

● **180-672B THE POLYMER SOLID STATE.** (4)

180-673B POLYMERS IN SOLUTIONS. (4) Thermodynamics of regular and of polymer solutions; osmotic pressure; phase separations; polymer configurations; light scattering; ultracentrifugation; viscometry; gel permeation chromatography; polyelectrolytes.

Professor Gray

180-674A INTRODUCTORY PHYSICAL CHEMISTRY OF POLYMERS. (4) A survey course on the structure of polymers; kinetics and mechanisms of polymer synthesis; molecular weight distributions; polymer configurations and the thermodynamics of polymer solutions; rubber, elasticity, osmometry and viscosity.

Professors Eisenberg and Marchessault

● **180-675A MECHANICAL PROPERTIES AND RHEOLOGY OF POLYMERS.** (4)

180-686B WET-END PAPERMAKING CHEMISTRY. (3) (Restricted to graduate students in Chemistry or Chemical Engineering or permission of instructor.) (Prerequisites: 180-543 and 180-585)

Review of the chemistry of various additives used in papermaking, such as wet and dry strength agents, sizing agents, fillers, filler retention aids, antifoam agents, biocides, dyes, dewatering agents, drainage and formation aids. The course also addresses the chemistry of deinking of waste papers and the treatment of effluents.

Professor van de Ven

180-691A,B,C M.Sc. THESIS RESEARCH. (3) Independent research work leading to writing of M.Sc. thesis for final submission to the Faculty of Graduate Studies and Research. **Staff**

180-692A,B,C M.Sc. THESIS RESEARCH. (6) Independent research work leading to writing of M.Sc. thesis for final submission to the Faculty of Graduate Studies and Research. **Staff**

180-693A,B,C M.Sc. THESIS RESEARCH. (9) Independent research work leading to writing of M.Sc. thesis for final submission to the Faculty of Graduate Studies and Research. **Staff**

180-694A,B,C M.Sc. THESIS RESEARCH. (12) Independent research work leading to writing of M.Sc. thesis for final submission to the Faculty of Graduate Studies and Research. **Staff**

180-695A,B,C M.Sc. THESIS RESEARCH. (15) Independent research work leading to writing of M.Sc. thesis for final submission to the Faculty of Graduate Studies and Research. **Staff**

180-696A,B,C M.Sc. THESIS RESEARCH. (6) Independent research work leading to writing of M.Sc. thesis for final submission to the Faculty of Graduate Studies and Research. **Staff**

180-697A,B,C M.Sc. THESIS RESEARCH. (9) Independent research work leading to writing of M.Sc. thesis for final submission to the Faculty of Graduate Studies and Research. **Staff**

180-698A,B,C M.Sc. THESIS RESEARCH. (12) Independent research work leading to writing of M.Sc. thesis for final submission to the Faculty of Graduate Studies and Research. **Staff**

180-699A,B,C PROJECT. (15) Restricted to students in the M.Sc. (Applied) program in Chemistry and designed to give them practical experience through a four-month project in some aspect of chemical industry

Professor Gray

180-721B ORGANIC CHEMISTRY RESEARCH SEMINAR. (3) Upon completion of the organic cumulative examinations, students will present a seminar on their research work (including background and future plans).

Professor Gleason, Coordinator

180-763A RESEARCH REPORT II. (3) (Restricted to graduate students in Chemistry.) Students will present a seminar on a complete or nearly complete research project and discuss these results with professors of the inorganic chemistry division.

Professor Hogan and Inorganic staff

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Chair — D. Mitchell

Chair of Graduate Program — G. McClure

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.

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)

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

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

Adjunct Professors

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

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

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

15.2 Programs Offered

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

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

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

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

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 requirements for both options pertain to well prepared students; others may be required to take additional courses as a condition of

admittance 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.

M.Sc. Degree

Candidates with a Bachelor's degree in a discipline other than Engineering, such as Science or Arts, may be accepted into a M.Sc. program in the Department. Such students would typically

study in the fluid mechanics, water resources, or environmental engineering areas, and would follow the Thesis Option program, as outlined above.

Ph.D. Degree

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

The Ph.D. program consists of a research project and courses as required to develop the candidate's background. Candidates are expected to take a comprehensive preliminary oral examination (course 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 2000-01.

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 A 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) Characterization of municipal and industrial solid wastes. Review of solid and hazardous waste impact, regulations and treatment options. Collection and transportation of solid wastes. Methods of reclamation and disposal. Introduction to the design of landfill sites and incinerators.

Professor Nicell

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

303-540A 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) Principles of rail system design, including vehicle motion calculations, supporting way design, and rail vehicle design. Planning and operational characteristics for rail freight systems and urban rail systems, with an assessment of operational and technological developments.

Messrs. Gussow and Hervieux

- **303-546A,B SELECTED TOPICS IN CIVIL ENGINEERING.** (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) Application of statistical principles to design of measurement systems and sampling programs. Introduction to experimental design. Graphical data analysis. Description of uncertainty. Parametric and nonparametric statistical tests. Trend analysis. Statistical analysis of censored data. Model parameter estimation methods. Linear and nonlinear regression methods. **Professor Nguyen**

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 A FLUID MECHANICS OF WATER POLLUTION. (3) (Prerequisite: 303-327B or equivalent.) Mixing, dilution and dispersion of pollutants discharged into lakes, rivers, estuaries and oceans; salinity intrusion in estuaries and its effects on dispersion; biochemical oxygen demand and dissolved oxygen as water quality indicators; thermal pollution; oil pollution. **Professor Chu**

303-576B HYDRODYNAMICS. (3) (Prerequisite: 303-327B) Equations of motion, stress and rate of strain, vorticity, potential flows, virtual mass, complex variables and conformal mapping. Free surface flows. Shallow water flows, method of characteristics, waves of finite amplitude. Flows on a geophysical scale, Ekman layers, homogenous lake circulation, seiches. Refraction and diffraction around breakwaters.

303-577B 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) Properties of bituminous materials, design of bituminous concrete mixes, construction control; evaluation of design parameters, factors controlling their variability; soil stabilization; frost effects; stresses and displacements in layered systems, analysis of rigid and flexible pavement systems; design of highway and airport pavements; pavement evaluation and strengthening; recycling.

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 anal-

ysis. 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)

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) Quantitative analysis of uncertainty in planning, design, construction, operation and rehabilitation of engineered facilities. Interprets fundamentals of probabilities, random processes, statistics, and decision analysis in the context of engineering applications, in particular description of variability of loads and environmental conditions, material properties performance prediction, system reliability analysis, and risk-based decision analysis. **Professor Chouinard**

● **303-610A,B 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)

303-614A COMPOSITES FOR CONSTRUCTION. (4) Fibre reinforced plastics (FRP), civil engineering applications; fibre, matrix, processing; plymechanics, strength, rigidity, stability, durability; FRP rebars and tendons for concrete, laminates for strengthening, pultruded beams and columns, FRP stay-in-place formwork for concrete, FRP - glulam beams; design criteria, design project. (Awaiting University Approval) **Professor Shao**

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.

● **303-617 B 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**

● **303-621A 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 indetermi-

nate 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 survey; 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)

303-651 A THEORY OF WATER AND WASTEWATER TREATMENT. (4) Theoretical aspects of the chemistry of water and wastewater treatment. This will include acid-base and solubility equilibria; redox reactions; reaction kinetics; reactor design; surface and colloid chemistry; gas transfer; mass transfer; stabilization and softening; disinfection; corrosion.

Professor Gehr

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

303-659B 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)

● **303-666B ENVIRONMENTAL AND WATER RESOURCES SYSTEMS.** (4)

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

303-683A 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-situtreatment techniques (physical, biological, and chemical).

Professor Ghoshal

● **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.

16 Classics

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

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Fax: (514) 398-8365

E-mail: cparis1@po-box.mcgill.ca

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

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)

Professors

A. Carson; B.A., M.A., Ph.D.(Tor.)

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

Associate Professor

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 2000-01 as the program has been temporarily suspended. Further information may be obtained from the Department of History.

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 2000-01.

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

17 Communication Sciences and Disorders

School of Communication Sciences and Disorders
Beatty Hall
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Canada

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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.(Thess.), M.Sc.(McG.), F.R.C.P.(C)

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.)

V. Gracco; B.A., M.A.(San Diego), Ph.D. (Wis.-Madison)

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.(Slippery Rock), M.A.(Minn.), Ph.D.(S.Flor.)

Assistant Professors (Special Category)

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

E. Thordardotir; B.A., M.Sc., Ph.D.(Wis.-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.)

H. Kisilevsky; B.A.(McG.), M.A.(UCLA), M.O.A.(Mtl.)

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

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

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

A. Sutton; B.A.(Tor.), M.S.(Boston), Ph.D.(McG.)

C. Timm; B.A.(C'dia), M.Sc.A.(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 Mtl.*); 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 degree 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 2000-01 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.

Ph.D. Option in Language Acquisition (LAO)

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

Funding

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

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

17.3 Admissions Requirements

M.Sc.(Applied)

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 2000-01 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, certified cheque or credit card - Amex, MC, Visa)
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 2000-01.

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

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

Required Courses

401-652A,B	(3)	Advanced Research Seminar I
401-653A,B	(3)	Advanced Research Seminar II
401-685A,B,C,T	(3)	Research Project I
401-686A,B,C,T	(3)	Research Project 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. (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.

401-685A,B,C,T RESEARCH PROJECT I. (3) Supervised research project.

401-686A,B,C,T RESEARCH PROJECT II. (3) Supervised research project.

18 Communications

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Director — Dr. W. Straw

Department Chair — Christine Ross

Director, Art History Graduate Studies — H. J. Böker

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,

B. Pennycook, R. Schutz, M. Somerville, P. Tancred, R. Yates

Adjunct Professor

J. Picot; B.A.(Montr.), M.A.(Con.), Ph.D.(S.Fraser)

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, James Administration Building, Room 400, 845 Sherbrooke Street W., Montreal, Quebec, H3A 2T5. (514) 398-3990. (<http://www.mcgill.ca/fgsr/fellow1.htm>)

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

18.3 Admission Requirements

M.A.

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

Ph.D.

Applicants for the Ph.D. program are expected to have completed the equivalent of an M.A. degree. Admission will be based on academic achievement and evidence of talent and strong motivation in 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 fulfillment of a language requirement and a written dissertation.

18.6 Courses Offered

● Denotes not offered in 2000-01.

□ 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 — TBA

Chairs of Graduate Program:

M.Sc. — T. Merrett

Ph.D. — G. Toussaint

19.1 Staff

Emeritus Professor

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

Professors

D. Avis; B.Sc.(Wat.), Ph.D.(Stan.)

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

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.) (*on leave 2000-01*)

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

Associate Professors

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

G. Dudek; B.Sc.(Queen's), M.Sc., Ph.D.(Tor.) (*on leave 2000-01*)

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.) (*on leave 2000-01*)

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

(*on leave 2000-01*)

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

Assistant Professor

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

K. Driesen; Licentiate, M.A.(Free Brussels), Ph.D.(UC- Santa-Barbara)

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

Adjunct Professors

R. De Mori, K. El Emam, 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 Ph.D. thesis proposal exam, 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.

Professor Driesen

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 history 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 Madhavji

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: 308-251 or 308-302) Introduction to programming techniques and hardware design concepts that facilitate interac-

tion 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**

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

Professor Crépeau

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

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 applications 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 Madhavji

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 Madhavji

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 ADVANCED CRYPTOGRAPHY (4) (3 hours) (Prerequisite: 308-547). Information theoretic definitions of security, zero-knowledge protocols, secure function evaluation protocols, cryptographic primitives, privacy amplification, error correction, quantum cryptography, quantum cryptanalysis..

Professor Crépeau

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 to 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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Chair — David C. Smith

Director of Graduate Programs — TBA

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.), F.R.S.C.
(*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

Martin Jeffery; B.A., S.T.L., M.A.(Ott.) (PT)

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

William Lawlor; B.Com., B.Ed.(Montr.), M.A., Ph.D.(Ott.) (PT)

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

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)

Eric Caplan; B.A.(Tor.), M.A.(Hebrew University), Ph.D.(McG.)

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

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

Faculty Lecturer

Joan C. Russell; B.Mus., L.Mus., M.Ed., Ph.D.(McG.)

Adjunct Professors

Henry A. Giroux; B.S.(S.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