

## 12 Biomedical Engineering

Department of Biomedical Engineering  
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Chair — R.E. Kearney

### 12.1 Staff

#### Professors

T.M.S. Chang; B.Sc., M.D., C.M., Ph.D.(McG.), F.R.C.P.(C)  
(*joint appt. with Physiology*)  
A.C. Evans; B.Sc.(Liv.), M.Sc.(Sur.), Ph.D.(Leeds) (*joint appt. with  
Neurology & Neurosurgery*)  
H.L. Galiana; B.Eng., M.Eng., Ph.D.(McG.) (*joint appt. with  
Otolaryngology*)  
R.E. Kearney; B.Eng., M.Eng., Ph.D.(McG.) (*joint appt. with  
Physiology*)

#### Associate Professors

J.D. Boby; B.Sc., M.Sc.(McG.), Ph.D.(Tor.) (*joint appt. with  
Surgery*)  
W.R.J. Funnell; B.Eng., M.Eng., Ph.D.(McG.) (*joint appt. with  
Otolaryngology*)  
G.B. Pike; B.Eng., M.Eng., Ph.D.(McG.) (*joint appt. with Neurology  
& Neurosurgery*)

#### Assistant Professors

D.L. Collins; B.Sc., M.Eng, Ph.D.(McG.) (*joint appt. with Neurology  
& Neurosurgery*)  
S. Prakash, B.Sc., M.Sc.(BHU-India), Ph.D.(McG.)  
M. Tabrizian, B.Sc.(Iran), M.Sc., Ph.D.(PMC-France),  
M.B.A.(HEC) (*joint appt. with Dentistry*)

#### Associate Members

S. De Serres (*Physical and Occupational Therapy*); J. Gotman  
(*Neurology & Neurosurgery*); B.N. Segal (*Otolaryngology*);  
T. Steffen (*Surgery*); C. Thompson (*Neurology & Neurosurgery*)

#### Adjunct Professors

J.H.T. Bates (VT); W.F. Decraemer (U. Antwerp);  
I.W. Hunter (M.I.T.), T.M. Peters (U.W.O.), P.L. Weiss (Hebrew)

#### Research Associates

C. Baker, D. Guitton, A. Katsarkas

### 12.2 Programs Offered

The Department offers a graduate training program leading to Master's (M.Eng.) and Ph.D. degrees in Biomedical Engineering.

It provides instruction and opportunities for interdisciplinary research in the application of engineering, mathematics, and the physical sciences to problems in medicine and the life sciences. Courses are offered for graduate students in the life sciences and in engineering and the physical sciences.

Excellent laboratory facilities for basic and applied research are available in the Department and in the laboratories of associated staff located elsewhere in the Medical Faculty. The Department operates a network of high performance workstations and well-equipped mechanical and electronics workshops.

Basic research in the Department concentrates on the application of quantitative engineering analysis methods to basic biomedical research problems. Currently active areas of research include: neuromuscular and postural control, muscle mechanics, the vestibular system, oculomotor control, the auditory system, joint prosthetics, biomaterials, artificial cells and organs, and medical imaging. Staff members are also active in more applied research related to the development of quantitative analysis tools and instruments for biomedical research. Areas of activity here include: signal analysis, system identification, modeling, simulation and

parameter estimation, image processing, pattern recognition, ultrasound, and biorobotics.

### 12.3 Admission Requirements

See minimum admission requirements in Section 5 of the General Information section of the *Graduate and Postdoctoral Studies Calendar*.

### 12.4 Application Procedures

Please address enquiries directly to the Department.

Commencing with applications for entry in January 2003, McGill's on-line application form will be available to all graduate program candidates at <http://www.mcgill.ca/applying/graduate>.

### 12.5 Program Requirements

Master's degrees (M.Eng.) require students to complete a minimum of 45 credits (24 thesis credits and 21 graduate course credits).

Graduate students may also be registered through departments of Medicine, Science and Engineering, and must then fulfill the requirements for advanced degrees imposed by their respective departments.

In addition, all students are required, through course work and independent study, to achieve a degree of inter-disciplinary competence appropriate to their area of specialization.

### 12.6 Courses for Higher Degrees

**For the term (Fall and/or Winter), days, and times when courses will be offered, please refer to the 2002-2003 Class Schedule on the Web, <http://www.mcgill.ca/minerva-students/class/>. Class locations and names of instructors are also provided.**

**Students preparing to register are advised to consult the Class Schedule website for the most up-to-date list of courses available. New courses may have been added or courses rescheduled after this Calendar went to press.**

**The schedule of courses to be offered in Summer 2003, will be available on the website in January 2003.**

BMDE has replaced 399 as the prefix for Biomedical Engineering courses.

The course credit weight is given in parentheses after the title.

**BMDE 500D1 SEMINARS IN BIOMEDICAL ENGINEERING.** (1.5) (Students must also register for BMDE 500D2) (No credit will be given for this course unless both BMDE 500D1 and BMDE 500D2 are successfully completed in consecutive terms)

**BMDE 500D2 SEMINARS IN BIOMEDICAL ENGINEERING.** (1.5) (Prerequisite: BMDE 500D1) (No credit will be given for this course unless both BMDE 500D1 and BMDE 500D2 are successfully completed in consecutive terms)

**BMDE 501 SELECTED TOPICS IN BIOMEDICAL ENGINEERING.** (3) (3-0-6) An overview of how techniques from engineering and the physical sciences are applied to the study of selected physiological systems and biological signals. Using specific biological examples, systems will be studied using: signal or finite-element analysis, system and identification, modelling and simulation, computer control of experiments and data acquisition.

**BMDE 502 BME MODELLING AND IDENTIFICATION.** (3) (Prerequisites: Undergraduate basic statistics and: either BMDE 519, or Signals and Systems (e.g., ECSE 303 & ECSE 304) or equivalent) Methodologies in biological control systems or distributed multi-dimensional biological processes, with interactive sessions using real biological data in a Matlab environment. System themes include parametric vs non-parametric system representations; linear/non-linear; noise, transients and time variation; and relevant identification approaches in continuous and discrete time formulations.

**BMDE 503 BIOMEDICAL INSTRUMENTATION.** (3) (2-1-6) A review of the principles and practice of making biological measurements in

the laboratory, including theory of linear systems, data sampling, computer interfaces, basic electronic circuit design and machining. Laboratory facilities allow students to experiment with computer-based data acquisition.

**BMDE 504 BIOMATERIALS AND BIOPERFORMANCE.** (3) (3-0-0) (Restricted to graduate and final-year undergraduate students from physical, biological and medical science, and engineering.) Biological and synthetic biomaterials, medical devices, and the issues related to their bioperformance. The physicochemical characteristics of biomaterials in relation to their biocompatibility and sterilization.

**BMDE 505 CELL AND TISSUE ENGINEERING.** (3) (1.5 hours lecture/1.5 hours seminar per week) Application of the principles of engineering, physical, and biological sciences to modify and create cells and tissues for therapeutic applications will be discussed, as well as the industrial perspective and related ethical issues.

**BMDE 519 BIOMEDICAL SIGNALS AND SYSTEMS.** (3) (2-0-8) (Prerequisites: Satisfactory standing in U3 Honours Physiology (Neurophysiology option); or U3 Major in Physics-Physiology; or permission of instructor.) An introduction to the theoretical framework, experimental techniques and analysis procedures available for the quantitative analysis of physiological systems and signals. Lectures plus laboratory work using the Biomedical Engineering computer system. Topics include: amplitude and frequency structure of signals, filtering, sampling, correlation functions, time and frequency-domain descriptions of systems.

**BMDE 650 ADVANCED MEDICAL IMAGING.** (3) (Prerequisite: MDPH 607) Review of advanced techniques in medical imaging including: fast magnetic resonance imaging (MRI), functional MRI, MR angiography and quantitative flow measurement, spiral and dynamic x-ray computed tomography, 2D/3D positron emission tomography (PET), basic PET physiology, tracer kinetics, surgical planning and guidance, functional and anatomical brain mapping, 2D and 3D ultrasound imaging, and medical image processing.

**BMDE 690 THESIS RESEARCH 1.** (3)

**BMDE 691 THESIS RESEARCH 2.** (3)

**BMDE 692 THESIS RESEARCH 3.** (3)

**BMDE 693 THESIS RESEARCH 4.** (3)

**BMDE 694 THESIS RESEARCH 5.** (3)

**BMDE 695 THESIS SUBMISSION.** (12)

**BMDE 700 Ph.D. COMPREHENSIVE.** (0)

Related courses offered in other units include the following:

#### Computer Science

COMP 538 Person-Machine Communication (3)  
COMP 540 Matrix Computations (3)

#### Electrical Engineering

ECSC 512 Digital Signal Processing 1 (3)  
ECSC 523 Speech Communications (3)  
ECSC 526 Artificial Intelligence (3)  
ECSC 529 Image Processing & Communication (3)  
ECSC 626 Computer Vision (4)

#### Mechanical Engineering

MECH 561 Biomechanics of Musculoskeletal Systems (3)

#### Physiology

PHGY 423 Physiological Dynamics (3)  
PHGY 502 Exercise Physiology (3)  
PHGY 517 Artificial Internal Organs (3)  
PHGY 518 Artificial Cells (3)

For full course descriptions refer to appropriate Calendar entry.

Other courses can be found in related departments.

## 13 Chemical Engineering

Department of Chemical Engineering  
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Website: <http://www.mcgill.ca/chemeng>

Chair — R.J. Munz

### 13.1 Staff

#### Post-Retirement

W.J.M. Douglas; B.Sc.(Queen's), M.S.E., Ph.D.(Mich.)  
J.-M. Charrier; Dipl.Ing., (E.N.S.A.M. Paris), M.S., Ph.D.(Akron), Eng.

#### Professors

D.G. Cooper; B.Sc., Ph.D.(Tor.)  
J.M. Dealy; B.S.(Kansas), M.S.E., Ph.D.(Mich.), Eng.  
M.R. Kamal; B.S.(Ill.), M.S., Ph.D.(Carn.-Mellon), Eng.  
R.J. Munz; B.A.Sc., M.A.Sc.(Wat.), Ph.D.(McG.), Eng.  
A.D. Rey; B.Ch.E.(C.C.N.Y.), Ph.D.(Calif.) (*James McGill Professor*)

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

B. Volesky; M.Sc.(Czech. Tech. Univ.), Ph.D.(W.Ont.)  
M.E. Weber; B.S.E.(Prin.), Sc.D.(M.I.T.), P.Eng.

#### Associate Professors

D. Berk; B.Sc.(Bosphorus), M.E.Sc.(W.Ont.), Ph.D.(Calg.), P.Eng.  
J.-L. Meunier; D.Ing.(E.P.F.L.), M.Sc., Ph.D.(I.N.R.S.), Eng.

#### Assistant Professors

W.A. Brown; B.Eng., M.Eng., Ph.D.(McG.), P. Eng.  
S. Coulombe; B.Sc., M.Eng.(Sherb.), Ph.D.(McG.)  
R.L. Leask; B.A.Sc., M.A.Sc.(Wat.), Ph.D.(Tor.)  
S. Omanovic; B.Sc., Ph.D.(Zagreb)

#### Paprican Adjunct Professor

G.J. Kubes; B.Sc., M.Sc.(Prague), Ph.D.(Bratislava), P.Eng.

#### Adjunct Professors

A. Beils, C. Bélanger, P. Bisailon, R. Campeau, P. Csakany, M. Davidovsky, F. Dubuc, G. Garnier, S. Guiot, B. Huang, D.J. McKeagan, C. Miguez, A.S. Mujumdar, P. Nadeau, R. Nayar, N.P. Peters, M. Renaud, B. Sarkis, J. Sarlis, A. Tasan, R.C. Urquhart, L.A. Utracki, P. Wood-Adams.

#### Associate Members

T.M.S. Chang (*Physiology*)  
R.H. Crotonogino; H.L. Goldsmith (*Experimental Medicine*)

### 13.2 Programs Offered

The Department offers programs leading to the Master of Engineering, the Master of Science and the Doctor of Philosophy degrees.

Two options are available for the M.Eng. degree: the thesis option and the project option. The M.Eng. (Thesis) is a research-oriented degree requiring a limited number of courses and a research thesis; the M.Eng. (Project) is a course-oriented degree which includes a project. Three specialized versions of the M.Eng. (Project) are offered: specialization in pulp and paper; specialization in petrochemicals, polymers and plastics; specialization in environmental engineering.

The M.Sc. degree is appropriate for science graduates wishing to complete a Master's thesis without acquiring a broad engineering background. The requirements for the M.Sc. are similar to those for the M.Eng. (Thesis).

The Ph.D. is a research degree requiring a thesis which makes a distinct contribution to knowledge.

The Department's offices and research laboratories are located in the M.H. Wong Building, which was completed in 1996. Members of the Department are active in a number of research areas, including heat transfer; mass transfer; separation processes; coupled transport processes; thermodynamics and transport properties; chemical reaction engineering; plasma reactor studies; biochemical engineering; environmental engineering; polymer engineering and rheology. Most staff are members of one or more research groups.

Researchers in Polymer Engineering are members of Polymer McGill which also includes researchers from the Department of Chemistry and Paprican. The group cooperates with researchers at Ecole Polytechnique de Montréal and the Industrial Materials Institute of the National Research Council of Canada.

Research in Biochemical Engineering involves both the microbiology and technology of the production of new products, the development of novel biological reactors including their control and optimization as well as down-stream processing.

Research in Thermal Plasma Technology includes fundamental studies in high temperature transport phenomena and reactor design, as well as applied studies in plasma processing and torch design. Close collaboration is maintained with the Université de Sherbrooke through the Interuniversity Plasma Technology Research Centre (CRTP) and with the thermal plasma technology group of Hydro-Québec.

Research related to the Environment is pursued on many fronts; for example, the polymer group is exploring the recycling of plastics into chemicals by thermal and chemical means, the plasma group is investigating plasma-assisted incineration, the biochemical group is evaluating biosorbents for heavy metals. Other projects involve dewatering sludges by electroosmosis, electrokinetic soil remediation, membrane distillation to remove volatile organic compounds from water, etc.

Research in Pulp & Paper is closely associated with the Pulp & Paper Research Institute of Canada (Paprican). Specialized equipment and facilities of the Paprican main laboratory near Montreal are made available, and several staff are associated jointly with Paprican and the Department.

### 13.3 Admissions Requirements

Admission to graduate study requires a minimum CGPA of 3.0/4.0 (or equivalent) for the complete Bachelor's program or a minimum GPA of 3.2/4.0 (or equivalent) in the last two years of full-time studies. Non-Canadian applicants whose mother tongue is not English must achieve a minimum TOEFL score of 577 on the paper-based test (233 on the computer-based test) prior to admission.

#### M.Eng. (Thesis), M.Eng. (Project)

Admission requires a Bachelor's degree (or equivalent) in chemical or other engineering. Students whose degrees are not in chemical engineering may be required to complete some undergraduate courses during their studies. Students with Bachelor's degrees in science wishing to pursue the M.Eng. first enter a Qualifying Program, normally of two semesters, to prepare for entry into the M.Eng. program.

#### M.Sc.

Admission requires a Bachelor's degree (or equivalent) in science. In some cases, depending on the area of research, the student may be required to complete one or two extra courses as part of the graduate program.

#### Ph.D.

Admission requires a Master's degree (or equivalent) from a recognized university. Students in the Department's M.Eng. (Thesis) or M.Sc. program may transfer to the Ph.D. program after one year without submitting the Master's thesis following a formal "fast track" procedure.

### 13.4 Application Procedures

A preliminary application form and application information are available at the following web address, <http://chegrad.chemeng.mcgill.ca>. The completed preliminary application form is evaluated

by the Admissions Committee who send the formal application form only if there is a reasonable probability of admission.

Applications will be considered when the Graduate Admissions Committee has received:

1. application form of the Graduate and Postdoctoral Studies Office;
2. official transcripts;
3. two letters of reference;
4. application fee of \$60 Canadian;
5. TOEFL test results (if required).

Application deadlines are March 1 for September (Fall term) admission, September 15 for January (Winter term) admission and January 31 for May (Summer term) admission.

Commencing with applications for entry in January 2003, McGill's on-line application form will be available to all graduate program candidates at <http://www.mcgill.ca/applying/graduate>.

### 13.5 Program Requirements

#### M.Eng., M.Sc.

The Master's degrees require the completion of 45 credits and three terms of residence at McGill.

#### M.Eng. (Thesis), M.Sc.

Courses: 12 credits (a minimum of 9 credits in chemical engineering)

Research: 33 credits which include completion of a thesis proposal, presentation of a seminar and submission of a thesis

#### M.Eng. (Project)

Courses: 33-39 credits (a minimum of 18 credits in chemical engineering)

Project: (design or research): 6-12 credits

The specialized versions of the M.Eng. (Project) follow the above distribution between courses and project.

The specialization in Pulp and Paper, which is offered in cooperation with the Pulp and Paper Research Institute of Canada, consists of a sequence of courses over three consecutive semesters (12 months) beginning in May. The project and the majority of the courses are specialized in pulp and paper. (This program will not be offered in 2002-03.)

The specialization in petrochemicals, polymers and plastics, which is offered in cooperation with the Institut Français du Pétrole (IFP), requires that the Winter semester be spent at IFP in Paris where 15 course credits are completed. This program may be entered in September, January or May.

The specialization in environmental engineering requires the completion of a Core of 12 credits of environmental engineering courses and a research or design project related to the environment.

#### Ph.D.

The Ph.D. requires three years of residence at McGill.

Courses: 2 chemical engineering courses.

Research: completion of a thesis proposal, its defense, presentation of 2 seminars, and submission and defense of a thesis.

### 13.6 Courses

**For the term (Fall and/or Winter), days, and times when courses will be offered, please refer to the 2002-2003 Class Schedule on the Web, <http://www.mcgill.ca/minerva-students/class/>. Class locations and names of instructors are also provided.**

**Students preparing to register are advised to consult the Class Schedule website for the most up-to-date list of courses available. New courses may have been added or courses rescheduled after this Calendar went to press.**

**The schedule of courses to be offered in Summer 2003, will be available on the website in January 2003.**

CHEE has replaced 302 as the prefix for Chemical Engineering courses.

The course credit weight is given in parentheses after the title.



- Denotes courses not offered in 2002-03

**CHEE 571 SMALL COMPUTER APPLICATIONS: CHEMICAL ENGINEERING.** (3) (2-0-7) (Prerequisite: CHEE 458 or permission of the instructor.) The use of small computers employing a high level language for data acquisition and the control of chemical processes. Real-time system characteristics and requirements, analog to digital, digital to analog conversions and computer control loops are examined. Block level simulation.

- **CHEE 581 POLYMER COMPOSITES ENGINEERING.** (3) (3-0-6)

**CHEE 591 ENVIRONMENTAL BIOREMEDIATION.** (3) (3-0-6) The presence and role of microorganisms in the environment, the role of microbes in environmental remediation either through natural or human-mediated processes, the application of microbes in pollution control and the monitoring of environmental pollutants.

**CHEE 611 HEAT AND MASS TRANSFER.** (4) Heat and mass transfer in laminar and turbulent flows; scaling; models for interphase transport.

**CHEE 621 THERMODYNAMICS.** (4) Theory and application of phase and chemical equilibria in multicomponent systems.

- **CHEE 630 PAPER: STRUCTURE AND PROPERTIES.** (4)

**CHEE 631 FOUNDATIONS OF FLUID MECHANICS.** (4) Rigorous derivation of equations of motion; creeping flow inviscid flow; boundary layer theory; hydrodynamic stability; turbulent flow, separated flows, drag on submerged bodies.

- **CHEE 632 PULPING ENGINEERING.** (4)

- **CHEE 633 BLEACHING AND RECOVERY.** (3)

- **CHEE 636 UNIT OPERATIONS OF PAPERMAKING.** (4)

- **CHEE 638 TOPICS IN PULP AND PAPER.** (4)

**CHEE 641 CHEMICAL REACTION ENGINEERING.** (4) Interpretation of chemical reaction data, especially for heterogeneous systems. Residence time, complete segregation, maximum mixedness, other advanced concepts. Reactor design.

**CHEE 643 THERMAL PLASMA TECHNOLOGY.** (3) (Prerequisite: Permission of the instructor) An introduction to thermal (high temperature) plasmas as applied to chemical and materials engineering. Degree of ionization, velocity distribution function, plasma parameters, collisions and diffusion, energy states, plasma generation, diagnostic techniques for plasma and particles, particle-plasma interaction, mathematical modelling of plasma systems, applications.

- **CHEE 652 DRYING: PRINCIPLES AND PRACTICE.** (2)

- **CHEE 655 PULP AND PAPER DESIGN PROJECT.** (6)

**CHEE 662 COMPUTATIONAL METHODS.** (4) Methods of weighted residuals; solution to non-linear algebraic equations; stability in nonlinear equations; bifurcations; mesh refinement strategies; convection dominated transport; hyperbolic equations, particle simulation methods.

**CHEE 672 PROCESS DYNAMICS AND CONTROL.** (4) (Prerequisite: CHEE 455) Process representation and identification and simulation; sensor stability; sensitivity of feedback control systems; feed-forward control; discrete representation of continuous systems; controller tuning; adaptive control.

- **CHEE 674 CONTROL IN PULP AND PAPER.** (3) (Prerequisite: CHEE 672 or permission of instructor.)

**CHEE 681 POLYMER CHEMICAL ENGINEERING.** (3) Application of chemical engineering fundamentals to the preparation and processing of polymers. Classification and characterization of polymers, reaction media and kinetics of polymerization, reactor design, viscoelasticity and rheology, processing techniques, extrusion, molding, composite formation, adhesion.

**CHEE 682 ENGINEERING PROPERTIES OF POLYMERIC MATERIALS.** (3) Mechanical and transport properties of non-crystallizing and crystallizing thermoplastics, rigid thermosets, fibers, films, elastomers and composites with particle and fiber reinforcement. Elasticity, visco-elasticity, ultimate properties, diffusion of liquids and gases, thermal and electrical properties.

- **CHEE 683 POLYMER RHEOLOGY.** (3)

**CHEE 684 POLYMER PROCESSING.** (3) Survey of engineering properties of polymers and processing operations, degradation of polymers, extrusion, injection molding, fiber spinning, film blowing, blow molding, thermoforming, miscellaneous other processes. Lectures, plant visits, problem assignments.

**CHEE 685 POLYMER PRODUCT AND PROCESS DESIGN PROJECT.** (3) Principles of product design, optimization and processing conditions for the production of plastics articles. Selection of resins, process and equipment and tool design, considering cost, safety and environmental aspects of production. Students undertake projects to define specifications for the manufacture of selected plastics articles.

**CHEE 686 POLYMER ENGINEERING LABORATORY.** (3) Study of experimental aspects of polymer characterization. Areas of study are selected from molecular weight determination, polymer morphology, mechanical and rheological behaviour. Polymer processing areas available for study include extrusion, mixing and injection and compression molding.

**CHEE 690 RESEARCH TECHNIQUES.** (3) This course introduces techniques and develops skills necessary for commencing a particular thesis research project. A written report is required.

**CHEE 691 SELECTED TOPICS IN CHEMICAL ENGINEERING.** (1)

**CHEE 692 SELECTED TOPICS IN CHEMICAL ENGINEERING.** (2)

**CHEE 693 SELECTED TOPICS IN CHEMICAL ENGINEERING.** (3)

**CHEE 694 SELECTED TOPICS IN CHEMICAL ENGINEERING.** (4)

**CHEE 695 PROJECT IN CHEMICAL ENGINEERING.** (6) Independent work under the general direction of a full-time staff member, on a problem of industrially-oriented design or research leading to a comprehensive report.

**CHEE 696 EXTENDED PROJECT.** (6) Extended independent work on a problem of industrially-oriented design or research, leading to a comprehensive project report.

**CHEE 697 THESIS PROPOSAL.** (6) Independent work under the supervision of the thesis advisor(s) leading to a thesis proposal.

**CHEE 698 THESIS RESEARCH 1.** (12) (Prerequisite: CHEE 697) Ongoing research pertaining to thesis.

**May also be available as: CHEE 698N1, CHEE 698N2.**

**CHEE 699 THESIS RESEARCH 2.** (15) (Prerequisite: CHEE 698) Ongoing research pertaining to thesis.

**CHEE 795 PH.D. THESIS PROPOSAL.** (0) Independent work under the supervision of the thesis advisor(s) leading to a thesis proposal.

**CHEE 796 PH.D. PROPOSAL DEFENCE.** (0) Presentation and defence of thesis proposal at an oral examination.

**CHEE 797 PH.D. SEMINAR.** (0) (Prerequisite: CHEE 796) Required for all Ph.D. candidates. Presentation of a seminar on an aspect of their thesis work.

## 14 Chemistry

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Chair — R.B. Lennox

Director of Graduate Studies — M. Dahma

## 14.1 Staff

### *Emeritus Professors*

B.C. Eu; B.Sc.(Seoul), Ph.D.(Brown)  
 J.F. Harrod; B.Sc., Ph.D.(Birm.)  
 A.S. Hay; B.Sc.(Alta.), Ph.D.(Ill.), F.R.S.  
 M. Onyszchuk; B.Sc.(McG.), M.Sc.(W.Ont.), Ph.D.(Cantab),  
 Ph.D.(McG.), F.C.I.C.  
 D. Patterson; M.Sc.(McG.)  
 A.S. Perlin; M.Sc., Ph.D.(McG.), F.C.I.C., F.R.S.C.  
 W.C. Purdy; B.A.(Amh.), Ph.D.(M.I.T.), F.C.I.C.  
 L.E. St-Pierre; B.Sc.(Alta.), Ph.D.(Notre Dame), F.C.I.C.  
 M.A. Whitehead; B.Sc., Ph.D., D.Sc.(Lond.), F.C.I.C.

### *Professors*

I.S. Butler; B.Sc., Ph.D.(Brist.), F.C.I.C.  
 T.H. Chan; B.Sc.(Tor.), M.A., Ph.D.(Prin.), F.C.I.C., F.R.S.C.  
 M. Damha; B.Sc., Ph.D.(McG.)  
 A. Eisenberg; B.S.(Wor. Poly.), M.A., Ph.D.(Prin.), F.C.I.C.  
 P.G. Farrell; B.Sc., Ph.D., D.Sc.(Ex.)  
 D.F.R. Gilson; B.Sc.(Lond.), M.Sc., Ph.D.(Br.Col.), F.C.I.C.  
 D.N. Harpp; A.B.(Middlebury), M.A.(Wesleyan), Ph.D.  
 (N.Carolina), F.C.I.C.  
 G.E. Just; Ing.Chem.(E.T.H. Zürich), Ph.D.(W.Ont.), F.C.I.C.  
 R.B. Lennox; B.Sc., M.Sc., Ph.D.(Tor.)  
 R.H. Marchessault; B.Sc.(Montr.), Ph.D.(McG.), F.C.I.C., F.R.S.C.  
 D.M. Ronis; B.Sc.(McG.), Ph.D.(M.I.T.)  
 E.D. Salin; B.Sc.(Calif.), Ph.D.(Oregon)  
 B.C. Sanctuary; B.Sc., Ph.D.(Br.Col.)  
 A.G. Shaver; B.Sc.(Carl.), Ph.D.(M.I.T.)

### *Associate Professors*

M.P. Andrews; B.Sc., M.Sc., Ph.D.(Tor.)  
 B.A. Arndtsen; B.A.(Carl.), Ph.D.(Stan.)  
 D.H. Burns; B.Sc.(Puget Sound), Ph.D.(Wash.)  
 W.C. Galley; B.Sc.(McG.), Ph.D.(Calif.)  
 A. Kakkar; B.Sc., M.Sc.(Chan. U., India), Ph.D.(Wat.)  
 R.J. Kazlauskas; B.Sc.(Clev. State), Ph.D.(M.I.T.)  
 J.F. Power; B.Sc., Ph.D.(C'dia)  
 L. Reven; B.A.(Carl.), Ph.D.(Ill.)

### *Assistant Professors*

P. Ariya; B.Sc., Ph.D.(York)  
 K. Auclair; B.Sc.(U.Q.A.C.), Ph.D.(Alta)  
 C.J. Barrett; B.Sc., M.Sc., Ph.D.(Queen's)  
 J.L. Gleason; B.Sc.(McG.), Ph.D.(Va.)  
 H. Sleiman; B.Sc.(A.U.B.), Ph.D.(Stanford)  
 P. Wiseman; B.Sc.(St.F.X.), Ph.D.(W.Ont.)

### *Lecturers*

J. Finkenbine, G. Wilczek

### *Paprican Adjunct Professors*

D. Argyropoulos, D.G. Gray, R. St. John Manley,  
 T.G.M. Van de Ven

### *Associate Members*

J.A. Finch (Mining, Metals and Materials Engineering),  
 O.A. Mamer (University Clinic, RVH), B.I. Posner (Medicine),  
 K. Gehring (Biochemistry)

### *Adjunct Professors*

Y. Guindon, Y. Tsantrizos, I. Wharf, R. Zamboni

## 14.2 Programs Offered

M.Sc., Ph.D. and the M.Sc. (Applied).

### **Research in Chemistry**

Members of the Department are active in directing research in the following fields:

**Analytical** – Atomic and molecular spectroscopy; laboratory automation; artificial intelligence; instrument design; optimization of data processing techniques; application of modern analytical techniques to biochemical and medical systems; detectors for liquid chromatography; photothermal analytical methods; thermal wave imaging; development of analytical techniques for studies of diffu-

sion and photodegradation in thin films. Technique development for quantitative spectroscopy in scattering media. Micronano-sensors; Chemoinformatics. Analytical spectroscopy of bioenergetics.

**Bio-organic** – Enzyme chemistry; protein and nucleic acid structure and function; drug design and modification; active site stereochemistry; molecular basis of regulation and pharmacological action; lipid and lipid analogue chemistry.

**Biophysical** – Excited electronic states of proteins and nucleic acids; spectroscopic probes of biopolymer conformation; sensitized photochemistry in biopolymers; dynamics of protein and nucleic acid conformations. Spectroscopic analysis of oxygen transport in aerobic metabolism.

**Colloid and Polymer** – Monomolecular layers; solution properties of high polymers; molecular morphology; rheology and stability of dispersions; phase transitions in polymers and polymer blends; polymer reinforcement; radiation effects and solid-state polymerization; mechanisms of polymerization reactions; wetting and spreading; the glass transition; molecular dynamics and polymer properties; ionic polymers; cellulose and paper; carbohydrate biopolymers; pollution abatement; polymer melt rheology; synthetic latex; rheo- and electro-optical phenomena; polymers at interfaces.

**Inorganic** – Synthesis of new classes of organometallic complexes and inorganic polymers; homogeneous catalysis; catenated polysulfur and polysulfoxide complexes; organosilicon chemistry; spectroscopic studies (e.g., FT-IR, laser Raman, multinuclear NMR, and mass) of complexes; kinetics and mechanisms of inorganic and organometallic reactions; bioinorganic chemistry; inorganic materials chemistry; asymmetric catalysis; surface chemistry.

**Organic** – Synthesis and structure of heterocyclic compounds; natural products; carbohydrates; cellulose; plant-growth regulators; organic sulphur, chemistry; stereochemistry; reaction mechanisms; charge transfer complexes; new synthetic methods; conformational analysis; solvation effects; substituent effects; polymer supports; nucleic acids, anti-sense and anti-gene oligonucleotides.

**Physical** – Laser excited luminescence and novel optical materials. Order-disorder phenomena in molecular crystals and liquid crystals. Vibrational spectroscopy at high pressures. Nuclear quadrupole resonance spectroscopy.

**Pulp and Paper** – Research in areas of chemistry of interest to the Canadian pulp and paper industry is also performed at the Pulp and Paper Research Centre, adjacent to the Chemistry Department. Current research topics include cellulose and lignin chemistry, the chemistry of pulping and bleaching, colloidal aspects of papermaking, physical chemistry of cellulosic materials, and de-inking and recycling of paper.

**Theoretical** – Non-equilibrium statistical mechanics, kinetic theory of fluids and plasmas, non-equilibrium thermodynamics of non-linear transport processes for systems far from equilibrium and fluid dynamics. Theories of nuclear magnetic resonance and multiquantum NMR spectra are developed with emphasis on the determination of the structures of proteins from NMR. Molecular structure, chemical bonding, intermolecular forces in solids and isolated molecules in dimers and metastable polymers are studied quantum mechanically.

## 14.3 Admission Requirements

The minimum academic standard for admission to research thesis M.Sc., Ph.D. and the M.Sc. (Applied) degree programs is a minimum standing equivalent to a Cumulative Grade Point Average (CGPA) of 3.0 out of a possible 4.0 or a CGPA of 3.2/4.0 for the last two full-time academic years. Applicants from other institutions should have an academic background equivalent to that of a McGill graduate in the Chemistry Honours/Major programs. If possible, candidates should specify the field of research in which they are interested.

## 14.4 Application Procedures

All inquiries concerning graduate work in the Department should be addressed to the Director of Graduate Studies, Department of Chemistry.

### FINANCIAL ASSISTANCE

#### M.Sc. and Ph.D. Degrees

Financial assistance for accepted graduate students who do not hold fellowships or scholarships is normally available in the form of laboratory demonstrators/assistantships, and occasionally by payment from research funds. Graduate students devote 12 hours per week (contact hours, plus grading of reports, etc.) during the academic session to their teaching duties. Financial assistance during the remainder of the year is provided from research funds. Most students receive partial fee waivers. Scholarship holders, such as NSERC or awards of similar value, receive a tuition fee waiver.

#### M.Sc. (Applied) Degree

Financial assistance for candidates in the M.Sc. (Applied) program is not available during the two academic sessions when courses are taken, unless candidates are recipients of scholarships. During the four-month project, candidates are paid at rates established by participating companies.

## 14.5 Program Requirements

### M.Sc.\* and Ph.D. Degrees

1. Students must take such examinations as may be required in (a) assigned courses given in the Department of Chemistry, (b) assigned cognate courses given in other departments. Courses are assigned after taking into consideration the student's previous training and research interest.
2. Students must successfully complete a research project and submit an acceptable thesis.
3. Students must satisfy the examiners in an oral examination on the thesis and related subjects (required only of candidates for the Ph.D. degree).
4. All the usual requirements of the Graduate and Postdoctoral Studies Office must be satisfied.

\* This program requires 45-50 credits.

A minimum of 6 credits of course work is required; the balance of credits will be made up from either a combination of course work (graduate and undergraduate) and thesis credits, or from thesis research credits only. There will be a minimum of 24 credits in the thesis research component.

#### M.Sc. (Applied) Degree

This program requires a minimum of 45 credits, 30 credits of course work (graduate and undergraduate) plus a 15-credit project in some aspect of chemical industry, normally completed during a four-month project.

### Examinations in Chemistry

1. Examinations in assigned courses are normally taken by the candidates in December and May. In special circumstances, and with the permission of the Department and the Graduate and Postdoctoral Studies Office, they may be taken in September.
2. A candidate for the Ph.D. degree shall pass all such examinations, other than those in certain special courses, before the final year, except in special circumstances and then only with the approval of the Department.

## 14.6 Courses for Higher Degrees

For the term (Fall and/or Winter), days, and times when courses will be offered, please refer to the 2002-2003 Class Schedule on the Web, <http://www.mcgill.ca/minerva-students/class/>. Class locations and names of instructors are also provided.

Students preparing to register are advised to consult the Class Schedule website for the most up-to-date list of courses available. New courses may have been added or courses rescheduled after this Calendar went to press.

The schedule of courses to be offered in Summer 2003, will be available on the website in January 2003.

The course credit weight is given in parentheses after the title. Term(s) offered (Fall, Winter, Summer) may appear after the credit weight to indicate when a course would normally be taught. Please check the Class Schedule to confirm this information.

### Advanced Undergraduate Courses

Undergraduate courses may be required of a student who is admitted to a graduate program if deficiencies are perceived in the student's previous training. Descriptions of undergraduate courses may be found in the Faculty of Science section of the *Undergraduate Programs Calendar*.

**NOTE:** All undergraduate courses administered by the Faculty of Science (courses at the 100- to 500-level) have limited enrolment. CHEM has replaced 180 as the prefix for Chemistry courses.

● Denotes courses not offered in 2002-03

**CHEM 503 DRUG DESIGN AND DEVELOPMENT 1.** (3) (Fall) (Prerequisites: CHEM 302, BIOL 200, BIOL 201 or BIOC 212, PHAR 300 or PHAR 301 or PHAR 303 or permission of instructor) (Students can register only with permission of coordinators. Priority: students registered in the Minor in Pharmacology) (Not open to students who are taking or have taken PHAR 503) Interdisciplinary course in drug design and development covering chemistry, mechanisms of action and steps in drug development, principles and problems in drug design.

**CHEM 504 DRUG DESIGN AND DEVELOPMENT 2.** (3) (Winter) (Prerequisite: CHEM 503 and permission of instructor) (Students can register only with permission of coordinators) (Not open to students who are taking or have taken PHAR 504) Groups of 2-4 students with different backgrounds will form a team. Each team will select a lead compound, design the analogues, propose the pre-clinical and clinical studies, present possible untoward effects, and reasons for drug (dis)approval.

**CHEM 531 CHEMISTRY OF INORGANIC MATERIALS.** (3) (Winter) (3 lectures) (Prerequisite: CHEM 381) Structure, bonding, synthesis, properties and applications of covalent, ionic, metallic crystals, and amorphous solids. Defect structures and their use in synthesis of specialty materials such as electronic conductors, semiconductors, and superconductors, and solid electrolytes. Basic principles of composite materials and applications of chemistry to materials processing.

**CHEM 534 NANOSCIENCE AND NANOTECHNOLOGY.** (3) (Fall) (Prerequisites: CHEM 334 or PHYS 334 or permission of instructor. Corequisites: one of CHEM 345, PHYS 357, or PHYS 446 or permission of instructor) (Not open to students who have taken or are taking PHYS 534) Topics discussed include scanning probe microscopy, chemical self-assembly, computer modelling, and microfabrication/micromachining.

● **CHEM 543 CHEMISTRY OF PULP AND PAPER.** (3) (Fall) (2 lectures plus a reading/research project.) (Prerequisite: CHEM 302 or permission of instructor.)

**CHEM 547 LABORATORY AUTOMATION.** (3) (Winter) (Two 1.5 hour lectures, lab) (Prerequisite: CHEM 377, equivalent or permission of instructor) Automation and data handling with respect to modern chemical laboratory instrumentation. Basic electronics, data acquisition, evaluation of laboratory needs, data processing methodologies.

**CHEM 552 PHYSICAL ORGANIC CHEMISTRY.** (3) (Fall) (Prerequisite: CHEM 302) The correlation of theory with physical measurements on organic systems; an introduction to photochemistry; solvent and substituent effects on organic reaction rates, etc.; reaction mechanisms.

**CHEM 555 NMR SPECTROSCOPY.** (3) (Fall) (3 lectures) (Prerequisite: CHEM 355 or equivalent) Interpretation of proton and carbon-



13 nuclear magnetic resonance spectroscopy in one dimension for structural identification.

**CHEM 556 ADVANCED QUANTUM MECHANICS.** (3) (Fall) (3 lectures) (Prerequisites: CHEM 345 and PHYS 242) Quantum mechanical treatment of species of chemical interest. Introduction to perturbation theory, both time-dependent and time-independent. Treatment of the variational principle. Introduction to atomic spectra. Chemical bonding in terms of both the valence bond and molecular orbital theory. Elementary collision theory. Interaction of radiation with molecules.

**CHEM 567 CHEMOMETRICS: DATA ANALYSIS.** (3) (Fall) (2 lectures and 3 hours of laboratory) (Prerequisite: Linear Algebra and experience in some computer programming language) Topics covered include; factorial analysis of chemical spectra, pattern recognition from multisensor data, linear and nonlinear optimization for the determination of optimal reaction conditions molecular modeling, multisensor calibration, etc.

**CHEM 571 POLYMER SYNTHESIS.** (3) (Winter) (3 lectures) (Prerequisite: CHEM 302 or equivalent, or permission of instructor.) A survey of polymer preparation and characterization; mechanisms of chain growth, including free radical, cationic, anionic, condensation and transition metal-mediated polymerization, and the effects of these mechanisms on polymer architecture; preparation of alternating, block, graft and stereoblock copolymers; novel macromolecular structures including dendrimers and other nanostructures.

● **CHEM 572 SYNTHETIC ORGANIC CHEMISTRY.** (3) (3 lectures) (Prerequisite: CHEM 382)

**CHEM 575 CHEMICAL KINETICS.** (3) (Winter) (3 lectures) (Prerequisites: CHEM 273 and CHEM 213) Kinetic laws, measurement of reaction rates, transition state and collision theory. Elementary reactions in gas, solution and solid phases and on surfaces. Reaction mechanisms, laser techniques, molecular beams, chemiluminescence, explosions. Extensive use of computers to simulate the kinetic behaviour of chemical systems.

● **CHEM 576 QUANTUM CHEMISTRY.** (3) (Lecture and/or reading course) (Prerequisite: CHEM 345)

● **CHEM 577 ELECTROANALYTICAL CHEMISTRY.** (3) (Prerequisites: CHEM 367 and CHEM 377)

● **CHEM 581 INORGANIC TOPICS 1.** (3) (Prerequisite: CHEM 381)

**CHEM 585 COLLOID CHEMISTRY.** (3) (Winter) (Prerequisites: CHEM 273 and CHEM 345, MATH 223 and MATH 315, PHYS 241 and PHYS 242 or permission of instructor) Principles of the physical chemistry of phase boundaries. Electrical double layer theory; van der Waals forces; Brownian motion; kinetics of coagulation; electrokinetics; light scattering; solid/liquid interactions; adsorption; surfactants; hydrodynamic interactions; rheology of dispersions.

**CHEM 587 TOPICS IN MODERN ANALYTICAL CHEMISTRY.** (3) (Fall) (Prerequisites: CHEM 367 and CHEM 377) Current theories of aqueous and nonaqueous solutions, with application to analytical chemistry; recent advances in analytical techniques. Topics may include: chromatography; applications of kinetics, solvent extraction and thermal analysis, with emphasis on their theoretical basis.

**CHEM 591 ADVANCED COORDINATION CHEMISTRY.** (3) (Winter) (3 hours) (Prerequisite: CHEM 381) (For Honours and Major Chemistry students or with permission) In-depth treatment of advanced topics in coordination chemistry, such as bio-inorganic chemistry and transition metal catalysis and solid state inorganic chemistry.

**CHEM 593 STATISTICAL MECHANICS.** (3) (Winter) (2 lectures) (Research project) (Prerequisite: CHEM 345. Recommended: CHEM 355) Basic hypotheses of statistical thermodynamics; ideal monatomic, diatomic and polyatomic gases; Einstein and Debye models of solids; statistical theory of black-body radiation; Debye-Hückel theory of electrolyte solutions; absolute reaction rate theory of rate processes; theories of solutions.

**CHEM 597 ANALYTICAL SPECTROSCOPY.** (3) (Fall) (2 lectures; 3 hours lab) (Prerequisites: CHEM 367 and CHEM 377) The design and analytical use of spectroscopic instrumentation with respect to fundamental and practical limitations. Classical emission, fluores-

cence, absorption and chemical luminescence. Topics may include photo-acoustic spectroscopy, multielement analysis, X-ray fluorescence and modern multiwavelength detector systems.

● **CHEM 603 INFRARED AND RAMAN SPECTROSCOPY.** (5)

● **CHEM 605 ELECTRONIC SPECTROSCOPY.** (5)

**CHEM 611 INORGANIC TOPICS 2.** (4) This advanced level course surveys recent trends in inorganic chemistry. Students select a topic from the current literature, research the topic, present periodic oral reports and a final summary paper. The instructor participates as a tutor and gives occasional oral presentations on topics of his choice.

**CHEM 612 ORGANOMETALLIC CHEMISTRY.** (5) A first course at the graduate level in organometallic chemistry. The theory and practice of the field is treated starting from basic principles of inorganic and organic chemistry.

● **CHEM 619 ADVANCED ATMOSPHERIC CHEMISTRY.** (4)

**CHEM 621 RECENT ADVANCES IN ORGANIC CHEMISTRY.** (5) A systematic survey of the mechanisms of the most common organic reactions from studies of reactions in the current literature.

● **CHEM 623 STEREOCHEMISTRY.** (5)

● **CHEM 624 SPECIAL TOPICS: ORGANIC CHEMISTRY.** (4)

● **CHEM 624D1 SPECIAL TOPICS: ORGANIC CHEMISTRY.** (2)

● **CHEM 624D2 SPECIAL TOPICS: ORGANIC CHEMISTRY.** (2).

● **CHEM 626D1 FUNDAMENTALS OF MEDICINAL CHEMISTRY.** (2)

● **CHEM 626D2 FUNDAMENTALS OF MEDICINAL CHEMISTRY.** (2)

● **CHEM 627 SPECIAL TOPICS 2.** (5)

**CHEM 629 ORGANIC SYNTHESIS.** (5) An advanced course in the synthesis of organic molecules with an emphasis on stereoselective transformations. Topics will include multiple bond formation, functional group interconversions, carbon-carbon bond formation and stereoselective oxidations and reductions.

● **CHEM 631D1 SELECTED TOPICS IN ANALYTICAL CHEMISTRY.** (2)

● **CHEM 631D2 SELECTED TOPICS IN ANALYTICAL CHEMISTRY.** (2)

**CHEM 634 SEMINAR IN ADVANCED MATERIALS.** (3) A series of research-level seminars about topics of current interest in advanced materials. Topics include molecular and nanoelectronics, computational approaches to materials design and property predictions, new techniques in molecular and atomic imaging, advances in materials preparation, quantum devices and quantum computing.

**CHEM 636 LABORATORY AUTOMATION 2.** (5) (Prerequisite: CHEM 547) Students will undertake a chemical laboratory automation project. Design and implementation problems will be discussed by the students in seminars and advanced topics in automated chemical instrumentation will be presented. Several experiments will be required.

● **CHEM 643 ORGANIC CHEMISTRY / WOOD COMPONENTS.** (4)

● **CHEM 645 QUANTUM MECHANICS.** (5)

● **CHEM 645D1 QUANTUM MECHANICS.** (2.5)

● **CHEM 645D2 QUANTUM MECHANICS.** (2.5)

● **CHEM 646 ADVANCED STATISTICAL MECHANICS.** (4)

**CHEM 647 PHYSICAL CHEMISTRY: SPECIAL TOPIC 1.** (4)

**CHEM 648 PHYSICAL CHEMISTRY: SPECIAL TOPIC 2.** (4)

**CHEM 650 SEMINARS IN CHEMISTRY 1.** (1) (1 seminar) (Required of first year graduate students in Chemistry.) A seminar course designed for graduate students in chemistry which in conjunction with McGill Chemical Society will provide exposure to a broad range of special topics within the discipline.

**CHEM 651 SEMINARS IN CHEMISTRY 2.** (1) (1 seminar) (Required of first year graduate students in Chemistry.) A seminar course designed for graduate students in chemistry which in conjunction with McGill Chemical Society will provide exposure to a broad range of special topics within the discipline.

**CHEM 655 ADVANCED NMR SPECTROSCOPY.** (4) (1 lecture) (Prerequisite: CHEM 555 or equivalent.) Advanced techniques of

nuclear magnetic resonance spectroscopy, Fourier transform methods, multiple pulsing, two-dimensional pulse sequencing.

**CHEM 661 LITERATURE REVIEW AND PROPOSAL.** (3) (Restricted to graduate students in Chemistry.) Students will review the relevant literature concerning their particular area of research and describe plans for future work.

**CHEM 662 RESEARCH REPORT 1.** (3) (Restricted to graduate students in Chemistry.) Students will prepare a research proposal, and give a seminar.

● **CHEM 666D1 SPECIAL TOPICS 2.** (3)

● **CHEM 666D2 SPECIAL TOPICS 2.** (3)

● **CHEM 667 SPECIAL TOPICS.** (4)

● **CHEM 672 THE POLYMER SOLID STATE.** (4) M

**CHEM 673 POLYMERS IN SOLUTIONS.** (4) Thermodynamics of regular and of polymer solutions; osmotic pressure; phase separations; polymer configurations; light scattering; ultracentrifugation; viscometry; gel permeation chromatography; polyelectrolytes.

● **CHEM 674 INTRODUCTORY PHYSICAL CHEMISTRY - POLYMERS.** (4)

● **CHEM 675 MECHANICAL PROPERTIES AND RHEOLOGY - POLYMERS.** (4)

● **CHEM 678 POLYMER KINETICS.** (5)

● **CHEM 681 SELECTED TOPICS IN RADIOCHEMISTRY.** (4)

**CHEM 686 WET-END PAPERMAKING CHEMISTRY.** (3) (Restricted to graduate students in Chemistry or Chemical Engineering or permission of instructor.) (Prerequisites: CHEM 543 and CHEM 585) Review of the chemistry of various additives used in papermaking, such as wet and dry strength agents, sizing agents, fillers, filler retention aids, antifoam agents, biocides, dyes, dewatering agents, drainage and formation aids. The course also addresses the chemistry of deinking of waste papers and the treatment of effluents.

**CHEM 691 M.Sc. THESIS RESEARCH.** (3) Independent research work leading to writing of M.Sc. thesis for final submission to the Graduate and Postdoctoral Studies Office.

**CHEM 692 M.Sc. THESIS RESEARCH.** (6) Independent research work leading to writing of M.Sc. thesis for final submission to the Graduate and Postdoctoral Studies Office.

**CHEM 693 M.Sc. THESIS RESEARCH.** (9) Independent research work leading to writing of M.Sc. thesis for final submission to the Graduate and Postdoctoral Studies Office.

**CHEM 694 M.Sc. THESIS RESEARCH.** (12) Independent research work leading to writing of M.Sc. thesis for final submission to the Graduate and Postdoctoral Studies Office.

**CHEM 695 M.Sc. THESIS RESEARCH.** (15) Independent research work leading to writing of M.Sc. thesis for final submission to the Graduate and Postdoctoral Studies Office.

**CHEM 696 M.Sc. THESIS RESEARCH.** (6) Independent research work leading to writing of M.Sc. thesis for final submission to the Graduate and Postdoctoral Studies Office.

**CHEM 697 M.Sc. THESIS RESEARCH.** (9) Independent research work leading to writing of M.Sc. thesis for final submission to the Graduate and Postdoctoral Studies Office.

**CHEM 698 M.Sc. THESIS RESEARCH.** (12) Independent research work leading to writing of M.Sc. thesis for final submission to the Graduate and Postdoctoral Studies Office.

● **CHEM 699 PROJECT.** (15)

● **CHEM 699D1 PROJECT.** (7.5)

● **CHEM 699D2 PROJECT.** (7.5)

**CHEM 721 ORGANIC CHEMISTRY RESEARCH SEMINAR.** (3) Upon completion of the organic cumulative examinations, students will present a seminar on their research work (including background and future plans).

**CHEM 763 RESEARCH REPORT 2.** (3) (Restricted to graduate students in Chemistry.) Students will present a seminar on a complete or nearly complete research project and discuss these results.

## 15 Civil Engineering and Applied Mechanics

Department of Civil Engineering and Applied Mechanics  
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Telephone: (514) 398-6858

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Email: gradadvice.civil@mcgill.ca

Website: <http://www.mcgill.ca/civil/>

Chair — D. Mitchell

Chair of Graduate Program — TBA

### 15.1 Staff

#### *Emeritus Professors*

L.J. Arcand; B.Sc., M.Eng.(McG.), Q.L.S., M.C.I.S., M.A.S.P.

P.J. Harris; B.Sc.(Man.), M.Eng., Ph.D.(McG.), F.E.I.C.,

F.C.S.C.E., Eng.

S.B. Savage; B.Eng.(McG.), M.S.Eng.(Cal.Tech.), Ph.D.(McG.),

F.R.S.C.

#### *Professors*

V.H. Chu; B.S.Eng.(Taiwan), M.A.Sc.(Tor.), Ph.D.(M.I.T.), Eng.

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

F.C.S.C.E., F.A.C.I., Hon.F.I.E.P., Eng.

D. Mitchell; B.A.Sc., M.A.Sc., Ph.D.(Tor.), F.A.C.I., Eng.

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

A.P.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.

S.C. Shrivastava; B.Sc.(Eng.) (Vikram), M.C.E.(Del.), Sc.D.(Col.), Eng.

#### *Associate Professors*

L. Chouinard; B.Eng., M.Eng.(Montr.), B.C.L.(McG.), Sc.D.(M.I.T.), Eng.

R. Gehr; B.Sc.(Eng.) (Witw.), M.A.Sc., Ph.D.(Tor.), P.Eng.

(on leave 2002-03)

G. McClure; B.Eng.(Mont.), S.M.C.E.(M.I.T.), Ph.D.(Mont.), Eng.

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

*Dawson Scholar*)

#### *Assistant Professors*

S.J. Gaskin; B.Sc.(Eng.) (Queen's), Ph.D.(Cant.), Eng.

S. Ghoshal; B.C.E.(India), M.S.(Missouri), Ph.D.(Carnegie Mellon)

M. Haider; B.Sc.(Peshwar), M.A.Sc., Ph.D.(Tor.)

C. Rogers; B.A.Sc., M.A.Sc. (Waterloo), Ph.D.(Sydney), P.Eng.

Y. Shao; B.Sc., M.S.(Tongji), Ph.D.(Northwestern)

#### *Adjunct Professors*

S. Babarutsi, A. Beaubien, P. Boucher, S. Guiot, J. Gussow,

L. Hervieux, G. Holder, R.D. Japp, J. Mirza, R. G. Redwood,

S.B. Savage, P. Trottier, A. Zaki, R. Zaloum

### 15.2 Programs Offered

Advanced courses of instruction and laboratory facilities are available for engineering graduate students desiring to proceed to the degrees of M.Eng., M.Sc. and Ph.D.

Graduate studies and research are at present being conducted in the fields of structures and structural mechanics, rehabilitation, fluid mechanics and hydraulics, materials engineering, soil behaviour, soil mechanics and foundations, water resources engineering, and environmental engineering.

#### **M.Eng. (Project) Degree in Civil Engineering – Option in Rehabilitation of Urban Infrastructure**

This program is offered to students with a university undergraduate degree in engineering who want to specialize in the field of maintenance and rehabilitation of urban infrastructures. It is offered jointly by McGill University and École de Technologie Supérieure, École Polytechnique de Montréal, and Institut



National de la Recherche Scientifique - Urbanisation. A student registered at McGill is required to take courses at the other four institutions.

### **M. Eng. (Environmental Engineering Option) Degree**

This program is offered to students with a university undergraduate degree in engineering who desire graduate education in the environmental engineering field. This option is within the context of the existing M.Eng. (Project Option) and M.Sc. (Applied) programs currently offered in the Departments of Agricultural and Biosystems, Chemical, Civil, and Mining, Metals and Materials Engineering. This program will emphasize interdisciplinary fundamental knowledge courses, practical applications in diverse environmental contexts, and functional skills need for solving environmental problems. Candidates must possess a Bachelor's degree in engineering with superior academic achievement (a minimum of CGPA of 3.0 out of a possible 4.0).

### **M.Sc. Degree**

Candidates with a Bachelor's degree in a discipline other than Engineering, such as Science or Arts, may be accepted into a M.Sc. program in the Department. Such students would typically study in the fluid mechanics, water resources, or environmental engineering areas, and would follow the Thesis Option program, as outlined above.

## **15.3 Admission Requirements**

The general rules of the Graduate and Postdoctoral Studies Office apply and are detailed in the General Information section. The minimum academic standard for admission is a Cumulative Grade Point Average (CGPA) of 3.0/4.0 or better.

Applicants whose native language is not English or French, and who have not completed an undergraduate degree in Canada, are expected to achieve a grade of 580 or better on the paper-based (237 on the computer-based) Test of English as a Foreign Language (TOEFL) for entry to the Ph.D. program, and 550 on the paper-based (213 on the computer-based) TOEFL for other programs. The test is administered by the Educational Testing Service and is easily available throughout the world. The results reach McGill approximately eight weeks after the test is taken. It is the student's responsibility to make the necessary arrangements with the examining board to write the test in the country of residence. Full information about the Test and a registration form may be obtained by writing to: Test of English as a Foreign Language, Box 6191, Princeton, New Jersey 08540-6151, U.S.A.

## **15.4 Application Procedures**

Applications will be considered upon receipt of:

1. Application form
2. Two official transcripts
3. Two confidential letters of reference
4. \$60 application fee
5. Test results (TOEFL)

Applicants for entry into a graduate program are requested to address their completed forms for admission to the Chair of the Graduate Studies Admissions Committee, Department of Civil Engineering and Applied Mechanics.

Applications for September admission should be submitted by March 1, and those for January admission by August 1 (international students) and October 1 (Canadian students).

Commencing with applications for entry in January 2003, McGill's on-line application form will be available to all graduate program candidates at <http://www.mcgill.ca/applying/graduate>.

## **15.5 Program Requirements**

### **M.Eng. Degree**

Candidates may satisfy the requirements for the M.Eng. degree by following one of two options:

**Thesis Option** program (45 credits) requires a research thesis (27 credits) and a minimum of five courses (18 credits). The thesis describing the candidate's research is to be submitted in accordance with the regulations of the Graduate and Postdoctoral Studies Office.

ance with the regulations of the Graduate and Postdoctoral Studies Office.

**Project Option** program requires a minimum of 30 credits of course work plus a project, the total amounting to 45 credits. The credits assigned to the project can vary between 5 and 15 depending on the amount of work involved.

Both programs normally require that coursework credits be earned at the 500 and 600 levels. However, at least two courses must be taken at the 600 level. The above minimum course requirements for both options pertain to well prepared students; others may be required to take additional courses as a condition of acceptance or as determined in consultation with their director of studies or research. Only one 400-level civil engineering course may be counted towards program requirements. Courses at the 200 and 300 level cannot be counted towards the program requirements.

Three terms of resident study at McGill are required for the degree. This is a minimum requirement and usually a longer period will be necessary. This residence requirement can also be satisfied by Project Option students through part-time (evening) studies over a period of three or more years.

### **Master of Engineering (Environmental Engineering Option) Degree**

The program consists of a minimum of 45 credits, of which, depending on the student's home department, a minimum of 5 and a maximum of 15 may be allotted to the project. The balance is earned by coursework, of which one to three approved undergraduate (below 500-level) courses are allowed.

To complete the option, students must:

- complete four (4) required core courses (see section A below);
- complete a minimum of two (2) engineering courses (see section B below);
- complete a minimum of two (2) non-engineering courses (each course should be chosen from a different department) (see section C below)
- complete a design or research project of 5 to 15 credits
- complete all the remaining courses (to a total of at least 45 credits) as required in the student's departmental program (these courses must be approved by the student's Academic Advisor); and
- obtain a grade of 65% (or B-) or better in all required and approved courses

### **Prerequisite**

(Not credited to the Master Environmental Engineering Option Program) CIVE 225 Environmental Engineering or equivalent environmental engineering courses.

#### **A. Required Core Courses**

CHEE 591 Environmental Bioremediation  
CIVE 555 Environmental Data Analysis  
or AEMA 611 Experimental Designs  
CIVE 615 Environmental Engineering  
OCCH 612 Principles of Toxicology  
or FDSC 505 Health Risks of Toxicants

#### **B. Elective Engineering Courses**

These are to be chosen from a list of specific courses offered by the following Engineering Departments:

Agricultural and Biosystems Engineering  
Chemical Engineering  
Civil Engineering and Applied Mechanics  
Mechanical Engineering  
Mining, Metals and Materials Engineering

#### **C. Elective Non-engineering Courses**

These are to be chosen from a list of specific courses offered by the following units:

Faculty of Agricultural and Environmental Sciences  
Department of Atmospheric and Ocean Sciences  
Department of Biology  
Department of Chemistry  
Department of Earth and Planetary Sciences

Department of Economics  
 McGill School of Environment  
 Department of Epidemiology and Biostatistics  
 Department of Geography  
 Faculty of Law  
 Faculty of Management  
 Department of Occupational Health  
 Department of Political Science  
 Faculty of Religious Studies  
 Department of Sociology  
 School of Urban Planning

The Environmental Engineering Option Program is administered by the Faculty of Engineering. Further information may be obtained from the Program Coordinator, Department of Civil Engineering and Applied Mechanics.

### **M.Eng. (Project) Degree in Civil Engineering – Option in Rehabilitation of Urban Infrastructure**

This program is offered jointly by McGill University and École de Technologie Supérieure, École Polytechnique de Montréal, and Institut National de la Recherche Scientifique - Urbanisation. A student registered at McGill is required to take courses at the other four institutions.

The program leads to a professional non-thesis (Project Option) degree with a minimum of 45 credits divided in three modules described below. Depending on their background and interests, students would specialize in one or two out of three possible areas: (1) underground water supply and drainage systems; (2) road infrastructure; (3) bridges, overpasses and tunnels. Students registered at McGill can specialize in area 3 or jointly in areas 2 and 3; students interested in other program scenarios are encouraged to register at one of the other four participating institutions.

#### **Module 1 Required courses (15 credits)**

CIV(1) 6313 Méthodologie de réhabilitation des infrastructures urbaines  
 MGC(2) 810 Gestion des projets de construction et de réhabilitation  
 CIVE 512(3) Advanced Civil Engineering Materials (required for McGill students)  
 or GCI(4) 715 Matériaux pour la réhabilitation des infrastructures urbaines  
 RIU(5) 9500 Analyse du processus de décision et choix technologiques  
 RIU 9501 Financement des infrastructures et finances publiques locales

#### **Module 2 Specialized courses (15 credits)**

Elective courses in rehabilitation (6 to 12 credits)  
 Area 1 Underground water supply and drainage systems  
 CIV 6314 Évaluation des systèmes d'alimentation en eau et d'assainissement  
 GCI 745 Réhabilitation des systèmes d'alimentation en eau et d'assainissement  
 Area 2 Road Infrastructure  
 MGC 835 Évaluation des chaussées  
 MGC 840 Conception et réhabilitation des chaussées  
 Area 3 Bridges, overpasses and tunnels  
 CIVE 527 Renovation and preservation of infrastructure  
 CIVE 617 Design and rating of highway and railway bridges (required for McGill students)  
 or CIV 6511 Conception et évaluation des ponts

Other graduate electives (3 to 9 credits) to be approved by the inter-university program coordination committee. McGill students specializing in area 3 are required to take at least 6 credits at McGill, while those specializing in areas 2 and 3 must take 3 credits at McGill.

#### **Module 3 Integration (15 credits)**

Research project (15 credits)  
 (1) Course offered by École Polytechnique de Montréal  
 (2) Course offered by École de Technologie Supérieure

- (3) Course offered by McGill University
- (4) Course offered by Université de Sherbrooke (Longueuil Campus)
- (5) Course offered by Institut National de la Recherche Scientifique - Urbanisation

Documentation outlining the program and giving additional information is available on request.

#### **M.Sc. Degree**

Candidates with a Bachelor's degree in a discipline other than Engineering, such as Science or Arts, may be accepted into a M.Sc. program in the Department. Such students would typically study in the fluid mechanics, water resources, or environmental engineering areas, and would follow the Thesis Option program, as outlined above.

#### **Ph.D. Degree**

Candidates normally register for the M.Eng. degree, Thesis Option, or M.Sc. degree in the first instance. Those who have a Master's degree acceptable to the Department may, however, be considered for direct registration for the Ph.D. degree (Ph.D.II).

The Ph.D. program consists of a research project and courses as required to develop the candidate's background. Candidates are expected to take a comprehensive preliminary oral examination (course CIVE 701) within the first year of their Ph.D. registration. They must fulfill the requirements outlined in the General Information section of the *Graduate and Postdoctoral Studies Calendar*. There is no foreign language requirement.

Direct transfer into the Ph.D. program (fast-tracking) may be available for students who have demonstrated a superior record in the undergraduate program.

## **15.6 Courses for Higher Degrees**

**For the term (Fall and/or Winter), days, and times when courses will be offered, please refer to the 2002-2003 Class Schedule on the Web, <http://www.mcgill.ca/minerva-students/class/>. Class locations and names of instructors are also provided.**

**Students preparing to register are advised to consult the Class Schedule website for the most up-to-date list of courses available. New courses may have been added or courses rescheduled after this Calendar went to press.**

**The schedule of courses to be offered in Summer 2003, will be available on the website in January 2003.**

CIVE has replaced 303 as the prefix for Civil Engineering and Applied Mechanics courses.

● Denotes courses not offered in 2002-03

● **CIVE 512 ADVANCED CIVIL ENGINEERING MATERIALS.** (3)(3-3-3)

● **CIVE 514 STRUCTURAL MECHANICS.** (3) (3-1-5) Stress, strain, and basic equations of linear elasticity. General and particular solutions of plane and axisymmetric problems. Stress concentration and failure criteria. Unsymmetrical bending of beams; shear centres; torsion of thin-walled structural members. Curved beams. Formulation and applications of energy principles, and their connection to finite-element method.

● **CIVE 526 SOLID WASTE MANAGEMENT.** (3) (3-2-4)

● **CIVE 527 RENOVATION AND PRESERVATION: INFRASTRUCTURE.** (3) (3-2-4) Maintenance, rehabilitation, renovation and preservation of infrastructure; infrastructure degradation mechanisms; mechanical, chemical and biological degradation; corrosion of steel; condition surveys and evaluation of buildings and bridges; repair and preservation materials, techniques and strategies; codes and guidelines; case studies.

● **CIVE 540 URBAN TRANSPORTATION PLANNING.** (3) (3-1-5) (Prerequisite: CIVE 319 or permission of instructor.) Process and techniques of urban transportation engineering and planning, including demand analysis framework, data collection procedures, travel demand modelling and forecasting, and cost-effectiveness framework for evaluation of project and system alternatives.

● **CIVE 541 RAIL ENGINEERING.** (3) (3-1-5)

● **CIVE 546 SELECTED TOPICS IN CIVIL ENGINEERING 1.** (3) (3-0-6)

● **CIVE 550 WATER RESOURCES MANAGEMENT.** (3) (3-0-6)

**CIVE 553 STREAM POLLUTION AND CONTROL.** (3) (3-2-4) Water quality standards. Physical and chemical pollution, and bacterial contamination of surface waters. Effects of specific types of pollution such as thermal, point and non-point sources. Stream self purification. Effects on lake eutrophication. Pollution surveys and methods of control.

**CIVE 555 ENVIRONMENTAL DATA ANALYSIS.** (3) (3-0-6) Application of statistical principles to design of measurement systems and sampling programs. Introduction to experimental design. Graphical data analysis. Description of uncertainty. Hypothesis tests. Model parameter estimation methods: linear and nonlinear regression methods. Trend analysis. Statistical analysis of censored data. Statistics of extremes.

● **CIVE 570 WAVES AND COASTAL ENGINEERING.** (3) (3-0-6) (Prerequisite: CIVE 327)

● **CIVE 572 COMPUTATIONAL HYDRAULICS.** (3) (3-0-6) (Prerequisite: CIVE 327 or equivalent)

**CIVE 573 HYDRAULIC STRUCTURES.** (3) (3-0-6) (Prerequisites: CIVE 323 and CIVE 327) Hydraulic aspects of the theory and design of hydraulic structures. Storage dams, spillways, outlet works, diversion works, drop structures, stone structures, conveyance and control structures, flow measurement and culverts.

**CIVE 574 FLUID MECHANICS OF WATER POLLUTION.** (3) (Prerequisite: CIVE 327 or equivalent.) Mixing, dilution and dispersion of pollutants discharged into lakes, rivers, estuaries and oceans; salinity intrusion in estuaries and its effects on dispersion; biochemical oxygen demand and dissolved oxygen as water quality indicators; thermal pollution; oil pollution.

● **CIVE 576 HYDRODYNAMICS.** (3) (3-0-6) (Graduate Corequisite: CIVE 428)

**CIVE 577 RIVER ENGINEERING.** (3) (3-0-6) (Graduate Corequisite: CIVE 428) Fluvial geomorphology; sediment properties; river turbulence; mechanics of the entrainment, transportation and deposition of solids by fluids; threshold of movement; bed forms; suspended load, bed load and total load equations; stable channel design and regime rivers; river modeling; river engineering and river management.

● **CIVE 579 WATER POWER ENGINEERING.** (3) (3-0-6) (Prerequisites: CIVE 323 and MIME 310)

● **CIVE 585 GROUNDWATER HYDROLOGY.** (3) (3-0-6)

● **CIVE 586 EARTHWORK ENGINEERING.** (3) (3-0-6)

● **CIVE 587 PAVEMENT DESIGN.** (3) (3-0-6)

**CIVE 602 FINITE ELEMENT ANALYSIS.** (4) (Prerequisite: CIVE 514) Development of displacement based simple and high order, one, two and three dimensional elements for linear elastic stress analysis. Variational and other methods for element formulation. Plate bending and shell elements. Finite element programming. Use of package programs in static analysis of structures.

● **CIVE 603 STRUCTURAL DYNAMICS.** (4)

● **CIVE 604 THEORY OF PLATES AND SHELLS.** (4)

● **CIVE 605 STABILITY OF STRUCTURES.** (4)

● **CIVE 606 PLASTIC STRUCTURAL ANALYSIS.** (4)

**CIVE 607 ADVANCED DESIGN IN STEEL.** (4) Design and behaviour of cold formed and hot rolled structural steel members and systems. Lateral load resistance design of steel roof diaphragms, flexural design of composite slabs, bracing requirements and design procedures for steel structures, floor vibration, member torsion, slender members and design procedures for low rise steel frame buildings.

● **CIVE 609 RISK ENGINEERING.** (4)

**CIVE 610 SPECIAL TOPICS IN STRUCTURAL MECHANICS.** (4) Special problems in the theory and design of structures. These may include topics in the theories of elasticity and plasticity and advanced theories of shell structures.

**CIVE 612 EARTHQUAKE-RESISTANT DESIGN.** (4) Static and dynamic analyses, design codes, effects of local ground conditions, ductility demands on structural components. Inelastic behaviour of beams, columns, joints, shear walls and bracing under cyclic loading of steel concrete and masonry structures. Design applications.

● **CIVE 613 NUMERICAL METHODS: STRUCTURAL ENGINEERING.** (4)

**CIVE 614 COMPOSITES FOR CONSTRUCTION.** (4) Fibre reinforced plastics (FRP), civil engineering applications; fibre, matrix, processing; plymechanics, strength, rigidity, stability, durability; FRP rebars and tendons for concrete, laminates for strengthening, pultruded beams and columns, FRP stay-in-place formwork for concrete, FRP - glulam beams; design criteria, design project.

**CIVE 615 ENVIRONMENTAL ENGINEERING.** (3) The course will expose the students to various environmental engineering issues. Lectures will be given by faculty and invited speakers from industry. Each student is required to prepare a written technical paper and make oral presentation.

**CIVE 617 DESIGN AND RATING OF HIGHWAY AND RAILWAY BRIDGES.** (4) Criteria for bridge design, evaluation and rehabilitation; analysis of super-structures; design and construction of steel and concrete bridges; introduction to cable-stayed and suspension bridges; deck joints and bearings; rating, repair and rehabilitation of bridges.

● **CIVE 618 DESIGN IN CONCRETE 1.** (4)

● **CIVE 621 BEHAVIOUR OF CONCRETE STRUCTURES.** (4)

● **CIVE 622 PRESTRESSED CONCRETE.** (4)

● **CIVE 623 DURABILITY OF MATERIALS.** (4)

**CIVE 624 DURABILITY OF STRUCTURES.** (4) Basic concepts, safety, durability, repair and strengthening; reliability analysis; deterioration mechanisms, preventive and corrective measures; design for durability; parking structures; bridges; steel, timber and masonry structures; municipal infrastructure; strengthening and retrofitting; management systems; case studies. This course will involve field trips and group design exercises.

● **CIVE 628 DESIGN OF WOOD STRUCTURES.** (4)

**CIVE 630 THESIS RESEARCH 1.** (3)

**CIVE 631 THESIS RESEARCH 2.** (3)

**CIVE 632 THESIS RESEARCH 3.** (3)

**CIVE 633 THESIS RESEARCH 4.** (6)

**CIVE 634 THESIS RESEARCH 5.** (6)

**CIVE 635 THESIS RESEARCH 6.** (6)

**CIVE 648 SPECIAL TOPICS IN CIVIL ENGINEERING.** (4) Special topics of an advanced nature relating to Civil Engineering will be presented by staff and visiting lecturers.

● **CIVE 651 THEORY: WATER / WASTEWATER TREATMENT.** (4)

**CIVE 652 BIOLOGICAL TREATMENT: WASTEWATERS.** (4) Process kinetics and reactors. Population kinetics of microorganisms and their role in the various waste treatment processes. Unit processes for wastewater treatment, such as suspended-growth, attached-growth processes, sludge treatment, and nutrient removal. Biological treatment techniques for groundwater decontamination. Laboratory pilot plant exercises.

● **CIVE 657 WASTE DISPOSAL IMPACT.** (3)

● **CIVE 659 CHEMICAL ANALYSIS OF WATERS AND WASTES.** (4)

**CIVE 660 CHEMICAL AND PHYSICAL TREATMENT OF WATERS.** (4) Theory and design of specific processes used for the physical and/or chemical purification of waters and wastewaters, including mixing, flocculation, sedimentation, flotation, filtration, disinfection, adsorption, ion exchange, aeration, membrane processes, distillation, removal of specific inorganics and organics, taste and odour control, process control, sludge treatment. Laboratory exercises will complement theoretical aspects.



- **CIVE 664 MODELLING ENVIRONMENTAL/WATER RESOURCES ENGINEERING.** (4)
  - **CIVE 665 APPLIED ELASTICITY AND TENSOR.** (4)
  - **CIVE 666 ENVIRONMENTAL / WATER RESOURCES SYSTEMS.** (4)
  - **CIVE 667 PLASTICITY.** (4)
  - **CIVE 678 GRAVITY CURRENTS.** (4)
  - **CIVE 680 FUNDAMENTALS OF SOIL BEHAVIOUR.** (4)
  - **CIVE 683 ADVANCED FOUNDATION DESIGN.** (4)
  - **CIVE 684 GROUNDWATER POLLUTION AND TRANSPORT PROCESSES.** (4)
- CIVE 686 SITE REMEDIATION.** (4) Field investigations; geotechnical and geophysical techniques; hydrogeological conditions; risk assessment; contaminant transport; remedial action plan; containment systems (gas, surface water, and ground water); on-site and off-site treatment techniques (solidification, stabilization, landfilling, and soil washing); In-situtreatment techniques (physical, biological, and chemical).
- CIVE 691 PROJECT 1.** (1)
  - CIVE 692 RESEARCH PROJECT.** (1)
  - CIVE 693 RESEARCH PROJECT.** (1)
  - CIVE 694 PROJECT 4.** (4)
  - CIVE 695 PROJECT 5.** (5)
  - CIVE 696 RESEARCH PROJECT.** (6)
  - CIVE 697 RESEARCH PROJECT.** (7)
  - CIVE 701 PH.D. COMPREHENSIVE PRELIMINARY ORAL EXAM.** (0)

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## 16 Classics

Graduate Program in Classics  
 Department of History  
 Stephen Leacock Building, Room 625  
 855 Sherbrooke Street West  
 Montreal, QC H3A 2T7  
 Canada

Telephone: (514) 398-3977  
 Fax: (514) 398-8365  
 Email: [graduate.history@mcgill.ca](mailto:graduate.history@mcgill.ca)  
 Website: <http://www.arts.mcgill.ca/programs/history/>

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### 16.1 Staff

#### *Emeritus Professors*

P. F. McCullagh; B.A.(Tor.), M.A.(McG.), Ph.D.(Chic.)  
 P. Vivante; B.A.(Oxon.), Dott.Lett.(Florence)

#### *Professor*

T. Wade Richardson; B.A.(McG.), A.M., Ph.D.(Harv.)

#### *Associate Professor*

Michael J. Silverthorne; B. Litt., M.A., D. Phil.(Oxon.)

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### 16.2 Programs Offered

**M.A. with Thesis** (48 credits over 4 terms, in 18 or 24 months)

**M.A. non-Thesis option** (48 credits over 3 or 4 terms, in 18 months)

**Ph.D.**

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### 16.3 Admission Requirements

#### **M.A. Program**

Candidates are required to have a B.A. Honours in Classics or equivalent.

#### **Ph.D. Program**

Candidates are required to have a McGill M.A. in Classics or equivalent.

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### 16.4 Application Procedures

No applications will be accepted for 2002-03 as the program has been temporarily suspended. Further information may be obtained from the Department of History.

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### 16.5 Program Requirements

Please consult the Department for detailed regulations.

#### **M.A. with thesis**

- 1) Course work: 18 credits
- 2) Special subjects: 6 credits (CLAS 695D1/CLAS 695D2)
- 3) Thesis: 24 credits:
  - 1: CLAS 696 – Methods (3)
  - 2: CLAS 697 – Proposal (3)
  - 3: CLAS 698 – Preparation (6)
  - 4: CLAS 699 – Completion (12)

#### **M.A. non-thesis option**

- 1) Course work: 24 credits;
- 2) Special subjects: 12 credits (CLAS 685D1/CLAS 685D2, CLAS 686D1/CLAS 686D2);
- 3) Research papers: 12 credits
  - 1: CLAS 681 (3)
  - 2: CLAS 682 (3)
  - 3: CLAS 683 (3)
  - 4: CLAS 684 (3)

#### **Ph.D.**

- 1) Course work: 24 credits;
- 2) Reading list;
- 3) Thesis and Oral Defence.

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### 16.6 Courses Offered

For the term (Fall and/or Winter), days, and times when courses will be offered, please refer to the 2002-2003 Class Schedule on the Web, <http://www.mcgill.ca/minerva-students/class/>. Class locations and names of instructors are also provided.

Students preparing to register are advised to consult the Class Schedule website for the most up-to-date list of courses available. New courses may have been added or courses rescheduled after this Calendar went to press.

The schedule of courses to be offered in Summer 2003, will be available on the website in January 2003.

**Courses with numbers ending D1 and D2** are taught in two consecutive terms (most commonly Fall and Winter). Students must register for both the D1 and D2 components. No credit will be given unless both components (D1 and D2) are successfully completed in consecutive terms.

CLAS has replaced 114 as the prefix for Classics courses. The course credit weight is given in parentheses after the title.

- Denotes courses not offered in 2002-03

**CLAS 515D1 LATIN AUTHORS.** (3) Completion of a Reading List in Latin, with Faculty supervision, to be tested by written examination.

**CLAS 515D2 LATIN AUTHORS.** (3)

**CLAS 525D1 ANCIENT GREEK AUTHORS.** (3) Completion of a Reading List in Greek, with Faculty supervision, to be tested by written examination.

**CLAS 525D2 ANCIENT GREEK AUTHORS.** (3)

- **CLAS 610 AESCHYLUS.** (3)
- **CLAS 611 LATIN POETRY.** (3)
- **CLAS 612 LATIN POETRY.** (3)
- **CLAS 613 LATIN POETRY.** (3)
- **CLAS 614 LATIN POETRY.** (3)
- **CLAS 615D1 GREEK POETRY.** (3)
- **CLAS 615D2 GREEK POETRY.** (3)
- **CLAS 621 GREEK POETRY.** (3)

- CLAS 622 GREEK POETRY. (3)
- CLAS 623 GREEK POETRY. (3)
- CLAS 624 GREEK POETRY. (3)
- CLAS 629 GREEK PROSE. (3)
- CLAS 651 LATIN PROSE. (3)
- CLAS 652 LATIN PROSE. (3)
- CLAS 653 LATIN PROSE. (3)
- CLAS 654 LATIN PROSE. (3)
- CLAS 656D1 NON-LITERARY SUBJECTS. (3)
- CLAS 656D2 NON-LITERARY SUBJECTS. (3)
- CLAS 657 NON-LITERARY SUBJECTS. (3)
- CLAS 658D1 NON-LITERARY SUBJECTS. (3)
- CLAS 658D2 NON-LITERARY SUBJECTS. (3)
- CLAS 659D1 NON-LITERARY SUBJECTS. (3)
- CLAS 659D2 NON-LITERARY SUBJECTS. (3)
- CLAS 661 GREEK PROSE. (3)
- CLAS 662 GREEK PROSE. (3)
- CLAS 663 GREEK PROSE. (3)
- CLAS 664 GREEK PROSE. (3)
- CLAS 667 NON-LITERARY SUBJECTS. (3)
- CLAS 669 NON-LITERARY SUBJECTS. (3)
- CLAS 676 INTENSIVE READING COURSE. (3)
- CLAS 677 INTENSIVE READING COURSE. (3)
- CLAS 678 INTENSIVE READING COURSE. (3)
- CLAS 679 INTENSIVE READING COURSE. (3)
- CLAS 680D1 GREEK POETRY. (3)
- CLAS 680D2 GREEK POETRY. (3)
- CLAS 681 M.A. RESEARCH PAPER 1. (3)
- CLAS 682 M.A. RESEARCH PAPER 2. (3)
- CLAS 683 M.A. RESEARCH PAPER 3. (3)
- CLAS 684 M.A. RESEARCH PAPER 4. (3)
- CLAS 685D1 M.A. SPECIAL SUBJECT 1. (3)
- CLAS 685D2 M.A. SPECIAL SUBJECT 1. (3)
- CLAS 686D1 M.A. SPECIAL SUBJECT 2. (3)
- CLAS 686D2 M.A. SPECIAL SUBJECT 2. (3)
- CLAS 687 INTENSIVE READING COURSE. (3)
- CLAS 688 INTENSIVE READING COURSE. (3)
- CLAS 691 SEMINAR. (3)
- CLAS 692 SEMINAR. (3)
- CLAS 695D1 M.A. SPECIAL SUBJECT. (3)
- CLAS 695D2 M.A. SPECIAL SUBJECT. (3)
- CLAS 696 M.A. THESIS 1: RESEARCH METHODS IN CLASSICS. (3)
- CLAS 697 M.A. THESIS 2: RESEARCH PROPOSAL. (3)
- CLAS 698 M.A. THESIS 3 THESIS PREPARATION. (6)
- CLAS 699 M.A. THESIS 4: THESIS COMPLETION. (12)
- CLAS 701 PH.D. COMPREHENSIVE EXAMINATION. (12)
- CLAS 702 SEMINAR IN LATIN LITERATURE. (6)
- CLAS 703 SEMINAR IN GREEK LITERATURE. (6)
- CLAS 712 TUTORIAL / PROJECT IN CLASSICS. (3)
- CLAS 713 TUTORIAL / PROJECT IN CLASSICS. (3)
- CLAS 714 TUTORIAL/PROJECT IN CLASSICS. (3)
- CLAS 790 FOREIGN LANGUAGE REQUIREMENT - LATIN. (3)
- CLAS 791 FOREIGN LANGUAGE REQUIREMENT - ANCIENT GREEK. (3)
- CLAS 792 FOREIGN LANGUAGE REQUIREMENT - MODERN GREEK. (3)

## 17 Communication Sciences and Disorders

School of Communication Sciences and Disorders  
Beatty Hall  
1266 Pine Avenue West  
Montreal, QC H3G 1A8  
Canada

Telephone: (514) 398-4137  
Fax: (514) 398-8123  
Email: [scsd@mcgill.ca](mailto:scsd@mcgill.ca)  
Website: <http://www.mcgill.ca/scsd>

*Director* — Rachel Mayberry

*Research Director* — Marc Pell

### 17.1 Staff

#### *Emeritus Professor*

Donald Doehring; B.A.(Buff.), M.A.(N.M.), Ph.D.(Ind.)

#### *Professors*

Shari Baum; B.A.(C'nell), M.S.(Vt.), M.A., Ph.D.(Brown)  
Athanasios Katsarkas; M.D.(Thess.), M.Sc.(McG.), F.R.C.P.(C)

#### *Associate Professors*

Martha Crago; B.A., M.Sc.A., Ph.D.(McG.)  
Vincent Gracco; B.A., M.A.(San Diego), Ph.D.(Wis.-Madison)  
Rachel Mayberry; B.A.(Drake), M.S.(Wash.), Ph.D.(McG.)  
Linda Polka; B.A.(Slippery Rock), M.A.(Minn.), Ph.D.(S.Flor.)

#### *Assistant Professors*

Marc Pell; B.A.(Ott.), M.Sc., Ph.D.(McG.)  
Elin Thordardottir; B.A., M.Sc., Ph.D.(Wis.-Madison)

#### *Assistant Professor (Special Category)*

Susan Rvachew; B.Sc.(Alta.), M.Sc., Ph.D.(Calgary)

#### *Assistant Professors (Part-Time)*

Gabriel Leonard; B.A.(Dublin), D.A.P., M.Sc., Ph.D.(McG.)  
Sybil Schwartz; B.Sc.(McG.), M.Sc.A.(Iowa St.), Ph.D.(McG.)  
Rosalee Shenker; B.Sc.(Syr.), M.A.(Calif. St.), Ph.D.(McG.)

#### *Faculty Lecturer*

Jeanne Claessen; M.A.(Reading), Dip. Clinical Communication  
Studies (City University, London)

#### *Faculty Lecturers (Part-Time)*

Joane Déziel; B.Sc, M.Sc.(Montr.)  
Daphne Ducharme; B.A., M.A.ED, Ph.D.(Ott.)  
Caroline Erdos; B.A.(C'dia), M.Sc.(McG.)  
Ruth Gesser; B.A.(C'dia), M.Sc.A.(McG.)  
Jill Harrison; B.A., M.Sc.(McG.)  
Helena Kisilevsky; B.A.(McG.), M.A.(UCLA), M.O.A.(Montr.)  
Anne Le Turdu; M.A.(U de médecine Claude-Bernard Lyon-France)  
Judith Robillard-Shultz; B.A., M.Sc.A.(McG.)  
Megha Sundara; B.Sc., M.Sc.(All India Inst. of Speech & Hearing)  
Colleen Timm; B.A.(C'dia), M.Sc.A.(McG.)  
Paraskevi Tsagaroulis; B.Sc.(McG.), M.Cl.Sc.(W.Ont.)  
Patricia Viens; ASLTA Certificate(Rochester IT), ASL Workshop  
Certificate(Vista U.)

#### *Associate Members*

Eva Kehayia (Physical and Occupational Therapy)  
Yuriko Oshima-Takane (Psychology)

#### *Adjunct Members*

Howard Chertkow (*Jewish Gen.*); M.D.(W. Ont.), F.R.C.P.  
(Neurology)  
David McFarland (*Montr.*); B.A., M.A.(Calif. St.), Ph.D.(Purdue)

### 17.2 Programs Offered

The School offers a professional degree in Communication Sciences and Disorders at the M.Sc. (Applied) level with specialization in Speech-Language Pathology, and two research degrees, an M.Sc. (Research) and a Ph.D. in Communication Sciences and Disorders.

**Please note:** The Audiology specialization of the M.Sc. (Applied) program has been suspended indefinitely.

### **M.Sc.(Applied) Degree in Communication Sciences and Disorders**

The professional degree leads to a Master of Science (Applied) with a specialization in Speech-Language Pathology. The program involves two academic years of full-time study and related practical work followed by a summer internship. To prepare students as creative professionals, the program emphasizes the understanding of principles and theories, and their present or potential clinical applications, in addition to the teaching of specific techniques for assessment and intervention. Active participation in the learning process is encouraged.

The profession of Speech-Language Pathology concerns assessment and intervention in speech and language disorders. In particular, the Speech-Language Pathologist is concerned with two major parameters of communication sciences and disorders: language and speech. At present, most speech-language pathologists in Canada work in hospitals, public school systems, rehabilitation centres, and in special education facilities.

**Requirements for Licensure** – The majority of provinces in Canada and certain states in the U.S.A. require that those intending to practice as Speech-Language Pathologists within their borders comply with special provincial or state licensing regulations. Graduates wishing to practice in the province of Quebec must be members of l'Ordre des Orthophonistes et Audiologistes du Québec (OOAQ) in order to call themselves Speech-Language Pathologists. Further information is available from the OOAQ, 1265 rue Berri, Bureau 730, Montreal, Quebec, H2L 4X4. Telephone: (514) 282-9123.

Quebec law requires that candidates seeking licensure in provincially recognized professions demonstrate a verbal and written working knowledge of the French language. See the Language Requirements for Professions in the General Information and Regulations section of the *Health Sciences Calendar*.

### **Research Degrees – M.Sc. and Ph.D.**

Selected candidates may be accepted for the M.Sc. and Ph.D. research degrees. Each student's Thesis supervisor and Thesis Committee design an individualized program of study in collaboration with the student. The program can include graduate courses offered by the School and by other departments at McGill.

### **Ph.D. Option in Language Acquisition (LAP)**

Information about this option is available from the School and on the following website: <http://www.psych.mcgill.ca/lap.html>.

### **Funding**

The IODE Provincial Chapter of Quebec funds two \$1,000 "Silence to Sound" awards for studies in hearing impairment. These in-course awards based on academic merit, financial need, and potential for excellence are awarded by the School.

Montreal League for the Hard of Hearing Award. Candidates must be enrolled at the graduate level in the School and working in the area of hearing impairment. Awarded by the School. Value – up to \$1,000.

## **17.3 Admissions Requirements**

### **M.Sc.(Applied)**

An applicant must hold an undergraduate degree with a minimum B average (3.0 on a 4.0 point scale) or better in areas relevant to the selected field of specialization. Specific requirements are six credits in statistics, a total of 18 credits across the disciplines of psychology and linguistics (with a minimum of six credits in each discipline). Knowledge of physiology is also desirable.

### **M.Sc. in Communication Sciences and Disorders**

The M.Sc. provides research training for:

1. students who are also taking courses for professional qualification;

2. students who have a non-thesis professional degree in Communication Sciences and Disorders; and
3. students with degrees in related fields who wish to do research but not obtain professional qualification in Communication Sciences and Disorders.

### **Ph.D. in Communication Sciences and Disorders**

Applicants should normally have a Master's degree with thesis or its equivalent in Communication Sciences and Disorders or a related field (e.g. psychology, linguistics).

Students who possess an appropriate Bachelor's degree or Master's degree without thesis will also be considered for the Ph.D. program, but, if admitted, must first complete a qualifying year of coursework and a research project in the School ("fast-track" option).

## **17.4 Application Procedures**

**Commencing with applications for entry in January 2003, McGill's on-line application form will be available to all graduate program candidates at <http://www.mcgill.ca/applying/graduate>.**

### **M.Sc.(Applied)**

The complete application should be submitted directly to the School's Admissions Secretary and must be received by February 1, or it may not be considered for the following academic year. Applications will be considered upon receipt of:

1. completed application and information forms
2. two official copies of all university transcripts (only one official transcript from McGill University)
3. two letters of recommendation from professors (on the appropriate forms)
4. listing of relevant courses completed and in progress, relevant experience, and publications
5. statement of interest
6. a \$60 application fee (credit card, money order, or certified cheque)
7. students living outside of Canada whose first language is not English and who have not received university education in English must also provide official reports of their score on the "Test of English as a Foreign Language" (TOEFL). A score of 550 or better on the paper-based test (213 on the computer-based test) is required for admission.

### **M.Sc. (thesis) and Ph.D. programs**

Applications should be submitted directly to the School's Admissions Secretary. Applications are processed when they are received. However, students must apply no later than February 22 for fall admission, October 25 for winter admission, and January 25 for summer admission. Students who are accepted early for the fall admission generally have the most options with respect to applying for external funding.

Applications will be considered upon receipt of:

1. to 7. as above, plus
8. Students who have completed any of their post-secondary education outside of Canada or the United States, must submit official reports of their performance on the General Graduate Record Examination (GRE). Applicants should send a photocopy of their personal report as soon as it is received. Other applicants are also strongly encouraged to submit reports of their performance on the GRE.

## **17.5 Program Requirements**

### **M.SC.(APPLIED) DEGREE IN COMMUNICATION SCIENCES AND DISORDERS (68 credits)**

The professional degree program leads to a Master of Science, Applied degree in Communication Sciences and Disorders with a specialization in Speech-Language Pathology. The program involves two academic years of full-time study and related practical work followed by a summer internship.



**Please note:** The Audiology specialization of the M.Sc. (Applied) program has been suspended indefinitely.

### M.Sc.(Applied) – Speech-Language Pathology Specialization

#### Year 1 Required Courses (31 credits)

##### Fall

- SCSD 616 (3) Audiology  
 SCSD 617 (3) Anatomy & Physiology of Speech & Hearing  
 SCSD 619 (3) Phonological Development  
 SCSD 624 (3) Language Processes  
 SCSD 633 (3) Language Development  
 SCSD 681 (1) Practicum and Seminar 1

##### Winter

- SCSD 631 (3) Speech Science  
 SCSD 632 (3) Phonological Disorders in Children  
 SCSD 637 (3) Developmental Language Disorders 1  
 SCSD 638 (3) Neurolinguistics  
 SCSD 682 (1) Practicum and Seminar 2

##### Summer

- SCSD 646 (2) Clinical Practicum

#### Year 1 Complementary Course (3 credits)

One three-credit seminar option must be taken.

#### Year 2 Required Courses (31 credits)

##### Fall

- SCSD 618 (3) Research & Measurement Methodologies  
 SCSD 636 (3) Fluency Disorders  
 SCSD 639 (3) Voice Disorders  
 SCSD 643 (3) Developmental Language Disorders 2  
 SCSD 644 (3) Applied Neurolinguistics  
 SCSD 683 (1) Practicum and Seminar 3

##### Winter

- SCSD 609 (3) Neuromotor Disorders  
 SCSD 642 (3) Aural Rehabilitation  
 SCSD 668 (3) Communicatively Disordered Person: Practice  
 SCSD 669 (3) Special Developmental Speech/Language Problems  
 SCSD 684 (1) Practicum and Seminar 4

##### Summer

- SCSD 679 (2) Advanced Clinical Practicum

#### Year 2 Complementary Course (3 credits)

One three-credit seminar option must be taken.

### M.Sc.(Applied) Complementary Course List

- SCSD 634 (3) Research & Measurement Methodologies 2  
 SCSD 649 (3) Psycholinguistics of Gesture & Sign Language  
 SCSD 664 (3) Topics in Comm. Sciences & Disorders 1  
 SCSD 666 (3) Topics in Comm. Sciences & Disorders 3  
 SCSD 667 (3) Topics in Comm. Sciences & Disorders 4  
 SCSD 670 (3) Topics in Comm. Sciences & Disorders 2

A seminar may also be taken outside of the School upon approval of a faculty advisor.

### M.SC. IN COMMUNICATION SCIENCES AND DISORDERS (45 credits)

M.Sc. candidates must complete at least 45 credits, including a minimum of 24 and a maximum of 39 credits for thesis research (courses SCSD 671, SCSD 672, SCSD 673 and SCSD 674), and a minimum of 6 credits in other courses. The non-thesis credits can be special topic courses in the School and/or courses in other departments, as arranged with the student's thesis supervisor.

#### Thesis Component – Required (24 credits)

- SCSD 671 (12) M.Sc. Thesis 1  
 SCSD 672 (12) M.Sc. Thesis 2

#### Complementary Courses (21 credits)

a maximum of 15 credits may be chosen from:

- SCSD 673 (12) M.Sc. Thesis 3  
 SCSD 674 (3) M.Sc. Thesis 4

a minimum of 6 credits must be chosen from:

- SCSD 675 (12) Special Topics 1  
 SCSD 676 (9) Special Topics 2  
 SCSD 677 (6) Special Topics 3  
 SCSD 678 (3) Special Topics 4

or courses in other departments, as arranged with the student's thesis supervisor

### PH.D. IN COMMUNICATION SCIENCES AND DISORDERS

Ph.D. students must complete a full graduate course in statistics and both advanced research seminars as well as the other course requirements in their individual program of study, and pass a comprehensive examination. Students entering the Ph.D. program through the fast-track option must additionally demonstrate the ability to complete a research project and related coursework during the initial year. An examination in a foreign language is not required.

#### Required Courses

- SCSD 652 (3) Advanced Research Seminar 1  
 SCSD 653 (3) Advanced Research Seminar 2  
 SCSD 685 (3) Research Project 1  
 SCSD 686 (3) Research Project 2  
 SCSD 701 Doctoral Comprehensives

### 17.6 Courses

**For the term (Fall and/or Winter), days, and times when courses will be offered, please refer to the 2002-2003 Class Schedule on the Web, <http://www.mcgill.ca/minerva-students/class/>. Class locations and names of instructors are also provided.**

**Students preparing to register are advised to consult the Class Schedule website for the most up-to-date list of courses available. New courses may have been added or courses rescheduled after this Calendar went to press.**

**The schedule of courses to be offered in Summer 2003, will be available on the website in January 2003.**

SCSD has replaced 401 as the prefix for Communication Sciences and Disorders courses.

The course credit weight is given in parentheses after the title.

- Denotes courses not offered in 2002-03

**SCSD 609 NEUROMOTOR DISORDERS.** (3) The focus of this course will be on the assessment and management of motor speech disorders, associated with both acquired and developmental neuromotor disorders, and swallowing disorders (of both neuromotor and structural origin).

**SCSD 616 AUDIOLOGY.** (3) Basic diagnostic and rehabilitative procedures, goals and procedures used in clinical audiology, and the psychoacoustic theories on which they are based will be presented.

**SCSD 617 ANATOMY AND PHYSIOLOGY: SPEECH AND HEARING.** (3) The anatomy and physiology of speech and hearing mechanisms will be covered. Topics will include neuroanatomy, the anatomy and physiology of the head, neck and upper torso, and the external, middle, and inner ear.

**SCSD 618 RESEARCH AND MEASUREMENT METHODOLOGIES 1.** (3) Methodologies used in research and measurement in the field of communication sciences and disorders will be introduced. Topics covered include: the nature and interpretation of test norms; validity; interpretation of test score differences; and questionnaire development (scaling). Tests currently used in speech-language pathology and audiology are examined.

**SCSD 619 PHONOLOGICAL DEVELOPMENT.** (3) Theories and research related to normal and abnormal phonological development in children will be studied.

**SCSD 624 LANGUAGE PROCESSES.** (3) The structure and nature of on-line processing of the language code, and the interaction of structure and function of language will be studied. Theories about the nature of representation and research concerning its process-

ing, and the role of sociocultural factors in linguistic performance also will be covered.

**SCSD 631 SPEECH SCIENCE.** (3) The acoustic analysis and perception of speech and related pathologies will be presented. Theories and models of speech production, speech motor control, and speech perception will be considered.

**SCSD 632 PHONOLOGICAL DISORDERS: CHILDREN.** (3) The nature of phonological disorders and clinical approaches for their remediation in children will be presented.

**SCSD 633 LANGUAGE DEVELOPMENT.** (3) Theories of language acquisition, prerequisites to language development, and current issues in research will be studied. Topics include the role of input, individual differences in acquisition, and language socialization.

**SCSD 634 RESEARCH AND MEASUREMENT METHODS 2.** (3) This course addresses the strengths and weaknesses of various research designs. Issues concerning the analysis and interpretation of research results also will be discussed.

**SCSD 636 FLUENCY DISORDERS.** (3) The nature of stuttering, various causal theories, and techniques for evaluation and treatment of children and adults will be presented.

**SCSD 637 DEVELOPMENTAL LANGUAGE DISORDERS 1.** (3) The nature of developmental language disorders and the assessment of language competence and performance in both speaking and non-speaking children will be studied.

**SCSD 638 NEUROLINGUISTICS.** (3) Current theories of language-brain relationships and speech and language deficits subsequent to brain damage will be studied. A review of current research on phonetic, lexical, and syntactic processing in brain-damaged individuals is included.

**SCSD 639 VOICE DISORDERS.** (3) Information about the vocal mechanism, its pathologies, and methods of evaluation and treatment will be studied.

**SCSD 642 AURAL REHABILITATION.** (3) This course addresses the effects of hearing impairment in adults as well as in the developing child with attention to problems in speech, language, and cognitive function as well as social-emotional adjustment. Various intervention approaches are examined.

**SCSD 643 DEVELOPMENTAL LANGUAGE DISORDERS 2.** (3) Major theories of language disorders are translated into intervention principles used in language treatment programs. Adaptations of intervention techniques to suit specific disorders (including augmentative communication) will be explored.

**SCSD 644 APPLIED NEUROLINGUISTICS.** (3) Various classificatory systems and appropriate assessment and remediation principles for brain-damaged individuals will be covered. Theoretical and clinical issues relevant to treatment of aphasic, neuromotor, and memory disorders will be considered.

**SCSD 646 INTRODUCTORY CLINICAL PRACTICUM.** (2) This course provides an introduction to professional practice through intensive exposure to a variety of clinical populations.

**SCSD 649 PSYCHOLINGUISTICS: GESTURE AND SIGN LANGUAGE.** (3) Gestured under two naturally occurring conditions is examined: (1) spontaneous speech where gesture serves as an adjunct to communication, and (2) sign language where gesture is the primary means of communication. The development of these gestural phenomena in the absence and presence of various communication disorders is also examined.

**SCSD 652 ADVANCED RESEARCH SEMINAR 1.** (3) (This course may be taken as an advanced course for M.Sc. students.) Pro seminar in which current research topics in communication disorders will be discussed.

**SCSD 653 ADVANCED RESEARCH SEMINAR 2.** (3) (This course may be taken as an advanced course for M.Sc. students.) Pro seminar in which current research topics in communication disorders will be discussed.

**SCSD 664 COMMUNICATION SCIENCES AND DISORDERS 1.** (3) Current research and professional issues in communication sciences

and disorders will be discussed. Specific topics to be selected yearly.

**SCSD 666 COMMUNICATION SCIENCES AND DISORDERS 3.** (3) Current research and professional issues in communication sciences and disorders will be discussed. Specific topics to be selected yearly.

**SCSD 667 COMMUNICATION SCIENCES AND DISORDERS 4.** (3) Current research and professional issues in communication sciences and disorders will be discussed. Specific topics to be selected yearly.

**SCSD 668 COMMUNICATIVELY DISORDERED PERSON: PRACTICE.** (3) This course addresses clinical and supervisory processes, the social and emotional impact of communicative disabilities, and professional issues related to the practice of speech-language pathology and audiology.

**SCSD 669 SPECIAL DEVELOPMENTAL SPEECH/LANGUAGE PROBLEMS.** (3) Information pertinent to cerebral palsy, cleft palate, autism, mental retardation, multiple handicaps and syndromes involving speech and language disorders will be presented. General descriptions of the disorders and specific assessment and remedial procedures will be addressed.

**SCSD 670 COMMUNICATION SCIENCES AND DISORDERS 2.** (3) Current research and professional issues in communication sciences and disorders will be discussed. Specific topics to be selected yearly.

**SCSD 671 M.Sc. THESIS 1.** (12)

**Also available as: SCSD 671D1, SCSD 671D2; SCSD 671N1, SCSD 671N2**

**SCSD 672 M.Sc. THESIS 2.** (12)

**Also available as: SCSD 672D1, SCSD 672D2; SCSD 672N1, SCSD 672N2.**

**SCSD 673 M.Sc. THESIS 3.** (12)

**Also available as: SCSD 673D1, SCSD 673D2; SCSD 673N1, SCSD 673N2.**

**SCSD 674 M.Sc. THESIS 4.** (3)

**SCSD 675 SPECIAL TOPICS 1.** (12)

**Also available as: SCSD 675D1, SCSD 675D2.**

**SCSD 676 SPECIAL TOPICS 2.** (9)

**Also available as: SCSD 676D1, SCSD 676D2.**

**SCSD 677 SPECIAL TOPICS 3.** (6)

**Also available as: SCSD 677D1, SCSD 677D2.**

**SCSD 678 SPECIAL TOPICS 4.** (3)

**SCSD 679 ADVANCED CLINICAL PRACTICUM.** (2) This course enhances professional practice independence through intensive exposure to a variety of clinical populations.

**SCSD 681 PRACTICUM AND SEMINAR 1.** (1) Course provides initial practicum experiences including a combination of the following: speech/language and hearing screenings, facility tours, short term placements and laboratory assignments.

**SCSD 682 PRACTICUM AND SEMINAR 2.** (1) This course provides clinical experience through short-term placements and screenings, as well as discussions of current practicum issues.

**SCSD 683 PRACTICUM AND SEMINAR 3.** (1) Professional practice experiences focusing on a variety of clinical populations are provided. Discussion of advanced issues in clinical practice is included.

**SCSD 684 PRACTICUM AND SEMINAR 4.** (1) This course provides clinical practicum experiences in a range of settings. Professional practice issues are considered.

**SCSD 685 RESEARCH PROJECT 1.** (3) Supervised research project.

**SCSD 686 RESEARCH PROJECT 2.** (3) Supervised research project.

**SCSD 701 DOCTORAL COMPREHENSIVE.** (0)

**May also be available as: SCSD 701D1, SCSD 701D2.**

**SCSD 712 LANGUAGE ACQUISITION ISSUES 4.** (2)

## 18 Communication Studies

Department of Art History and Communication Studies  
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Canada

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Website: <http://www.arts.mcgill.ca/programs/AHCS>

*Chair* — Christine Ross

*Director, Graduate Programs in Art History* —  
Hans J. Böker (on leave Sept. 2002 - Dec. 2003)

*Acting Director, Graduate Programs in Art History* —  
Christine Ross

*Director, Graduate Programs in Communication* — Will Straw

### 18.1 Staff

#### *Emeritus Professors*

John M. Fossey; B.A.(Birm.), D.U.(Lyon II), F.S.A., R.P.A.  
George Galavaris; M.A.(Athens), M.F.A., Ph.D.(Prin.), F.R.S.C.  
George Szanto; B.A.(Dart.), Ph.D.(Harv.)

#### *Professor*

Hans J. Böker; Ph.D.(Saarbrücken), Dr. Ing.-habil(Hannover) (on  
leave Sept. 2002 - Dec. 2003)

#### *Associate Professors*

David Crowley; B.A.(Johns H.), M.Sc.(Penn.), Ph.D.(McG.)  
Christine Ross; M.A.(C'dia.), Ph.D.(Paris I)  
Will Straw; B.A.(Carl.), M.A., Ph.D.(McG.)

#### *Assistant Professors*

Ting Chang; B.A.(McG.), M.A.(Tor.), Ph.D.(Sussex)  
Sheryl N. Hamilton; L.L.B.(Sask.), B.A., M.A.(Carl.), Ph.D.(C'dia)  
Bronwen Wilson; B.A., M.A.(U.B.C.), Ph.D.(Northwestern)

#### *Assistant Professors (Special Category)*

Francesca Dal Lago; B.A.(Univ. of Venice), M.A., Ph.D.(NYU)  
Martha Langford; B.F.A.(N.S.C.A.D.), M.A., Ph.D.(McG.)

#### *Adjunct Professors*

David W. Booth; B.A., M.A., M.Phil., Ph.D.(Tor.)  
Louis De Moura Sobral; M.A., Ph.D.(Louvain)  
Johanne Lamoureux; B.A., M.A.(Montr.), Ph.D.(E.H.E.S.S., Paris)  
Charles Levin; B.A., M.A.(McG.), Ph.D.(C'dia)  
Constance Naubert-Riser; B.A., M.A.(Ott.), Ph.D.(Lyon III)  
Jocelyne Picot; B.A.(Montr.), M.A.(Con.), Ph.D.(S. Fraser)

### 18.2 Programs Offered

The Communication Studies Program offers courses and directs project research in preparation for the M.A. (Thesis and Non-thesis options) and Ph.D. in Communications.

The Program is concerned with the study of communications phenomena through interdisciplinary activity that includes both theoretical and practical considerations of the various modes and media of communication. The Program does not provide the purely technical training which can be more appropriately carried out by institutions of technology and communication arts, rather the focus is on broadening the understanding of the interplay between practical needs and theoretical perspectives. The special theoretical interest of the Program centres on the nature and scope of human communications as they emphasize the relationship of cognitive, social and aesthetic problems.

For more information on the Program, please visit our website <http://www.arts.mcgill.ca/programs/AHCS>.

To obtain financial aid information please consult the Graduate and Postdoctoral Studies Office, McGill University, James Administration Building, Room 400, 845 Sherbrooke Street W., Montreal,

Quebec, H3A 2T5. Telephone: (514) 398-3990. Website:  
<http://www.mcgill.ca/fgsr>.

For programs in Art History refer to [section 7](#).

### 18.3 Admission Requirements

#### **M.A.**

An Honours Bachelor's degree or equivalent is required of applicants for the M.A. program with a minimum CGPA of 3.3 on 4.0. In any case, the transcript must show breadth or depth in related areas of study.

#### **Ph.D.**

Applicants for the Ph.D. program are expected to have completed the equivalent of an M.A. degree. Admission will be based on academic achievement and evidence of talent and strong motivation in communication studies.

### 18.4 Application Procedures

Applications will be considered upon receipt of:

1. Completed and signed application form.
2. A non-refundable application fee of \$60 Canadian must accompany each application (including McGill students), otherwise it cannot be considered. This sum must be remitted using one of the following methods:
  - a. Credit card (by completing the appropriate section of the application form).
  - b. Certified cheque in Cdn. currency drawn on a Canadian bank.
  - c. Certified cheque in U.S. currency drawn on a U.S. bank.
  - d. Canadian Money Order in Cdn. currency.
  - e. U.S. Money Order in U.S. currency.
  - f. An international draft in Canadian funds drawn on a Canadian bank requested from the applicant's bank in his/her own country.
3. Two official copies of all transcripts are required for admission. Transcripts written in a language other than English or French must be accompanied by a certified translation. An explanation of the grading system used by the applicant's university is essential. It is the applicant's responsibility to arrange for transcripts to be sent. Documents submitted will not be returned. It is desirable to submit a list of the titles of courses taken in the major subject, since transcripts often give code numbers only.
4. Two letters of recommendation on letterhead or bearing the university seal and with original signatures from two instructors familiar with the applicant's work, preferable in the applicant's area of specialization, are required. It is the applicant's responsibility to arrange for these letters to be sent.
5. Non-Canadian applicants whose mother tongue is not English and who have not completed an undergraduate degree using the English language are required to submit documented proof of competency in oral and written English, by completing the TOEFL exams (minimum score 550 on the paper-based test or 213 on the computer-based test). Results must be submitted as part of the application.
6. Statement of interest of at least 500 words addressing the student's interest in Communication and the proposed area of research.
7. Two examples of written work.
8. Proof of Citizenship (certified photocopy of passport, birth certificate or equivalent).

Deadline for application is January 15.

Inquiries regarding the Program should be addressed to the Graduate Administrative Coordinator, Department of Art History and Communication Studies, McGill University, 853 Sherbrooke Street West, Montreal, QC H3A 2T6.

Commencing with applications for entry in January 2003, McGill's on-line application form will be available to all graduate program candidates at <http://www.mcgill.ca/applying/graduate>.



## 18.5 Program Requirements

### M.A. Degree (48 credits)

The Master's Program consists of a three-semester program of courses. Successful completion of the M.A. requires either:

- Thesis option:** a total of 8 courses (24 credits) and a thesis (24 credits), or
- Non-Thesis option:** a total of 12 courses (36 credits) and two research projects (12 credits);

and the fulfilment of a language requirement.

### Ph.D. Degree

Candidates with an M.A. degree will be admitted at the Ph.D. 2 level, thereby gaining credit for one year of resident study. When admitted at Ph.D. 1 level, three years of residence are required for the Doctoral degree. The program of study is comprised of 4 courses, the Pro-Seminar, a comprehensive examination, a project, the fulfillment of a language requirement and a written dissertation with its defence.

## 18.6 Courses Offered

For the term (Fall and/or Winter), days, and times when courses will be offered, please refer to the 2002-2003 Class Schedule on the Web, <http://www.mcgill.ca/minerva-students/class/>. Class locations and names of instructors are also provided.

Students preparing to register are advised to consult the Department website (<http://www.arts.mcgill.ca/programs/AHCS>) for the most up-to-date list of courses available. New courses may have been added or courses rescheduled after this Calendar went to press.

ENGC has replaced 109 as the prefix for Communication Studies courses.

The course credit weight is given in parentheses after the title.

- Denotes courses not offered in 2002-03.

**NOTE:** All undergraduate courses administered by the Faculty of Arts (courses at the 100- to 500-level) have limited enrolment.

**ENGC 521 COMMUNICATIONS IN HISTORY.** (3) North American communication studies have undergone five discernible changes in the definition and focus of the field. The major "schools" of thought to be covered are the Chicago and Lazarsfeld heritages, the institutionalization of communication science in the academy, and the post-modern period.

- **ENGC 531 FEMINIST COMMUNICATION THEORY.** (3)

**ENGC 541 CULTURAL INDUSTRIES.** (3) The convergence of computerized technologies and cultural industries and how these have produced entire new forms of cultural expression in film, TV, and the Internet.

- **ENGC 560 COMMUNICATIONS AND DEVELOPMENT.** (3)

- **ENGC 611 HISTORY/THEORY/TECHNOLOGY.** (3)

**ENGC 613 GENDER AND TECHNOLOGY.** (3) Contemporary culture and media in Canada and Quebec since 1945, with special emphasis on the '70s.

**ENGC 616 STAFF-STUDENT COLLOQUIUM.** (3) Pro-Seminar in Communications. A required course for all new M.A. and Ph.D. students. The Pro-Seminar is designed to explore theoretical and methodological issues in Communications through a series of presentations by the faculty and other McGill associates.

**ENGC 617 STAFF-STUDENT COLLOQUIUM.** (3) A required course for all new M.A. and Ph.D. students. The Pro-Seminar is designed to explore theoretical and methodological issues in Communications through a series of presentations by the faculty and other McGill associates.

**ENGC 619 CULTURAL COMMODITIES.** (3) The relationship between current theories of communications, cultural policy and cultural institutions. Analysis of popular culture and its relationship to other cultural artifacts in modern societies.

**ENGC 621 INTERPERSONAL COMMUNICATION.** (3) An examination of communication behavior with a special emphasis placed on the study of interpersonal communication in the mass media, especially advertising and political rhetoric.

- **ENGC 623 INFORMATION DESIGN.** (3)

**ENGC 625 NEW MEDIA POLICY.** (3) New media policies in relation to changing communication needs in the context of shifting regulatory demands.

- **ENGC 629 CANADIAN CULTURAL COMMUNICATIONS POLICY.** (3)

**ENGC 630 READINGS IN COMMUNICATIONS RESEARCH.** (3)

**ENGC 631 DISCOURSE ANALYSIS.** (3) Introduction to important trends in traditional, structural, and post-structural theories of discourse analysis.

**ENGC 633 GENDER AND REPRESENTATION.** (3) Research Seminar on a topic on gender.

**ENGC 637 CULTURAL ANALYSIS IN HISTORY.** (3) Further analysis of cultural products, policy, history and the role of cultural institutions in the development of media practices.

**ENGC 639 INTERPRETIVE METHODS IN MEDIA.** (3) A study of the various modes of interpreting and understanding the products of the mass media and of other human communication events.

- **ENGC 641 PROPAGANDA.** (3)

- **ENGC 643 NARROWCAST MEDIA.** (3)

**ENGC 646 POPULAR MEDIA.** (3) An assessment of popular culture and the research strategies employed; an examination of semiotics, critical theory, literary criticism, psychoanalysis, and cultural studies. Case studies from several of the following areas will be critiqued: fashion, music, advertising sub-cultural codes and behavior, soap operas, visual art and cult films.

- **ENGC 647 COMPUTERS AND THE MEDIA.** (3)

- **ENGC 649 AUDIENCE ANALYSIS.** (3)

- **ENGC 655 INTERP METH/MEDIA/COMMS.1.** (3)

**ENGC 692 M.A. THESIS PREPARATION 1.** (6)

May also be available as:

**ENGC 692D1, ENGC 692D2; ENGC 692N1, ENGC 692N2.**

**ENGC 693 M.A. THESIS PREPARATION 2.** (6)

May also be available as:

**ENGC 693D1, ENGC 693D2; ENGC 693N1, ENGC 693N2.**

**ENGC 694 M.A. THESIS PREPARATION 3.** (6)

May also be available as:

**ENGC 694D1, ENGC 694D2; ENGC 694N1, ENGC 694N2.**

**ENGC 695 M.A. THESIS PREPARATION 4.** (6)

May also be available as:

**ENGC 695D1, ENGC 695D2; ENGC 695N1, ENGC 695N2.**

**ENGC 696 RESEARCH PROJECT 1.** (6)

**ENGC 697 RESEARCH PROJECT 2.** (6)

**ENGC 702 COMPREHENSIVE EXAMINATION PART 1.** (6) A required course for all new M.A. and Ph.D. students. The Pro-Seminar is designed to explore theoretical & methodological issues in Communications through a series of presentations by the GPC faculty and other McGill associates.

May also be available as: **ENGC 702D1, ENGC 702D2.**

**ENGC 703 COMPREHENSIVE EXAMINATION PART 2.** (6)

May also be available as: **ENGC 703D1, ENGC 703D2.**

**ENGC 704 COMPREHENSIVE EXAMINATION PART 3.** (6)

May also be available as: **ENGC 704D1, ENGC 704D2.**

**ENGC 705 COMPREHENSIVE EXAMINATION PART 4.** (6)

May also be available as: **ENGC 705D1, ENGC 705D2.**

**ENGC 730 READINGS IN COMMUNICATIONS RESEARCH.** (3)

## 19 Computer Science

School of Computer Science  
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Director — D. Thérien

Chairs of Graduate Program:

M.Sc. – T. Merrett  
 Ph.D. – G. Toussaint

### 19.1 Staff

*Emeritus Professor*

C. Paige; B.Sc., B. Eng.(Sydney), Ph.D.(London, England)

*Professors*

D. Avis; B.Sc.(Wat.), Ph.D.(Stan.)  
 L. Devroye; M.S.(Louvain), Ph.D.(Texas)  
 K. Fukuda; M.Sc., Ph.D.(Admin. Eng, KEIO), Ph.D.(Waterloo)  
 L. Hendren; B.Sc., M.Sc.(Queen's), Ph.D.(Cornell)  
 T.H. Merrett; B.Sc.(Queen's), D.Phil.(Oxon.)  
 M.M. Newborn; B.E.E.(R.P.I.), Ph.D.(Ohio St.), F.A.C.M.  
 P. Panangaden; M.Sc.(I.I.T. Kanpur), Ph.D.(Wis.)  
 G.F.G. Ratzler; B.Sc.(Glas.), M.Sc.(McG.)  
 B. Reed; B.Sc, Ph.D.(McG.)  
 D. Therien; B.Sc.(Mont.), Ph.D.(Wat.) (*James McGill Professor*)  
 G.T. Toussaint; B.Sc.(Tulsa), Ph.D.(Br.Col.)(*on leave 2002-03*)

*Associate Professors*

C. Crepeau; B.Sc., M.Sc.(Montr.), Ph.D.(M.I.T.)  
 G. Dudek; B.Sc.(Queen's), M.Sc., Ph.D.(Tor.)  
 N. Friedman; B.A.(W.Ont.), Ph.D.(Tor.)  
 L. Hendren; B.Sc., M.Sc.(Queen's), Ph.D.(Cornell)  
 C. Tropper; B.Sc.(McG.), Ph.D.(Brooklyn Poly.)  
 S. Whitesides; M.S.E.E.(Stan.), Ph.D.(Wis.)

*Assistant Professors*

D. Bryant; B.Sc., Ph.D.(U. of Canterbury)  
 X-W. Chang; B.Sc., M.Sc.(Nanjing), Ph.D.(McG.)  
 K. Driesen; Licentiate, M.A.(Free Brussels), Ph.D.(UC- Santa Barbara)  
 M.T. Hallett; B.Sc.(Queens), Ph.D. (Vic. B.C.)  
 B. Kemme; B.Sc.(U. of Seville), M.Sc. (UC- Santa Barbara), Ph.D.(ETH, Zurich)  
 M. Langer; B.Sc. (McG.), M.Sc.(UC- Santa Barbara), Ph.D.(McG.)  
 D. Precup; B.Sc.(Tech. U. of Cluj-Napoca), M.Sc., Ph.D.(Mass, Amherst)  
 K. Siddiqi; B.Sc.(Lafayette), M.Sc., Ph.D (Brown)  
 H. Vangheluwe; B.Sc., M.Sc., D.Sc.(Ghent)  
 C. Verbrugge; B.A.(Queen), Ph.D.(McG.)

*Faculty Lecturer*

J. Vybihal; M.Sc.(McG.)

*Adjunct Professors*

R. De Mori, K. El Emam, S. Hyder, V. van Dongen

### 19.2 Programs Offered

Master's in Computer Science (Thesis Option)

Master's in Computer Science (Project Option)

Ph.D. in Computer Science

### 19.3 Admission Requirements

#### Master's (M.Sc.)

The minimum requirement for admission is a bachelor's degree (CGPA 3.2 or better, or equivalent) with the course work in Com-

puter Science indicated in the brochure "Information for Applicants to Graduate Programs".

The brochure supplements information in this Calendar and should be consulted by all graduate students.

#### Ph.D.

Candidates who do not hold a Master's degree from a recognized department of Computer Science will normally first register for the M.Sc.

Candidates with excellent standing in the M.Sc. program may be allowed to proceed to the Ph.D. degree without first submitting a Master's thesis; however, in other cases, permission to proceed to the Ph.D. may depend on the standing obtained in the M.Sc. Exceptional candidates who do not hold a Master's degree in Computer Science are, on rare occasions, admitted directly to the Ph.D. program.

### 19.4 Application Procedures

Applications will be considered upon receipt of:

1. application form
2. transcripts
3. letters of reference
4. \$60 application fee
5. test results (GRE, TOEFL)

All information is to be submitted directly to the Graduate Secretary.

**Deadline(s):** February 1st (if applicant wishes to be considered for scholarship awards); April 1st. Application documents are also available at our website: <http://www.cs.mcgill.ca/acadpages/grad/applying.html>.

Commencing with applications for entry in January 2003, McGill's on-line application form will be available to all graduate program candidates at <http://www.mcgill.ca/applying/graduate>.

### 19.5 Program Requirements

#### Master's

The M.Sc. program has two options, a thesis and a project option. All students are required to take a reading course during their first year. In addition, the thesis option (49 credits) requires six courses and a thesis, and the project option (46 credits) requires nine courses and a project. Courses will be chosen with guidance from an academic adviser, subject to approval by the School.

#### Ph.D.

Candidates must fulfill the requirements outlined in the General Information section of the *Graduate and Postdoctoral Studies Calendar*. They must successfully complete courses (determined by their Progress Committee), the Ph.D. thesis proposal exam, a yearly Progress Report before their Progress Committee, and submit a Ph.D. thesis. There is no language requirement.

### 19.6 Courses

**Please note: courses may have been rescheduled or new courses added after this Calendar went to press. Students preparing to register are advised to consult the 2002-2003 Class Schedule on the Web at <http://www.mcgill.ca/minerva-students> for the most up-to-date information.**

**The Class Schedule includes the term(s), days, and times when courses will be offered, as well as class locations and names of instructors.**

**The schedule of courses to be offered in Summer 2003 will be available on the website in January 2003.**

The course credit weight is given in parentheses after the title. Term(s) offered (Fall, Winter, Summer) may appear after the credit weight to indicate when a course would normally be taught. Please check the Class Schedule to confirm this information.

COMP has replaced 308 as the prefix for Computer Science courses.

- Denotes courses not offered in 2002-03

**NOTE:** All undergraduate courses administered by the Faculty of Science (courses at the 100- to 500-level) have limited enrolment.

● **COMP 505 ADVANCED COMPUTER ARCHITECTURE.** (3) (Fall) (3 hours) (Prerequisites: COMP 302 and COMP 273 or equivalent)

**COMP 506 ADVANCED ANALYSIS OF ALGORITHMS.** (3) (Winter) (3 hours) (Prerequisite: COMP 330 or COMP 360 or COMP 405 or COMP 431) The study of computational complexity and intractability: Cook's Theorem, NP-completeness, oracles, the polynomial hierarchy, lower bounds, heuristics, approximation problems.

**COMP 507 COMPUTATIONAL GEOMETRY.** (3) (Fall) (3 hours) (Prerequisite: COMP 360 or COMP 405 or equivalent or corequisite COMP 506) Problems in computational geometry; worst-case complexity of geometric algorithms; expected complexity of geometric algorithms and geometric probability; geometric intersection problems; nearest neighbor searching; point inclusion problems; distance between sets; diameter and convex hull of a set; polygon decomposition; the Voronoi diagram and other planar graphs; updating and deleting from geometric structures.

**COMP 520 COMPILER DESIGN.** (4) (Fall) (3 hours, 1 hour consultation) (Prerequisites: COMP 273 and COMP 302) The structure of a compiler. Lexical analysis. Parsing techniques. Syntax directed translation. Run-time implementation of various programming language constructs. Introduction to code generation for an idealized machine. Students will implement parts of a compiler.

**COMP 522 MODELLING AND SIMULATION.** (3) (Fall) (3 hours) (Prerequisites: COMP 251, COMP 302, COMP 350) Simulation and modeling processes, state automata, Petri Nets, state charts, discrete event systems, continuous-time models, hybrid models, system dynamics and object-oriented modeling.

**COMP 524 THEORETICAL FOUNDATION OF PROGRAMMING LANGUAGE.** (3) (Fall) (3 hours) (Prerequisite: COMP 302, and MATH 340 or MATH 235) Operational and denotational semantics of programming languages. Equivalence theorems for first-order languages. Lambda calculus. Type-inference, typed lambda calculus. Polymorphism. Elements of domain theory and fixed-point induction.

● **COMP 525 FORMAL VERIFICATION.** (3) (Winter) (3 hours) (Prerequisites: COMP 251, COMP 310, COMP 330 and MATH 340)

**COMP 526 PROBABILISTIC REASONING AND AI.** (3) (Winter) (3 hours) (Prerequisites: COMP 206, COMP 360, COMP 424 and MATH 323) Belief networks, Utility theory, Markov Decision Processes and Learning Algorithms.

**COMP 531 THEORY OF COMPUTATION.** (3) (Winter) (3 hours) (Prerequisite: COMP 330) Models for sequential and parallel computations: Turing machines, boolean circuits. The equivalence of various models and the Church-Turing thesis. Unsolvable problems. Model dependent measures of computational complexity. Abstract complexity theory. Exponentially and super-exponentially difficult problems. Complete problems.

● **COMP 534 TEAM SOFTWARE ENGINEERING.** (3) (Winter) (3 hours) (Prerequisite: COMP 433 or equivalent)

**COMP 535 COMPUTER NETWORKS 1.** (3) (Fall) (3 hours) (Prerequisite: COMP 310) (Students may not take COMP 435 and COMP 535 for credit) Exposition of the first four layers of the ISO model for computer network protocols, i.e., the physical, data, network, and transport layers. Basic hardware and software issues with examples drawn from existing networks, notably SNA, DECnet, and ARPAnet.

**COMP 537 INTERNET PROGRAMMING.** (3) (Winter) (3 hours) (Prerequisites: COMP 251 and COMP 302, and any one of COMP 310, COMP 420, COMP 424, or COMP 433) Sockets, User Datagram Protocol (UDP), Transmission utility protocols; Remote Terminal Protocol (Telnet), Simple Mail Transfer Protocol (SMTP), File Transfer Protocol (FTP) Hypertext Transfer Protocol (HTTP), Internet resource database and search engines. Remote File Systems. Distributed objects, Common Object Request Broker Architecture (CORBA).

● **COMP 538 PERSON-MACHINE COMMUNICATION.** (3) (Winter) (3 hours) (Prerequisites: COMP 251, COMP 302)

**COMP 540 MATRIX COMPUTATIONS.** (3) (Winter) (3 hours) (Prerequisite: MATH 327 or COMP 350) Designing and programming reliable numerical algorithms. Stability of algorithms and condition of problems. Reliable and efficient algorithms for solution of equations, linear least squares problems, the singular value decomposition, the eigenproblem and related problems. Perturbation analysis of problems. Algorithms for structured matrices.

**COMP 547 CRYPTOGRAPHY AND DATA SECURITY.** (3) (Fall) (3 hours) (Prerequisite: COMP 360) (Restriction: Not open to students who have taken 308-647) This course presents an in-depth study of modern cryptography and data security. The basic information theoretic and computational properties of classical and modern cryptographic systems are presented, followed by a cryptanalytic examination of several important systems. We will study the applications of cryptography to the security of systems.

**COMP 557 COMPUTER GRAPHICS.** (3) (Winter) (3 hours) (Prerequisite: MATH 223 and COMP 251) The study of fundamental mathematical, algorithmic and representational issues in computer graphics. The topics to be covered are: overview of graphics process, projective geometry, homogeneous coordinates, projective transformations, quadrics and tensors, line-drawing, surface modelling and object modelling reflectance models and rendering, texture mapping, polyhedral representations, procedural modeling, and animation.

**COMP 558 FUNDAMENTALS OF COMPUTER VISION.** (3) (Winter) (3 hours) (Prerequisites: COMP 206, COMP 360, MATH 222, MATH 223) (Restriction: not open to students who have taken 308-766 before January 2001) Biological vision, edge detection, projective geometry and camera modeling, shape from shading and texture, stereo vision, optical flow, motion analysis, object representation, object recognition, graph theoretic methods, high level vision, applications.

**COMP 560 GRAPH ALGORITHMS AND APPLICATIONS.** (3) (Fall) (3 hours) (Prerequisite: COMP 360 or COMP 405 or COMP 431 or MATH 343) Algorithms for connectivity, partitioning, clustering, colouring and matching. Isomorphism testing. Algorithms for special classes of graphs. Layout and embeddings algorithms for graphs and networks.

**COMP 562 COMPUTATIONAL BIOLOGY METHODS.** (3) (Fall) (3 hours) (Prerequisites: COMP 330, COMP 350, COMP 360 and MATH 323) Application of computer science techniques to problems arising in biology and medicine, techniques for modeling evolution, aligning molecular sequences, predicting structure of a molecule and other problems from computational biology.

**COMP 566 DISCRETE OPTIMIZATION 1.** (3) (Fall) (3 hours) (Prerequisites: COMP 360 or COMP 405 and MATH 223) Use of computer in solving problems in discrete optimization. Linear programming and extensions. Network simplex method. Applications of linear programming. Vertex enumeration. Geometry of linear programming. Implementation issues and robustness. Students will do a project on an application of their choice.

**COMP 567 DISCRETE OPTIMIZATION 2.** (3) (Winter) (3 hours) (Prerequisites: COMP 566 or MATH 417) Formulation, solution and applications of integer programs. Branch and bound, cutting plane, and column generation algorithms. Combinatorial optimization. Polyhedral methods. A large emphasis will be placed on modeling. Students will select and present a case study of an application of integer programming in an area of their choice.

**COMP 573 MICROCOMPUTERS.** (3) (Fall or Winter) (3 hours) (Prerequisite: COMP 273) Characteristics and internal structure of microcomputers and workstations. Architectures of current CISC and RISC micro processors. Assembler and machine languages for microcomputers. System software. Applications for single and networked microcomputers. Students will be assigned "hands-on" projects.

**COMP 575 FUNDAMENTALS OF DISTRIBUTED ALGORITHMS.** (3) (Winter) (3 hours) (Prerequisite: COMP 310) Study of a collection of algorithms which are basic to the world of concurrent program-



ming. Discussion of algorithms from the following areas: termination detection, deadlock detection, global snapshots, clock synchronization, fault tolerance (byzantine and self-stabilizing systems). Students will implement algorithms on the BBN butterfly and will present papers on topics in these areas.

**COMP 577 DISTRIBUTED DATABASE SYSTEMS.** (3) (Fall) ((3 hours)) (Prerequisites: COMP 421 and COMP 310) Issues related to distributed database both from a theoretical and practical point of view. Fundamental problems of distributed systems such as time or failure, distributed transaction management, fault-tolerance, replication, data distribution, and system architecture and design.

**COMP 601D1 SPECIAL TOPICS IN COMPUTER SCIENCE.** (2) (2 per term) (Restricted to Computer Science students) (Students must also register for COMP 601D2) (No credit will be given for this course unless both COMP 601D1 and COMP 601D2 are successfully completed in consecutive terms)

**COMP 601D2 SPECIAL TOPICS IN COMPUTER SCIENCE.** (2) (Prerequisite: COMP 601D1) (No credit will be given for this course unless both COMP 601D1 and COMP 601D2 are successfully completed in consecutive terms)

**May also be available as: COMP 601N1, COMP 601N2.**

● **COMP 605 PARALLEL COMPUTER ARCHITECTURE.** (4) (3 hours)

● **COMP 608 ADVANCED COMPUTATIONAL GEOMETRY.** (4) (3 hours) (Prerequisite: COMP 507)

**COMP 610 INFORMATION STRUCTURES 1.** (4) (3 hours) Study of elementary data structures: lists, stacks, queues, trees, hash tables, binary search trees, red-black trees, heaps. Augmenting data structures. Sorting and selection, Recursive algorithms. Advanced data structures including binomial heaps, Fibonacci heaps, disjoint set structures, and splay trees. Amortizing. String algorithms. Huffman trees and suffix trees. Graph algorithms.

**COMP 612 DATABASE SYSTEMS.** (4) (3 hours) Database programming using the relational algebra. Introduces the relational model of databases and high level programming techniques with applications to data processing, text and picture processing, knowledge bases and logic programming on secondary storage.

**COMP 617 INFORMATION SYSTEMS.** (4) (3 hours) (Prerequisite: COMP 612) Seminar course. A major area of application of the techniques covered in 308-612 is discussed. No prior expertise in the application area is required, since the emphasis of the course is on methods of computation. Storage structures and algorithms for efficient retrieval and processing of data for the application will be discussed.

**COMP 621 OPTIMIZING COMPILERS.** (4) (3 hours) (Prerequisite: COMP 251 or equivalent, COMP 302 or equivalent, COMP 520 is useful but not strictly necessary) This course examines the components of optimizing compiler, tree-like and graph-like intermediate representations, flow analysis, abstract interpretation, program transformation, register allocation, an introduction to instruction scheduling and parallelization techniques. Students complete assignments and a course project.

**COMP 623 CONCURRENT PROGRAMMING LANGUAGES.** (4) (3 hours) (Prerequisite: COMP 302 or equivalent.) The course will include the following topics: deadlock, fairness, liveness and safety properties, distributed protocols, standard concurrent programming problems, a comparative study of concurrent programming paradigms. Additional topics: dataflow programming, concurrent constraint programming, concurrent logic programming, process algebra, fault tolerant distributed systems, parallel object-oriented languages.

**COMP 627 THEORETICAL PROGRAMMING LANGUAGES.** (4) (3 hours) (Prerequisites: COMP 524 and COMP 530) Programming language semantics. Lambda calculus, the Church Rosser theorem, typed lambda calculus, the strong normalization theorem, polymorphism, type inference, elements of domain theory, models of the lambda calculus, relating operational and denotational semantics, full abstraction. Reasoning about programs. Soundness and relative completeness of program logics.

● **COMP 630 SOFTWARE DEVELOPMENT ENVIRONMENT.** (4) (3 hours) (Prerequisite: COMP 434) The course aims to teach the main features of, and the techniques to construct, Software Development Environments (SDEs). Students would benefit from this course by obtaining an understanding of the practical problems in large scale software development projects, and how formal and practical approaches may be put to use in solving these problems.

● **COMP 631 SOFTWARE PROCESS ENGINEERING.** (4) (3 hours) (Prerequisite: COMP 434)

● **COMP 642 NUMERICAL ESTIMATION.** (4) (4 hours) (Prerequisites: MATH 323, MATH 324 and COMP 350) (Corequisite: COMP 540)

● **COMP 644 PATTERN RECOGNITION.** (4) (3 hours)

**COMP 646 COMPUTATIONAL PERCEPTION.** (4) (3 hours) Seminar course on perception problems from a computer science perspective. Vision problems such as stereo, shading, motion, color, object recognition. Audition problems such as sonar, source localization, source recognition.

**COMP 647 ADVANCED CRYPTOGRAPHY.** (4) (3 hours) (Prerequisite: COMP 547) Information theoretic definitions of security, zero-knowledge protocols, secure function evaluation protocols, cryptographic primitives, privacy amplification, error correction, quantum cryptography, quantum cryptanalysis.

● **COMP 648 MOTION PLANNING AND ROBOTICS.** (4) (3 hours) (Given in alternate years.)

**COMP 652 MACHINE LEARNING.** (4) (Prerequisites: COMP 424, COMP 526 or ECSE 526, COMP 360, MATH 323 or ECSE 305.) An overview of state-of-the-art algorithms used in machine learning, including theoretical properties and practical applications of these algorithms.

**COMP 656 RUN-TIME LANGUAGE SUPPORT.** (4) Hardware and software support for late binding, polymorphic calls and garbage collection in object-oriented languages.

● **COMP 675 PARALLEL SEARCH PROBLEMS.** (4) (3 hours)

**COMP 690 PROBABILISTIC ANALYSIS OF ALGORITHMS.** (4) (3 hours) Probabilistic analysis of algorithms and data structures under random input. Expected behavior of search trees, tries, heaps, bucket structures and multidimensional data structures. Random sampling, divide-and-conquer, grid methods. Applications in computational geometry and in game tree searching. Combinatorial search problems. Algorithms on random graphs.

**COMP 694 RESEARCH PROJECT 1.** (6) (Restricted to Computer Science students) Ongoing research pertaining to project.

**COMP 695 RESEARCH PROJECT 2.** (6) (Restricted to Computer Science students) Ongoing research pertaining to project.

**COMP 698 THESIS RESEARCH 1.** (9) (Restricted to Computer Science students) Ongoing research pertaining to thesis.

**COMP 699 THESIS RESEARCH 2.** (15) (Restricted to Computer Science students) Ongoing research pertaining to thesis.

**COMP 700 PH.D. COMPREHENSIVE EXAMINATION.** (0)

**COMP 701 THESIS PROPOSAL AND AREA EXAMINATION.** (3)

**COMP 760 ADVANCED TOPICS THEORY 1.** (4)

**COMP 761 ADVANCED TOPICS THEORY 2.** (4)

**COMP 762 ADVANCED TOPICS PROGRAMMING 1.** (4)

**COMP 763 ADVANCED TOPICS PROGRAMMING 2.** (4)

**COMP 764 ADVANCED TOPICS SYSTEMS 1.** (4)

**COMP 765 ADVANCED TOPICS SYSTEMS 2.** (4)

**COMP 766 ADVANCED TOPICS APPLICATIONS 1.** (4)

**COMP 767 ADVANCED TOPICS: APPLICATIONS 2.** (4)

## 20 Dentistry

Department of Dentistry  
Faculty of Dentistry  
3640 University Street, Room M18  
Montreal, QC H3A 2B2  
Canada

Telephone: (514) 398-7227

Fax: (514) 398-8900

Website: <http://www.mcgill.ca/dentistry/>

*Dean, Faculty of Dentistry* — J.P. Lund

*Associate Dean, Research* — M.D. McKee

*Director, Graduate Studies* — J.S. Feine

*Director, Graduate Program*

*in Oral and Maxillofacial Surgery* — T.W. Head

### 20.1 Staff

#### *Professors*

M.C. Bushnell; B.A.(Maryland), M.A., Ph.D.(American U.)  
F. Cervero; M.B., Ch.B., Ph.D.(Madrid), D.Sc.(Edinburgh)  
J.S. Feine; D.D.S., M.S.(Texas), H.D.R.  
J.P. Lund; B.D.S.(Adel.), Ph.D.(W.Ont.)  
C.E. Smith; D.D.S., Ph.D.(McG.)

#### *Associate Professors*

G. Bennett; B.A.(Rutgers), M.A., Ph.D.(Virginia)  
P.J. Chauvin; B.Sc.,D.D.S.(McG.), M.Sc.(W.Ont.), F.A.A.O.P.,  
F.R.C.D.(C)  
M. Dagenais; D.M.D.(Montr.), Dip. Oral Radiology(Tor.)  
T.W. Head; B.Sc.(Sir G. Wms.), D.D.S., M.Sc.(McG.),  
F.R.C.D.(C), Dipl. A.B.O.M.S.  
M.D. McKee; Ph.D.(McG.)  
S. Schwartz; D.M.D.(Montr.), M.Sc. Cert. Pedo.(Boston), F.I.C.D.,  
F.A.C.D.  
E.D. Shields; B.Sc.(Ball State), D.D.S., Ph.D.(Ind.)

#### *Assistant Professors*

P.J. Allison; B.D.S., F.D.S.R.C.S.,M.Sc.(London), Ph.D.(McG.)  
J.R. Emery; D.D.S., M.Sc.(McG.), F.R.C.D.(C), Dipl. A.B.O.M.S.  
E.P. Klemetti; D.D.S.(Helsinki), Ph.D.(Kuopio, Finland)  
H. LeMoual; D.E.A., M.Sc.(Paris), Ph.D.(Montr.)  
J.-M. Retrouvey; D.M.D.(Montr.), M.Sc.(Boston)  
M. Tabrizian; D.E.A., Ph.D.(Paris)

#### *Adjunct Professors*

A. Charbonneau; D.M.D., M.Sc., Ph.D.(Montr.)  
S. Marchand; (UQAT), M.Sc.(UQTR), Ph.D.(Montr.)  
J. Morais; M.D.(Montr.)  
D.J. Ostry; B.A.Sc., M.A.Sc., Ph.D.(Tor.)

#### *Associate Members*

E.L. Franco; B.Sc.(Estadual de Campinas), M.P.H.,  
Dr.P.H.(Chapel Hill)  
E.G. Gisel; B.S.(Zurich), B.S., M.S., Ph.D.(Temple)  
J. Penrod; M.D.(Stan.), Ph.D.(Prin.)  
H. Warshawsky; B.Sc.(Sir G.Wms.), M.Sc., Ph.D.(McG.)

### 20.2 Programs Offered

#### **M.Sc. in Dental Sciences**

The goal of this program is to train students in research in the dental sciences which comprise a number of disciplines relating to the functioning of the oro-facial complex.

Please consult the Graduate Secretary, Faculty of Dentistry, for further details.

#### **M.Sc. in Dental Sciences, option in Oral and Maxillofacial Surgery**

A residency training program in Oral and Maxillofacial Surgery provides a candidate with a comprehensive background for the practice of Oral and Maxillofacial Surgery as a specialty.

During the four years of the program the candidate serves as a resident principally at the Montreal General Hospital. During this time the resident is given increasing responsibility for the care of in-patients and out-patients, as well as being required to fulfill certain basic science courses and other assignments. A research project must be undertaken, followed by a Master's thesis.

The program is open to one candidate per year.

### 20.3 Admission Requirements

#### **M.Sc. in Dental Sciences**

Students who have successfully completed the D.D.S./D.M.D. degree or a B.Sc. degree with a CGPA of 3.0 on 4.0 in any of the disciplines in the Health Sciences (Anatomy, Biochemistry, Microbiology and Immunology, Physiology) or related disciplines (Biology, Chemistry, Physics, Psychology) are eligible to apply for admission to a graduate program in the Faculty of Dentistry leading to the M.Sc. degree in Dental Sciences. In addition to submitting GRE scores, TOEFL tests must be passed in the case of non-Canadians whose mother tongue is not English.

The number of candidates accepted each year will depend on the elective courses and research facilities available which are applicable to the candidate's area of expertise.

#### **M.Sc. in Dental Sciences, option in Oral and Maxillofacial Surgery**

Candidates for this program must possess a D.D.S. or D.M.D. degree or its equivalent, and be acceptable to l'Ordre des Dentistes du Québec as a training candidate in a hospital.

### 20.4 Application Procedures

Commencing with applications for entry in January 2003, McGill's on-line application form will be available to all graduate program candidates at <http://www.mcgill.ca/applying/graduate>.

#### **M.Sc. in Dental Sciences**

All applications must include an up-to-date official transcript of academic performance, two letters of recommendation and a brief resume indicating their particular field of interest for the M.Sc. degree. B.Sc. students who have not obtained eligible qualifications will be required to make up for deficiencies in their academic profile by taking a qualifying year.

Students must be accepted by a research director before the Faculty approves the application, prior to final acceptance by the Graduate and Postdoctoral Studies Office.

Deadline for receipt of the completed application is December 30 for Fall and September 1 for Winter.

Applications may be obtained by writing to the Graduate Program in Dental Sciences, Faculty of Dentistry, McGill University, 3640 University Street, Montreal, QC H3A 2B2.

#### **M.Sc. in Dental Sciences, option in Oral and Maxillofacial Surgery**

Applications must be submitted by September 15.

Information for financial support for this program may be obtained by writing to Dr. T.W. Head, Director of the program.

Further information may be obtained by writing to Graduate Program in Oral and Maxillofacial Surgery, Faculty of Dentistry, McGill University, 3640 University Street, Montreal, QC H3A 2B2.

### 20.5 Program Requirements

All students who are registered in Graduate Clinical Programs in the Faculty of Dentistry, McGill University, and who are not already registered with l'Ordre, must register with l'Ordre des Dentistes du Québec. Further information may be obtained from the Registrar of l'Ordre des Dentistes du Québec, 625 René-Lévesque Boulevard West, Fifteenth Floor, Montreal, QC H3B 1R2.

#### **M.Sc. IN DENTAL SCIENCES**

The M.Sc. degree should normally be completed within 2 years of full-time study.

**Required Courses** (8 credits)

EPIB 607	(4)	Inferential Statistics (or equivalent course)
DENT 671D1	(2)	Graduate Seminars in Dental Sciences 1
DENT 671D2	(2)	Graduate Seminars in Dental Sciences 1

**Complementary Courses** (8 – 14 credits)

chosen from the following:

ANAT 632D1	(3)	Experimental Morphology
ANAT 632D2	(3)	Experimental Morphology
ANAT 663D1	(4.5)	Histology
ANAT 663D2	(4.5)	Histology
BIOC 404	(3)	Biophysical Chemistry
BIOC 450	(3)	Protein Structure and Function
BIOC 454	(3)	Nucleic Acids
BIOC 456	(3)	Biochemistry of Membranes
BIOL 524	(3)	Topics in Molecular Biology of the Gene
DENT 562	(3)	Calcified Tissues
DENT 654	(3)	Mechanisms and Management of Pain
EPIB 606	(4)	Epidemiology: Principles and Methods
EPIB 611	(3)	Measurement in Health Care Research
EPIB 621	(3)	Data Analysis in Health Sciences 1
EPIB 635	(3)	Clinical Trials
EPIB 655	(3)	Public Health Research
EPIB 681	(3)	Data Analysis in Health Sciences 2
EXMD 610	(3)	Methods in Biomedical Research
POTH 630	(3)	Measurement in Rehabilitation 2
PSYC 505	(3)	The Psychology of Pain

Other complementary courses in the University may be taken with the approval of the supervisor or research director.

**Thesis Research Courses** (24 – 30 credits)

The required number of Master's thesis credits (minimum 24) will be made up from among the following:

DENT 650	(3)	Thesis Research 1
DENT 651	(6)	Thesis Research 2
DENT 652	(9)	Thesis Research 3
DENT 653	(15)	Thesis Research 4

**M.SC. IN DENTAL SCIENCE, OPTION IN ORAL AND MAXILLOFACIAL SURGERY** (46 credits)

Duration: Four calendar years commencing July 1.

Students will register in the four-year graduate-training program, which leads to a McGill Certificate of Residency Training. They will concurrently register with the Graduate and Postdoctoral Studies Office during the Third and Fourth years of the program and complete the requirements for the M.Sc. degree during these two years.

**Required Courses** (16 credits)

DENT 631	(3)	OMFS 2 Seminar
DENT 632	(3)	Clinical OMFS 2
DENT 641	(3)	OMFS 3 Seminar
DENT 642	(3)	Clinical OMFS 3
EPIB 607	(4)	Inferential Statistics (or equivalent course)

**Thesis Component – Required** (30 credits)

DENT 651	(6)	Thesis Research 2
DENT 652	(9)	Thesis Research 3
DENT 653	(15)	Thesis Research 4

**20.6 Courses for the M.Sc. in Dental Sciences**

For the term (Fall and/or Winter), days, and times when courses will be offered, please refer to the 2002-2003 Class Schedule on the Web, <http://www.mcgill.ca/minerva-students/class/>. Class locations and names of instructors are also provided.

Students preparing to register are advised to consult the Class Schedule website for the most up-to-date list of courses available. New courses may have been added or courses rescheduled after this Calendar went to press.

Courses with numbers ending D1 and D2 are taught in two consecutive terms (most commonly Fall and Winter). Students

must register for both the D1 and D2 components. No credit will be given unless both components (D1 and D2) are successfully completed in consecutive terms.

DENT has replaced 590 as the prefix for Dentistry courses. The course credit weight is given in parentheses after the title.

● Denotes courses not offered in 2002-03

**DENT 562 CALCIFIED TISSUES.** (3) (3 hours of lecture supplemented by 1 hour laboratory or conferences) An advanced course on the morphology and cell biology of calcified tissues. This course provides a problem-oriented analysis of research on the structure and mechanism of formation of connective tissue, cartilage and bone, but with particular emphasis on the tissues of the tooth.

- **DENT 626D1 PATHOLOGY ORAL MAXILLO SRGNS.** (2)
- **DENT 626D2 PATHOLOGY ORAL MAXILLO SRGNS.** (2)

**DENT 631 OMFS 2 SEMINAR.** (3)

**DENT 632 CLINICAL OMFS 2.** (3)

**May also be available as:**

**DENT 632D1, DENT 632D2.**

**DENT 641 OMFS 3 SEMINAR.** (3) Advanced seminar presented on a weekly basis on topics pertinent to Oral and Maxillofacial surgery.

**DENT 642 CLINICAL OMFS 3.** (3)

**DENT 650 THESIS RESEARCH 1.** (3) Independent work under the direction of a supervisor on a research problem in the student's designated area of research: Literature Review and Hypothesis Generation.

**DENT 651 THESIS RESEARCH 2.** (6) Independent work under the direction of a supervisor on a research problem in the student's designated area of research: Literature Review and Protocol Development.

**DENT 652 THESIS RESEARCH 3.** (9) Independent work under the direction of a supervisor on a research problem in the student's designated area of research.

**May also be available as:**

**DENT 652D1, DENT 652D2.**

**DENT 653 THESIS RESEARCH 4.** (15) Independent work under the direction of a supervisor on a research problem in the student's designated area of research: Data Analysis & Thesis Preparation.

**May also be available as:**

**DENT 653D1, DENT 653D2;  
DENT 653J1, DENT 653J2, DENT 653J3.**

**DENT 654 MECHANISMS AND MANAGEMENT OF PAIN.** (3) (Open to all health professionals) Presentation of the neurobiology of pain and analgesia, clinical pain conditions, basic and applied research methods in the study of pain, and the theory and practice of pain management. The course is designed for graduate students interested in pain mechanisms and clinical residents interested in pain management.

**DENT 671D1 GRADUATE SEMINARS IN DENTAL SCIENCES 1.** (2)

One advanced research seminar every week over the fall and winter terms given by invited local and out-of-town speakers on their current research in Oral Biology.

**DENT 671D2 GRADUATE SEMINARS IN DENTAL SCIENCES 1.** (2)

See DENT 671D1 for course description.

**May also be available as:**

**DENT 671N1, DENT 671N2.**



## 21 Developing-Area Studies

Centre for Developing-Area Studies (CDAS)  
3715 Peel Street  
Montreal, QC H3A 1X1  
Canada

Telephone: (514) 398-3507

Fax: (514) 398-8432

Email: adm.cdass@mcgill.ca

Website: <http://www.mcgill.ca/cdas>

*Director* — Rosalind E. Boyd, Ph.D.

*Documentalist* — Iain Blair

Email: doc.cdass@mcgill.ca

*Adjunct Professor* — Dr. Izzud-Din Pal

*Senior Research Associate* — Dr. Myriam Gervais

*Visiting Professor* — Dr. Daniel Haile

The CDAS focuses on research concerning social and economic problems within countries in Africa, Asia, the Caribbean, Latin America and the Middle East, using an interdisciplinary framework. It organizes seminars and conferences on development issues and globalization, primarily in the social sciences.

The CDAS has a specialized library (the Gutkind Library), open to the public. In addition, it maintains an active publications program centred around the internationally respected journal *Labour, Capital and Society* and has research fellows and research groups in residence.

The CDAS works with an international community of scholars, development groups and the public, and is currently involved in a series of research and development projects focusing on gender, environment, the labouring poor, human security, and globalization.

Graduate students with research interests in international development can apply to become fellows.

## 22 Dietetics and Human Nutrition

School of Dietetics and Human Nutrition  
Room MS2-039, Macdonald-Stewart Building  
Macdonald Campus, McGill University  
21,111 Lakeshore Road  
Sainte-Anne-de-Bellevue, QC H9X 3V9  
Canada

Telephone: (514) 398-7762

Fax: (514) 398-7739

Email: grant@macdonald.mcgill.ca

Website: <http://www.mcgill.ca/dietetics>

*Director* — Katherine Gray-Donald

### 22.1 Staff

*Emeritus Professor*

Helen Neilson; B.H.S., M.Sc.(McG.)

*Professors*

Peter J.H. Jones; B.Sc., M.Sc.(Br.Col.), Ph.D.(Tor.)

Harriet V. Kühnlein; B.S.(Penn. St.), M.S.(Oregon St.),

Ph.D.(Calif.) (*joint appt. with Faculty of Medicine*)

*Associate Professors*

Laurie H.M. Chan; B.Sc., M.Sc.(Hong Kong), Ph.D.(Lond.) (*joint appt. with Natural Resource Sciences, and Food Science and Agricultural Chemistry*) (NSERC Northern Chair)

Grace Egeland; B.A.(Luther College), Ph.D.(Pitts.) (*Canada Research Chair*)

Katherine Gray-Donald; B.Sc., Ph.D.(McG.) (*joint appt. with Epidemiology and Biostatistics, Faculty of Medicine*)

Tim A. Johns; B.Sc.(McM.), M.Sc.(Br.Col.), Ph.D.(Mich.) (*joint appt. with Plant Science*)

Kristine G. Koski; B.S., M.S.(Wash.), Ph.D.(Calif.) (*joint appt. with the Division of Experimental Medicine, Faculty of Medicine*)  
Stan Kubow; B.Sc.(McG.), M.Sc.(Tor.), Ph.D.(Guelph)  
Louise Thibault; B.Sc., M.Sc., Ph.D.(Laval)  
Linda J. Wykes; B.Sc., M.Sc., Ph.D.(Tor.) (*William Dawson Scholar*)

*Assistant Professor*

David J. Bissonnette; B.Sc.(McG.), Ph.D.(Tor.)

*Faculty Lecturers*

Linda Jacobs Starkey; B.Sc.(Mt. St. Vincent), M.Sc., Ph.D.(McG.) (*University Coordinator, Professional Practice (Stage) in Dietetics*)

Maureen Rose-Lucas; B.Sc., M.Sc., Ph.D.(McG.)

*Associate Members*

Anaesthesia: Franco Carli

Food Science & Agricultural Chemistry: Selim Kermasha

Parasitology: Marilyn E. Scott;

Psychiatry: Simon N. Young

Medicine: Louis Beaumier, Katherine Cianflone,

Rejeanne Gougeon, L. John Hoffer, Errol B. Marliss,

Jean-François Yale

*Adjunct Professors*

Kevin A. Cockell (Health Canada), Jeffrey S. Cohn (Clinical Research Inst. of Canada), Mary L'Abbé (Health Canada)

### 22.2 Programs Offered

M.Sc., M.Sc. Applied and Ph.D. in Human Nutrition.

The M.Sc. and Ph.D. programs are research degrees wherein students conduct research with one of the faculty members. Most areas of research in Human Nutrition are covered including nutritional biochemistry, clinical nutrition, community or international nutrition. Prospective students are encouraged to contact faculty members to discuss potential research areas since final acceptance requires identification of a research supervisor.

The M.Sc. Applied is intended to provide advanced learning in Nutrition with substantial course work and either a *practicum in the field of Dietetics* or a *project in the area of Human Nutrition*. Students need not define their research area prior to enrolment.

*Research Facilities:* Students may conduct research at the School of Dietetics and Human Nutrition, including the Mary Emily Clinical Nutrition Research Unit, the Centre for Indigenous Peoples' Nutrition and Environment (CINE), or at the McGill University Health Centre.

In addition to their research, eligible candidates may complete the equivalent of a Dietetics Internship for membership in the professional association for registration as Dietitians and Nutritionists in Canada. However, completion of specific undergraduate dietetics course work and practica will increase the duration and cost of the program.

### 22.3 Admission Requirements

**M.Sc.**

Applicants must be graduates of a university of recognized reputation and hold a B.Sc. degree equivalent to a McGill Honours degree in a subject closely related to the one selected for graduate work. Applicants must have at least a cumulative grade point average (CGPA) in McGill University's credit equivalency of 3.2/4.0 (Second Class-Upper division) during the last four full-time semesters of a completed Bachelor's degree program in nutrition or a closely related field.

Students with limitations in their academic background may be admitted into a qualifying program for a maximum of two semesters if they have met the School's minimum CGPA of 3.2 of 4.0.

**Successful completion of a qualifying program does not guarantee admission to a degree program.**

**M.Sc. (Applied)**

Applicants to the M.Sc. Applied project or practicum options must have a B.Sc.(Nutritional Sciences) or equivalent with a GPA of 3.2 or higher. The program is available to students who do not have a

working knowledge of French, however, not all project or practicum opportunities will be open to them.

All eligible candidates may select the project option. The project option may also serve as a route to dietetics credentialing for some candidates. Applicants who have completed a dietetics internship and six months' work experience are eligible for the practicum option.

#### Ph.D.

Admission for Ph.D. studies normally requires a M.Sc. degree in an area related to the chosen field of specialization.

## 22.4 Application Procedures

Applicants for graduate studies through academic units in the Faculty of Agricultural and Environmental Sciences may submit on-line applications via the Web at <http://www.mcgill.ca/applying/graduate> or printed applications. Supporting documents must be sent to:

Student Affairs Office (Graduate Studies)  
Macdonald Campus of McGill University  
21,111 Lakeshore  
Sainte-Anne-de-Bellevue, QC H9X 3V9  
Canada

Telephone: (514) 398-7925

Fax: (514) 398-7968

Email: [grad@macdonald.mcgill.ca](mailto:grad@macdonald.mcgill.ca)

Applications will be considered upon receipt of a signed and completed application form, \$60 application fee, current resumé, statement describing reasons for interest in the program and career goals, all official transcripts, two signed original letters of reference on official letterhead of originating institution, and (if required) proof of competency in oral and written English by appropriate exams. DOCUMENTS SUBMITTED WILL NOT BE RETURNED.

**Deadlines** – Applications, including all supporting documents must reach the Student Affairs Office no later than June 15 (March 1 for International) for the *September session*; October 15 (July 1 for International) for the *January session*; February 15 (November 1 for International) for the *Summer session*. It may be necessary to delay review of the applicant's file until the following admittance period if application materials including supporting documents are received after these dates. International applicants are advised to apply well in advance of the deadline because immigration procedures may be lengthy. Applicants are encouraged to make use of the web-based application form on the McGill website <http://www.mcgill.ca/applying/graduate>

**Application Fee (non-refundable)** – A fee of \$60 Canadian must accompany each application (including McGill students), *otherwise it cannot be considered*. This sum must be remitted using one of the following methods:

1. Credit card (by completing the appropriate section of the application form). NB: on-line applications must be paid for by credit card.
2. **Certified** cheque in Cdn.\$ drawn on a Canadian bank.
3. **Certified** cheque in U.S.\$ drawn on a U.S. bank.
4. Canadian Money order in Cdn.\$.
5. U.S. Money Order in U.S.\$.
6. An international draft in Canadian funds drawn on a Canadian bank requested from the applicant's bank in his/her own country.

**Transcripts** – Two official copies of all transcripts are required for admission. Transcripts written in a language other than English or French must be accompanied by a certified translation. An explanation of the grading system used by the applicant's university is essential. It is the applicant's responsibility to arrange for transcripts to be sent.

It is desirable to submit a list of the titles of courses taken in the major subject, since transcripts often give code numbers only. Applicants must be graduates of a university of recognized reputation and hold a Bachelor's degree equivalent to a McGill Honours

degree in a subject closely related to the one selected for graduate work.

The minimum cumulative grade point average (CGPA) is 3.0/4.0 (second-class upper) or 3.2/4.0 during the last two full-time years of university study. High grades are expected in courses considered by the academic unit to be preparatory to the graduate program.

**Letters of Recommendation** – Two letters of recommendation *on letterhead (official paper) or bearing the university seal* and with original signatures from two instructors familiar with the applicant's work, preferably in the applicant's area of specialization, are required. It is the applicant's responsibility to arrange for these letters to be sent.

**Competency in English** – Non-Canadian applicants whose mother tongue is not English and who have not completed an undergraduate degree using the English language are required to submit documented proof of competency in oral and written English, by appropriate exams, e.g. TOEFL (minimum score 560 on the paper-based test, 220 on the computer-based) or IELTS (minimum overall band 6.5). The MCHE is not considered equivalent. The School reserves the right to request TOEFL results. Please contact the School for details. Results must be submitted as part of the application. The University code is 0935 (McGill University, Montreal); please use Department code 31 (Graduate Schools), Biological Sciences - Agriculture, to ensure that your TOEFL reaches this office without delay.

**Graduate Record Exam (GRE)** – The GRE is required for all applicants to the School of Dietetics and Human Nutrition who are submitting non-Canadian and non-U.S. transcripts.

**Financial aid is very limited and highly competitive. It is suggested that students give serious consideration to their financial planning before submitting an application.**

Acceptance to all programs depends on a staff member agreeing to serve as the student's supervisor and the student obtaining financial support. Normally, a student will not be accepted unless adequate financial support can be provided by the student and/or the student's supervisor. Academic units cannot guarantee financial support via teaching assistantships or other funds.

**Qualifying Students** – Some applicants whose academic degrees and standing entitle them to serious consideration for admission to graduate studies, but who are considered inadequately prepared in the subject selected may be admitted to a *Qualifying Program*. The course(s) to be taken in a *Qualifying Program* will be prescribed by the academic unit concerned. *Qualifying students* are registered in graduate studies, **but not as candidates for a degree**. Only one qualifying year is permitted. **Successful completion of a qualifying program does not guarantee admission to a degree program.**

## 22.5 Program Requirements

### M.Sc.

Program requirements for the M.Sc. include a minimum of 45 credits. This is comprised of 31 credits for the thesis (NUTR 680, NUTR 681, NUTR 682, NUTR 683), two credits of required seminars (NUTR 695, NUTR 696), and four three-credit graduate courses. The student may be advised to take more than four courses.

### M.Sc. Applied

Program requirements for the M.Sc. Applied include a minimum of 45 credits. This is comprised of 29 course credits (nine three-credit courses and two credits of required seminars (NUTR 695, NUTR 696), and 16 credits of project or practicum courses.

### Ph.D.

Requirements for the Ph.D. include a course of study recommended by the committee including a comprehensive examination (NUTR 701), a research dissertation, and two credits of required seminars (NUTR 797, NUTR 798). Course work at the Ph.D. level normally comprises a smaller portion than for the M.Sc. degree. The research program must clearly show originality and be a con-

tribution to knowledge. At least three years are required to meet the Ph.D. requirements. Outstanding students may be permitted to transfer to the Ph.D. program following the first year of M.Sc. study.

## 22.6 Courses

For the term (Fall and/or Winter), days, and times when courses will be offered, please refer to the 2002-2003 Class Schedule on the Web, <http://www.mcgill.ca/minerva-students/class/>. Class locations and names of instructors are also provided.

Students preparing to register are advised to consult the Class Schedule website for the most up-to-date list of courses available. New courses may have been added or courses rescheduled after this Calendar went to press.

The schedule of courses to be offered in Summer 2003, will be available on the website in January 2003.

NUTR has replaced 382 as the prefix for Nutrition and Dietetics courses.

The course credit weight is given in parentheses after the title.

● Denotes courses not offered in 2002-03

★ Denotes courses offered only in alternate years.

Some courses are given every second year.

Students may also take courses in other faculties such as Medicine or Education.

★ **NUTR 501 NUTRITION IN DEVELOPING COUNTRIES.** (3) (Fall) (2 lectures and one seminar) (Prerequisite: consent of instructor) This course will cover the major nutritional problems in developing countries. The focus will be on nutrition and health and emphasize young children and other vulnerable groups. The role of diet and disease for each major nutritional problem will be discussed.

**NUTR 510 PROFESSIONAL PRACTICE - STAGE 4.** (14) (Fall) (Prerequisite: NUTR 409) (Restriction: Not open to students who have taken NUTR 410) Interrelated modules of directed experience in clinical nutrition, foodservice management, nutrition education and community nutrition, in health care setting and in the private sector.

● ★ **NUTR 511 NUTRITION AND BEHAVIOUR.** (3) (2 lectures and one seminar) (Prerequisite: NUTR 445 for undergraduate students or consent of instructor)

● **NUTR 512 HERBS, FOODS AND PHYTOCHEMICALS.** (3) (3 lectures and a project)

● ★ **NUTR 600 ADVANCED CLINICAL NUTRITION 1.** (3) (3 lectures) (Prerequisites: Courses in human nutrition, biochemistry and physiology and permission of instructor.)

● ★ **NUTR 601 ADVANCED CLINICAL NUTRITION 2.** (3) (3 lectures) (Prerequisites: NUTR 377, NUTR 344, NUTR 445 or equivalent and permission of instructor.)

★ **NUTR 602 NUTRITIONAL - STATUS ASSESSMENT.** (3) (1 lecture and 1 lab) (Prerequisites: courses in human nutrition, biochemistry and physiology.) The understanding and evaluation of dietary and anthropometric indices used in the nutritional assessment of individuals and groups.

★ **NUTR 603 NUTRITIONAL TOXICOLOGY.** (3) (Prerequisites: courses in human nutrition, biochemistry and physiology.) Combined lectures and tutorials cover topics in: mechanisms of nutrient modulation of xenobiotic toxicities; effects of nutrient excess and malnutrition on drug metabolism and toxicity; biogeography and hazards of environmental contaminants and food toxins; and nutrient effects on teratogenesis and carcinogenesis.

● ★ **NUTR 604 INTEGRATED METABOLIC RESEARCH.** (3) (2 seminars and 1 lab visit) (Prerequisites: at least one 500 or 600-level course in nutritional biochemistry, e.g. ANSC 551, ANSC 552, ANSC 634, and permission of instructor.)

**NUTR 606 HUMAN NUTRITION RESEARCH METHODS.** (3) (3 lectures) (Prerequisites: A graduate course in statistics or permission

of the instructor.) Basic approaches, philosophy and techniques used in nutrition research with human population groups. The course will include the formation and criticism of designs for research, sampling techniques, measurement and analysis issues and human research ethics.

**NUTR 608 SPECIAL TOPICS 1.** (3) (Prerequisite: permission of instructor and Director of School. Restricted to graduate students in Nutrition.) Prescribed reading, conference, lectures, assignments and/or practical work on selected topics in student's area of specialization. An approved course outline must be on file in the School's office prior to registration.

**NUTR 609 SPECIAL TOPICS 2.** (3) (Prerequisite: permission of instructor and Director of School. Restricted to graduate students in Nutrition.) An individualized course to allow students to undertake projects in library, laboratory, or field study. An approved course outline must be on file in the School's office prior to registration.

● ★ **NUTR 610 MATERNAL AND CHILD NUTRITION.** (3)

● ★ **NUTR 620 NUTRITION OF INDIGENOUS PEOPLES.** (3) (Prerequisite: One course in nutritional sciences.)

★ **NUTR 623 FUNCTIONAL FOODS.** (3) (Prerequisite: NUTR 207, NUTR 307 or equivalent) The science and application of functional foods and nutraceuticals in the context of maintenance of optimal health and disease risk reduction. Legislative and regulatory frameworks which control the use of the functional foods and nutraceuticals sector.

**NUTR 651 M.Sc. (APPLIED) NUTRITION 1.** (3) (Corequisites: NUTR 606, NUTR 695) Review of literature and problem definition for both the project option or for placement preparation for practicum option. This course relates to the Human Nutrition M.Sc. (Applied) degree and is required for both project and practicum options.

**NUTR 652 M.Sc. (APPLIED) PROJECT 1.** (3) (Prerequisite: NUTR 651) Project design and planning.

**NUTR 653 M.Sc. (APPLIED) PROJECT 2.** (3) (Prerequisite: NUTR 652) Project execution. This project relates to the Human Nutrition M.Sc. (Applied) degree.

**NUTR 654 M.Sc. (APPLIED) PROJECT 3.** (3) (Prerequisite: NUTR 653) Continuation of project execution and data collection; preliminary analysis. This project relates to the Human Nutrition M.Sc. (Applied) degree.

**NUTR 655 M.Sc. (APPLIED) PROJECT 4.** (3) (Prerequisite: NUTR 654) Data analysis. Submission of project report. This project relates to the Human Nutrition M.Sc. (Applied) degree.

**NUTR 656 M.Sc. (APPLIED) PRACTICUM 1.** (3) (Prerequisite: NUTR 651) Clinical or community placement (4 weeks). Submission of placement report. This practicum relates to the Human Nutrition M.Sc. (Applied) degree.

**NUTR 657 M.Sc. (APPLIED) PRACTICUM 2.** (3) (Prerequisite: NUTR 656) Continuation of placement (4 weeks). Submission of placement report. This practicum relates to the Human Nutrition M.Sc. (Applied) degree.

**NUTR 658 M.Sc. (APPLIED) PRACTICUM 3.** (3) (Prerequisite: NUTR 657) Continuation of placement (4 weeks). Submission of placement report. This practicum relates to the Human Nutrition M.Sc. (Applied) degree.

**NUTR 659 M.Sc. (APPLIED) PRACTICUM 4.** (3) (Prerequisite: NUTR 658) Continuation of placement (4 weeks). Submission of placement report. This practicum relates to the Human Nutrition M.Sc. (Applied) degree.

**NUTR 660 M.Sc. (APPLIED) NUTRITION 2.** (1) (Prerequisites: NUTR 653; NUTR 659 or NUTR 655) Oral presentation. This presentation relates to the Human Nutrition M.Sc. (Applied) degree, project and practicum options.

● **NUTR 679 INTERNATIONAL NUTRITION.** (3)



**NUTR 680 HUMAN NUTRITION M.Sc. THESIS 1.** (6) Independent research under the direction of a supervisor toward completion of the M.Sc. thesis.

**May also be available as: NUTR 680D1, NUTR 680D2; NUTR 680N1, NUTR 680N2.**

**NUTR 681 HUMAN NUTRITION M.Sc. THESIS 2.** (6) Independent research under the direction of a supervisor toward completion of the M.Sc. thesis. Presentation of a thesis proposal.

**May also be available as: NUTR 681D1, NUTR 681D2; NUTR 681N1, NUTR 681N2.**

**NUTR 682 HUMAN NUTRITION M.Sc. THESIS 3.** (9) Independent research under the direction of a supervisor toward completion of the M.Sc. thesis.

**May also be available as: NUTR 682D1, NUTR 682D2; NUTR 682N1, NUTR 682N2.**

**NUTR 683 HUMAN NUTRITION M.Sc. THESIS 4.** (10) Final submission, thesis defense seminar and approval of the M.Sc. thesis.

**May also be available as: NUTR 683D1, NUTR 683D2; NUTR 683N1, NUTR 683N2.**

**NUTR 695 HUMAN NUTRITION SEMINAR 1.** (1) Students will present a recent original research article in which the methods and data presentation will be critically analyzed. The article must be approved by the instructor.

**NUTR 696 HUMAN NUTRITION SEMINAR 2.** (1) Students will present a recent original research article in which the methods and data presentation will be critically analyzed. The article must be approved by the instructor.

**NUTR 701 DOCTORAL COMPREHENSIVE EXAMINATION.** (0) (See Faculty Regulations)

**May also be available as: NUTR 701D1, NUTR 701D2.**

● **NUTR 795 HUMAN NUTRITION SEMINAR 4.** (0)

**NUTR 797 HUMAN NUTRITION SEMINAR 3.** (1) Doctoral candidates will present a recent original research article in which the methods and data presentation will be critically analyzed. The article must be approved by the instructor.

**NUTR 798 HUMAN NUTRITION SEMINAR 4.** (1) Doctoral candidates will present a group of recent research articles in which the methods and data presentation will be critically analyzed. The articles must be approved by the instructor.

## 23 Earth and Planetary Sciences

Department of Earth and Planetary Sciences  
Frank Dawson Adams Building  
3450 University Street  
Montreal, QC H3A 2A7  
Canada

Telephone: (514) 398-6767  
Fax: (514) 398-4680  
Email: carol.matthews@mcgill.ca  
Website: <http://www.eps.mcgill.ca>

Chair — Alfonso Mucci

### 23.1 Staff

#### *Emeritus Professors*

E.W. Mountjoy; B.A.Sc.(Br.Col.), Ph.D.(Tor.)  
W.H. MacLean; B.Geol.Eng.(Colo. Sch. of Mines), M.Sc.(A),  
Ph.D.(McG.)  
C.W. Stearn; B.Sc.(McM.), M.S., Ph.D.(Yale), F.R.S.C.

#### *Professors*

J. Arkani-Hamed; B.Eng.(Tehran), Ph.D.(M.I.T.)  
D. Francis; B.Sc.(McG.), M.Sc.(Br.Col.), Ph.D.(M.I.T.)  
A.J. Hynes; B.Sc.(Tor.), Ph.D.(Cantab.)  
O.G. Jensen; B.Sc., M.Sc., Ph.D.(Br.Col.)  
R.F. Martin; B.Sc.(Ott.), M.S.(Penn. St.), Ph.D.(Stan.)  
A. Mucci; B.Sc., M.Sc.(Montr.), Ph.D.(Miami)  
A.E. Williams-Jones; B.Sc., M.Sc.(Natal), Ph.D.(Queen's)

#### *Associate Professors*

D. Baker; B.A.(Chic.), Ph.D.(Penn. St.)  
J. Paquette; B.Sc., M.Sc.(McG.), Ph.D.(Stonybrook)  
J. Stix; A.B.(Dart.), M.Sc., Ph.D.(Tor.)  
H. Vali (Director, Electron Microscopy Centre)

#### *Assistant Professors*

M. Best; B.Sc.,(Laurentian), Ph.D.(Chicago)  
B. Hart; B.A.(McM.), M.Sc.(UQAR), Ph.D.(W.Ont.)

#### *Adjunct Professors*

H. Hofmann; B.Sc., M.Sc., Ph.D.(McG.)  
B. Sundby; B.Sc., M.Sc., Ph.D., Senior Ph.D.(U of Bergen,  
Norway)

#### *Lecturer*

S.T. Ahmedali

#### *Associate Members*

M. Bilodeau (Mining Engineering)  
B. Volesky (Chemical Engineering)

#### *Research Associate*

P. Lorrain

## 23.2 Programs Offered

Opportunities for advanced study and research in geology, geochemistry, geophysics, planetary sciences and oceanography are available to qualified students. Graduate programs leading to the M.Sc., and Ph.D. degrees are offered.

Financial assistance is available in the form of demonstratorships, research assistantships and scholarships.

### AREAS OF RESEARCH

#### **Economic Geology**

Application of geochemistry in understanding the genesis of hydrothermal mineral deposits (Cu, Mo, W, Sn, Au, Ag, and REE), in particular those associated with felsic intrusives and carbonates. Experimental simulations of fluid-rock interaction and investigation of metal solubility and speciation at elevated temperatures and pressures.

#### **Environmental Geology and Low Temperature Geochemistry**

Low-temperature geochemistry and chemical oceanography; chemical thermodynamics and kinetics of solid solution reactions in natural environments; early diagenesis of marine, coastal, and estuarine sediments; crystal growth mechanisms in low-temperature aqueous solutions and their influence on element partitioning in minerals.

#### **High-Temperature Geochemistry**

Experimental and theoretical studies of melting and crystallization in oxide, silicate and sulfide systems at temperatures and pressures up to 2200°C and 5.5 Gpa. Spectroscopic studies of the structure of silicate melts and their transport properties, diffusion and viscosity. Effects of volatiles on the melting and crystallization of igneous systems.

#### **Igneous Petrology**

Origin and evolution of basic magmas in the mantles of the terrestrial planets; non-orogenic magmatism, alkali feldspars as indicators of magmatic and post-magmatic processes; high-temperature geochemistry, experimental investigation of petrogenetic processes, structure and properties of silicate melts and glasses, physical and chemical controls on volcanic eruptions.

#### **Mineralogy/Crystal Chemistry**

Studies of crystal growth mechanism of minerals, with emphasis on carbonate minerals, natural and synthetic, of sedimentary and hydrothermal origin. X-ray diffraction, electron probe microanalysis, atomic force microscopy and cathodoluminescence are used to study the influence of conditions of growth on the incorporation of trace elements, surface topography and crystal morphology.

#### **Petroleum Geoscience**

Integrated studies of hydrocarbon reservoirs using 3-D seismic data, borehole logs, core and outcrop analogues; reservoir compartmentalization by stratigraphic and structural features;

attribute-based prediction of physical properties; naturally fractured tight-gas reservoirs.

#### Planetary Sciences

Geophysical potential fields, dynamics of planetary interiors; global geodynamics and physics of Earth's interior; seismology – tectonophysics, geophysical systems analysis.

#### Sedimentary Geology

Sedimentology and stratigraphy of modern and ancient clastic and carbonate systems from outcrop, marine sampling, and subsurface data; sequence stratigraphy; diagenesis.

#### Tectonics

Tectonics and structural geology, transpression in the Canadian Cordillera, origin of the Hudson Bay Arc, gravity features of sutures in the Canadian Shield, uplift of the Laurentides, paleomagnetism and plate motions.

#### Volcanology

Physical and chemical approaches to the study of active volcanoes and magmatic-hydrothermal systems; caldera systems, including the chemistry of silicic volcanic rocks, field and experimental studies of collapse mechanisms, and comparisons of recent and ancient caldera systems; magmatic volatiles and volcanic gas studies; arc volcanism, including eruption monitoring; and subaqueous volcanism, including experimental studies of subaqueous pyroclastic flows, and fragmentation of magma.

### 23.3 Admission Requirements

Applicants should have an academic background equivalent to that of a McGill graduate in the Honours or Major program in geology, geophysics, chemistry, or physics (3.0 out of 4.0). The admissions committee may modify the requirements in keeping with the field of graduate study proposed. In some cases a qualifying year may be required.

### 23.4 Application Procedures

Applications and all supporting documents should be received in the Department before February 1st for admission the following September. Applicants who want to be considered for entrance awards, or requiring financial assistance, should apply as early as possible. There are no special forms required to apply for financial aid from the Department, as all applicants will be considered for the awards for which they are eligible.

Candidates should indicate their field(s) of interest when making formal application for admission. Specific inquiries concerning the Department should be addressed to Graduate Admissions, Department of Earth and Planetary Sciences.

Commencing with applications for entry in January 2003, McGill's on-line application form will be available to all graduate program candidates at <http://www.mcgill.ca/applying/graduate>.

### 23.5 Program Requirements

#### M.Sc. Degree (45 credits)

The M.Sc. degree program includes:

- 12 credits from formal graduate courses to be chosen with the approval of the research director and Director of Graduate Studies and
- a thesis (33 credits) to be submitted according to the regulations of the Graduate and Postdoctoral Studies Office and the Department.

#### Ph.D. Degree

The Ph.D. degree program comprises:

- an approved program of courses selected in consultation with the student's academic adviser, and approved by the Academic Standing Committee,
- a Comprehensive oral examination at the end of the Ph.D.II, and
- research leading to a Ph.D. thesis followed by an oral defense.

Highly qualified B.Sc. graduates may be admitted directly to the Ph.D.I year. Students with the M.Sc. degree may be admitted to either the Ph.D.I or Ph.D.II year, depending on their background. Students are required to take 18 credits of graduate course study in the Ph.D.I year, and 6 credits plus a comprehensive oral examination in the Ph.D.II year. There is no language requirement for the Ph.D. degree.

### 23.6 Graduate Courses

**Please note: courses may have been rescheduled or new courses added after this Calendar went to press. Students preparing to register are advised to consult the 2002-2003 Class Schedule on the Web at <http://www.mcgill.ca/minerva-students> for the most up-to-date information.**

**The Class Schedule includes the term(s), days, and times when courses will be offered, as well as class locations and names of instructors.**

**The schedule of courses to be offered in Summer 2003 will be available on the website in January 2003.**

The course credit weight is given in parentheses after the title. Term(s) offered (Fall, Winter, Summer) may appear after the credit weight to indicate when a course would normally be taught. Please check the Class Schedule to confirm this information.

EPSC has replaced 186 as the prefix for Earth and Planetary Sciences courses.

- Denotes courses not offered in 2002-03

**NOTE:** All undergraduate courses administered by the Faculty of Science (courses at the 100- to 500-level) have limited enrolment.

**EPSC 501 CRYSTAL CHEMISTRY.** (3) (Winter) (2 hours lectures, 1 hour seminar) Discussion of crystal structures and compositions of important mineral groups, especially oxides, sulphides and silicates. Solid solution. Relation of structure to morphology and to chemical and physical properties of the rock-forming minerals.

**EPSC 510 GEODYNAMICS AND GEOMAGNETISM.** (3) (Fall) (3 lecture) (Prerequisites: EPSC 320, MATH 319 or permission of the instructor. Corequisite: EPSC 350) The gravity field of the Earth and planets, body and orbital dynamics the Earth, moon and planets, tidal interactions of the Earth-moon-sun system, deformation of the Earth under static and dynamic loads, the magnetic field of the Earth and planets: the magnetosphere, the external radiation belts, magnetohydrodynamic models of the core dynamo, geochemical convection in the core, fluid dynamic motions of the outer core, dynamics of the inner core.

- **EPSC 519 ISOTOPE GEOLOGY.** (3) (Fall) (3 lectures)

**EPSC 525 SUBSURFACE MAPPING.** (3) (Winter) (Prerequisites: EPSC 455 or permission of instructor) This course will provide participants the opportunity to learn how different types of data (wireline logs, seismic, etc.) are employed to map geological features in the subsurface. Lectures will teach participants about the physical basis of each of the data types, and the basic mapping and analytical techniques (e.g., geostatistics, gridding) that are employed in subsurface mapping. The principal focus will be on applying these techniques and concepts to real-world data sets.

**EPSC 530 VOLCANOLOGY.** (3) (Fall) (2 hours lecture, 3 hours laboratory) (Prerequisites: EPSC 212 and EPSC 312, or permission of instructor) The physical mechanisms which drive volcanoes and volcanic activity are presented. Descriptive, practical and theoretical approaches to the study of volcanoes are discussed.

**EPSC 542 CHEMICAL OCEANOGRAPHY.** (3) (Fall) (Prerequisites: CHEM 213, CHEM 257 or equivalents, or registration in Graduate Program in Oceanography) History of chemical oceanography. Seawater composition and definition of salinity/chlorinity. Minor and trace-element distribution in the ocean. Geochemical mass balance. Dissolved gases in sea water. CO<sub>2</sub> and the carbonate system. Chemical speciation. Physical chemistry of seawater. Organic matter and the carbon cycle in the marine environment. Sediment geochemistry.

- **EPSC 545 LOW-TEMPERATURE GEOCHEMISTRY.** (3) (Winter) (Prerequisites: CHEM 203, CHEM 213, EPSC 212, EPSC 312)

● **EPSC 546 DIAGENESIS.** (3) (Fall) (2 lecture, 3 laboratory/seminars) (Prerequisites: EPSC 212, EPSC 220, EPSC 312)

**EPSC 547 HIGH-TEMPERATURE GEOCHEMISTRY.** (3) (Fall) (2 hours lectures, 3 hours laboratory) (Prerequisites: CHEM 203, CHEM 204 or CHEM 213, or permission of instructor) The application of thermodynamic principles to igneous and metamorphic petrology and economic geology. Topics include but are not restricted to: solid solutions in minerals, behaviour of geological fluids, phase equilibria, flow processes, estimation of thermodynamic data.

● **EPSC 548 PROCESSES OF IGNEOUS PETROLOGY.** (3) (Fall) (2 hours lecture, 1 hour seminar) (Prerequisite: EPSC 423)

● **EPSC 549 HYDROGEOLOGY.** (3) (Winter) (3 hours lecture, 1-2 hours laboratory) (Prerequisite: permission of the instructor)

**EPSC 550 SELECTED TOPICS 1.** (3) (Fall or Winter) (2 hours seminar, permission of department undergraduate advisor) Research seminar and/or lecture with readings in topics concerning aspects of current interests in Earth & Planetary Sciences.

**EPSC 551 SELECTED TOPICS 2.** (3) (Fall or Winter) (2 hours seminar, permission of department undergraduate advisor) Research seminar and/or lecture with readings in topics concerning aspects of current interest in Earth & Planetary Sciences.

**EPSC 552 SELECTED TOPICS 3.** (3) (Fall or Winter) (2 hours seminar, permission of department undergraduate advisor) Research seminar and/or lecture with readings in topics concerning aspects of current interest in Earth & Planetary Sciences.

● **EPSC 570 COSMOCHEMISTRY.** (3) (Fall) (3 hours lecture) (Prerequisites: EPSC 220, EPSC 210 or permission of instructor)

● **EPSC 580 AQUEOUS GEOCHEMISTRY.** (3) (Winter) (3 hours lecture) (Prerequisites: EPSC 210, EPSC 212 or permission of instructor)

● **EPSC 590 APPLIED GEOCHEMISTRY SEMINAR.** (3) (Winter) (3 hours seminar) (Prerequisite: permission of instructor)

**EPSC 601 FELSIC IGNEOUS PETROLOGY.** (3) (Prerequisite: EPSC 423 or equivalent) A review of the mineralogy and phase equilibria relevant to felsic igneous systems. Role of crust and mantle source-areas. Importance of postmagmatic phenomena. Petrogenetic schemes in the current literature.

● **EPSC 603 MAFIC IGNEOUS ROCKS.** (3) (Prerequisite: EPSC 423 or equivalent)

● **EPSC 604D1 PETROLOGY OF MINERAL DEPOSITS.** (3) (3 hours lecture or seminar)

● **EPSC 604D2 PETROLOGY OF MINERAL DEPOSITS.** (3)

● **EPSC 613 REGIONAL STRUCTURAL ANALYSIS.** (3) (2 hours lectures, 2 hours lab)

● **EPSC 631 FIELD STUDIES - OROGENIC BELTS.** (3)

● **EPSC 631D1 FIELD STUDIES - OROGENIC BELTS.** (1.5)

● **EPSC 631D2 FIELD STUDIES - OROGENIC BELTS.** (1.5)

**EPSC 638 EVOLUTION OF PLANETS.** (3) The formation of the solar system, dynamics of planetary nebulae, accretion of planets, dynamics of the planetary system, thermal evolution and internal structure of planets, and origin of the planetary magnetic field.

**EPSC 644 TOPICS - ADVANCED EARTH SCIENCES 1.** (3) (3 hours lectures or seminars) A survey of a research topic of particular current interest.

**EPSC 645 TOPICS - ADVANCED EARTH SCIENCES 2.** (3) (3 hours lectures or seminars) A survey of a research topic of particular current interest.

● **EPSC 650 GREENSTONE BELTS.** (3) (2 hours lecture, 3 hours lab)

● **EPSC 655 ALTERATION LITHOGEOCHEMISTRY.** (3) (2 hours lecture, 3 hours lab)

**EPSC 697 THESIS PREPARATION 1.** (9) Independent study, theoretical and/or laboratory work in connection with the development of an M.Sc. thesis. Success in the course is dependent on presentation of an adequate progress report to the supervisory committee.

**May also be available as:**

**EPSC 697D1, EPSC 697D2; EPSC 697N1, EPSC 697N2.**

**EPSC 698 THESIS PREPARATION 2.** (12) Independent study, theoretical and/or laboratory work in connection with the development of an M.Sc. thesis. Success in the course is dependent on presentation of an adequate progress report to the supervisory committee.

**May also be available as:**

**EPSC 698D1, EPSC 698D2; EPSC 698N1, EPSC 698N2.**

**EPSC 699 THESIS PREPARATION 3.** (12) Independent study, theoretical and/or laboratory work in connection with the development of an M.Sc. thesis. Success in the course is dependent on presentation of an adequate progress report to the supervisory committee.

**May also be available as:**

**EPSC 699D1, EPSC 699D2; EPSC 699N1, EPSC 699N2.**

**EPSC 700D1 PRELIMINARY DOCTORAL EXAMINATION.** (0) (Students must also register for EPSC 700D2) (No credit will be given for this course unless both EPSC 700D1 and EPSC 700D2 are successfully completed in consecutive terms) (EPSC 700D1 and EPSC 700D2 together are equivalent to EPSC 700)

**EPSC 700D2 PRELIMINARY DOCTORAL EXAMINATION.** (0) (Prerequisite: EPSC 700D1) (No credit will be given for this course unless both EPSC 700D1 and EPSC 700D2 are successfully completed in consecutive terms) (EPSC 700D1 and EPSC 700D2 together are equivalent to EPSC 700)

● **EPSC 706 ADVANCED SEDIMENTOLOGY.** (6) (2 hours lectures or seminar and 3 hours lab)

● **EPSC 706D1 ADVANCED SEDIMENTOLOGY.** (3)

● **EPSC 706D2 ADVANCED SEDIMENTOLOGY.** (3)

**EPSC 710 GEOTECTONICS.** (3) (2 hours lectures or seminars) Plate tectonics and orogenesis. Plate tectonics in the geologic past. Problems of tectonic evolution in Precambrian time.

**EPSC 713 ECONOMIC GEOLOGY 1.** (3) (3 hours seminar) (Prerequisite: undergraduate course in economic geology or permission of the instructor.) Physicochemical controls of hydrothermal mineral deposition. Discussion of fluid inclusion theory and application; stable isotope systematics, wall-rock alteration; ore mineral solubility and speciation; and mechanisms of mineral deposition.

**EPSC 714 ECONOMIC GEOLOGY 2.** (3) (3 hours seminar) (Prerequisite: undergraduate course in economic geology or permission of the instructor.) Genesis of hydrothermal mineral deposits. Discussion of geological setting, fluid and metal sources, method of metal transport, and factors controlling metal concentration for a selection of hydrothermal mineral deposit types.

**EPSC 715 INSTRUMENTAL ANALYSIS.** (3) (3 hours lectures, 3 hours lab) Application of analytical instrumental techniques to obtaining reliable chemical data from complex (geological and environmental) materials, and evaluation of the data in problem solving. Electron Microprobe Analysis (WDS and EDS), Scanning Electron Microscopy, X-ray Fluorescence Spectrometry, X-ray Diffraction, Atomic Spectroscopy (Atomic Absorption, ICP and ICP-MS), Neutron Activation Analysis.

● **EPSC 717D1 ADVANCED EARTH PHYSICS.** (3) (2 hours lecture or seminar and assignments)

● **EPSC 717D2 ADVANCED EARTH PHYSICS.** (3)

● **EPSC 719 ISOTOPE GEOLOGY SEMINAR.** (3) (2 hours seminar and assigned reading) (Prerequisites: EPSC 519 and permission of instructor)

**EPSC 725 INDEPENDENT STUDIES 1.** (3) (Not available to students who have taken EPSC 720. Ineligible for credit in M.Sc. Thesis program) Research and/or reading project. Independent study under the guidance of qualified staff in areas of special interest to the student.

**EPSC 726 INDEPENDENT STUDIES 2.** (3) (Not available to students who have taken EPSC 720. Ineligible for credit in M.Sc. Thesis program) Research and/or reading project. Independent study under the guidance of qualified staff in areas of special interest to the student.