

15 Civil Engineering and Applied Mechanics

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Chair — R.D. Japp

Chair of Graduate Program — A.P.S. Selvadurai

15.1 Staff

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.
R.G. Rice; B.A.Sc.(Tor.), S.M.(M.I.T.), Dipl.U. & R. Pl., Ph.D.(Tor.),
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.
R.D. Japp; B.Eng., M.Eng., Ph.D.(McG.), Eng.
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.

Assistant Professors

S.J. Gaskin; B.Sc.(Eng.)(Queen's), Ph.D.(Cant.)
S. Ghoshal; B.C.E.(India), M.S.(Missouri), Ph.D.(Carnegie Mellon)
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, J. Mirza, T.S. Nguyen, R.G. Redwood,
S.B. Savage, P. Trottier, R.N. Yong, 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, Institut National de la Recherche Scientifique - Urbanisation, and Université de Sherbrooke. 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 and Metallurgical 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 Faculty apply and are detailed in the General Information and Faculty Regulations section. The minimum academic standard for admission is normally a Cumulative Grade Point Average (CGPA) of 3.0 or better. The General Test of the GRE is required of all applicants whose university degree(s) were obtained outside of North America.

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 Test of English as a Foreign Language (TOEFL) for entry to the Ph.D. program, and 550 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 (GRE, 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 April 1, and those for January admission by August 1 (international students) and October 1 (Canadian students).

15.5 Program Requirements

15.5.1 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 rules of the Faculty.

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 at least 12 of the coursework credits be at the 600 level. The above minimum course require-

ments 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.

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) 303-225B Environmental Engineering or equivalent environmental engineering courses

A. Required Core Courses

- 303-554A Environmental Engineering Seminar
- 302-591B Environmental Bioremediation
- 303-555B Environmental Data Analysis
or 360-611B Experimental Designs
- 392-612A Principles of Toxicology
or 333-505B 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 and Metallurgical Engineering

C. Elective Non-engineering Courses

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

- 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
- Department of Epidemiology and Biostatistics
- Department of Geography
- Faculty of Law
- Faculty of Management
- Department of Occupational Health
- Department of Political Science
- Department 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, Professor V.T.V. Nguyen, 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, Institut National de la Recherche Scientifique - Urbanisation, and Université de Sherbrooke. 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
- 303-512(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

- 303-527 Renovation and preservation of infrastructure
- 303-617 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 - 2 options)

Option 1:

- 303-528 Rehabilitation case studies (3 credits)
- Research project (12 credits)

Option 2:

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.

15.5.2 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.

15.5.3 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 303-701) within the first year of their Ph.D. registration. They must fulfill the requirements outlined in the general rules of the Faculty. There is no foreign language requirement.

15.6 Courses for Higher Degrees

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

- Denotes not offered in 1999-2000.
Not all of the courses listed below are given each year; a list of courses to be offered is made available in the Department prior to each term.

303-512 B ADVANCED CIVIL ENGRG. MATERIALS. (3) (Prerequisite: 303-202B) Production, structure and properties of engineering materials; ferrous alloys, treatments, welding, special steels, cast iron; ceramic materials; polymers; composite materials; concrete, admixtures, structure, creep, shrinkage; asphalt and asphaltic materials; clay materials and bricks; impact of environment on material response, durability, quality assessment and control, industrial specifications; recent advances.

Professor Shao

303-514A STRUCTURAL MECHANICS. (3) Stress, strain, and basic equations of linear elasticity. General and particular solutions of plane and axisymmetric problems. St. Venant's theory. Stress concentration and failure criteria. Formulation and applications of energy principles, and their connection to finite-element and boundary-element methods. Unsymmetrical bending of beams; shear centres; torsion of thin-walled structural members. Curved beams.

Professor Shrivastava

● **303-526B SOLID WASTE MANAGEMENT.** (3) (Prerequisite: 303-225B)

303-527A RENOVATION AND PRESERVATION OF INFRASTRUCTURE. (3) (Prerequisite: 303-202B) 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. **Professor Mirza**

303-528A,B,C REHABILITATION CASE STUDIES. (3) Topical case studies from industrial and governmental experience in rehabilitation of infrastructure. Course conducted in collaboration with four other institutions.

303-540A URBAN TRANSPORTATION PLANNING. (3) (Prerequisite: 303-319B 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. **Professor Rice and Messrs. Boucher and Trottier**

- **303-541B RAIL ENGINEERING.** (3)
- **303-546A,B SELECTED TOPICS IN CIVIL ENGINEERING.** (3)
- **303-547A,B SELECTED TOPICS IN CIVIL ENGINEERING I.** (3)

- **303-548A,B SELECTED TOPICS IN CIVIL ENGINEERING II.** (3)

303-550A WATER RESOURCES MANAGEMENT. (3) A review of state-of-the-art water resources management techniques; case studies and their application to Canadian situations; identification of major issues and problem areas; interprovincial and international river basins; implications of development alternatives; institutional arrangements for planning and development of water resources; legal and economic aspects. **Professor Nguyen**

303-553B STREAM POLLUTION AND CONTROL. (3) 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. **Professor Gehr**

- **303-555B ENVIRONMENTAL DATA ANALYSIS.** (3)

303-571B HYDRAULIC MACHINES. (3) (Prerequisite: 303-428A) Types of pump, performance data and operation of centrifugal pumps, design of pump intakes. Types of turbine, similitude, cavitation, sizing of power stations. Pump-turbines, transients, pressure rise, overspeed. Frequency control of hydraulic turbines.

303-572A COMPUTATIONAL HYDRAULICS. (3) (Prerequisite: 303-327B) Computation of unsteady flows in open channels; abrupt waves, flood waves, tidal propagation; method of characteristics; mathematical modelling of river and coastal currents.

Professor Chu

303-573A HYDRAULIC STRUCTURES. (3) (Prerequisites: 303-323A and 303-327B) 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. **Mr. Holder**

● **303-574 B FLUID MECHANICS OF WATER POLLUTION.** (3) (Prerequisite: 303-327B or equivalent.)

● **303-575B FLUID MECHANICS OF AIR POLLUTION.** (3) (Prerequisite: 303-327B or equivalent.)

● **303-576B HYDRODYNAMICS.** (3) (Prerequisite: 303-327B)

303-577A RIVER ENGINEERING. (3) (Corequisite: 303-428A) 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. (Awaiting University Approval) **Professor Gaskin**

● **303-579B WATER POWER ENGINEERING.** (3) (Prerequisites: 303-323A, 306-310A,B)

303-585A GROUNDWATER HYDROLOGY. (3) (Prerequisite: permission of instructor.) Groundwater geology; steady-state and transient-state regional groundwater; infiltration and recharge; hydrological cycle; chemical constituents; adsorption/desorption processes; Groundwater exploration techniques; pumping tests; groundwater pollution; diffusion and dispersion; thermal processes; groundwater resource management.

Professor Selvadurai

● **303-586B EARTHWORK ENGINEERING.** (3)

● **303-587B PAVEMENT DESIGN.** (3)

303-602B FINITE ELEMENT ANALYSIS. (4) (Prerequisite: 303-514A) 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. **Professor Shrivastava**

303-603B STRUCTURAL DYNAMICS. (4) Dynamic loads on structures; equations of motion of linear single- and multiple-degree-of-freedom systems and of continuous systems; free and forced vibrations; damping in structures; modal superposition and time-

history analysis; earthquake effects; provisions of the National Building Code of Canada for seismic analysis.

Professor McClure

303-604B THEORY OF PLATES AND SHELLS. (4) Analysis of stresses and deformations in plates bent by transverse loads. Circular and rectangular plates. Membrane theory of shells. Axially symmetric bending of cylindrical, conical and spherical shells. Shells of revolution; theory of shallow shells. Use of package programs in the analysis of plate and shell structures.

Professor Shrivastava

303-605B STABILITY OF STRUCTURES. (4) Buckling of elastic columns by equilibrium analysis. Buckling of inelastic columns. Energy analysis and approximate methods. Stability of frames. Torsional buckling of columns and flexural-torsional buckling of beams. Buckling of plates and axially compressed circular cylindrical shells. Stability analysis using the finite element method.

Professor McClure

303-607A ADVANCED DESIGN IN METALS. (4) Physical properties of metals, residual stresses, design concepts. Column theories, column strength, beam-column design, structural frames. Plastic design concepts, ultimate strength, axial forces with bending, shear forces with bending. Economic design considerations.

- **303-609B RISK ENGINEERING.** (4)

- **303-610B SPECIAL TOPICS IN STRUCTURAL MECHANICS.** (4)

303-612A EARTHQUAKE-RESISTANT DESIGN OF STRUCTURES. (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.

Professors Mitchell and Redwood

303-613A,B NUMERICAL METHODS IN STRUCTURAL ENGINEERING. (4) Review of computational methods used in linear static and dynamic problems in structural engineering analysis. Eigenvalue problems in dynamics and stability analysis. Solution techniques for nonlinear equations. Selection criteria: accuracy, stability, efficiency and convergence. Overview of coding techniques used in package programs for structural analysis. Assignments involving computer programming and the use of numerical package programs.

Professor Chouinard

303-615A ENVIRONMENTAL ENGINEERING SEMINAR. (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. (Awaiting University Approval)

- **303-617 A DESIGN AND RATING OF HIGHWAY AND RAILWAY BRIDGES.** (4)

303-618A DESIGN IN CONCRETE I. (4) Concrete physical properties, creep, shrinkage; review of ultimate strength design; combined loadings; design of frames and flat plates; limit design, yield line theory; prestressed concrete, partial prestressing and load balancing. The course will include group projects.

Professor Mirza

- **303-619B DESIGN IN CONCRETE II.** (4)

- **303-621A BEHAVIOUR OF CONCRETE STRUCTURES.** (4)

303-622 A PRESTRESSED CONCRETE. (4) Material properties; prestressing methods and systems; the behaviour and design of members subjected to axial forces, bending, shear and torsion; prestress losses; design of statically determinate and indeterminate structures; composite precast construction; prestressed concrete floor systems. Application to bridge design.

Professor Mitchell

303-623A DURABILITY OF MATERIALS. (4) Safety, serviceability, durability and service life; quality assurance and quality control; material structures, properties and degradation; concrete materials, as-built properties; steel corrosion and protection; steel, timber and masonry properties; deterioration mechanisms; condition sur-

vey; maintenance and repair strategies, materials and processes; economic appraisal, recent development; case studies.

Professor Mirza

303-624B 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.

Professor Mirza

- **303-630A,B,C THESIS RESEARCH I.** (3)

- **303-631A,B,C THESIS RESEARCH II.** (3)

- **303-632A,B,C THESIS RESEARCH III.** (3)

- **303-633A,B,C THESIS RESEARCH IV.** (6)

- **303-634A,B,C THESIS RESEARCH V.** (6)

- **303-635A,B,C THESIS RESEARCH VI.** (6)

- **303-648A,B SPECIAL TOPICS IN CIVIL ENGINEERING.** (4)

- **303-650B DISTRIBUTION AND COLLECTION SYSTEMS.** (4)

- **303-651 B THEORY OF WATER AND WASTEWATER TREATMENT.** (4)

303-652 A BIOLOGICAL TREATMENT OF 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.

Dr. Zaloum

- **303-654B SANITARY ENGINEERING DESIGN.** (4)

- **303-655A WATER RESOURCES ENGINEERING.** (4)

303-656A SYSTEMS ANALYSIS ENGINEERING. (4) Introduction to systems analysis and mathematical optimization; structuring and solution of mathematical programming models with emphasis on nonlinear programming; decision analysis; systems simulation; application of systems analysis techniques to the solution of civil engineering problems.

Professor Nguyen

- **303-657A WASTE DISPOSAL IMPACT.** (3)

- **303-658B SOURCES AND CHARACTERISTICS OF WASTES.** (3)

303-659D,N CHEMICAL ANALYSIS OF WATERS AND WASTES. (4) Theoretical aspects and laboratory analyses for water and wastewater quality, including pH, acidity, alkalinity, hardness, colour, conductivity, solids, turbidity, chlorine, BOD, COD, TOC, TKN, nitrates, phosphorus, oil and grease; also spectroscopic and chromatographic methods.

Professors Gehr and Nicell

303-660B 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.

Professor Gehr

303-664A MODELLING IN ENVIRONMENTAL/WATER RESOURCES ENGINEERING. (4) Concepts of mathematical modelling and simulation in environmental and water resources engineering. Statistical univariate and multivariate models. Simulation techniques. Introduction to stochastic modelling. Time series analysis and synthesis.

Professor Nguyen

- **303-665A APPLIED ELASTICITY AND TENSOR CALCULUS.** (4)

303-666B ENVIRONMENTAL AND WATER RESOURCES SYSTEMS. (4) Planning and analysis of environmental and water resources systems. Application of systems analysis techniques and probability theory in the analysis of linear, nonlinear, deterministic and stochastic systems.

Professor Nguyen

- **303-667A PLASTICITY.** (4)

● **303-670B WATER WAVES AND ALLIED MOTIONS.** (4)

303-678B GRAVITY CURRENTS AND RELATED PHENOMENA. (4)

Internal hydraulics of one-layer and two-layers systems. Boussinesq's approximation, concepts of specific energy and specific force, upstream and downstream influences. Waves, instabilities and turbulence in continuous stratified flows; the flux, gradient and local Richardson numbers. Turbulent mixing and entrainment across gravity and turbulent interfaces. Turbulent thermals, turbulent plumes and related mixing phenomena. **Professor Chu**

● **303-679B LOW REYNOLDS NUMBER FLUID FLOW.** (4)

303-680A FUNDAMENTALS OF SOIL BEHAVIOUR. (4) Soil mineralogy, composition and structure; clay minerals and soil identification techniques; clay - water interactions; soil water potential; soil stability; physical properties of soils; chemical properties of solutions and ground water; flow in saturated and unsaturated soils; soil engineering properties (volume change, swelling, and strength); environmental properties (hydraulic conductivity, diffusivity, and adsorption)

● **303-682A SOIL PROPERTIES AND THEIR MEASUREMENT.** (4)

303-683B ADVANCED FOUNDATION DESIGN. (4) Design of shallow foundations, bearing capacity and settlement, combined footings and rafts; eccentric and inclined loads, footings in slopes, machine foundations. Deep foundations; caissons and piers, piles, pile groups, tension piles. Tunnels and tunnel linings, flexible culverts. Earth pressures, retaining walls, sheeting and bracing, cofferdams. Case records of foundation performance including failures.

303-684B GROUNDWATER POLLUTION AND TRANSPORT

PROCESSES. (4) Advective flow; diffusion transport; diffusion and dispersion coefficients; partition coefficients; adsorption isotherms; conditioned partition coefficients; accumulation and attenuation; irreversible thermodynamic modelling; Fickian models; calibration and validation requirements; field predictions and calibrations; monitoring and validation; spatial and temporal variability of transport phenomena and coefficients.

303-686B 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-sitreatment techniques (physical, biological, and chemical). **Professor Ghoshal**

303-688B SOIL CONTAMINANT INTERACTIONS. (4) Physical and chemical properties of contaminants; interactive process, physical and chemical adsorption, adsorption models, desorption, cation exchange, precipitation, and complexation; role of clay minerals amorphous material, and natural soil organic; mechanisms of contaminant attenuation; contaminant influence on soil properties (geotechnical and geoenvironmental); principles of transport processes in soils.

● **303-689A DYNAMICS OF FOUNDATIONS AND EARTH STRUCTURES.** (4)

303-691A,B,C RESEARCH PROJECT. (1)

303-692A,B,C RESEARCH PROJECT. (2)

303-693A,B,C RESEARCH PROJECT. (3)

303-694A,B,C RESEARCH PROJECT. (4)

303-695A,B,C RESEARCH PROJECT. (5)

303-696A,B,C RESEARCH PROJECT. (6)

303-697A,B,C RESEARCH PROJECT. (7)

303-701A,B,C PH.D. PRELIMINARY ORAL EXAM. (4)

● **303-724B ADVANCED TOPICS IN CONCRETE STRUCTURES.** (4)

● **303-757B SPECIAL TOPICS IN SANITARY ENGINEERING.** (4)

● **303-771B SPECIAL TOPICS IN FLUID MECHANICS.** (4)

303-791A PHYSICS, CHEMISTRY AND BIOLOGY OF SOILS. (4)

Weathering processes (physical, chemical, biological); clay minerals (primary and secondary); amorphous materials; precipitates;

soil organic matter, biological activity, microbial by-products; solubility equilibria; transformations (chemical, biological, alteration products); thermodynamic stability; soil- water concepts, thermodynamics, modelling, relation to environmental problems, ground water contamination and chemistry.

303-792B MECHANICS OF PARTICULATE MEDIA. (4) (Prerequisite 303-667B) Properties of particulate media, contact theory, equilibrium and compatibility, elastic-plastic problems, single phase and two phase systems. Yield criteria, critical state analyses, micro and macro analysis, constitutive modelling, stress distribution, arching effects, bulk flow problems, analytical and numerical solution techniques, probabilistic and stochastic analyses.

● **303-794A SPECIAL TOPICS IN SOIL MECHANICS.** (4)

● **303-795B SPECIAL TOPICS IN SOIL BEHAVIOUR.** (4)

303-796B CONTAMINANT TRANSPORT IN SOILS. (4) Advanced studies relating to: Nature and properties of contaminants; soil contaminant interactions, fundamentals, adsorption and precipitation mechanisms; contaminant neutralization, biodegradation by soil microbes, physical and chemical transformations, dilution; transport processes in soils, diffusion, advection, convection, dispersion; contaminant transport prediction, diffusion modelling, diffusion-advection modelling, irreversible thermodynamics modelling; diffusion coefficients; contaminant transport, control, treatment, and containment.

16 Classics

Graduate Program in Classics
Stephen Leacock Building
855 Sherbrooke Street West
Montreal, QC
Canada H3A 2T7
Telephone: (514) 398-3977

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

Associate Professors

A. Carson; B.A., M.A., Ph.D.(Tor.)
M.J. Silverthorne; B. Litt., M.A., D. Phil.(Oxon.)

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.

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.

16.4 Application Procedures

No applications will be accepted for 1999-2000.

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 (695D)
- 3) Thesis: 24 credits:
 - I: 114-696A – Methods (3)
 - II: 114-697B – Proposal (3)
 - III: 114-698A – Preparation (6)
 - IV: 114-699B – Completion (12)

M.A. non-thesis option

- 1) Course work: 24 credits;
- 2) Special subjects: 12 credits (114-685D, 114-686D);
- 3) Research papers: 12 credits
 - I: 114-681A (3)
 - II: 114-682B (3)
 - III: 114-683A (3)
 - IV: 114-684B (3)

Ph.D.

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

16.6 Courses Offered

- Denotes not offered in 1999-2000.

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

114-515D LATIN AUTHORS. (6)	
114-525D ANCIENT GREEK AUTHORS. (6)	
● 114-614A LATIN POETRY. (3)	Professor Richardson
● 114-653B LATIN PROSE. (3)	Professor Richardson
● 114-664A GREEK PROSE. (3)	Staff
114-681A RESEARCH PAPER I. (3)	Staff
114-682B RESEARCH PAPER II. (3)	Staff
114-683A RESEARCH PAPER III. (3)	Staff
114-684B RESEARCH PAPER IV. (3)	Staff
● 114-685D SPECIAL SUBJECTS. (6)	Staff
● 114-686D SPECIAL SUBJECTS. (6)	Staff
● 114-691A SEMINAR. (3)	Professor Silverthorne
● 114-695D SPECIAL SUBJECTS. (6)	Staff
114-696A THESIS I. (3)	Staff
114-697B THESIS II. (3)	Staff
114-698A THESIS III. (6)	Staff
114-699B THESIS IV. (12)	Staff
114-701D COMPREHENSIVE EXAMINATION.	
114-714A,B TUTORIAL/PROJECT IN CLASSICS. (3)	Staff

17 Communication Sciences and Disorders

School of Communication Sciences and Disorders
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 Montreal, QC
 Canada, H3G 1A8
 Telephone: (514) 398-4137
 Fax: (514) 398-8123
 Email: axsc@musica.mcgill.ca

Director — R. Mayberry

Research Director — M. Pell

17.1 Staff

Emeritus Professor

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

Professor

A. Katsarkas; M.D.(Salonika U. Greece), M.Sc.(McG.), F.R.C.P.

Associate Professors

S. Baum; B.A.(C'nell), M.S.(Vt.), M.A., Ph.D.(Brown)

M. Crago; B.A., M.Sc.A., Ph.D.(McG.)

R. Mayberry; B.A.(Drake), M.S.(Wash.), Ph.D.(McG.)

J. McNutt; B.S.(Edin.). M.Ed.(Penn. St.), Ph.D.(Kent St.)

L. Polka; B.A.(Penn.), M.A.(Minn.), Ph.D.(Flor.)

Assistant Professors (Special Category)

M. Pell; B.A.(Ott.), M.Sc., Ph.D.(McG.)

E. Thordardotir; B.A., M.Sc., Ph.D.(U.W.-Madison)

Assistant Professors (Part-Time)

G. Leonard; B.A.(Dublin), D.A.P., M.Sc., Ph.D.(McG.)

S. Schwartz; B.Sc.(McG.), M.Sc.A.(Iowa St.), Ph.D.(McG.)

R. Shenker; B.Sc.(Syr.), M.A.(Calif. St.), Ph.D.(McG.)

Faculty Lecturer

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

Faculty Lecturers (Part-Time)

P. Bager; B.A.(Manit.), M.Sc.A.(McG.)

R. Gesser; B.A.(C'dia), M.Sc.A.(McG.)

A. Gingras; B.A.(McG.), M.Sc.(Alta.)

J. Gordon; B.A.(Bishop's), M.Sc.(McG.)

C. Mhun; B.A., M.Sc.A.(McG.)

J. Miller; B.Sc.(Wis.-Mil.), M.Sc.(Purdue)

J. Paradis; B.A.(Ott.), M.Sc., Ph.D.(McG.)

L. Polomeno; B.A., B.Ed. (McG.), M.Sc. (Syracuse)

J. Robillard-Shultz; B.A., M.Sc.A.(McG.)

N. Shahnaz; B.Sc.(Iran), M.Sc.(McG.)

R. Springer; B.A., M.Sc.A.(McG.)

M. Sundara; B.Sc., M.Sc.(All India Inst. of Speech & Hearing)

P. Witcher; B.S.W.(McG.)

Associate Member

Yuriko Oshima-Takane (Psychology)

Adjunct Members

D. Caplan (*Harvard*); B.Sc., Ph.D.(M.I.T.), M.D., C.M.(McG.)

H. Chertkow (*Jewish Gen.*); M.D.(W. Ont.), F.R.C.P. (Neurology)

D. McFarland (*U. of Mt.*); B.A., M.A.(Calif. St.), Ph.D.(Purdue)

G. Waters (*Boston U.*); B.A.(McG.), Ph.D.(C'dia)

17.2 Programs Offered

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

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

The professional degree leads to a Master of Science (Applied) with a specialization in either Speech-Language Pathology or Audiology. 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.

The profession of Audiology is concerned with the non-medical assessment of hearing disorders. The audiologist is also trained to undertake aural rehabilitation, which includes the selection of appropriate hearing aids, the use of residual hearing, and the development of speech reading. Most audiologists work as clinicians and are employed in hospitals, but some work in schools for the hearing-impaired. An emerging area involves consultation with industry and government on damage to hearing due to noise pollution. **Note:** Applications to the specialization in audiology are not being accepted for the 1999-2000 academic year.

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 or Audiologists 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 and Audiologists. 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.

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.

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

17.3 Admissions Requirements

M.Sc.(Applied)

Applicants must indicate whether they wish to specialize in Audiology or in Speech and Language Pathology. 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 prerequisites are six credits in statistics, 12 credits in psychology, and six credits in linguistics. Knowledge of physiology is also desirable.

For those wishing to specialize in Audiology, some psychology credits may be replaced by credits in mathematics, physics and electronics. **Note:** Applications to the specialization in audiology are not being accepted for the 1999-2000 academic year/

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

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 (money order or certified cheque only)
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 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 either Speech-Language Pathology or Audiology. The program involves two academic years of full-time study and related practical work followed by a summer internship.

M.Sc., Applied – Audiology Specialization

Note: Applications to the Audiology specialization are not being accepted for 1999-2000.

Year 1 Required Courses (31 credits)

401-616A	(3)	Audiology
401-617A	(3)	Anatomy & Physiology of Speech & Hearing
401-618A	(3)	Research and Measurement Methodologies
401-619A	(3)	Phonological Development
401-654A	(3)	Hearing Science I
401-681A	(1)	Practicum and Seminar I

- 401-631B (3) Speech Science
 401-634B (2) Research & Measurement Methodologies II
 401-655B (3) Advanced Clinical Audiology
 401-656B (3) Hearing Science II
 401-682B (1) Practicum and Seminar II
 401-646C (2) Clinical Practicum

Year 1 Complementary Course (3 credits)

One three-credit seminar option must be taken.

Year 2 Required Courses (31 credits)

- 401-657A (3) Instrumentation
 401-658A (3) Amplification
 401-659A (3) Pediatric Audiology
 401-661A (3) Rehabilitation of Adult Onset Hearing Impairment
 401-668A (3) Communicatively Disordered Person: Practice
 401-683A (1) Practicum and Seminar III
 401-633B (3) Language Development
 401-642B (3) Aural Rehabilitation
 401-662B (3) Auditory Evoked Potentials
 401-663B (3) Peripheral & Central Auditory Disorders
 401-684B (1) Practicum and Seminar IV
 401-679C (2) Advanced Clinical Practicum

Year 2 Complementary Course (3 credits)

One three-credit seminar option must be taken.

M.Sc., Applied – Speech-Language Pathology Specialization**Year 1 Required Courses** (31 credits)

- 401-616A (3) Audiology
 401-617A (3) Anatomy & Physiology of Speech & Hearing
 401-619A (3) Phonological Development
 401-624A (3) Language Processes
 401-633A (3) Language Development
 401-681A (1) Practicum and Seminar I
 401-631B (3) Speech Science
 401-632B (3) Phonological Disorders in Children
 401-637B (3) Developmental Language Disorders I
 401-638B (3) Neurolinguistics
 401-682B (1) Practicum and Seminar II
 401-646C (2) Clinical Practicum

Year 1 Complementary Course (3 credits)

One three-credit seminar option must be taken.

Year 2 Required Courses (31 credits)

- 401-618A (3) Research & Measurement Methodologies
 401-636A (3) Fluency Disorders
 401-639A (3) Voice Disorders
 401-643A (3) Developmental Language Disorders II
 401-644A (3) Applied Neurolinguistics
 401-683A (1) Practicum and Seminar III
 401-609B (3) Neuromotor Disorders
 401-642B (3) Aural Rehabilitation
 401-668B (3) Communicatively Disordered Person: Practice
 401-669B (3) Special Developmental Speech/Language Problems
 401-684B (1) Practicum and Seminar IV
 401-679C (2) Advanced Clinical Practicum

Year 2 Complementary Course (3 credits)

One three-credit seminar option must be taken.

M.Sc., Applied Complementary Course List

- 401-634B (3) Research & Measurement Methodologies II
 401-649B (3) Psycholinguistics of Gesture & Sign Language
 401-664B (3) Topics in Comm. Sciences & Disorders I
 401-666B (3) Topics in Comm. Sciences & Disorders III
 401-667B (3) Topics in Comm. Sciences & Disorders IV
 401-670B (3) Topics in Comm. Sciences & Disorders II

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 401-671, 672, 673 and 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)

- 401-671 (12) M.Sc. Thesis I
 401-672 (12) M.Sc. Thesis II

Complementary Courses (21 credits)

a maximum of 15 credits may be chosen from:

- 401-673 (12) M.Sc. Thesis III
 401-674 (3) M.Sc. Thesis IV

a minimum of 6 credits must be chosen from:

- 401-675D,A,B,C (12) Special Topics I
 401-676D,A,B,C (9) Special Topics II
 401-677D,A,B,C (6) Special Topics III
 401-678A,B (3) Special Topics IV

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

PH.D. IN COMMUNICATION SCIENCES AND DISORDERS

All 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.

An examination in a foreign language is not required.

Required Courses

- 401-652A,B (3) Advanced Research Seminar I
 401-653A,B (3) Advanced Research Seminar II
 401-701A,B,D Doctoral Comprehensives

17.6 Courses

The letters which form part of the course numbers have the following significance:

- A – fall term
 B – winter term
 C – summer session courses starting in May
 D – fall and winter term

The course credit weight appears in parenthesis (#) after the name.

401-609B 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).

401-616A AUDIOLOGY AND AURAL REHABILITATION. (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.

401-617A ANATOMY AND PHYSIOLOGY OF 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.

401-618A RESEARCH AND MEASUREMENT METHODOLOGIES I. (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.

401-619A PHONOLOGICAL DEVELOPMENT. (3) Theories and research related to normal and abnormal phonological development in children will be studied.

401-624A 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 processing, and the role of sociocultural factors in linguistic performance also will be covered.

401-631B 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.

401-632B PHONOLOGICAL DISORDERS IN CHILDREN. (3) The nature of phonological disorders and clinical approaches for their remediation in children will be presented.

401-633A 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.

401-634B RESEARCH AND MEASUREMENT METHODOLOGIES II. (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.

401-636A FLUENCY DISORDERS. (3) The nature of stuttering, various causal theories, and techniques for evaluation and treatment of children and adults will be presented.

401-637B DEVELOPMENTAL LANGUAGE DISORDERS I. (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.

401-638B 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.

401-639A VOICE DISORDERS. (3) Information about the vocal mechanism, its pathologies, and methods of evaluation and treatment will be studied.

401-642B 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.

401-643B DEVELOPMENTAL LANGUAGE DISORDERS II. (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.

401-644A 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.

401-646C CLINICAL PRACTICUM. (2) This course provides an introduction to professional practice through intensive exposure to a variety of clinical populations.

401-649B PSYCHOLINGUISTICS OF 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.

401-652A,B ADVANCED RESEARCH SEMINAR I. (3) Pro seminar in which current research topics in communication disorders will be discussed. (This course may be taken as an advanced course for M.Sc. students.)

401-653A,B ADVANCED RESEARCH SEMINAR II. (3) Pro seminar in which current research topics in communication disorders will be discussed. (This course may be taken as an advanced course for M.Sc. students.)

401-654A HEARING SCIENCE I. (3) Basic information regarding the acoustics and psychoacoustics of sound is provided.

401-655B ADVANCED CLINICAL AUDIOLOGY. (3) Specialized diagnostic tests and procedures for assessment of auditory function are analyzed. The effects of noise on auditory function and issues related to hearing conservation also will be addressed.

401-656B HEARING SCIENCE II. (3) A basic understanding of normal and impaired auditory function from both a physiological and psychological perspective is presented. Auditory function will be evaluated with respect to both simple and complex sounds.

401-657A INSTRUMENTATION. (3) Instrument use in diagnostic and rehabilitative Audiology, including calibration and maintenance, will be addressed.

401-658A AMPLIFICATION. (3) Hearing aids and amplification systems currently available for the hearing impaired individual will be studied.

401-659A PEDIATRIC AUDIOLOGY. (3) Current practices and research in the auditory assessment of infants and children will be addressed.

401-661A REHABILITATION OF ADULT ONSET HEARING IMPAIRMENT. (3) Theoretical and practical aspects of the aural rehabilitation of impaired individuals with adult onset of the impairment will be studied.

401-662B AUDITORY EVOKED POTENTIALS. (3) Presentation of auditory evoked potentials focusing on the auditory brainstem response (ABR) including clinical applications of ABR in site-of-lesion testing with infants and difficult-to-test populations.

401-663B PERIPHERAL AND CENTRAL AUDITORY DISORDERS. (3) Audiological evaluation including case history and descriptive techniques, various tests for detecting and differentiating auditory disorders, and clinical decision making and protocol development in assessment of site of lesion and auditory disorders will be addressed.

401-664B TOPICS IN COMMUNICATION SCIENCES AND DISORDERS I. (3) Current research and professional issues in communication sciences and disorders will be discussed. Specific topics to be selected yearly.

401-666B TOPICS IN COMMUNICATION SCIENCES AND DISORDERS III. (3) Current research and professional issues in communication sciences and disorders will be discussed. Specific topics to be selected yearly.

401-667B TOPICS IN COMMUNICATION SCIENCES AND DISORDERS IV. (3) Current research and professional issues in communication sciences and disorders will be discussed. Specific topics to be selected yearly.

401-668B 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.

401-669B 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.

401-670B TOPICS IN COMMUNICATION SCIENCES AND DISORDERS II. (3) Current research and professional issues in communication sciences and disorders will be discussed. Specific topics to be selected yearly.

401-679C ADVANCED CLINICAL PRACTICUM. (2) This course enhances professional practice independence through intensive exposure to a variety of clinical populations.

401-681A PRACTICUM AND SEMINAR I. (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.

401-682B PRACTICUM AND SEMINAR II. (1) This course provides clinical experience through short-term placements and screenings, as well as discussions of current practicum issues.

401-683A PRACTICUM AND SEMINAR III. (1) Professional practice experiences focusing on a variety of clinical populations are provided. Discussion of advanced issues in clinical practice is included.

401-684B PRACTICUM AND SEMINAR IV. (1) This course provides clinical practicum experiences in a range of settings. Professional practice issues are considered.

18 Communications

Graduate Program in Communications
3465 Peel Street
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Website: <http://www.arts.mcgill.ca/gpc/>

Director — Dr. W. Straw

18.1 Staff

Professors

D. Crowley; B.A.(Johns H.), M.Sc.(Penn.), Ph.D.(McG.)
G.J. Robinson; B.A.(Swarth.), M.A.(Chic.), Ph.D.(Ill)
W. Straw; B.A.(Car.), M.A., Ph.D.(McG.)
G. Szanto; B.A.(Dart.) Ph.D.(Harv.)

Associate Members

A. Adams, J. Galaty, M. Green, M. Hjort, D. Johnston, B. Kaite,
P. Livingston, J. Marchessault, S. Nemiroff, P. Ohlin,
R. Pennycook, C. Ross, R. Schutz, M. Somerville, P. Tancred,
R. Yates

Adjunct Professors

J. Picot; B.A.(Montr.), M.A.(Con.), Ph.D.(S.Fraser)
B. Massumi; B.A.(Brown), M.A., Ph.D.(Yale) (*Australian National University*)

Faculty Lecturers

C. Levin; B.A., M.A.(McG), Ph.D.(Con.)
A. Péricard; B.A., M.A.(UQAM), Ph.D.(McG.)

18.2 Programs Offered

The Graduate Program in Communications 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 an 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.

The Program is subdivided into the following areas: Cultural Theory and Cultural Practice, History and Theory of Communications, Media Studies. Degree candidates are encouraged to explore these aspects of communication studies by drawing upon the resources of the various departments throughout the University with which the Program has established close working relations. For more information on the Program, please visit our website.

A number of financial aid opportunities and scholarships are available to Graduate students, some from the University itself (Teaching and Research Assistantships, McGill Major Fellowships), and others from governmental agencies. Application deadlines are early in the Fall. Information on eligibility can be obtained from the Program or through the Graduate Faculty's Fellowships Office, McGill University, Dawson Hall, Room 408, 853 Sherbrooke Street W., Montreal, Quebec, H3A 2T6. (514) 398-3995. (<http://www.mcgill.ca/fgsr/fellowl.htm>)

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. 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 communications studies.

18.4 Application Procedures

Applications will be considered upon receipt of:

1. Application form.
2. \$60 application fee.
3. Transcripts (2 official copies).
4. Letters of Recommendation (2 official letters).
5. Written samples (2 samples, English or French translations).
6. Statement of Interest (4 copies).
7. Proof of Citizenship.
8. TOEFL (minimum score of 550).

Deadline for application is January 15.

Inquiries regarding the Program should be addressed to the Admissions Coordinator, Graduate Program in Communications, McGill University.

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:

- a) Thesis option: a total of 8 courses (24 credits) and a thesis (equivalent to 24 credits), or
 - b) Non-Thesis option: a total of 12 courses (36 credits) and two research projects (equivalent to 12 credits);
- and the fulfilment of a language requirement.

Ph.D. Degree

Candidates with an M.A. will be admitted into Phase II of the doctoral program, thereby gaining credit for one year of resident study. Three years of residence are normally required for the Doctoral degree. The program of study is comprised of three or more projects, the fulfilment of a language requirement and a written dissertation.

18.6 Courses Offered

- Denotes not offered in 1999-2000.
- Denotes limited enrolment.

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

109-200A,B HISTORY OF COMMUNICATIONS I. (3) The social and cultural implications of major developments in communications from pre-history to the start of the electronic age.

109-210A,B HISTORY OF COMMUNICATIONS II. (3) The social and cultural consequences of major developments in mass communications from the onset of the electronic age to the present.

109-521A,B 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.

● **109-531A,B FEMINIST COMMUNICATION THEORY.** (3)

109-541A,B 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.

109-611A,B HISTORY/THEORY/TECHNOLOGY. (3) A critical appraisal of current issues in the field of communications notably through an examination of how new theorists have dealt with the effects and consequences of developments in the technologies of communication. The contributions of Canadian media theorists figure significantly in the seminar's concerns.

109-613A,B GENDER AND TECHNOLOGY. (3) Contemporary culture and media in Canada and Quebec since 1945, with special emphasis on the 70s.

□ **109-616A,617B (109-702D) PRO-SEMINAR IN COMMUNICATIONS.** (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.

109-619A,B 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.

109-621A,B 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.

109-623A,B INFORMATION DESIGN. (3) Examination of the basic concepts and methodologies in the design of information.

109-625A,B NEW MEDIA POLICY. (3) New media policies in relation to changing communication needs in the context of shifting regulatory demands.

● **109-629A,B CANADIAN CULTURAL COMMUNICATIONS POLICY.** (3)

● **109-631A,B DISCOURSE ANALYSIS.** (3)

● **109-633A,B GENDER AND REPRESENTATION.** (3)

109-637A,B CULTURAL ANALYSIS IN HISTORY. (3) Further analysis of cultural products, policy, history and the role of cultural institutions in the development of media practices.

109-639A,B 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.

109-643A,B NARROWCAST MEDIA. (3) Seminar in theories of communications and alternative media.

109-646A,B 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.

● **109-647A,B COMPUTERS AND THE MEDIA.** (3)

109-649A,B AUDIENCE ANALYSIS. (3) Advanced theoretical and empirical work on audience analysis from the perspective of recent research in mass communications.

109-696A,B RESEARCH PROJECT I. (6)

109-697A,B RESEARCH PROJECT II. (6)

19 Computer Science

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Director — D. Therien

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.) (*on leave winter 2000*)

L. Devroye; M.S.(Louvain), Ph.D.(Texas)

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.)

D. Therien; B.Sc.(Mont.), Ph.D.(Wat.)

G.T. Toussaint; B.Sc.(Tulsa), Ph.D.(Br.Col.)

Associate Professors

C. Crepeau; B.Sc., M.Sc.(Montr.), Ph.D.(M.I.T.)

N. Friedman; B.A.(W.Ont.), Ph.D.(Tor.)

L. Hendren; B.Sc., M.Sc.(Queen's), Ph.D.(Cornell)

N. Madhavji; B.Sc.(Essex), Ph.D.(Man.)

C. Tropper; B.Sc.(McG.), Ph.D.(Brooklyn Poly.)

S. Whitesides; M.S.E.E.(Stan.), Ph.D.(Wis.)

Assistant Professor

X-W. Chang; B.Sc., M.Sc.(Nanjing), Ph.D.(McG.)

G. Dudek; B.Sc.(Queen's), M.Sc., Ph.D.(Tor.)

K. Siddiqi; B.Sc.(Lafayette), M.Sc., Ph.D.(Brown)

Adjunct Professors

R. De Mori, P. Dini, G.R. Gao, 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

The minimum requirement for admission is a bachelor's degree (CGPA 3.0 or better, or equivalent) with the course work in Computer 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.

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 rules of the Faculty. They must successfully complete courses (determined by supervisor), the comprehensive examination and submit a Ph.D. thesis. There is no language requirement.

19.6 Courses

Not every course listed here is offered each year. Precise information about course offerings is available from the School at the beginning of the term.

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

308-505A HIGH-PERFORMANCE COMPUTER ARCHITECTURE. (3) (3 hours) (Prerequisites: 308-302 and 308-305 or equivalent.) Basic principles and techniques in the design of high-performance computer architecture. Topics include memory architecture: cache structure and design, virtual memory structures: pipelined processor architecture: pipeline control and hazard resolution, pipelined memory structures, interrupt, evaluation techniques; vector processing; RISC vs. CISC architecture; general vs. special purpose architectures; VLSI architectures; VLSI architecture issues.

Staff

308-506B ADVANCED ANALYSIS OF ALGORITHMS. (3) (3 hours) (Prerequisite: 308-330 or 308-360 or 308-405 or 308-431) The study of computational complexity and intractability: Cook's Theorem, NP-completeness, oracles, the polynomial hierarchy, lower bounds, heuristics, approximation problems.

Professor Whitesides

308-507A COMPUTATIONAL GEOMETRY. (3) (3 hours) (Prerequisite: 308-360 or -405 or equivalent or co-requisite 308-506) Problems in computational geometry; worst-case complexity of geometric algorithms; expected complexity of geometric algorithms and geometric probability; geometric intersection problems; nearest neighbour searching; point inclusion problems; distance between sets; the diameter and convex hull of a set; polygon decomposition; the

Voronoi diagram and other planar graphs; updating and deleting from geometric structures.

Professor Toussaint

308-520A COMPILER DESIGN. (4) (3 hours, 1 hour consultation) (Prerequisites: 308-273 and 308-302) 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.

Professors Friedman and Hendren

308-524B PROGRAMMING LANGUAGE THEORY. (3) (3 hours) (Prerequisite: 308-302 and 189-340 or 189-235) 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-points induction.

Professors Friedman and Panangaden

308-530A FORMAL LANGUAGES. (3) (3 hours) (Prerequisite: 308-203) The definition of a language. Grammars. Finite automata and regular languages. Context free languages. Pushdown automata. Turing machines and undecidable problems. Context sensitive and phrase-structure languages.

Professor Thérien

308-531B THEORY OF COMPUTATION. (3) (3 hours) (Prerequisite: 308-330) 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.

Professor Thérien

308-534B TEAM SOFTWARE ENGINEERING. (3) (3 hours) (Prerequisite: 308-433A or equivalent) Team-work and team-processes for evolving software systems. Guided by defined processes, project teams will elicit new requirements, design code and test an enhanced software system. Team members will play various technical and managerial roles in carrying out their software project.

Professor Madhavi

308-535A COMPUTER NETWORKS. (3) (3 hours) (Prerequisite: 308-310) 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.

Professor Tropper

308-537B INTERNET PROGRAMMING. (3) (3 hours) (Prerequisites: 308-302 and 308-251) 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. Transactions and transaction processing systems and monitors. Distributed objects, Common Object Request Broker Architecture (CORBA) and OpenDoc.

Professor Merrett

308-538B PERSON-MACHINE COMMUNICATION (3) (3 hours) (Prerequisite: 308-424 or 308-425 or 308-426) Introduction to programming techniques and hardware design concepts that facilitate interaction between humans and computers. Theories and models for person-machine communication, object oriented design and software engineering of interfaces. Natural language facilities.

Staff

308-540B MATRIX COMPUTATIONS. (3) (3 hours) (Prerequisite: 189-327 or 308-350) 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.

Professor Chang

308-557B FUNDAMENTALS OF COMPUTER GRAPHICS. (3) (3 hours) (Prerequisites: 189-223 and 308-251 or -302) 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 coordi-

nates, projective transformations, quadrics and tensors, line-drawing, surface modelling and object modelling reflectance models and rendering, texture mapping, polyhedral representations, procedural modeling, and animation. **Professor Dudek**

308-560A GRAPH ALGORITHMS AND APPLICATIONS. (3) (3 hours) (Prerequisites: 308-360 or 308-405 or 308-431 or 189-343) Algorithms for connectivity, partitioning, clustering, colouring and matching. Isomorphism testing. Algorithms for special classes of graphs. Layout and embeddings algorithms for graphs and networks. **Professor Whitesides**

308-566A COMPUTER METHODS IN OPERATIONS RESEARCH. (3) (3 hours) (Prerequisites: 308-360 or -405 and 189-251) Use of the computer in solving deterministic problems in operations research. Linear programming and extensions. Efficient methods for large problems. Transportation problems. Network models. Integer Programming. **Professor Avis**

□ **308-573A,B MICROCOMPUTERS.** (3) (3 hours) (Prerequisite: 308-305) Characteristics and internal structure of microcomputers and workstations. Architectures of current CISC and RISC microprocessors. Assembler and machine languages for microcomputers. System software. Applications for single and networked microcomputers. Students will be assigned "hands-on" projects. **Professor Ratzer**

308-575A FUNDAMENTALS OF DISTRIBUTED ALGORITHMS. (3) (3 hours) (Prerequisite: 308-310) Study of a collection of algorithms basic to the world of concurrent programming. We discuss algorithms from the following areas: termination detection, deadlock detection, global snapshots, clock synchronization, fault tolerance (byzantine and self-stabilizing systems). **Professor Tropper**

308-601D,N SPECIAL TOPICS IN COMPUTER SCIENCE. (4) (2 per term) (Restricted to Computer Science students.) Students will report on a specific area of computer science. Topics will be selected to reflect the current research interests of the staff of the School. **Professor Merrett**

308-605B PARALLEL COMPUTER ARCHITECTURE. (4) (3 hours) Basic principles and techniques in parallel computer architecture. Topics include: characteristics of parallel computation models; instruction-level parallelism and architectures; vector architecture; shared memory vs. message-passing architectures; memory models and cache coherence; interconnection techniques and high-speed networks, parallel programming issues; multithreaded architecture; future trends. **Staff**

308-608B ADVANCED COMPUTATIONAL GEOMETRY. (4) (3 hours) (Prerequisite: 308-507) Advanced topics in computational geometry emphasizing problems in dimensions three and higher. Convex hulls, collision avoidance problems, minimal enclosing boxes, interlocking polyhedra, space partitioning, extremal sections of convex polyhedra, reverse search and enumeration, geometric problems from the manufacturing industry including injection molding, gravity casting, stereolithography, NC-machining and tolerancing metrology. **Professor Toussaint**

308-610A INFORMATION STRUCTURES I. (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. **Professor Devroye**

308-611B INFORMATION STRUCTURES II. (4) (3 hours) Graphs play an important role in computer science: as data structures, as tools in algorithmic analysis, and as a source of algorithmic problems. This course is an introduction to graph theory for computer scientists via the problem-solving approach. Emphasis on developing oral and written communication skills. **Professor Avis**

308-612A DATABASE SYSTEMS. (4) (3 hours) Database programming using the relational algebra. Introduces the relational model of databases and high level programming techniques with applica-

tions to data processing, text and picture processing, knowledge bases and logic programming on secondary storage.

Professor Merrett

308-617B INFORMATION SYSTEMS. (4) (3 hours) (Prerequisite: 308-612) 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. **Professor Merrett**

308-621B OPTIMIZING COMPILERS. (4) (3 hours) (Prerequisite: 308-251 or equivalent, 308-302 or equivalent, 308-520 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. **Professor Hendren**

308-622B COMPILING FOR PARALLEL MACHINES. (4) (3 hours) (Prerequisites: 308-520 and 308-505 or equivalents, suggested prerequisites/corequisites 308-621 and 308-623) This course studies the contemporary work in compiler design and implementation for parallel computer systems such as vector/pipelined machines, superscalar/superpipelined machines, and SIMD/MIMD multiprocessor systems. Compiling issues for novel architectures with fine-grain parallelism. **Professor Hendren**

308-623B CONCURRENT PROGRAMMING LANGUAGES. (4) (3 hours) (Prerequisite: 308-302 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. **Professor Panangaden**

308-627B THEORY OF PROGRAMMING LANGUAGES. (4) (3 hours) (Prerequisites: 308-524 and 308-530) 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. **Professor Panangaden**

308-630A SOFTWARE DEVELOPMENT ENVIRONMENT TECHNIQUES. (4) (3 hours) (Prerequisite: 308-434) 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. **Professor Madhavi**

308-631A SOFTWARE PROCESS ENGINEERING. (4) (3 hours) (Prerequisite: 308-434) Software is critical; the record is poor, and improvement action is needed. The quality of a software system is governed by the quality of the process used to develop and maintain it. The course aims to describe the technical and managerial topics critical in the design, engineering and management of software processes. **Professor Madhavi**

308-644B PATTERN RECOGNITION. (4) (3 hours) Techniques for smoothing, approximating and enhancing spatial and temporal data. Feature extraction and shape measurement using spatial moments and medial axis transforms. Detecting structure using Hough transforms and proximity graphs. Discriminant functions. Neural networks. Bayesian decision theory. Feature selection. Estimation of misclassification. Nearest neighbor decision rules. Applications. **Professor Toussaint**

308-647B CRYPTOGRAPHY AND DATA SECURITY. (4) (3 hours) An introduction to private and public key cryptography, and its application to the security of electronic mail, databases and networks.

Topics include: classical cryptography, Shannon's theory, the data encryption standard, the RSA system, signature schemes, key distribution, identification and authenticity. **Professor Avis**

308-648B MOTION PLANNING AND ROBOTICS. (4) (3 hours) (Given in alternate years.) Topics in motion planning, including: algorithms and complexity results for collision avoidance; the configuration space approach; the algebraic cell decomposition approach; motion planning using Voronoi diagrams; object representation schemes. **Professor Whitesides**

308-650B ANALYSIS OF COMBINATORIAL ALGORITHMS. (4) (3 hours) Design, implementation and analysis of efficient combinatorial algorithms for computing shortest paths, network flows, minimum cost network flows, spanning trees and matching in graphs. Applications to reliability of networks, critical path, transshipment, vehicle routing and machine sequencing problems. Efficient use of data structures to reduce running time. **Professor Avis**

308-675A PARALLEL SEARCH PROBLEMS. (4) (3 hours) A study of recent work in parallel search techniques. Algorithms to be considered are: parallel branch and bound, parallel minimax and parallel resolution techniques for theorem proving. Students will be expected to write programs implementing algorithms for parallel search on the School's 32-processor BBN parallel computer. **Professor Newborn**

308-690A 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. **Professor Devroye**

308-694A,B,C RESEARCH PROJECT I. (6)* Ongoing research pertaining to project.

308-695A,B,C RESEARCH PROJECT II. (6)* Ongoing research pertaining to project.

308-698A,B,C THESIS RESEARCH I. (9)* Ongoing research pertaining thesis.

308-699A,B,C THESIS RESEARCH II. (15)* Ongoing research pertaining to thesis.

308-700A PH.D. COMPREHENSIVE EXAMINATION. (4)

308-701A,B SUMMER THESIS PROPOSAL AND AREA EXAMINATION. (4)

308-760A ADVANCED TOPICS: THEORY I. (4)

308-761B ADVANCED TOPICS: THEORY II. (4)

308-762A ADVANCED TOPICS: PROGRAMMING I. (4)

308-763B ADVANCED TOPICS: PROGRAMMING II. (4)

308-764A ADVANCED TOPICS: SYSTEMS I. (4)

308-765B ADVANCED TOPICS: SYSTEMS II. (4)

308-766A ADVANCED TOPICS: APPLICATIONS I. (4)

308-767B ADVANCED TOPICS: APPLICATIONS II. (4)

* Restricted to Computer Science students.

20 Culture and Values in Education

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Fax: (514) 398-4642

Website: <http://www.mcgill.ca/cve/cve.html>

Chair — David C. Smith

Director of Graduate Programs — Boyd E. White

20.1 Staff

Professors

Thomas A. Francoeur; B.A. Lic. Ped., D.Ed.(Montr.), M.A.(Ott.), Dipl. Pst. Theol.(Brussels)

Ratna Ghosh; B.A.(Calcutta), M.A., Ph.D.(Calg.) (*William C. Macdonald Professor of Education*)

Barry Levy; B.A., M.A., BRE(Yeshiva), Ph.D.(N.Y.U.)

David C. Smith; B.Ed., M.A.(McG.), Ph.D.(Lond.), F.C.C.T., F.R.S.A.

R. Lynn Studham; N.D.D.(Sunder.), A.R.A.(Royal Acad., Copen.), M.A.(E. Carolina), C.S.G.A., S.C.A.

Associate Professors

Yarema G. Kelebay; B.A., B.Ed.(Montr.), M.A.(Sir G.Wms.), Ph.D.(C'dia) (*joint appt. with Educational Studies*)

Rachelle Keyserlingk; B.A., B.Ed.(W.Ont.), Cert. Spec. Ed., M.A.(Ott.) (*joint appt. with Educational and Counselling Psychology*)

Jing Lin; B.A.(Guanxi), M.A., Ed.D.(Mich.)

Ronald Morris; B.Ed., M.A., Ph.D.(McG.)

Gentile Tondino; R.C.A. (*joint appt. with Architecture*)

Boyd E. White; B.A.(Sir G.Wms.), B.F.A.(C'dia), M.F.A.(Inst. Allende, Guanajuato), Ph.D.(C'dia)

Assistant Professors

Spencer Boudreau; B.A.(Don Bosco), B.A., M.A.(Sherb.), Ph.D.(C'dia)

Kevin McDonough; B.A., B.Ed., M.Ed.(U. Alta.), Ph.D.(Ill.)

Elizabeth Wood; B.F.A.(York), B.F.A.(C'dia), Dip. Ed., M.A., Ph.D.(McG.)

Adjunct Professors

Henry A. Giroux; B.S.(Southern Maine), M.A.(Appalachian St.), Ph.D.(Carnegie-Mellon)

Jaswant K. Guzder; B.Sc., M.D.C.M., Dip. Psychiatry(McG.)

Gabriel Moran; B.A., M.A., Ph.D.(Catholic U. of America)

Peter Roche de Coppens; B.S.(Col.), M.A., Ph.D.(Fordham), M.S.W.(Montr.)

20.2 Programs Offered

The Department offers M.A. (thesis and non-thesis options) and Ph.D. (*ad hoc*) degrees. Prospective applicants to the Ph.D. (*ad hoc*) program should contact the Department at (514) 398-5068.

Applicants should be advised that these degrees do not confer certification to teach in the province of Quebec.

The M.A. program is designed to support enquiries into the meaning and purpose of education, to help candidates gain facility in appropriate research skills, and to develop innovative approaches to educational thought and practice.

The program encourages research into educational issues that have a culture and/or values orientation as a key investigative focus on more specific topics covered in the department – such as philosophy of education, international and comparative education, intercultural education, development education, gender education, religious/spirituality education, values/moral education, peace education and aesthetics education.

Students are expected to plan the general direction of their program with their advisor(s), taking into account their background, interests, professional and academic aims.

20.3 Admission Requirements

1. Candidates must hold a Bachelor's degree from a recognized university with a minimum standing equivalent to a CGPA of 3.0 on 4.0.
2. A concentration of courses related to the area chosen for graduate work is required.

20.4 Application Procedure

Applications will be considered upon receipt of:

1. Application form.

2. \$60 application fee.
3. A letter of intent, stating professional goals, career plans, reasons for interest in and expectations from the program.
4. Two letters of reference from persons familiar with the prospective student's academic capabilities.
5. Official Transcripts.
6. A sample of the student's writing and, where appropriate, presentation of a portfolio of work.
7. TOEFL test results (if required).

All information is to be submitted directly to the Graduate Program Director in the Department of Culture and Values in Education.

Applicants will be interviewed in person (or by telephone if necessary) by the Director of his/her designated program.

Candidates applying for admission for the first time and wishing to start in the summer session must apply by February 1, and those interested in commencing studies in the fall should apply before May 1.

20.5 Program Requirements

M.A. CULTURE AND VALUES IN EDUCATION THESIS OPTION (45 credits)

Required Course (6 credits)

423-615 (6) Selected Issues in Contemporary Education

Complementary Courses (15 credits)

411-692 (3) Qualitative Research Methods
or equivalent

12 credits, selected in consultation with an advisor and with the approval of the Program Director, of which 9 credits will be in the area of concentration and 3 credits in a complementary area.

With the approval of the Program Director some courses may be selected from other McGill departments and/or faculties, or other universities.

Thesis Component – Required (24 credits)

423-690 (6) Thesis Preparation I

423-691 (6) Thesis Preparation II

423-692 (12) Thesis Preparation III

M.A. CULTURE AND VALUES IN EDUCATION NON-THESIS OPTION (45 credits)

Required Courses (18 credits)

423-615 (6) Selected Issues in Contemporary Education

423-633 (12) Special Project

Complementary Courses (24 credits)

411-692 (3) Qualitative Research Methods
or equivalent

21 credits, selected in consultation with an advisor and with the approval of the Program Director, of which 15 credits will be in the area of concentration and 6 credits in a complementary area. With the approval of the Program Director some courses may be selected from other McGill departments and/or faculties, or other universities.

Elective Course (3 credits)

20.6 Courses

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

● Denotes courses not offered in 1999-2000.

● 423-505 EDUCATION AND SOCIAL ISSUES. (3)

● 423-510 PHILOSOPHICAL THINKING IN THE CLASSROOM. (3)

423-603 READING COURSE. (6)

● 423-604 SELECTED EDUCATIONAL THEORIES. (3)

● 423-605 SOCIAL AND EDUCATIONAL FUTURES. (3)

● 423-606 PHILOSOPHY OF MORAL EDUCATION. (3)

● 423-607 VALUES EDUCATION: CONTEMPORARY APPROACHES. (3)

● 423-608 EDUCATIONAL IMPLICATIONS OF SOCIAL THEORY. (3)

● 423-609 EDUCATIONAL AND PHILOSOPHICAL THOUGHT. (3)

● 423-611 PHILOSOPHICAL ASPECTS OF EDUCATIONAL ENQUIRY. (3)

423-614A SOCIOLOGY OF EDUCATION. (3) Social context of schooling, including education and social stratification and socialization processes within and outside schools.

423-615A ISSUES IN EDUCATION I. (3) An examination of philosophical, aesthetic and values issues in education. (Awaiting University Approval)

423-616 READING COURSE. (3)

423-617B AESTHETICS AND EDUCATION. (3) An examination and critical analysis of selected readings on the topic of aesthetics, with specific reference to their application to educational practice.

● 423-618 PERFORMANCE/STUDIO CRITIQUE I. (3)

423-622B STUDIES IN COMPARATIVE EDUCATION. (3) Comparative study of the economic, political and social aspects of education systems.

423-623B ISSUES IN EDUCATION II. (3) An examination of political, cultural, and multicultural issues in education. (Awaiting University Approval)

423-625 SPECIAL TOPICS: CULTURE IN EDUCATION. (3) In-depth examination of topics in culture in education. Content will vary from year to year and will be announced prior to registration. (Examples: Postmodernism and Education; Antiracist Education; Cultural Relativism and Critical Thinking; Popular Culture and Education.)

423-626 SPECIAL TOPICS: VALUES IN EDUCATION. (3) In-depth examination of topics in values in education. Content will vary from year to year and will be announced prior to registration. (Examples: Spirituality and Education; Patterns of Moral/Spiritual Development; Ethics and Education.)

● 423-630 FOUNDATIONS OF RELIGIOUS EDUCATION. (3)

● 423-631 THEORIES OF RELIGIOUS EDUCATION. (3)

423-632A PEACE EDUCATION. (3) The historical development of education for peace; examination of different philosophical approaches to peace education; critical study of selected projects and programs.

423-633D SPECIAL PROJECT. (12) (Prerequisite: Completion of program course requirements. For non-thesis students only.) An investigation into an educational problem, or issue, or innovative practice in the student's area of concentration, supervised by the student's supervisor and with departmental approval. The student will complete the Special Project by submitting a monograph, project report or production, accompanied by a written component.

● 423-639 EDUCATION AND DEVELOPMENT. (3)

● 423-641 PATTERNS OF RELIGIOUS DEVELOPMENT I. (3)

● 423-643 WOMEN, EDUCATION AND DEVELOPMENT. (3)

● 423-649 EDUCATION IN MULTICULTURAL SOCIETIES. (3)

● 423-651 SELECTED RESEARCH TOPICS IN THE TEACHING OF RELIGION. (3)

● 423-652 STUDIES IN NATIONAL EDUCATION SYSTEMS I. (3)

● 423-653 STUDIES IN NATIONAL EDUCATION SYSTEMS II. (3)

● 423-659 PRINCIPLES OF EDUCATION IN HUMAN SEXUALITY. (3)

● 423-672 GENDER ISSUES AND POLICY STUDIES IN EDUCATION. (3)

423-690D THESIS PREPARATION I. (6) A supervised comprehensive study and written review of the literature in the area of the student's thesis topic.

423-691D THESIS PREPARATION II. (6) Supervised independent work leading to an elaborated written proposal of the student's

thesis project, to be presented and defended at a colloquium convened by the Department.

423-692D THESIS PREPARATION III. (12) Supervised on-going research and writing pertaining to the student's thesis. Submission of the completed thesis for examination and evaluation.

- **426-610 STUDIO TUTORIAL.** (6) (Advisor permission required)
- **426-612 ART EDUCATION TUTORIAL.** (3) (Not open to those who have taken 426-612D 6 credits – prior to 1993.)
- **426-613 RESEARCH PAPER ON ART EDUCATION.** (6)
- **426-638 EXHIBITION.** (12)
- **429-615 SPECIAL TOPICS IN MUSIC EDUCATION.** (3)
- **429-642 THE ROLE OF MUSIC EDUCATION IN CHILD DEVELOPMENT.** (3)
- **429-652 APPROACHES TO MUSIC CURRICULUM.** (3)

21 Dentistry

Department of Dentistry
Faculty of Dentistry
McGill University
3640 University Street, Room M18
Montreal, QC Canada H3A 2B2
Telephone: (514) 398-7227
Fax: (514) 398-8900

Dean, Faculty of Dentistry — J.P. Lund

Associate Dean of Dentistry, Graduate Studies and Research —
M.D. McKee

Interim Director, Graduate Program in Oral and Maxillofacial Surgery — T.W. Head

21.1 Staff

Professors

M.C. Bushnell; B.A.(Maryland), M.A., Ph.D.(American U.)
J.P. Lund; B.D.S.(Adel.), Ph.D.(W.Ont.)
C.E. Smith; D.D.S., Ph.D.(McG.)
H. Warshawsky; B.Sc.(Sir G. Wms.), M.Sc., Ph.D.(McG.)

Associate Professors

P.J. Chauvin; B.Sc.,D.D.S.(McG.), M.Sc.(W.Ont.), F.A.A.O.P.,
F.R.C.D.(C)
J.S. Feine; D.D.S., M.S.(Texas), H.D.R.
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.(BallState), D.D.S., Ph.D.(Ind.)
I. Stangel; D.M.D.(Penn.)

Assistant Professors

P.J. Allison; B.D.S., F.D.S.R.C.S., M.Sc.(London), Ph.D.(McG.)
M. Dagenais; D.M.D.(Montr.), Dip. Oral Radiology(Tor.)
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)

Adjunct Professor

A. Charbonneau; D.M.D., M.Sc., Ph.D.(Montr.)
E. Franco; B.Sc.(Estadual de Campinas), M.P.H.,
Dr.P.H.(N. Carolina)
S. Marchand; (UQAT), M.Sc.(UQTR), Ph.D.(Montr.)
D.J. Ostry; B.A.Sc., M.A.Sc., Ph.D.(Tor.)
E. Sacher; B.S.(CCNY), Ph.D.(Penn. State)

Associate Member

E.G. Gisel; B.S.(Zurich), B.S., M.S., Ph.D.(Temple)

21.2 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, Department of Oral Biology, for further details.

M.Sc. 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.

21.3 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 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 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.

21.4 Application Procedures

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 Faculty of Graduate Studies and Research.

Deadline for receipt of the completed application is March 1 for Fall; and November 1 for Winter.

Applications may be obtained by writing to Office of the Associate Dean, Graduate Studies and Research, Faculty of Dentistry.

M.Sc. 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, Interim Director of the program.

Further information may be obtained by writing to Graduate Program in Oral and Maxillofacial Surgery, Department of Dentistry, Montreal General Hospital, 1650 Cedar Avenue, Montreal, Québec H3G 1A4.

21.5 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. This registration fee is \$50.00. Further information may be obtained from the Registrar of l'Ordre des Dentistes du Québec, 625 René-Lévesque Boulevard West, Fifteenth Floor, Montreal, Québec H3B 1R2.

M.SC. IN DENTAL SCIENCES

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

Required Courses (7 credits)

513-607A (3) Principles of Inferential Statistics in Medicine (or equivalent course)

4 credits, one graduate seminar

590-671D,N Graduate Seminars in Dental Sciences
590-672D,N Graduate Seminars in Dental Sciences
590-771D Graduate Seminars in Dental Sciences
590-772D Graduate Seminars in Dental Sciences

Suggested Complementary Courses (8 – 14 credits)

590-562B (2) Calcified Tissues
590-654B (3) Mechanisms and Management of Pain
504-632D (6) Experimental Morphology
504-663D (9) Histology
177-524B (3) Topics in Molecular Biology of the Gene

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:

590-650A,B, or C (3) Thesis Research Course I
590-651A,B, or C (6) Thesis Research Course II
590-652B,C,D,E,G or L (9) Thesis Research Course III
590-653A,B,D, or K (15) Thesis Research Course IV

M.SC. IN ORAL AND MAXILLOFACIAL SURGERY

Duration: Four calendar years commencing July 1. The following courses are included in the program:

590-611C,D,H,J,K (9) Oral and Maxillofacial Surgery I Seminars
590-612C,D,H,K (24) Oral and Maxillofacial Surgery I Clinical
590-613C,D,K (3) Anatomy/Surgical Anatomy
590-621C,D,G,H (12) Anaesthesia
590-622A,C,D (6) General Surgery
590-623A,B,C,D (4) Surgical Intensive Care Unit
590-624A,B,C,D (4) Emergency
590-625A,C,D,E (6) Internal Medicine
590-626A,B,C,D (4) Pathology
590-631C,D,H,J,K (9) Oral and Maxillofacial Surgery II Seminars
590-632C,D,G,H,K (3) Oral and Maxillofacial Surgery II Clinical
590-633A,B,C,D,E (24) Research (including thesis)
590-641A,C,D,H,K (9) Oral and Maxillofacial Surgery III Seminars
590-642A,C,D,K (18) Oral and Maxillofacial Surgery III Clinical
590-643A,C,D,G,H,T (6) Oral and Maxillofacial Surgery III Trauma
590-644A,B,C,D (3) Surgical Elective

21.6 Courses for the M.Sc. in Dental Sciences

590-671/2D AND 590-771/2D GRADUATE SEMINARS IN DENTAL SCIENCES. (4) 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.

Course Coordinator:
Dr. E.D. Shields and staff

590-562B CALCIFIED TISSUES. (3) (3 hours of lecture supplemented by 1 hour laboratory of 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.

Course Coordinators:
Dr. H. Warshawsky and Dr. C.E. Smith

590-650A,B,C THESIS RESEARCH I. (3) Independent work under the direction of a supervisor on a research problem in the student's designated area of research.

Course Coordinators:
Research Supervisors

590-651A,B,C THESIS RESEARCH II. (6) Independent work under the direction of a supervisor on a research problem in the student's designated area of research.

Course Coordinators:
Research Supervisors

590-652B,C,D,E,G,L THESIS RESEARCH III. (9) Independent work under the direction of a supervisor on a research problem in the student's designated area of research.

Course Coordinators:
Research Supervisors

590-653A,B,D,K THESIS RESEARCH IV. (15) Independent work under the direction of a supervisor on a research problem in the student's designated area of research.

Course Coordinators:
Research Supervisors

590-654B MECHANISMS AND MANAGEMENT OF PAIN. (3) 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.

Course Coordinators:
Dr. M.C. Bushnell and Dr. A. Vainio

22 Developing Area Studies

Centre for Developing Area Studies
3715 Peel Street
Montreal, QC
Canada H3A 1X1
Telephone: (514) 398-3507
Fax: (514) 398-8432
Email: ED10@musica.mcgill.ca
Website: <http://www.arts.mcgill.ca/programs/cds/index.htm>

Director — R.E. Boyd

Documentalist — Iain Blair

The Centre 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 Centre has a specialized documentation room, 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 Centre 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,

environmental management training, the labouring poor, literacy, and foreign investment.

Graduate students with an interest in international development can apply to become fellows.

23 Dietetics and Human Nutrition

School of Dietetics and Human Nutrition
Room MS2-039, Macdonald-Stewart Building
Macdonald Campus, McGill University
21,111 Lakeshore Road
Ste-Anne-de-Bellevue, QC
Canada H9X 3V9
Telephone: (514) 398-7762
Fax: (514) 398-7739
Email: laduke@agradm.lan.mcgill.ca
Website: <http://www.agrenv.mcgill.ca/dietetic>

Director — K. Gray-Donald

23.1 Staff

Emeritus Professor

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

Professors

P.J.H. Jones; B.Sc., M.Sc.(Br.Col.), Ph.D.(Tor.)
H.V. Kühnlein; B.S.(Penn. St.), M.S.(Oregon St.), Ph.D.(Calif.)
(joint appt. with Faculty of Medicine)

Associate Professors

K. Gray-Donald; B.Sc., Ph.D.(McG.) (joint appt. with Epidemiology and Biostatistics, Faculty of Medicine)
T.A. Johns; B.Sc.(McM.), M.Sc.(Br.Col.), Ph.D.(Mich.) (joint appt. with Plant Science)
K.G. Koski; B.S., M.S.(Wash.), Ph.D.(Calif.) (joint appt. with McGill Nutrition and Food Science Centre, and Division of Experimental Medicine, Faculty of Medicine)
S. Kubow; B.Sc.(McG.), M.Sc.(Tor.), Ph.D.(Guelph)
L. Thibault; B.Sc., M.Sc., Ph.D.(Laval)

Assistant Professors

D.J. Bissonnette; B.Sc.(McG.), Ph.D.(Tor.)
L. Chan; B.Sc., M.Sc.(Hong Kong), Ph.D.(Lond.) (joint appt. with Natural Resource Sciences, and Food Science and Agricultural Chemistry)
O. Receveur; B.Sc., M.Sc., Ph.D.(Calif.)
L.J. Wykes; B.Sc., M.Sc., Ph.D.(Tor.)

Cross-Appointed Professors

F. Carli (Anaesthesia); K. Ciafone (Medicine);
L.J. Hoffer (Medicine); E.B. Marliss (Medicine);
M.E. Scott (Parasitology); S. Young (Psychiatry)

Associate Members

L. Beaumier (Montreal Children's Hospital); S. Kermasha (Food Sc./Agr. Chem.); R. Gougeon (Medicine); J.F. Yale (Medicine)

Adjunct Professors

K.A. Cockell (Health Canada), J.S. Cohn (Clinical Research Inst. of Canada), S.-H. Shen (National Research Council Canada)

23.2 Programs Offered

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

Candidates may conduct research in areas of nutritional biochemistry, clinical nutrition, community or international nutrition. In addition, eligible candidates may complete the equivalent of a Dietetic Internship for membership in the professional association for registration as Dietitians and Nutritionists in Canada. The M.Sc. (Applied) provides an opportunity to undertake course work and an applied project or advanced professional practice. For details on eligibility, required courses, etc., please contact the University Coordinator (Email: starkey@agradm.lan.mcgill.ca).

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.

23.3 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. This implies that about one-third of all undergraduate courses should have been devoted to the subject itself and another third to cognate subjects. Some Major Programs (at McGill and elsewhere) contain the necessary amount of specialization and may qualify the applicant for consideration. High grades are expected in courses considered by the School to be preparatory to the graduate program.

Admission for M.Sc. studies requires at least a cumulative grade point average (CGPA) in McGill University's credit equivalency of 3.2/4.0 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)

Candidates must have a B.Sc. (Nutritional Sciences) or equivalent, with a dietetic internship or, be eligible to enter a dietetic internship program. Six months work experience in dietetics/nutrition practice is required for admission into the program.

Ph.D.

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

23.4 Application Procedures

Applications for Admission and all supporting documents must be sent directly to:

Student Affairs Office (Graduate Studies)
Macdonald Campus of McGill University
21,111 Lakeshore
Ste-Anne-de-Bellevue, Québec
H9X 3V9 CANADA
Telephone: (514) 398-7708
Fax: (514) 398-7968
Email: GRAD@macdonald.mcgill.ca

Applications will be considered upon receipt of a signed and completed application form, \$60 application fee, 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.

Deadlines – For **international students**, complete applications with supporting documents must reach the Student Affairs Office (Graduate Studies) at Macdonald Campus at least **eight months** prior to the intended start of program. May 1 for January (winter); September 1 for May (summer); January 1 for September (fall). For **domestic students**, complete applications with supporting documents must reach the office no later than **three months** in advance of intended start of program.

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. Certified personal cheque in Cdn.\$ drawn on a Canadian bank;