 12 credits of coursework in the student's B.Eng. program may double-count with the Minor.

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

The Environmental Engineering Minor Program is administered by the Department of Civil Engineering and Applied Mechanics. Further information may be obtained from Professor S. Ghoshal, Room 475C, Macdonald Engineering Building.

Note: Not all courses listed are offered every year. Students should consult with the department concerned about the courses that are offered in a given year.

Minor Requirements (21 credits)

Introductory course (3 credits minimum) – one of:

CHEE230 (3) Environmental Aspects of Technology
CIVE225 (4) Environmental Engineering

plus a minimum of 18 credits, either:

15 credits* (minimum) Engineering courses and
3 credits (minimum) Non-Engineering courses, from the course lists below:

* A minimum of 6 credits must be from outside the student's principal departmental program. A maximum of 6 credits of research project courses may be counted towards this category provided the project has sufficient environmental engineering content (project proposal requires approval of project supervisor and Coordinator of the Minor).

OR

15 credits specified for the section 15.1.2 "Barbados Field Study Semester", provided the project for CIVE/AGRI/URBP 519 Sustainable Development Plans has sufficient environmental engineering content (project proposal requires approval of the Coordinator of the Minor) and

3 credits chosen from the Engineering Course list below, excluding CHEE496.

Engineering Course List
(Environmental Engineering Minor)

Agricultural Engineering (Macdonald Campus)

BREE217 (3) Hydrology and Water Resources (not open to students who have passed CIVE323)
BREE322 (3) Organic Waste Management
BREE330 (3) GIS for Biosystems Engineering
BREE416 (3) Engineering for Land Development
BREE518 (3) Bio-Treatment of Wastes

Chemical Engineering

CHEE351 (3) Separation Processes
CHEE370 (3) Elements of Biotechnology
CHEE430 (3) Technology Impact Assessment (not open to students who have passed WILD437)
CHEE452 (3) Particulate Systems (offered in alternate years)
CHEE471 (3) Industrial Water Pollution Control (not open to students who have passed CIVE430)
CHEE472 (3) Industrial Air Pollution Control
CHEE496 (3) Environmental Research Project
CHEE591 (3) Environmental Bioremediation

Civil Engineering and Applied Mechanics

CIVE225 (4) Environmental Engineering
CIVE323 (3) Hydrology and Water Resources (not open to students who have passed BREE217)
CIVE421 (3) Municipal Systems
CIVE430 (3) Water Treatment and Pollution Control (not open to students who have passed CHEE471)
CIVE451 (3) Geoenvironmental Engineering
CIVE526 (3) Solid Waste Management
CIVE550 (3) Water Resources Management
CIVE553 (3) Stream Pollution and Control
CIVE555 (3) Environmental Data Analysis
CIVE572 (3) Advanced Hydraulics
CIVE574 (3) Fluid Mechanics of Water Pollution
CIVE577 (3) River Engineering
CIVE585 (3) Groundwater Hydrology

Mechanical Engineering

MECH343 (3) Energy Conversion
MECH434 (3) Turbomachinery
MECH447 (3) Combustion
MECH525 (3) Intro. to Nuclear Engineering
MECH526 (3) Manufacturing and the Environment
MECH534 (3) Air Pollution Engineering

Mining, Metals and Materials Engineering

MIME412 (3) Corrosion and Degradation
MIME451 (3) Environmental Controls: Met'l Plants
MIME555 (3) Thermal Remediation of Wastes
MPMC327 (3) Hydrogéologie appliquée
MPMC328 (3) Environnement et gestion des rejets miniers
MPMC422 (3) Ventilation minière et hygiène du travail

Urban Planning

URBP506 (3) Environmental Policy and Planning

Non-Engineering Course List
(Environmental Engineering Minor)

Agricultural Sciences (Macdonald Campus)

AEBI200 (3) Biology of Organisms
AEBI201 (3) Biology of Organisms 2
AEBI205 (3) Principles of Ecology
AEPH510 (3) Agricultural Micrometeorology
ENTO380 (3) Food Systems and the Environment
MICR230 (3) Introductory Microbiology (not open to students who have passed CHEE370)
MICR331 (3) Microbial Ecology (not open to students who have passed CHEE370)
MICR341 (3) Mechanisms of Pathogenicity
SOIL210 (3) Principles of Soil Science (not part of the Minor for Agricultural Engineering Students)
SOIL331 (3) Soil Physics
WILD333 (3) Physical and Biological Aspects of Pollution
WILD375 (3) Issues: Environmental Sciences
WILD415 (3) Conservation Law
WILD437 (3) Assessing Environmental Impact (not open to students who have passed CHEE430)
WOOD420 (3) Environmental Issues: Forestry
ZOOL315 (3) Science of Inland Waters

Anthropology

ANTH206 (3) Environment and Culture

Atmospheric and Oceanic Sciences

ATOC210 (3) Introduction to Atmospheric Science (not open to students who have passed GEOG321)
ATOC220 (3) Introduction to Oceanic Sciences

Biology

BIOL205 (3) Biology of Organisms
BIOL208 (3) Introduction to Ecology
BIOL432 (3) Limnology

BIOL470 (3) Lake Management

Chemistry
CHEM307 (3) Analytical Chemisty of Pollutants

Earth and Planetary Sciences
EPSC243 (3) Environmental Geology (not open to students who have passed or who will take EPSC221)
EPSC549 (3) Groundwater Hydrology

Economics
ECON225 (3) Economics of the Environment
ECON326 (3) Ecological Economics
ECON347 (3) Economics of Climate Change

Geography
GEOG200 (3) Geographical Perspectives: World Environmental Problems
GEOG201 (3) Introductory Geo-Information Science
GEOG203 (3) Environmental Systems
GEOG205 (3) Global Change: Past, Present and Future
GEOG302 (3) Environmental Management 1
GEOG308 (3) Principles of Remote Sensing
GEOG321 (3) Climatic Environments (not open to students who have passed ATOC210)
GEOG404 (3) Environmental Management 2

Law
CMPL580 (3) Environment and the Law

Microbiology and Immunology
MIMM211 (3) Introductory Microbiology

Religious Studies (Macdonald Campus)
RELG270 (3) Religious Ethics and the Environment

Sociology
SOCI328 (3) Environmental Sociology

8.5.8 Minor in Environment

Environmental studies involve the interactions between humans and their natural or technological environment. Environmental problems are frequently comprehensive and complex, and their satisfactory solutions require the synthesis of humanistic, scientific, and institutional knowledge.

The Minor in Environment is offered and administered by the McGill School of Environment (MSE). Inquiries should be directed to Mr. Peter Barry, MSE Program Coordinator, e-mail info.mse@mcgill.ca or telephone (514) 398-4306.

Since the program comprises a total of 18 credits for the Minor, additional credits beyond those needed for the B.Eng. degree are required. Students wishing to receive the Minor should prepare a program and have it approved by both their regular Engineering adviser and the MSE adviser. For program details, see "Minor in Environment", in section14.4.

8.5.9 Management Courses and Minor Program

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 as listed below.

Engineering Economy MIME310 introduces the concept of costs into evaluations of engineering projects and architectural proposals. Prerequisite to entry to this Minor is a grade C or better in MIME310.

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

Note: Course MGCR211, a course in statistics, and a course in micro-economics are prerequisite for MGCR341. If included in the Minor in Management, MGCR423 should be taken at the end of the program.

Engineering students may obtain a Minor in Management by completing 15 credits of courses from the following list of Faculty of Management courses with a grade of C or better. Successful completion of this Minor is noted on a student's transcript.

Required Courses (6 credits)
MGCR211 Introduction to Financial Accounting
MGCR320 Managing Human Resources

Complementary Courses (9 credits)
3 credits, one of List A:
MGCR213 Introduction to Management Accounting
MGCR341 Finance 1
MGCR373 Operations Research 1
MGCR382 International Business

3 credits, one of List B:
BUSA462 Management of New Enterprises
or BUSA465 Technological Entrepreneurship
MGCR222 Introduction to Organizational Behaviour
MGCR352 Marketing Management 1
or MRKT360 Marketing of Technology
MGCR360 Social Context of Business
MGCR423 Organizational Policy

3 credits, any available 300- or 400-level Management course (for which the prerequisites, if any, have been met).

An Engineering course deemed equivalent by the Faculty of Management may be substituted for course MGCR373. There are three courses in Engineering that qualify: CIVE208, MECH474 and MPMC326. It should be noted that MGCR373 does not count as a technical complementary course.

A student embarking on the Minor must be prepared to take credits additional to the normal Engineering program. The student may choose the non-technical complementary course(s) required in his/her program from list B above, but under no circumstances will more than 6 credits of non-technical complementary courses count towards both the Engineering program and the Minor. Students considering this Minor should consult their adviser or the Faculty of Engineering Student Affairs Office.

8.5.10 Materials Engineering Minor

Engineering students may obtain a Minor in Materials Engineering by completing 24 credits chosen from the required and complementary courses listed below. By a careful selection of complementary courses, Engineering students may obtain this Minor with a minimum of 15 additional credits. It should be noted that some departments (e.g., Mechanical Engineering) will allow their students to take courses from this list providing they complete the Minor prior to graduation. For further information, please contact the coordinator, Prof. J. Szpunar, Room 2M020, Wong Building.

Required Courses (15credits)
MIME260 Materials Science and Engineering
or CHEE380 Materials Science
MIME367 Electronic Properties of Materials
MIME465 Ceramic Engineering
CHEE481 Polymer Engineering
CHEE484 Materials Engineering

Complementary Courses (9credits)
Three courses to be chosen from the following list:
CHEE381 Polymer Technology
CHEE483 Industrial Rheology
CHEE487 Chemical Processing Electronics Industry
CHEE530 Structure and Properties of Paper
CHEE581 Polymer Composites Engineering
CHEM455 Introductory Polymer Chemistry
ECSE545 Microelectronics Technology
MECH530 Mechanics of Composite Materials
MIME360 Phase Transformations: Solids
MIME361 Liquid State Processing of Materials

MIME362 Mechanical Properties
MIME412 Corrosion and Degradation
MIME560 Joining Processes
MIME561 Advanced Materials Design
MIME563 Hot Deformation of Metals
MIME564 X-Ray Diffraction Analysis of Materials
MIME566 Texture, Structure & Properties of Polycrystalline Materials
MIME569 Electron Beam Analysis of Materials

8.5.11 Mathematics Minor

The Minor in Mathematics for students in the Faculty of Engineering requires satisfactory passes in 24 credits of approved courses in Mathematics not including the following:

MATH247 (or MATH223)
MATH260 (or MATH262 or MATH222)
MATH261 (or MATH263 or MATH315 or MATH325)
MATH265 (or MATH264 or MATH248 or MATH314)
MATH266
MATH270
MATH319

At least 18 credits must be chosen from the Mathematics and Statistics courses approved for the Mathematics Majors or Honours program, or from MATH249, MATH363, MATH381, MATH386. The remaining credits may be chosen from mathematically allied courses.

In addition to an Engineering adviser, each student in the Minor program must have an adviser designated by the Department of Mathematics and Statistics, normally beginning in the U2 year. The selection of courses for the Minor is to be done in conjunction with the Minor adviser. Please consult the Department of Mathematics and Statistics for an adviser.

8.5.12 Physics Minor

Students in Honours Electrical Engineering may obtain a Minor in Physics as part of their B.Eng. degree by satisfying the 18-credit requirement listed below:

PHYS253 Thermal Physics
PHYS357 Quantum Physics
PHYS457 Quantum Physics

and at least 9 credits chosen from the following:
PHYS332 Physics of Fluids
PHYS362 Statistical Mechanics
PHYS451 Classical Mechanics
PHYS514 General Relativity
PHYS551 Quantum Theory
PHYS557 Nuclear Physics
PHYS558 Solid State Physics
PHYS559 Advanced Statistical Mechanics
PHYS562 Electromagnetic Theory
PHYS567 Particle Physics

Students who take PHYS357 and PHYS457 can omit PHYS271 from their normal Electrical Engineering program. Candidates must go to the Department of Physics at registration time in their U3 year to fill out a Minor Program Form.

8.5.13 Technological Entrepreneurship Minor

Engineering students may obtain a Minor in Technological Entrepreneurship by completing 6 courses (18 credits) as listed below. Up to two courses (6 credits) may be double-counted for credit towards the Humanities and Social Sciences Complementary Courses.

This Minor is offered jointly by the Faculties of Engineering and Management. It will appeal to those students who have a concept, process or product idea in mind and who want to explore the opportunity of commercializing it. It will also be of interest to students who have a general interest in entrepreneurship and intend to pursue a career in small and medium-sized high technology/ engineering companies.

Students considering the Minor should consult Ms. Judy Pharo, Faculty of Engineering Student Affairs Office, e-mail judy.pharo @mcgill.ca.

Complementary Courses (18 credits)
any 6 courses (18 credits) from the following list:
BUSA465 (3) Technological Entrepreneurship
FACC500 (3) Technology Business Plan Design
FACC501 (3) Technology Business Plan Project
MGCR320 (3) Managing Human Resources
MGCR423 (3) Organizational Policy
MRKT360 (3) Marketing of Technology
ORGB321 (3) Leadership

8.5.14 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.

The Minor consists of 24 credits (8 courses). Up to four of the courses (12 credits) may be double-counted for credit towards the B. Eng. degree in Electrical Engineering or Computer Engineering. Students in other programs may double-count up to three courses (9 credits).

Students considering this Minor should contact Ms. Judy Pharo, Faculty of Engineering Student Affairs Office, e-mail judy.pharo @mcgill.ca.

Required Courses (9 credits)
ECSE221 (3) Introduction to Computer Engineering
ECSE321 (3) Introduction to Software Engineering
ECSE428 (3) Software Engineering Practice

Complementary Courses (15 credits)
one course (3 credits), either:
COMP203 (3) Introduction to Computing 2
or COMP250 (3) Introduction to Computer Science

At least one course (3 credits) must be selected from the following list of engineering courses:
CHEE458 (3) Computer Applications
CHEE571 (3) Small Computer Applications: Chemical Engineering
CIVE460 (3) Matrix Structural Analysis
CIVE550 (3) Water Resources Management
CIVE572 (3) Computational Hydraulics
ECSE322 (3) Computer Engineering
ECSE424 (3) Human-Computer Interaction
ECSE427 (3) Operating Systems
ECSE526 (3) Artificial Intelligence
ECSE531 (3) Real Time Systems
ECSE532 (3) Computer Graphics
MECH474 (3) Selected Topics in Operations Research
MECH524 (3) Computer Integrated Manufacturing
MECH539 (3) Computational Aerodynamics
MECH545 (3) Advanced Stress Analysis
MECH576 (3) Computer Graphics and Geometrical Modelling

No more than two courses (6 credits) can be selected from the following list of courses offered by the School of Computer Science:
COMP302 (3) Programming Languages and Paradigms
COMP335 (3) Software Engineering Methods
COMP420 (3) Files and Databases
COMP421 (3) Database Systems
COMP424 (3) Topics: Artificial Intelligence 1
COMP426 (3) Automated Reasoning
COMP431 (3) Algorithms for Engineers
COMP433 (3) Personal Software Engineering
COMP538 (3) Person-Machine Communication