



**School of Graduate Studies Calendar
2009-2010**

McMASTER UNIVERSITY

School of Graduate Studies Calendar 2009-2010



The Arms of McMaster University, consisting of escutcheon, crest and escrol, were granted by Francis James Grant, Lord Lyon King of Arms, Edinburgh, 20 October, 1930. The heraldic description is:

Argent, an eagle displayed Gules beaked and membered Or, charged on the breast with a latin cross flory of the last, on a chief Azure a book expanded proper, leathered of the second buckles and straps Gold, between two maple leaves of the last. Above the shield is placed a helmet befitting their degree with a Mantling Gules doubled Argent and on a Wreath of their Liveries is set for crest on a mount Vert before an oak tree a stag courant both proper, and in an Escrol over the same this Motto, TA PANTA EN CHRISTOI SYNESTEKEN. (The translation of the Greek motto is "In Christ all things hold together", adapted from Colossians 1:17.)

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McMaster University

Produced by the School of Graduate Studies, Medy Espiritu, Assistant Secretary and SynApps System Administrator

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For copies of departmental brochure(s), write to the graduate department in which you are interested in studying:

Department Chair
Name of Graduate Department
McMaster University
1280 Main Street West
Hamilton, Ontario, Canada
L8S 4L8

A separate application for financial assistance is not required as all applicants are automatically considered for financial support. There is an application fee of \$90. Applications will be considered at any time, but graduate programs commence in September, January, and May.

DIRECTORY FOR INFORMATION AND CORRESPONDENCE

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Off-Campus Housing	Student Centre, Room B112	Ext. 24086
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The University will not be liable for any interruption in, or cancellation of, any academic activities as set forth in this Calendar and related information where such interruption is caused by fire, strike, lock-out, inability to procure materials or trades, restrictive laws or governmental regulations, actions taken by the faculty, staff, or students of the University or by others, civil unrest or disobedience, or any other cause of any kind beyond the reasonable control of the University.

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Catherine Hayward, M.D., Ph.D., F.R.C.P.C.
Heather Sheardown, B. Eng., Ph.D.
Douglas Welch, M.Sc., Ph.D.

Assistant Dean, Graduate Student Life and Research Training

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Richard Levin, B.A., M.A.

Graduate Registrar and Secretary

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University Librarian

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Secretary of the Board of Governors and the Senate

W. Bruce Frank, B.A., M.A., Ph.D.

PAST DEANS OF GRADUATE STUDIES

1956-61 Arthur N. Bourns, B.Sc., Ph.D., F.C.I.C. (Chemistry)
1961-65 Henry E. Duckworth, B.A., B.Sc., Ph.D., F.R.S.C. (Physics)
1965-71 Melvin A. Preston, C.D., M.A., Ph.D., F.R.S.C. (Physics)
1971-73 Alvin A. Lee, B.A., M.Div., M.A., Ph.D. (English)
1973-78 Leslie J. King, M.A., Ph.D. (Geography)
1978-79 (Acting), Denis M. Shaw, M.A., Ph.D., F.R.S.C. (Geology)
1979-84 Denis M. Shaw, M.A., Ph.D., F.R.S.C. (Geology)
1984-91 Chauncey D. Wood, A.B., M.A., Ph.D. (English)
Jan-June (Acting), Frederick L. Hall, A.B., M.Sc., Ph.D.
1992 (Civil Engineering & Engineering Mechanics,
Geography)

1992-94 Chauncey D. Wood, A.B., M.A., Ph.D. (English)
1994-99 John C. Weaver, B.A., M.A., Ph.D. (History)
1999-2005 Frederick L. Hall, A.B., M.Sc., Ph.D.
(Civil Engineering & Engineering Mechanics,
Geography)
Jan-June (Acting) Laura Finsten, B.A., M.A. Ph.D. (Anthropology)
2005
July-Dec (Acting) David Capson, B.Sc.Eng., M.Eng., Ph.D., P.Eng.
2005 (Electrical and Computer Engineering)
Jan 2006- June 2007 Frederick L. Hall, A.B., M.Sc., Ph.D.
(Civil Engineering & Engineering Mechanics,
Geography)
July 2007- June 2008 (Acting) David Capson, B.Sc.Eng., M.Eng., Ph.D., P.Eng.
(Electrical and Computer Engineering)

THE ASSOCIATE VICE-PRESIDENT AND DEAN'S MESSAGE

McMaster University is known world-wide for innovation in education and research, and the students who are enrolled in the School of Graduate Studies' programs are the engine that drives that reputation.

We offer 65 Master's level programs and 42 Ph.D. level programs in fields spanning the Humanities and Social Sciences, the Natural Sciences and Engineering, Business, and the Health Sciences. McMaster also has a long tradition of interaction across disciplinary boundaries, and students and faculty are increasingly finding homes for research and scholarship in our interdisciplinary programs.

The School of Graduate Studies provides leadership for all of these graduate programs, and is responsible for maintaining and improving the standards of graduate scholarship and research at McMaster, and enhancing McMaster's national and international reputation as a leader in graduate studies and research training. The School also leads strategic planning for graduate expansion and the development of new graduate programs and interdisciplinary programs, works to promote a holistic view of the graduate student experience at McMaster, and will play an increasing role in supporting knowledge translation, professional development, and research training at all levels.

I am honoured to be leading the School of Graduate Studies at this exciting time in the School's history, as we renew the School's mission: to provide the best education and training for our students, and to inspire the next generation of researchers, scholars, and leaders.

ALLISON B. SEKULER
Associate Vice President and Dean (Graduate Studies)

ALLISON B. SEKULER

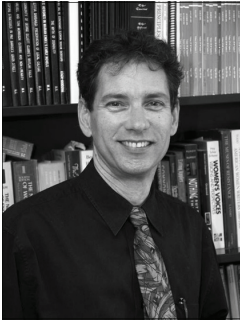


Dr. Allison Sekuler received her B.A. in Mathematics and Psychology degree from Pomona College in 1986. She completed her Ph.D. at the University of California, Berkeley. She is currently professor in the department of Psychology, Neuroscience and Behaviour.

Dr. Sekuler is a Canada Research Chair in Cognitive Neuroscience and focuses on vision science and aging in her research. She was McMaster's first Associate Vice-President (Research), and has served as Acting Vice-President for Research and International Affairs, Acting Associate Dean, Research and External Relations, Faculty of Science, and Associate Chair (Graduate Studies), Department of Psychology, Neuroscience and Behaviour. As Associate Vice-President (Research), she crafted new programs for post-doctoral fellows, spearheaded the development of new undergraduate research initiatives, and facilitated interdisciplinary research programs, including innovative interactions bridging researchers across the arts, humanities, sciences, and engineering. She is also deeply committed to knowledge translation, and helped found several high profile public outreach programs at McMaster, such as Science in the City and the MACafé Scientifique.

Dr. Sekuler has won numerous national and international awards for research, teaching and leadership, while graduating and supervising Ph.D., Master's, undergraduate students, and post-doctoral fellows, and has served on and chaired provincial, federal and international grant review panels and external boards related both to her research and to McMaster's mission.

DONALD GOELLNIGHT



Donald Goellnicht received his B.A. in English from Queen's University in 1975 and his M.A. and Ph.D. from McMaster University in 1976 and 1981. He taught at Henan University in Kaifeng, China in 1981-82 and then held a SSHRC Postdoctoral Fellowship before joining the Department of English at McMaster in 1984.

Dr. Goellnicht served as Chair of Graduate Studies in the Department of English from 1991 to 1995 and then as Department Chair from 1995 to 2004, during which time the Department undertook significant curricular development leading to the introduction of new B.A. and M.A. programs in Cultural Studies and Critical Theory that complement the B.A., M.A., and Ph.D. programs in English. He was Acting Associate Dean of Graduate Studies in 2006 and returned as Acting Chair of the Department in 2006-07. Dr. Goellnicht has served on the McMaster Senate and Board of Governors, as President of the Canadian Association of Chairs of English, and as Chair of the Asian American Literature Division of the Modern Language Association of America. He is currently Professor in the Department of English and Cultural Studies. To date, he has supervised eleven Ph.D. and eighteen M.A. students.

Dr. Goellnicht has been appointed Associate Dean of Graduate Studies for the Faculties of Business, Humanities, and Social Sciences for a five-year term. As Associate Dean, he is responsible for graduate admissions and the allocation of graduate scholarships to departments in each of these faculties. He also chairs each Faculty's Graduate Admissions and Study Committee, is a member of each Faculty's Graduate Curriculum and Policy Committee, and sits on Graduate Council and its Executive Committee.

Although originally trained as a scholar of British Romantic literature, Dr. Goellnicht's research and teaching focus has shifted over the years to Asian American and Asian Canadian literature, African American literature, and critical race studies. He is particularly interested in issues of race and ethnicity, gender and sexuality, diaspora and transnationalism in these literary and cultural traditions.

CATHERINE HAYWARD



Dr. Catherine Hayward trained in Medical Laboratory Technology at Dawson College and received her B.Sc. and M.D. from the University of Western Ontario in 1980 and 1984. She trained in Internal Medicine and Hematology at the University of Toronto and in Transfusion Medicine at McMaster University. In 1995, she received her Ph.D. in Medical Sciences from McMaster University, and the Governor General of Canada Gold Medal for her doctoral thesis. She is the recipient of the Gold Medal in Medicine from the Royal College of Physicians and Surgeons of Canada, a Premier's Research Excellence Award, among others. Dr. Hayward joined McMaster University Faculty in 1995 and is a Professor of Pathology and Molecular Medicine, and Medicine. She is a Hematologist at St. Joseph's Healthcare and Hamilton Health Sciences where she runs a clinic focused on bleeding problems and serves as Head of Coagulation for the Hamilton Regional Laboratory Medicine Program.

Dr. Hayward has long standing interests in education and research in Health Sciences. She served on the Graduate Policy and Curriculum Committee (Health Sciences) and she was Program Director for the McMaster University Adult Hematology Program. She established the Clinician Investigator Training Program at McMaster University as the first Program Director. She is Chair of the Clinician Investigator Program Advisory Committee for the Royal College of Physicians and Surgeons of Canada, and is leading initiatives to assess and improve clinician investigator training in Canada. She has served as Scientific Officer and Member of numerous peer review panels for granting agencies. She is President of the North American Specialized Coagulation Laboratory Association, Co-Chair of the Platelet Physiology Committee for the International Society on Thrombosis and Hemostasis and a member of the Board for the International Society of Laboratory Hematology. She also serves on Editorial and Advisory boards for journals in her field.

Dr. Hayward's research interests span bench to bedside investigations on bleeding disorders and the molecular mechanisms of hemostasis. Dr. Hayward has held continuous, peer reviewed grant funding and external career awards since her recruitment to Faculty. She is the recipient of a Canada Research Chair in Molecular Hemostasis, a Heart and Stroke Foundation of Ontario Career Investigator Award, and operating grant support from the Canadian Institutes of Health Research, the Heart and Stroke Foundation of Ontario and the Canadian Hemophilia Society. Her research team includes M.Sc. and Ph.D. students in Medical Sciences and postdoctoral fellows.

Dr. Hayward has been appointed Associate Dean of Graduate Studies for the Faculty of Health Sciences for a five-year term. As Associate Dean, she has primary responsibility for furthering McMaster goals for graduate education and research in health sciences, and provides the leadership and coordination of all activities related to these goals. She is also a member of Graduate Council and its Executive.

HEATHER SHEARDOWN

Heather Sheardown received her B. Eng. in Chemical Engineering from McMaster in 1989 and her Ph.D. from the University of Toronto in 1995. She did a post doctoral fellowship at McMaster from 1994-1996 and taught at the University of Ottawa from 1996 to 1998 before returning to the Department of Chemical Engineering at McMaster in 1998. She is cross-appointed to the Department of Pathology and Molecular Medicine and is a member of the School of Biomedical Engineering and holds an Adjunct Appointment to the School of Optometry at the University of Waterloo.

Dr. Sheardown has been appointed Associate Dean of Graduate Studies for the Faculty of Engineering for a five-year term. As Associate Dean, she is responsible for admissions and allocation of graduate scholarships as well as for working with the Faculty of Engineering and the School of Graduate Studies on graduate student issues including recruiting and the development of new programs. She chairs the Faculty's Graduate Admissions and Study Committee and the Graduate Curriculum and Policy Committee and sits on Graduate Council and its Executive Committee.

Dr. Sheardown is an active researcher in the field of ophthalmic biomaterials, with more than 70 publications and 8 patents pending for her work in this area. She has graduated 4 Ph.D. students and 16 M.A.Sc. students to date. She is currently the Scientific Director of the 20/20 NSERC Ophthalmic Materials Network which focuses on the development of new materials and drug delivery systems for the treatment of various eye diseases.

DOUG WELCH

Doug Welch received his B.Sc., M.Sc., and Ph.D. in Astronomy and Astrophysics from the University of Toronto in 1981, 1983, and 1985, respectively. He was an NSERC Visiting Fellow and a Research Associate at the National Research Council's Dominion Astrophysical Observatory in Victoria, British Columbia from 1985 to 1988. In September 1988, he came to McMaster as an Assistant Professor and NSERC University Research Fellow. At present, he is a Professor in the Department of Physics and Astronomy. Dr. Welch has served as an Associate Chair of the Department of Physics and Astronomy between 1992 and 1994 and as Chair between 1997 and 2000. He has recently been a Faculty Adjudicator responsible for cases involving graduate students. In 2004, he was Acting Associate Dean of Graduate Studies for the Faculties of Engineering and Science for one and a half years. To date, he has supervised five Ph.D. and four M.Sc. students. He has taken particular interest in the restructuring of first-year (undergraduate) physics instruction and has contributed significantly to a complete overhaul of that program. Dr. Welch supervised the refurbishment of the Planetarium at McMaster and is currently its Director.

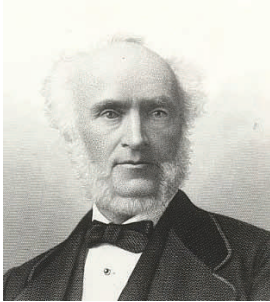
Dr. Welch has been appointed Associate Dean of Graduate Studies for the Faculty of Science for a five-year term. He is responsible for graduate student admissions and for the allocation of scholarships to the Faculty. As Associate Dean, he chairs the Graduate Curriculum Admissions and Study Committee and is a member of the Graduate Curriculum and Policy Committee for the Faculty. He also serves on Graduate Council and its Executive Committee.

Other responsibilities of Dr. Welch include being a member of the Organizing Committee of International Astronomical Union Commission 27, "Variable Stars." The current research interests of Dr. Welch include supernovae, the extragalactic distance scale, dark matter studies using microlensing, and variable stars. His work with the MACHO Project has involved the analysis and characterization of pulsating variable stars. He has been a Co-Investigator on several successful Hubble Space Telescope proposals and is a frequent user of offshore national facilities.

SESSIONAL DATES 2009-2010

Deadline Dates for Graduate Programs	Fall Term (1) (Sept-Dec 2009) (w & x)	Winter Term (2) (Jan-April 2010) (y & z)	Summer Term (S) (May-Aug 2010)
On-Time Registration	July 9-July 31	December 3-December 22	April 8-April 29
Late Registration	August 1-September 14	December 23-January 11	April 30-May 10
Final Dates to Add Courses:			
-- Full Courses	September 30		
-- Half Courses or Quarter Courses (1w or 2y)	September 30	January 29	May 21
-- Quarter Courses (1x or 2z)	November 6	March 5	
Final Dates to Delete Courses (NOTE: All courses on a student's record after these dates will require a grade):			
-- Full Courses	January 11, 2010		
-- Half Courses	October 16, 2009	February 12	June 11
-- Quarter Courses (1w or 2y)	September 30, 2009	January 29	
-- Quarter Courses (1x or 2z)	November 13, 2009	March 19	
Final Dates to Submit Grades:			
-- Full Courses		May 3	
-- Half Courses	January 11, 2010	May 3	August 13
-- Quarter Courses (1w or 2y)	November 6, 2009	March 5	
-- Quarter Courses (1x or 2z)	January 11, 2010	May 3	
Final Date to Submit Results of Incomplete (INC) Grades for Previous Term With Permission of Associate Dean	March 19, 2010	July 16	November 19
UNDERGRADUATE DATES			
Undergraduate Classes Begin	September 10	January 4	May 3
Undergraduate Classes End	December 4	April 8	June 18
Undergraduate Exam Period	December 8-22	April 10-28	
Mid-term Recess		February 15-20	
Holidays	October 12	April 2	May 24, July 1, August 2
	Fall 2009	Spring 2010	Fall 2010
CONVOCATIONS			
Fall -- All Faculties	November 20		November 19
Spring -- Faculty of Health Sciences (<i>except Nursing</i>)		May 21	
Spring -- All Other Faculties (<i>including Nursing</i>)		June 7 to June 11	
THESES			
Final Date to Submit Ph.D. Theses to Graduate Studies (Prior to Defense)	July 17	February 1 (<i>Health Sciences</i>) February 22 (<i>All others</i>)	July 23
Final Date to Submit Master's Theses to Departments (Prior to Defense)	August 21	March 19	August 20
Final Date to File Theses with Graduate Studies for Binding and Complete Degree Requirements			
-- Faculty of Health Sciences	September 28	April 7 (<i>except Nursing</i>)	September 28
-- All Other Faculties	September 28	April 28 (<i>including Nursing</i>)	September 28

McMASTER UNIVERSITY



William McMaster

Historically, McMaster University is the outgrowth of educational work initiated by Baptists in central Canada as early as the 1830s. Named after Senator William McMaster (1811-1887), who bequeathed substantial funds to endow "a Christian school of learning", the University was incorporated under the terms of an act of the Legislative Assembly of Ontario in 1887. The new University, housed in McMaster Hall in Toronto, offered courses in arts and theology. Degree programs began in 1890, with degrees first being conferred in 1894.

In 1930 the University moved from Toronto to Hamilton, the forty-first academic session opening on the present site. The University's lands and new buildings were secured through gifts from graduates, members of the churches of the Baptist Convention of Ontario and Quebec, and citizens of Hamilton.

Until 1957, the Governors of the University were elected by the Baptist Convention of Ontario and Quebec. In that year, the University became a non-denominational private institution. The historic Baptist connection was continued through the separate incorporation and affiliation of a theological school, McMaster Divinity College.

By the McMaster Act of 1968-69, McMaster Divinity College continued under its existing arrangement, but the rest of the University was organized into the Divisions of Arts, Science, and Health Sciences, each headed by a vice-president (academic).

In 1974 the divisional structure of the University was dissolved and the vice-presidents were replaced by a single Vice-President (Academic), now called Provost and Vice-President (Academic). The Faculties of Business, Engineering, Health Sciences, Humanities, Science, and Social Sciences were retained, each under the leadership of a dean.

The University corporation consists of up to thirty-seven governors. Academic work is under the direction of the University Senate, which is made up of representatives of the teaching and administrative staff, Governors, student body, and Alumni. The University is financed by means of endowment income, gifts, fees, and annual grants from the City of Hamilton, the Hamilton-Wentworth Region, The Province of Ontario, and the Government of Canada.

The University's activities are concentrated on an attractive campus located beside the Royal Botanical Gardens and yet within easy reach of downtown Hamilton. The central campus is reserved for pedestrian traffic only. There are over forty buildings providing classrooms, laboratories, computer facilities, seminar rooms, libraries, faculty club, residences, cafeterias, recreational facilities, and administrative and faculty office space.

DIRECTIONS

July 1, 1995 marked the beginning of Dr. Peter J. George's term as the sixth President and Vice-Chancellor of McMaster University. As part of his mandate, Dr. George and members of the McMaster community developed the new mission, vision, and set of 5 goals to be used as "a necessary roadmap to fulfill McMaster's future promise". The resulting document entitled, "Directions", was approved by the University Senate and Board of Governors in December, 1995. To promote public awareness, the vision and mission statements of the document appear below.

Mission

The mission statement acknowledges that this is a university in the generic sense and it is also a particular University, McMaster.

At McMaster our purpose is the discovery, communication, and preservation of knowledge. In our teaching, research, and scholarship, we are committed to creativity, innovation, and excellence. We value integrity, quality, and teamwork in everything we do. We inspire critical thinking, personal growth, and a passion for learning. We serve the social, cultural, and economic needs of our community and our society.

The mission statement establishes some broad boundaries that delimit what it is we do and what it is we value. These boundaries cannot be so wide that they fail to distinguish a university from a business firm, or McMaster from its sister institutions. However, the boundaries must be wide enough that they respect all of the goals we wish to set for ourselves.

The mission also reflects those qualities that we want, and expect, to see in our daily lives at this university. They may not be the kinds of things that we talk about every day with our colleagues, but they are those values and aspirations that draw us here and make us proud to be associated with McMaster.

Finally, the mission statement helps us to clarify our priorities. Clearly, this mission statement contains no list of "things to do", no action plans. It is not supposed to. But the mission statement should help us to set realizable goals by providing a common touchstone.

Vision

The vision statement captures what it is we want to be, our aspiration. We have chosen a vision statement that connects with mission, sets high standards, and is both distinctive and respectful of McMaster's heritage. It also reflects our ambition to be a place of learning that is open to the world.

At McMaster our vision is:

To achieve international distinction for creativity, innovation and excellence.

We will seek recognition for originality and imagination in research, scholarship and learning. We will encourage, recognize and reward significant achievement in those realms. A university with such a vision must be willing to measure its accomplishments against international standards.

1. GRADUATE STUDY AT McMASTER

Graduate study at McMaster University began over a century ago with M.A., M.Sc., and Ph.D. degrees first being conferred in 1894, 1942, and 1951 respectively. The administration of graduate work has taken various forms throughout this period. The Graduate Studies Committee of the Faculty of Arts and Science administered graduate work until 1957 when it was replaced by the Faculty of Graduate Studies. In 1969 McMaster University adopted its current administrative structure for graduate work. Taking the position that there should not be separate undergraduate and graduate teaching faculties, the Graduate Council was established as the deliberative, administrative and executive body reporting directly to the Senate on matters concerning graduate work.

When McMaster moved to its current graduate organization, the aims of graduate work were described as "the highest development of the powers of reasoning, judgment, and evaluation in intellectual concerns; specialized training in professional skills; initiation into research or scholarly work and development of a capacity for its successful and independent pursuit; the fruitful pursuit of research and scholarly work". This description remains as valid today as it was then.

Research is central to graduate work, and McMaster's strong research orientation has a pronounced effect on the character of its graduate programs. The numerous research achievements of McMaster faculty members have been recognized by grants, prizes, medals, and fellowships in academic societies. Such distinctions attest to the qualifications and dedication of faculty members in developing and disseminating knowledge. The education that McMaster faculty provide is valuable not only for the graduate student's career but also for the student's development as a person.

1.1 Programs of Study

McMaster University offers graduate programs that lead to one of the following degrees:

Master of Arts in Anthropology, Classics, Communication and New Media, Cultural Studies and Critical Theory, Economics, Economic Policy, English, French, Geography, Globalization, Health and Aging, History, Philosophy, Political Science, Religious Studies, Sociology, and Work and Society;

Master of Business Administration;

Master of Applied Science in Biomedical Engineering, Chemical Engineering, Civil Engineering, Communication and New Media, Computational Engineering and Science, Electrical and Computer Engineering, Engineering Physics, Materials Engineering, Mechanical Engineering, Software Engineering;

Master of Communications Management;

Master of Engineering in Chemical Engineering, Civil Engineering, Computational Engineering and Science, Computer Science, ADMI Design and Manufacturing, Electrical and Biomedical Engineering, Electrical and Computer Engineering, Engineering Physics, Manufacturing, Mechatronics, Nuclear Engineering (UNENE), Software Engineering; Software Engineering and Virtual Systems Design;

Master of Engineering Design;

Master of Engineering Entrepreneurship and Innovation;

Master of Engineering and Public Policy;

Master of Science in Biochemistry, Biology, Chemical Biology, Chemistry, Cognitive Science of Language, Computational Engineering and Science, Computer Science, Earth and Environmental Sciences, eHealth, Geography, Health and Radiation Physics, Health Research Methodology, Kinesiology, Materials Science, Mathematics, Medical Sciences (Blood and Vasculature; Cancer and Genetics; Infection and Immunity; Metabolism and Nutrition; Neurosciences and Behavioural Sciences; Physiology/Pharmacology), Neuroscience, Nursing, Occupational Therapy, Physics and Astronomy, Physiotherapy, Psychology, Radiation Sciences, Rehabilitation Science, and Statistics;

Master of Social Work;

MD/Ph.D. in Medical Sciences or Biochemistry and Biomedical Sciences

Doctor of Philosophy in Anthropology, Biochemistry, Biology, Biomedical Engineering, Business Administration (Finance; Human Resources; Information Systems; Management Science), Chemical Biology, Chemical Engineering, Chemistry, Civil Engineering, Classics, Cognitive Science of Language, Computational Engineering and Science, Computer Science, Earth and Environmental Sciences, Economics, Electrical and Computer Engineering, Engineering Physics, English, Geography, Health Policy, Health Research Methodology, History, Kinesiology, Materials Engineering, Materials Science (Blood and Vasculature; Cancer and Genetics; Infection and Immunity; Metabolism and Nutrition; Neurosciences and Behavioural Sciences; Physiology/Pharmacology), Neuroscience, Nursing, Philosophy, Physics and Astronomy, Political Science, Psychology, Radiation Sciences, Rehabilitation Science, Religious Studies, Social Work, Sociology, and Software Engineering.

1.2 Responsibilities to Graduate Students

The principal responsibilities that McMaster University has for the academic endeavours of its graduate students are shared by the School of Graduate Studies, the Faculty, the Department, the Supervisory Committee, and the Faculty Advisor. The following summarizes the responsibilities of each of these bodies.

1.2.1 The School of Graduate Studies

The name "School of Graduate Studies" refers to the Associate Vice-President & Dean and Associate Deans of Graduate Studies, the Graduate Council, and the registrarial duties associated with graduate administration.

The Associate Vice-President & Dean of Graduate Studies provides leadership in maintaining and improving the standards of graduate scholarship in the University. The responsibilities include: being the School's voice in graduate matters concerning research and its funding, scholarships and assistantships, the development of graduate programs and policy statements affecting graduate work; being the designated chair of Ph.D. dissertation oral examinations; approving the nomination of external examiners for Ph.D. theses and receiving the examiners' reports. The three Associate Deans of Graduate Studies routinely act as the Dean's delegates. They recommend revision or development of regulations or policies affecting graduate work, refer matters of policy and curriculum to the Graduate Curriculum and Policy Committees, and deal with student appeals. In addition to acting on behalf of the Graduate Admissions and Study Committees as described below, the responsibilities of the Associate Deans include the awarding of McMaster Graduate Scholarships by acting on recommendations received from departments offering graduate work.

The Graduate Registrar and Secretary of the School administers the academic affairs of students enrolled in the School of Graduate Studies. This responsibility includes: registering graduate students; assessing tuition fees; maintaining records and files for applicants and new or in-course students; arranging Ph.D. oral examinations; binding and depositing theses and dissertations in the Library; paying scholarship and research funds and teaching assistantships.

1.2.2 The Faculty

For each Faculty there is a Graduate Admissions and Study Committee which is chaired by an Associate Dean of the School of Graduate Studies. This committee, or the Associate Dean on its behalf, is responsible for matters concerning both incoming and in-course graduate students. More specifically, these responsibilities include: determining the admissibility of applicants; receiving reports on the progress of students and making decisions thereon, including recommendations to require a student to withdraw; ensuring that program requirements have been met prior to the awarding of degrees; approving off-campus courses and leaves of absence; and deciding on applications from students for special consideration with respect to academic regulations. In all of these matters, the Committee or the Associate Dean acts on recommendations made by departments.

1.2.3 The Department (or Graduate Program)

Typically, many of the duties of the Department in regard to graduate students are carried out by the Department Chair and the Graduate Advisor (in some programs these are referred to as Graduate Coordinators or Area Coordinators) for the Department. For purposes of graduate studies policies stated in sections 1 through 6 of the Graduate Calendar, all reference to Department Chair shall mean, in the graduate programs of the Faculty of Health Sciences, Program Coordinators or appropriate Assistant Dean. The departmental duties include making recommendations to the Graduate Admissions and Study Committee of the Faculty as noted above. The Department is responsible for matters such as: ensuring that every student has, at all times, a faculty advisor or a properly constituted supervisory

committee; reviewing annually each student's academic progress and reporting thereon; conducting comprehensive examinations and language examinations, when these are required; preparing and distributing guidelines and departmental regulations for supervisors and students; ensuring that each student is properly trained in all safety practices, guidelines, and policies for the use of any resources required in carrying out their work, where appropriate. In performing those duties that relate to individual students, the Department relies on advice from the Supervisory Committee or the faculty advisor.

In those cases in which a Supervisory Committee or faculty advisor determines that a student's progress is unsatisfactory, and recommends that the student be required to withdraw, the Department is expected to verify the reasons for the recommendation. If the recommendation is confirmed, the Department will forward the recommendation to the Associate Dean of Graduate Studies, who will receive it and act on behalf of the Faculty Admissions and Study Committee. If the Department is not convinced that the recommendation is appropriate, the Department may attempt to mediate between the supervisor and student, or may attempt to find an alternate Supervisory Committee or faculty advisor. If that is not possible because all members with expertise in the student's topic are already on the Supervisory Committee, then the Department may find it best to encourage the student to transfer elsewhere. If the student is very close to completion, the Department may advise the student to continue in the program despite the lack of Supervisory Committee support.

1.2.4 The Supervisory Committee

The Supervisory Committee, or the faculty advisor when no such committee is required, provides advice to the Department as noted above. Additional responsibilities include, where applicable: planning and approving the student's program of courses and research; approving thesis proposals; deciding, within departmental regulations, on the timing of the comprehensive examination and, language and other examinations; maintaining knowledge of the student's research activities and progress; giving advice on research; providing the student with regular appraisals of progress or lack of it; initiating appropriate action if the student's progress is unsatisfactory, including any recommendation that the student withdraw; deciding when the student is to write the thesis and giving advice during this process; acting as internal examiners for the thesis.

1.2.5 The Faculty Advisor

When a supervisory committee is not required, a faculty advisor will be assigned by the Department. Like the supervisory committee, the advisor will provide advice to the Department as noted in Section 1.2.3 above. His/her responsibilities will include: planning and approving the student's program of courses and research; deciding within departmental regulations, on the timing of the comprehensive examination, and language and other examinations; maintaining knowledge of the student's research activities and progress; giving advice on research; providing the student with regular appraisals of progress or lack of it (i.e. the student and student advisor have a mutual obligation to meet on a regular basis); initiating appropriate action if the student's progress is unsatisfactory, including any recommendation that the student withdraw.

1.2.6 The Course Instructor

Graduate course instructors at the 600- and 700-level are responsible for providing students with a written course outline. The outline shall specify the following: the content and duration of the course; the nature and timing of course assignments; the method of assessment that will be used to evaluate the student's work and any penalties that may be assessed for lateness. If the course is to extend beyond the academic term or session, or if assignments are to be due beyond the end of term or session, such arrangements must be specified clearly in the course outline.

Many graduate students complete part of their course work by registering for "reading" or "independent study" courses that are accorded regular course numbers for registration, but in which the content and requirements may vary widely from student to student or instructor to instructor. Often, such courses will be taken by a single student working with one instructor. In such courses, an instructor should make an agreement early in the term with each student registered for the course under his or her supervision and a written copy of the agreement should be provided to the student. The agreement should specify the instructor's expectations as to the work to be done, the method of evaluation, the need for and duration of meetings and discussion, and any penalties to be assessed for missed deadlines.

In graduate courses concerned with the study of topics at the leading edge of research, it is frequently difficult to predict accurately the content and direction the course will take. Such matters cannot be easily accommodated in written course outlines prepared before courses begin. Course instructors must be allowed flexibility to shift the focus of courses as research and other interests dictate. Instructors are nevertheless responsible for keeping their graduate students informed of changes as courses progress, and for doing so in writing when possible. While allowed flexibility with regard to content, instructors should refrain from altering the amount of work expected or the schedule of assignments and due dates specified in their original course outlines.

1.3 Responsibilities of Graduate Students to the University

Just as the University has responsibilities to graduate students, they have responsibilities to the University. The student's responsibilities include, but are not limited to: registering annually until graduation, withdrawal, or withdrawal in good standing due to time limit; paying fees as required; complying with the regulations of the School of Graduate Studies as set out in this Calendar. Where applicable, students are responsible for complying with such conditions as may be laid out in an accepted letter of offer. Students are also responsible for complying with the regulations of the Ontario Council on Graduate Studies, and McMaster University with respect to full- and part-time status (see sections 2.4.2 and 2.4.3) and, in particular, for informing the School of Graduate Studies of any change in employment status. Students are further responsible for informing the School of Graduate Studies, which acts as the official keeper of student records, of any change in personal information such as address, name, telephone number, etc. Students are also responsible for reporting through the department any change in student status, course registration, or withdrawal. With regard to research and study, students are responsible for maintaining contact and meeting regularly with the faculty advisor, thesis/project supervisor or supervisory committee, for observing departmental guidelines, and for meeting the deadlines of the department and the School of Graduate Studies.

If there is a problem with supervision, it is the student's responsibility to contact the Department Chair or Graduate Advisor. The provisions for changing a supervisor are outlined in Section 2.6.

Students who undertake to write master's or doctoral theses assume responsibility both for creating drafts of the thesis and for responding to direction from the Supervisory Committee. The student shall have the responsibility to write and ultimately to defend the thesis, and the Supervisory Committee has the responsibility to offer guidance in the course of the endeavour, and to recommend or not recommend the completed thesis for defence.

In order to receive a degree, the student must fulfill all departmental or program requirements and all University regulations, including those of the School of Graduate Studies. Students who have outstanding financial accounts at the end of the academic year will not receive their academic results, diplomas, or transcripts.

Since registration permits access to libraries and certain other academic facilities (including off-campus facilities), it also implies a commitment on the part of each graduate student to use such facilities in accordance with applicable rules, including all safety practices, guidelines and policies. Inappropriate behaviour that is deemed to be in violation of such practices and/or policies may lead to denial of access to the facility. If such a denial of access to facilities means that a student can no longer fulfill his/her academic obligations, the student will be required to withdraw involuntarily from his/her academic program. (see also Section 7.3.5)

Full-time students are obliged to be on campus, except for vacation periods or authorized off-campus status, for all three terms of the university year. Vacation entitlement is discussed in Section 2.4.6. Students always require their supervisor's approval to be absent from campus for a week or more. If the absence exceeds two weeks, the approval of the department chair is also required. In accordance with government regulations (see Section 2.4.2) students who will be absent from campus for more than four weeks in any one term require not only permission from the Department but also that of the appropriate Associate Dean of Graduate Studies. Note that this permission is needed even for field work or study elsewhere in the world, in order to allow the University to comply with the regulation requiring that a written explanation for such absences be lodged in the Graduate School office. Students may arrange, through the Department and the Associate Dean of Graduate Studies, to be "full-time off-campus" for periods of up to a year. In cases of unauthorized absence the student will be deemed to have withdrawn voluntarily from graduate study and will have to petition for readmission. No guarantee of readmission or of renewal of financial arrangements can be made.

2. GENERAL REGULATIONS OF THE GRADUATE SCHOOL

2.1 Admissions Requirements

McMaster University seeks candidates for graduate study who show high scholarly promise. Admission to a graduate program is based on a judgement by the University that the applicant can successfully complete the graduate degree program. The University's minimum requirements are identified in this section. Departments or programs may establish additional requirements, such as scores on the Graduate Record Examination (GRE). Applicants should read the admission statement for the program or department, as well as the section here. Admission is competitive: meeting the minimum requirements does not guarantee admission. Final decisions on matters of admission rest with the Graduate Admissions and Studies Committee for each Faculty.

2.1.1 Admission Requirements for Master's Degree

The University requires, as the major indicator of ability to complete a Master's program successfully, the holding of an Honours bachelor's degree with at least a B+ average (equivalent to a McMaster 8.5 GPA out of 12) in the final year in all courses in the discipline, or relating to the discipline, in which the applicant proposes to do graduate work. In a Master's program in the Faculty of Engineering the requirement is at least a B- average (equivalent to a McMaster 7.0 GPA). Strong letters of recommendation are also required.

Degrees and grades from foreign universities are evaluated for their equivalency to McMaster's. In recognition of the changes taking place in the structure of university education as a consequence of the Bologna Accord, three-year, first-cycle degrees that meet the criteria of the "Framework for Qualifications of the European Higher Education

Area" will be accepted in place of a four-year Honours degree. The equivalent of at least a B+ average (B- in Engineering) will still be required. A Diploma Supplement should accompany the official transcript [item (a) under Section 2.2].

Prospective applicants who lack some background in the discipline they wish to enter should consult the Undergraduate Calendar with regard to Continuing Student status. A continuing student is a university graduate who is not currently enrolled in a degree program, but who wishes to take one or more undergraduate classes.

Prospective applicants who did not attain the required standing in their undergraduate degree, but who have several years of work experience that is relevant to the program they wish to undertake, should discuss their situation with the department of interest. Evidence of ability to do graduate work will still be required.

2.1.2 Admission Requirements for Ph.D. Degree

Applicants may be admitted to a regular Ph.D. program at one of three stages in their academic work. Often they will have completed a Master's program. In some cases, they will be admitted to Ph.D. studies from a Master's program at McMaster without completing the Master's degree. In exceptional cases they may be admitted directly from a bachelor's degree.

For applicants who hold a Master's degree, the primary requirements are distinction in their previous graduate work (equivalent to at least a McMaster B+), and strong letters of reference.

Students enrolled in a Master's program at this University may be transferred to the Ph.D. program prior to completion of the Master's degree. Not sooner than two terms after initial registration in the Master's program here, students may request to be reclassified as Ph.D. students. After proper review, the department will recommend one of the following:

- admission to Ph.D. studies following completion of the requirements for the Master's degree;
- admission to Ph.D. studies without completion of a Master's program;
- admission to Ph.D. studies but with concurrent completion of all requirements for a Master's degree within two months from the date of reclassification;
- refusal of admission to Ph.D. studies.

For students in (b), the recommendation for admission to Ph.D. must identify which if any courses taken as a Master's student can be credited toward the requirements for the Doctoral program.

A student in (b) may re-register as a candidate for the Master's degree, provided that work to date has met the standards for the Master's program.

Students in (c) who do not complete the requirements for the Master's degree within the two months will lose their status as a Ph.D. candidate and be returned to Master's status.

In certain programs, applicants with a first degree only, may be admitted directly to Ph.D. studies. Such students must show sufficient promise, including at least an A average. Within one calendar year the progress of students admitted to Ph.D. studies directly from a Bachelor's degree will be reviewed by their supervisory committee and the program. The program then will recommend one of the following:

- proceed with Ph.D. studies;
- not proceed with Ph.D. studies but re-register as a Master's candidate;
- withdraw from the University.

A student admitted to a Ph.D. program who re-registers as a candidate for a Master's degree must meet all of the requirements for the Master's degree in order for it to be awarded.

Admission to a part-time Ph.D. program is possible only for an individual holding a Master's degree whose circumstances preclude uninterrupted full-time doctoral studies. Because of the divergent nature of academic disciplines, part-time doctoral work is not feasible in some areas. Accordingly, no Department or Program is obligated to offer part-time doctoral work. As part of their applications prospective part-time students are required to provide a plan of study, including a clear account of when and where the thesis research is to be conducted. If facilities at the place of employment are to be used for the research, the signed agreement of the employer, recognizing the conditions surrounding graduate work, is also required. In addition, departments may have other requirements for admission to a part-time doctoral program. A part-time doctoral student must be geographically available on a regular basis, and must be able to participate regularly in departmental seminars and colloquia.

2.1.3 Admission of Students with Related Work Experience or Course Work Beyond the Bachelor's Degree

As noted in Section 2.1 of the Graduate Calendar, "Admission to a graduate program is based on a judgement by the University that the applicant can successfully complete the graduate degree program". Some potential applicants may not satisfy our admission requirement for a 4-year honours degree with a B+ average in the final year. However, work experience and/or completed course work beyond the Bachelor's degree, may have some bearing on the applicant's ability to complete a graduate program. The admissions process will recognize these accomplishments as follows.

Admission to graduate studies for a student with related work experience and/or course work beyond the Bachelor's degree will be based on the following criteria:

1. References from reliable sources which specifically identify the applicant's aptitude for research and graduate education.
2. University 4-year undergraduate degree or equivalent, completed more than 4 years ago, together with additional course work taken since that time.
3. Significant record of workplace experience, the relevance of which will be assessed by the graduate program of choice.

2.1.4 Admission Requirements for Graduate Diploma Programs

See Section 12 for descriptions of McMaster's approved diplomas. The admission requirements for a graduate diploma are the same as are identified in Section 2.1.1 for admission to a Master's program.

Graduate Diploma students with at least a B+ average in their diploma course work may be eligible to transfer to a Master's degree in a related program, subject to the recommendation of the department or program to the relevant Faculty Graduate Admissions and Study Committee. If the diploma has not been completed, credit may be given toward the degree requirements for all graduate courses completed successfully. Approval of the department is required for any such credit to be applied toward a degree; it is not automatic. Departmental or program approval is normally based on an assessment of the amount of additional coursework that will be required for the degree.

If a student wishes to enter a related Master's program after the diploma has been completed, credit may be granted towards the subsequent degree program for those courses completed successfully, with a limit of one full course or half of the course requirements for the degree, whichever is less.

2.1.5 Admission Requirements for Post-Degree Students

A Post-degree Student is one who has not been admitted to a graduate degree or diploma program but who holds a university degree and has been given permission to take a specific graduate course. Permission to take a course as a post-degree student requires the approval of the course instructor, the Department Chair, and the School of Graduate Studies. An application is required for each course.

Although acceptance as a post-degree student carries no implications with respect to acceptance for a degree program in the School of Graduate Studies, the level of academic achievement expected for admission under this category is the same as that required of students admitted to a Master's program (Section 2.1.1). Courses taken as a post-degree student may be eligible for credit toward a Master's degree in a related program, to a maximum of one-half of the degree's course requirement, subject to the recommendation of the department or program to the relevant Faculty Graduate Admissions and Study Committee.

A student who has completed a relevant undergraduate degree and is not admissible under current standards, but who is currently in (or has had) full-time employment in the intended area of study may be admitted as a post-degree student. In such cases, any courses taken as a post-degree student will not be available for credit in a subsequent graduate program, because they will have been necessary to demonstrate admissibility.

The deadline for registration is the same as for graduate degree programs (see Sessional Dates, Registration).

(Note: A Graduate Diploma is distinct from a baccalaureate, Master's or Ph.D. degree, or diplomas and certificates awarded by the Centre for Continuing Education at McMaster University).

2.1.6 Non-Credit Participants in Graduate Courses

Graduate courses are not normally open to "auditors" who attend a course without the usual qualifications and without seeking academic credit. Under some circumstances, however, people who are not registered graduate students and who do not meet the requirements for admission as Post-degree (see Section 2.1.4) may attend a graduate course. This requires the written permission of the course instructor, the Department Chair, and the School of Graduate Studies. Upon completion of the course, and subject to confirmation from the instructor that his/her expectations regarding the student's participation were met (i.e. that the student attended at least 80% of the instruction), a transcript notation "Audit" will be recorded. No other grade will be assigned. Enquiries should be directed to the instructor or the Chair of the Department offering the course.

A fee is charged for each course taken as a non-credit participant (by persons who are not registered graduate students). See Section 5.1, Fees for Graduate Students, for the fee schedule.

2.1.7 Visiting Students

"Visiting Students" are individuals who are currently registered in a graduate degree program in another university, and who have made arrangements through both their home university and a graduate program at McMaster to spend some time at McMaster as part of their degree program at the home university. They are not (and will not be) enrolled in a degree program at McMaster. They are not part of any official exchange agreement including Ontario Visiting Graduate Student (OVGS) arrangement, although there may be an agreement between the McMaster program and their home institution. They may be at McMaster to take particular courses, or they may be here to engage in research relevant for their degree under the supervision of a McMaster faculty member, but in any case will be registered as full-time students for a maximum of one year. Acceptance is on the recommendation of the department or program here. The student is expected to pay the application fee, incidental fees and the appropriate Canadian equivalent per course fee for the time that they are registered here. It may also be necessary for them to enrol in the UHIP program to ensure adequate health insurance coverage during their stay.

2.1.8 English Language Requirements

English is the language of instruction at McMaster, except in the M.A. program in French. Hence it is essential that all students (except in the French program) be able to communicate effectively in English.

Applicants whose native language is not English will be required to furnish evidence of their proficiency in the use of the English language. Such applicants are required to supply this evidence as part of their application. The most common evidence is a score on the Test of English as a Foreign Language (TOEFL), administered by the Educational Testing Service (Princeton, N.J., USA). In Engineering, a TOEFL (iBT) score of 80 (550 on the paper-based TOEFL test or 213 on the computer-based TOEFL test) is necessary; in other Faculties a minimum of 92 (580 or 237) is required. The Michigan English Language Assessment Battery (MELAB), conducted by the Testing and Certification Division of the English Language Institute, University of Michigan (Ann Arbor, Michigan 48109 USA), is, however, the preferred test. A score of 85 is considered acceptable in the Faculties of Science and Engineering; 90 in the other Faculties. Other evidence of proficiency in English will also be considered.

2.2 Application for Admission

Enquiries about graduate work should be made directly to the department of interest. Our online application system is located at <https://gradapplication.mcmaster.ca/account/instructions.asp>.

Applications may be submitted at any time. However, most University scholarships and awards are adjudicated in late March or early April, so students applying later than March cannot be considered for these awards.

Applications from outside Canada should be completed at least five months before the desired date of entry in order to allow for any delays and for obtaining the necessary visa.

Application Fee

Applications must be accompanied by the required \$90 application fee. This fee is non-refundable and must be paid in Canadian dollars by means of a credit card payment or a cheque drawn on a Canadian bank made payable to McMaster University. Cheques drawn on Canadian banks should also include a \$15 processing fee for a total of \$105.

Required Documents

The following items are required before your online application will be considered complete. These documents should be sent to the **department chair** concerned.

- (a) One official transcript of academic work completed to date, sent directly from the issuing institution. If the final transcript does not show that a completed degree has been conferred, an official copy of your diploma is also required.
- (b) Two confidential letters of recommendation from instructors most familiar with your academic work. Recommendations must be provided directly from the instructors.
- (c) If English is not your native language, an official copy of your TOEFL score, or other evidence of competency in English. A minimum TOEFL (iBT) score of 80 (550 on the paper-based TOEFL test or 213 on the computer-based TOEFL test) is needed for the Faculty of Engineering, and a minimum of 92 (580 or 237) for all other Faculties. Some departments may require higher scores.
- (d) Statement of interest in pursuing graduate studies.

A graduate of a university outside Canada may also be required to submit a description of undergraduate and graduate courses taken in the field of specialization and in cognate fields.

Collection of Personal Information

Under the authority of the *McMaster University Act, 1976*, and by applying to McMaster or by enrolling in a program at the University, students expressly acknowledge and agree that the collection, retention, use and disclosure of relevant personal information is necessary for McMaster University to:

- establish a record of the student's performance in programs and courses;
- to assist the University in the academic and financial administration of its affairs;
- to provide the basis for awards and government funding; and
- to establish the student's status as a member of relevant student governmental organization.

Similarly, and in compliance with McMaster University's access to information and protection of privacy policies and Canadian and Ontario privacy laws, the University provides personal information to:

- the Canadian and Ontario government for the purposes of reporting purposes; and
- to appropriate student government organizations for the purposes of allowing such organizations to communicate with its membership and providing student government-related services consistent with the enrolment by a student at the University.

By applying and/or enrolling at McMaster University the student expressly consents to this collection, retention, use and disclosure of such personal information in this manner. Questions regarding the collection or use of personal information should be directed to the University Secretary, Gilmour Hall, Room 210, McMaster University.

2.3 Acceptance

Initial assessment of completed applications is the responsibility of departments. If that assessment is favourable, the department will recommend to the School of Graduate Studies Office of a favourable decision, or by the department of a negative decision. Applicants may be accepted conditionally before completing their present degree programs.

Official letters of admission are sent only by the School of Graduate Studies, and are valid only for the program and term stated in the admission letter. Successful applicants are required to respond in writing to the offer of admission within the interval identified in the offer letter. If circumstances develop making it impossible for a student to begin graduate work in the specified term, the department and the School reserve the right to reconsider the offer of admission, and any financial aid offered.

2.4 Registration

2.4.1 Procedures

All graduate students, in both the regular and part-time programs, are required to register and pay fees annually in September until they graduate or withdraw. If they fail to do so they do not retain the status of graduate student and must apply for re-admission if they wish at a later date to continue their studies. If the department approves, a student may be allowed to begin graduate work in the winter or summer term (January or May), in which case they will first register at the start of that term, but in any following years will register in September.

At the time of registration students list their program of studies as approved by their advisor (supervisor) and the chair of the department.

2.4.2 Provincial Definitions of Full- and Part-time Status

Under the regulations of the Government of Ontario, A *full-time* graduate student must:

- (a) *be pursuing his or her studies as a full-time occupation;*
- (b) *identify himself or herself as a full-time graduate student;*
- (c) *be designated by the university as a full-time graduate student;*
- (d) *be geographically available and visit the campus regularly. Without forfeiting full-time status, a graduate student, while still under supervision, may be absent from the university (e.g. visiting libraries, doing field work, attending a graduate course at another institution, etc.) provided that, if any such period of absence exceeds four weeks in any one term, written evidence shall be available in the Graduate Studies Office to the effect that the absence has the approval of the Chairman (sic) of the Department and the Associate Vice-President & Dean of Graduate Studies;*
- (e) *be considered to be a full-time graduate student by his/her supervisor or equivalent (designated by the university).*

In addition to these government regulations, it is the position of the Ontario Council on Graduate Studies, which appraises all of our graduate programs, that it supports "a ten-hour limit on university-related employment and encourage[s] full-time students to limit time spent on employment inside or outside the university."

2.4.3. McMaster University's Regulations for Full- and Part-time Status

In accordance with the above provincial regulations, McMaster requires students to register annually, and to confirm their status as a full-time graduate student. Only full-time graduate students are eligible for scholarship support. In accordance with OCGS's position, full-time graduate students are encouraged to limit time spent on employment and may not be employed more than 10 hours/week (on average in a term) for work that is paid through McMaster University.

Exceptions to this rule are possible with the approval of the School of Graduate Studies. A student seeking an exception must provide a study plan that has been approved by the departmental graduate studies committee or its equivalent. Ph.D. students who seek an exemption from the rule must arrange for a supervisory committee meeting, with a report of that meeting submitted to the Graduate School, every four months during the time they are employed beyond ten hours per week.

All active graduate students other than full-time graduate students as defined above are part-time graduate students.

2.4.4 Employment Regulations

In the McMaster context, there are three terms in the School of Graduate Studies for purposes of interpreting the rule in Section 2.4.2 limiting employment with the University to ten hours per week on average: Fall (September through December); Winter (January through April); and Summer (May through August). These are deemed to have 17, 17, and 18 weeks respectively. The ten-hour limit includes work as a Teaching Assistant at McMaster.

If the student is to be employed at the University other than as a TA or invigilator, the School of Graduate Studies should be informed in writing of the nature of the employment, and the approval of the supervisor and the chair of the department is required. The approval of the School of Graduate Studies is required if the student is to be hired for University teaching.

2.4.5 Leaves of Absence

GENERAL REGULATIONS

Leaves of absence are normally granted on a term-by-term basis and, whenever possible, should commence at the beginning of a term (i.e., January 1, May 1, or September 1). During the period of a Leave the

student cannot expect to be given guidance on the thesis or be entitled to use the University's facilities. During a Leave of Absence no tuition will be charged, nor will the student be eligible for any scholarship support. The length of time for completing the degree and for eligibility for scholarship support will be extended by the duration of the Leave on the resumption of studies. A student should resume studies at the beginning of a term. Leaves of Absence affecting Teaching Assistantship duties are covered by the Collective Agreement with Local 3906 (Unit 1) of the Canadian Union of Public employees.

Students should be aware that in the event of Leaves of Absence continuation of the same research project and/or supervisor cannot be guaranteed.

REASONS FOR LEAVES OF ABSENCE

A Leave of Absence for up to one year is permitted for reasons of illness or for reasons related to family responsibilities such as pregnancy and child rearing.

Students who have successfully completed at least one full year in a graduate program may apply for a Leave of Absence for up to one year for other personal circumstances, including severe financial problems, provided that the student's supervisor and the department support the request.

A Leave of Absence to obtain relevant work experience may be granted for one term for a Master's student, and for two terms for a Ph.D. student. No two Leaves taken to obtain relevant work experience may be consecutive.

A Leave of Absence will not be granted to pursue another program of study.

Note: Students who hold fellowships, scholarships or grants from NSERC, SSHRC, CIHR, or OGS should be aware that these agencies have policies governing the interruption and continuation of awards that may differ from the University's policy on leaves of absence. Students holding such awards and who intend to keep them are responsible for ensuring that any leave of absence taken does not conflict with the granting agency's regulations.

CONTINUATION OF SCHOLARSHIP FUNDING DURING GRADUATE STUDENT PARENTAL LEAVE FROM STUDIES

Intent

The Policy is intended to assist parents in successfully combining their graduate studies and family responsibilities without significant financial and/or academic impact. Recognizing the role of both parents in childbirth, adoption and child rearing, the University will provide the following arrangement for parents:

Eligibility and Benefits

- A full time graduate student in receipt of "McMaster graduate scholarship funds" will be eligible under this Policy regardless of marital status. For clarity, this Policy is equally applicable to same-sex parents.
- "Parent" includes a person who has a child (or children) by birth or by adoption. The School of Graduate Studies reserves the right to require confirming documentation of the birth(s) or adoption(s).
- For purposes of this Policy, McMaster "graduate scholarship funds" refers to the sum of departmental scholarship and research account support committed to the student at the time the leave commences and what would otherwise have been paid to the student during the period of the leave. It does not include funding from external sources.

Leave

- A full-time graduate student in receipt of "McMaster graduate scholarship funds" who has a child (or children) by birth or adoption may take a Parental Leave from studies for a maximum period of 4 *consecutive* months. A full-time graduate student

electing not to take the maximum amount of time available for a Leave will not have the option of taking any unused leave at a later date.

- It is understood that when a full-time graduate student takes a Parental Leave the duration of the leave will not be counted as time towards the time limits in which the student is required to complete his or her graduate studies program or thesis, as applicable.
- In order that suitable arrangements can be made to provide for the absence, students are expected to provide as much notice as possible of the intention to take a Parental Leave under this Policy.
- A Parental Leave must begin no later than 52 weeks after the birth of the child or, in the case of adoption of a child, after the child first comes into the custody, care and control of the parent.
- In exceptional circumstances, a Parental Leave may be extended beyond the 4-month period, at the discretion of the appropriate Dean/Supervisor and the Associate Vice-President & Dean of Graduate Studies. Such extension does not serve to increase or extend the period for which the financial benefit (outlined below) is available.
- A graduate student is normally expected to give four weeks notice of the date on which he/she intends to return to studies, should this be different from the date agreed at the time the Leave was granted.

Financial Benefit

- A full-time graduate student in receipt of "McMaster graduate scholarship funds" who has a child (or children) by birth or adoption and who takes a parental leave from studies will be entitled to continue to receive graduate scholarship funds at the normal monthly rate, to a maximum of \$750 per month (for a maximum total of \$3,000), provided that a "Leave of Absence Information Form" has been submitted to the School of Graduate Studies.
- If one of the parents is eligible for CIHR, NSERC, SSHRC, or any other scholarship continuance at any time during the parental leave, neither parent is eligible for this benefit.
- When two full-time McMaster graduate students have a child (or children) together, or adopt a child (or children) together, only one of the students will be entitled to claim this financial benefit.

Combination with Other Leaves

- Pregnancy and/or parental leave from McMaster University employment is entirely distinct and separate from this Policy and is subject to the provisions of any applicable collective agreement, employment policy, and/or legislation.
- A Parental Leave under this Policy *may* be taken simultaneously with an employment-related parental leave or pregnancy leave from McMaster University. However, students wishing to take such leaves simultaneously should be aware that Employment Insurance ("EI") will consider the financial benefit paid under this plan as 'earnings' and these 'earnings' are not considered as an approved Supplemental Unemployment Benefit Plan. This means that the financial benefit under this Policy will be allocated by EI to the weeks for which the payments are received and will correspondingly cause a reduction in available EI benefits for the employment-related leave during those same weeks.

For questions on the administration of this policy, contact the School of Graduate Studies.

2.4.6 Vacations

Full-time graduate students are expected to be on campus for all three terms of the university year, as specified in Section 1.3. In addition to statutory holidays (see Sessional Dates) and the week-long closing of the University from late December until early January, normal vacation entitlement is two weeks of vacation during the year, to be scheduled by mutual agreement with the research supervisor and the employment supervisor. Exception above this amount requires approval from the supervisory committee.

2.4.7 Petitions for Special Consideration

The University wishes to assist students with legitimate difficulties. It also has the responsibility to ensure that degree, program and course requirements are met in a manner that is equitable to all students. Students may petition the office of the Associate Dean of the School of Graduate Studies for special consideration when there are compelling medical, personal or family reasons to justify an exception to University regulations. The appropriate form may be found on the School of Graduate Studies website. The student's supervisor and Associate Chair are normally required to provide their independent assessments of the student's statement in the petition. Supporting documentation will be required but will not ensure approval of the petition. The authority to grant petitions lies with the School of Graduate Studies and is discretionary. It is imperative that students make every effort to meet the originally-scheduled course requirements and it is a student's responsibility to write examinations as scheduled.

2.5 Graduate Course Work

2.5.1 Averaging of Letter Grades

With the exception of courses in the M.B.A. Program, grades in graduate courses are reported as letter grades. However, instructors may record grades for individual components of the course either as letter or numerical grades. The averaging of letter grades assigned to individual components of a course must be done by using the McMaster 12-point scale, as follows: A+ = 12, A = 11, A- = 10, B+ = 9, B = 8, B- = 7, C+ = 6, C = 5, C- = 4, D+ = 3, D = 2, D- = 1, F = 0. Further, all .5 marks should be rounded up.

Note: McMaster University's Policy on Graduate Course Outlines is available at <http://www.mcmaster.ca/policy/faculty/Teaching/GraduateCourseOutlines.pdf>.

2.5.2 Course Levels and Types

Courses available for graduate credit are numbered either at the 700 - or 600-level (e.g. 771 or 6D06). Courses are restricted in enrolment to graduate students, with the exception of those undergraduate students registered in approved, accelerated M.Eng. programs and with written permission of their department (or program) chair, director, or designate. (Departments may have restrictions on the number of 600-level courses allowed for graduate credit). Graduate students taking 600-level courses are regularly required to do extra course work beyond that required of undergraduates in the corresponding 400-level course. Each department offers only a selection of its courses in any given year.

For 700-level courses, there are three types of courses. Full-year (i.e. two-term) courses do not have a prefix. One-term courses (half courses) are indicated by an asterisk (*) sign preceding the course number. Half-term (quarter courses or modules) are indicated by a pound (#) sign preceding the course number. In all cases, the expectation is that the course will meet at least three hours per week (on average). For 600-level courses, the first character represents the level of the course (combined graduate-undergraduate), the second character is a letter identifying the specific course within a department, the third character is a letter identifying the area of study within a program or simply a zero, and the fourth character indicates the number of units of course credit. Generally, 3-unit and 4-unit courses are one-term courses; 6-unit courses are full-year courses.

2.5.3 Course Categories

Courses can be designated as being in one of the six categories:

M (Count towards the Master's degree requirements)

This category identifies the courses that are to count towards the Master's degree requirements (including any additional graduate requirements or undergraduate courses specified by the supervisory committee or Department Chair). The passing grades for an M course are A+, A, A-, B+, B, and B- (except in the M.B.A. program, which uses a different scale).

D (Count towards the Doctoral degree requirements)

This category identifies the courses that are to count towards the Doctoral degree requirements (including any additional graduate requirements or undergraduate courses specified by the supervisory committee or Department Chair). The passing grades for a D course are A+, A, A-, B+, B, and B-.

EC (Extra Course)

This category identifies courses that the student is taking with the approval of the supervisor but that are not necessary to the student's current degree program. If a failing grade (i.e. less than B- in a graduate course or less than D- in an undergraduate course) is received in a course taken as Extra, the courses (and grade) will not appear on the student's transcript unless because of academic dishonesty. Courses designated as EC may subsequently be counted towards graduate degree requirements and the course designation changed to M or D, if approved by the Faculty Admissions and Study Committee.

Courses that are required by the supervisory committee or the Department Chair as additional requirements in excess of the stated minimum for the program must be designated as M or D.

DIP (Diploma Course)

This category identifies courses that are to count towards the requirements for a diploma. The passing grades for a DIP course are A+, A, A-, B+, B, and B-.

CER (Certificate Course)

This category identifies courses that the student is taking as individual courses not counting towards the requirements for a diploma. The passing grades for a CER course are A+, A, A-, B+, B, and B-.

AUD (Audit Course)

Graduate courses are not normally open to "auditors" who attend a course without seeking academic credit. Under some circumstances, however, graduate students may audit a graduate course. This requires the written permission of the course instructor and the student's supervisor (or graduate advisor if no supervisor exists) on the form entitled 'Audit Add Form'. Permission must be obtained prior to the deadline for adding courses. Upon completion of the course, and subject to confirmation from the instructor that his/her expectations regarding the student's participation were met (usually that the student attended at least 80% of the course), a transcript notation of "Audit" for that course will be recorded. No other grade will be assigned. Enquiries should be directed to the instructor or the Chair of the Department offering the course.

A fee may be charged for a course taken for audit if the graduate student is in a part-time program. See Section 5.1, Fees for Graduate Students, for the fee schedule.

2.5.4 Failing Grades and Incomplete Grades

All instances of failures are reviewed by the appropriate Faculty Committee on Graduate Admissions and Study. The Faculty Committee on Graduate Admissions and Study requests a departmental recommendation regarding the student, and this recommendation is given considerable weight. In the absence of a departmental recommendation to allow the student to continue, the student will be required to withdraw. Those allowed to remain in the program must either repeat or replace the failed course. A failing grade in a CER, DIP, M or D course remains on the transcript.

Under exceptional circumstances a course instructor may approve an extension for the student for the completion of work in a course and assign an Incomplete grade (INC). Normally this extension is in the range of a few weeks. A student who receives this permission must complete the work as soon as possible, and in any case early enough to allow the instructor to report the grade to the School of Graduate Studies by the date specified in the Sessional Dates near the beginning of this Calendar. If the INC grade is not cleared by the deadline, a failing grade will automatically be recorded.

2.5.5 Required Course for All Graduate Students

All graduate students, including part-time students, must complete the course *SGS #101- Academic Research Integrity and Ethics* within the first twelve months after their admission to graduate studies at McMaster. The purpose of this course is to ensure that the standards and expectations of academic integrity and research ethics are communicated early and are understood by incoming students. A graduate student may not obtain a graduate degree at McMaster without having passed this course. In the event that a student fails this course, they must retake it at the earliest opportunity. The course description for *SGS #101* may be found in Section 11.

2.6 Supervision

It is the responsibility of the department/program to ensure that every graduate student has, at all times, a faculty advisor or a properly constituted supervisory committee. The department/program should ensure that the members of a supervisory committee are sufficiently competent and experienced to serve at the required level. In identifying a supervisory committee, the department/program should consider the following, among other things: the balance of the committee by rank and experience; publications and other demonstrations of competence in scholarship or research on the part of the supervisor. Supervisory committees for Ph.D. candidates shall be reviewed annually by the department/program.

While the supervisor and student have a mutual obligation to meet on a regular basis, the department/program shall ensure there is a formal regular meeting of each Ph.D. supervisory committee at least once within the academic year (September-August), and possibly more often, to discuss the student's progress. Each Ph.D. supervisory committee must report annually on the student's progress and the department/program chair must forward such reports to the School of Graduate Studies. The report formally documents the supervisory committee's assessment of the progress of the student's program.

The department/program should prepare a set of guidelines for supervisors and students. The guidelines should deal with the selection and functioning of supervisory committees and should cover the joint responsibilities of faculty members and graduate students. The guidelines may be attached to or incorporated in department/program handbooks which give regulations supplementary to those in the Calendar. Items relevant to graduate supervision should be approved by the appropriate Faculty Committee on Graduate Admissions and Study. A copy of the guidelines shall be given to each faculty member and each graduate student.

It is possible to change supervisors or the membership of a supervisory committee, although this is not the norm. If the direction of the research changes, membership can be changed by mutual consent of the parties involved. Supervisors and/or supervisory committee members may not resign without the department's/program's approval.

If a student feels that she/he is receiving unsatisfactory supervision, he/she should consult the Department/Program Chair or Graduate Advisor. The appropriate person will be identified in the procedures for making changes in supervisory committee membership, specified in the departmental guidelines for graduate work. If this avenue is not sufficient, the student is encouraged to speak with the appropriate Associate Dean of Graduate Studies about the problem.

2.7 Theses**2.7.1 General**

No research for the Ph.D. or other graduate degrees at McMaster may be secret or classified. All theses will be available to borrowers in the University Library (See regulations governing microfilming).

The dissertation or thesis will be a coherent document that provides a complete and systematic account of the research accomplished by the writer. If some of the research undertaken expressly for the degree has previously been published or prepared for publication as one or more journal articles, or parts of books, those items may be included within the thesis under the following conditions: there must be material preceding the article or articles which sets the context for the work, and material in an introduction or conclusion that draws out the overall implications of the work; if there is multiple authorship of the separate articles, there must be a preface to the thesis that documents clearly the student's contribution to each of the papers and the student's contribution to the originality of the work, thereby clarifying in what way this work becomes the student's thesis. When journal articles are used in the thesis some reformatting may be required since all pages in the thesis must be 8 ½" x 11" in size, and the thesis must be successively paginated. The National Library of Canada requires that permission from the publisher be obtained when a published article is to be used in a thesis. A more detailed statement of the University's regulations regarding the inclusion of previously published/prepared material in theses is available from the School of Graduate Studies. Students intending to use this option must obtain permission from their supervisory committee.

Arrangements and expenses for typing the thesis are the responsibility of the student. The School of Graduate Studies provides instructions regarding thesis format and methods of thesis reproduction. These instructions are described in the handbook, Guide for the Preparation of Theses. The handbook is available on the School of Graduate Studies website (<http://www.mcmaster.ca/graduate/thesesguide.pdf>). Departments may issue special instructions concerning the proper form of graphs, tables, maps, and diagrams. Accepted forms of bibliographical reference in the particular discipline and other matters of format should be discussed with the thesis supervisor. Students may also refer to the instructions set forth in Kate L. Turabian's, A Manual for Writers of Term Papers, Theses, and Dissertations (6th ed., 1996). Theses must be presented in printing quality and format acceptable to the School of Graduate Studies.

Doctoral students and their supervisors should keep in mind that theses of extraordinary length are to be discouraged. The preparation of a lengthy Ph.D. thesis almost certainly extends the time that the student takes to complete his or her degree. It entails other costs as well, notably a greater cost to the student for reproduction and binding, and greater difficulty in arranging for external examiners and members of thesis defense committees. As a general rule, doctoral students are urged to limit their theses to no greater length than three hundred (300) manuscript pages. In cases where students and their supervisors believe that responsible scholarly treatment of the thesis topic requires substantially greater length than that specified above, a written approval from the appropriate Associate Dean of Graduate Studies must be obtained before the external examiner is contacted.

2.7.2 Response Times for Theses

Supervisory committees should respond to the draft of a Ph.D. thesis within 2 months. Providing comments on individual chapters will take proportionately less time. Very long theses or chapters may take more time. There are busy periods within the academic year when the time taken to provide comments might be a bit longer than this norm. However, in no case should the response time exceed 3 months.

For Master's theses the corresponding times are 1 month and 2 months.

2.7.3 Microfilming and Publication of Theses at McMaster University

The University requires that every thesis for a Ph.D. degree be published substantially as it is accepted. After all other requirements for the degree have been met, publication is accomplished in two ways. The first of these is a requirement in all programs. The second is strongly recommended by the University.

- (a) Through the University Library, the School of Graduate Studies forwards a copy of each Ph.D. thesis to the National Library of Canada, with an agreement form signed by the author, authorizing the National Library to microfilm the thesis and to sell or lend copies of the film on demand. This copy must be single sided. The National Library will film the thesis exactly as it is and list the thesis in Canadiana as a publication of the National Library.
- (b) The School of Graduate Studies will forward to the publishers of Dissertation Abstracts an approved abstract, prepared by the author, of not more than 300 words, of each Ph.D. thesis. The abstract is printed in Dissertation Abstracts, and the availability of the thesis in microfilm at the National Library announced. The publishers charge a fee for this service, and at the time of printing will provide the author with offprints for an additional charge. If the abstract contains more than 300 words, publication may be delayed and the author may be required to pay an additional fee to cover increased costs of publication. The publication cost of the abstract and copies is borne by the student. Arrangements and payment for publication must be made in the School of Graduate Studies when copies of the thesis are filed for binding.

At the conclusion of the thesis oral defense every Master's and Ph.D. student is required to sign a licence to the University. Ph.D. students are also required to sign a licence to the National Library authorizing microfilming and circulation of the thesis. The author shall have the right to request postponement for up to one year of publication by microfilm and/or deposit of the thesis in the library, in order to protect any rights to immediate commercial publication or to permit a patent application to be made.

3. REGULATIONS FOR MASTER'S DEGREES

Master of Applied Science, Master of Arts, Master of Communications Management, Master of Engineering, Master of Engineering Design, Master of Engineering Entrepreneurship and Innovation, Master of Engineering and Public Policy, Master of Science, Master of Social Work. Regulations for the M.B.A. program may be found in the M.B.A. Calendar, available from the DeGroot School of Business.

3.1 General

Three types of Master's programs are available, although not all departments offer each type. The first is the thesis program, consisting of both course work and a research thesis. The second type entails a project rather than a thesis, as well as course work. In some departments a course work-only program is available. Consult the departmental listings to see what types are available in a specific discipline.

If a department offers more than one of these types, the ability for a student to switch between them is not automatic, but is sometimes permitted. Approval of the supervisor and department chair (or graduate chair/advisor) is required. In many departments, there will be consequences for the level of financial support to the student. As well, there are likely to be consequences for the expected time to completion. Both financial support and expected time to completion should be clarified prior to approval of the change. If such a change is approved, notification should be sent to the School of Graduate Studies by the department or program, along with any change to the payroll authorization. Graduate Studies approval is not required.

The regular Master's programs are designed for those students who can devote their full time to graduate studies. (See Section 2.4.2 for the definitions of a full-time student.) Some departments also offer part-time programs. Consult the departmental listing in this Calendar to see whether or not a part-time program is available in a particular department.

Prior to the 2001-2002 academic year, all Master's degrees awarded within the Faculty of Engineering were designated as Master of Engineering (M. Eng.) degrees. On April 11, 2001, the University Senate approved the use of the Master of Applied Science (M.A.Sc.) designation for thesis-based degrees in the Faculty of Engineering. Non-thesis Master's degrees in the Faculty of Engineering retain the M. Eng. designation.

3.2 Program Requirements

A Master's program involving a thesis will normally be somewhat more specialized and will involve fewer courses than is the case in a Master's program without a thesis. A course Master's program is constructed by departments to contain a sufficient number of courses to make possible a diversified experience, for the student.

The student who is presenting a thesis as part of a program is required to complete, with at least B- standing, at least one full graduate course (or equivalent). Certain programs regularly prescribe additional graduate courses. In accordance with OCGS requirements, no more than one-third of the departmental minimum course requirements may be at the 600-level. The student may be required or permitted by the department to take courses in addition to those prescribed for graduate credit. In consultation with the programs concerned, one or more graduate courses in a related subject may be taken outside of the program.

Students will be required to meet any additional requirements of the program, including special seminars or colloquia. Such requirements are subject to approval by the appropriate Graduate Curriculum and Policy Committee.

3.3 Thesis

A thesis may be submitted at any time. The final date for submitting a thesis to the department for Autumn or Spring Convocation is found in the Sessional Dates Section. The thesis will be examined by a committee of not fewer than 3 members (including the supervisor) appointed by the department chair. The thesis will be defended by the candidate in an oral examination before this committee and such other members as may be appointed by the department chair. The Associate Vice-President & Dean of Graduate Studies may appoint members to these committees. The time of the defense will be set by the department chair; normally this will be about two weeks after the completed thesis has been submitted to the department.

Three copies of the thesis (two for the University Library and one for the department), containing an abstract of not more than 300 words must be filed in the School of Graduate Studies by the candidate no later than the date shown in the Sessional Dates section. Biology, Engineering departments and Medical Sciences, Nursing and HRM require an additional copy of the thesis to be filed, the fourth copy to go to the supervisor. The School of Graduate Studies will make arrangements to have the copies suitably bound at the candidate's expense. The cost of binding must be paid when the copies of the thesis are filed.

3.4 Project

In departments where there is the option of submitting a project, the department regulations must be observed. If the project is to be submitted to the University Library, the rules governing Master's theses must be followed.

3.5 Supervision

The general regulations regarding supervision, described earlier (Section 2.6, "Supervision"), apply to Master's students. If the student is registered in a thesis degree program, the thesis supervisor will have been identified by mutual consent, based on the nature of the thesis research. If the student is registering in a degree program

without a thesis, a faculty advisor will be assigned. In either case, the advisor may be changed with the approval of the Department, as described in Section 2.6.

3.6 Program Duration

The amount of work in a regular (full-time) Master's program for a student with good preparation varies across the campus, but generally programs involving a thesis are designed to take longer than those without a thesis. Programs with a thesis typically take sixteen to twenty months. Twelve-month non-thesis programs occur in Anthropology, Classics, Cultural Studies and Critical Theory, Economics, Economic Policy, English, French, History, Physics, Political Science, and Sociology.

For students in a regular program, the permissible time for completion of a Master's degree program is limited to three years from their initial registration in the program. For those students admitted to a part-time Master's program, and who complete all degree requirements while registered part-time, the permissible time is limited to five years from their initial registration.

Each student's progress is reviewed annually by the department, and on a more frequent basis by the supervisor. A student whose work is unsatisfactory may at any time be required to withdraw from the University. In those cases in which a student does not manage to complete the degree before the end of the time limit specified above, the University has no further obligation to provide supervision. Upon consultation with the department and on its recommendation, the student will be shown as having been "withdrawn in good standing due to time limit".

In the case of a student in a thesis program, if a completed thesis is submitted, and is acceptable to the department, the student can be readmitted in order to defend the thesis. However, thesis program students who have been withdrawn in good standing should be aware that they may be required to complete additional course work before being permitted to proceed to a defense of the thesis. In all cases, the department must first declare that the submitted thesis is ready for defense before the student will be readmitted.

A student enrolled in a course work or project program may also be readmitted if this is deemed acceptable by the student's department. However, course work and project program students who have been withdrawn in good standing should be aware that they may be required to retake courses in which the content is judged by their department to have changed significantly since first completion and/or may be required to take additional courses that are necessary to fulfill current program requirements.

At the time of readmission, the student will be required to pay a fee (equivalent to one year's tuition), to compensate for the costs of the defense and the subsequent processing of the thesis.

4. REGULATIONS FOR THE DEGREE DOCTOR OF PHILOSOPHY

4.1 General

The regular doctoral programs at McMaster have been designed for students who can devote full time to their studies. Academically, full-time Ph.D. study is the best and most efficient way to undertake the degree. However, some departments at McMaster University will consider individual applicants holding a Master's degree whose circumstances preclude uninterrupted full-time graduate work to undertake Ph.D. studies. Because of the divergent nature of academic disciplines, part-time Ph.D. work is not feasible in some areas.

Accordingly, no Department or Program is obligated to offer part-time Ph.D. work. Consult the department listings for information as to whether a part-time program is available in any particular department, or correspond with the department directly.

4.2 Program Requirements

McMaster University does not have a minimum course requirement for the Ph.D. Instead, it is left to each graduate program to establish its own minimum requirement, subject to the approval of the appropriate Graduate Curriculum and Policy Committee, and Graduate Council. In accordance with OCGS requirements, no more than one-third of the program's minimum course requirements may be at the 600-level.

Students should consult that section of the Calendar applicable to the graduate program in which they are interested.

The supervisory committee may also require a student to take courses in addition to the minimum prescribed by the program's regulations. These additional courses must be relevant to the student's program. They may be taken in another program and may be at either the undergraduate or graduate level. The student who is required to take undergraduate courses may register for a maximum of 12 units of such work.

Students will be required to meet any additional requirements of the program, including special seminars or colloquia. Such requirements are subject to approval by the appropriate Committee on Graduate Curriculum and Policy.

4.3 Examinations

All Ph.D. candidates at McMaster are expected to acquire, during the course of their studies, a comprehensive knowledge of the discipline or sub-discipline to which their field of research belongs. The Comprehensive Examination is designed to test students for this breadth of knowledge and the ability to integrate ideas. The form of the exam and its administration are the responsibility of the department in which the student is registered, not of the student's supervisory committee. The outcome will be reported to the School of Graduate Studies as "pass with distinction", "pass", or "fail".

If the result of the examination is "fail", the student must be given a second opportunity to take the examination, or those portions on which the failure occurred. This second opportunity is given in place of any 're-read' of a comprehensive exam, which is explicitly excluded from the Student Appeal Procedures, and in recognition of the fact that the failure may occur on the oral part of the examination. If a student chooses to withdraw from the program prior to that second opportunity, the result "fail" will remain on the student's record.

The Comprehensive Examination for full-time students will normally take place between 12 and 20 months after the student has begun Ph.D. work at McMaster, with an upper limit of 24 months. Individual exceptions require the approval of the appropriate Faculty Committee on Graduate Admissions and Study. Programs which offer part-time Ph.D. programs must require such students to take the Comprehensive Examination by the end of the 36th month.

Departments may hold qualifying or entrance examinations at the beginning of a student's doctoral studies.

There is no University-wide foreign language requirement for Ph.D. students. Many departments, however, do have such a requirement (see departmental regulations).

All departmental examination rules and practices are subject to approval by the Faculty Committee on Graduate Curriculum and Policy, which may refer questions to Graduate Council.

4.4 Thesis

A candidate must present a thesis which embodies the results of original research and mature scholarships. Before preparing the final version of the thesis the student must be authorized to do so by the supervisory committee.

When a majority of the supervisory committee have approved the final version of the thesis, it may be submitted to the School of Graduate Studies for examination. The oral defense will not be set-up until the report from the supervisory committee has been received and the date of the defense established.

In rare cases, a thesis defense can be held without Supervisory Committee approval. A student requesting such a defense should do so on the "Petition for Special Consideration". The section for comments by the supervisor and chair are then intended to provide additional information, not approval of the request. If such a petition is granted, the normal procedures for a defense will be modified in recognition of the unusual circumstances.

Students must submit three copies of the thesis to Graduate Studies and one copy to each member of the supervisory committee. Each thesis must include an abstract of not more than 300 words. The final date for submitting the thesis to Graduate Studies for Autumn or Spring Convocation is found in the Sessional Dates section.

Selection of the Examining Committee

Selection of an external examiner is the responsibility of the Associate Vice-President & Dean of Graduate Studies. To aid in that selection, the supervisory committee is required to provide, through the Chair of the Department (or equivalent), the names and contact information for three potential examiners, at least one month prior to the submission of the thesis. The nominees must not have primary appointments at McMaster University, and they must be at arm's length* from all members of the supervisory committee and the student. To maintain this distance, all communication with a potential or selected external examiner that is related to the examination and defense of the student must originate only from the School of Graduate Studies.

The examining body will consist of the following members: the student's supervisor, two representatives of the department selected by the chair (normally from the supervisory committee), and an external examiner. When the external examiner cannot attend the Thesis Oral Defense in person or through tele- or video-conferencing, there will be one additional representative of the faculty at large.

Regardless of whether he/she plans to attend an oral defense, the external examiner will provide a written report to the Associate Vice-President & Dean of Graduate Studies judging whether the written thesis is satisfactory for defense or not.

The definition of 'arm's length' is as follows: The nominees should not have been a research supervisor or student of the supervisor or the student within the last 6 years; should not have collaborated with the supervisor or the student within the past 6 years, or have made plans to collaborate with these individuals in the immediate future. There also should be no other potential conflicts of interest (e.g., personal or financial). External examiners should not have been employed by or affiliated with the student's or supervisor's Department within the past 6 years, nor expect to become employed in the Department soon.

Scheduling and Conducting the Oral Exam

If the external examiner approves the thesis for oral examination, an oral defense will be convened by the Associate Vice-President & Dean of Graduate Studies, chaired by herself or her delegate and conducted by all members of the examining committee. Quorum for the examination will be the Chair of the examining committee plus four examiners. At the discretion of the Chair, the Thesis Oral Defense will be open to members of the university community and the public who wish to attend as observers. The examination proper will be conducted only by the members of the examining committee. When they have completed their questions, the Chair may permit a few minutes of questioning by visitors. Normally the student will attempt to answer visitors' questions, but these are not to be considered part of the examination for the degree. Observers will withdraw prior to the committee's deliberations on the student's performance at the defense.

If the external examiner does not approve the thesis for an oral defense, the appropriate Associate Dean will convene a meeting with the student's supervisory committee to discuss the external examiner's report. The supervisory committee and student will make

every best effort to address the concerns of the examiner, and the revised thesis may be re-assessed again by the external examiner. In rare cases, a new external examiner may be appointed by the Associate Vice-President and Dean of Graduate Studies.

After a discussion of the examination, the Chair will ask for a vote on each of the two questions, the acceptance or rejection of the **written document** and the success or failure of the **defense**. If there are two or more negative or abstaining votes on either question, with at least one of these votes being from a member of the supervisory committee, the candidate is deemed to have failed this defense, and a reconvened oral defense must be held at a later date. The candidate should be told as clearly as possible what he/she must do to improve either or both the written thesis and his/her defense of it. The reconvened defense is the candidate's final opportunity to complete the degree. If the document or the defense of it is deemed to have failed a second time, that decision is final, and is not open to appeal. Membership on the reconvened examining committee should be the same as that for the original defense, except that one or two substitutions are permitted in order to expedite scheduling of the reconvened defense. In the event the written thesis is approved conditionally, the Supervisor is responsible for ensuring that (1) the candidate is advised of the conditions in writing, (2) the candidate receives and understands the form used to confirm that the conditions have been met, and (3) the supervisor is also aware of the form.

Following the committee's decision, the Chair will secure the written votes of each examiner, sign the report form, and return it to the School of Graduate Studies.

After a successful defence, the candidate must correct any errors detected by the readers and resubmit six copies to the School of Graduate Studies for binding. The fee for binding and costs for postage are paid by the student. One copy of the bound thesis goes to the supervisor, one to the department, two to the University Library, and one to the student. One unbound copy goes to the National Library for microfilming.

4.5 Supervision

The general regulations in regard to supervision, described earlier (Section 2.6), apply to doctoral students.

Students will be expected to confer with the Chair of the Department/Program and others in choosing a supervisor for their entire doctoral program, including the proposed research. As soon as possible, and in any case not later than six months following their arrival, a supervisory committee will be appointed by the department/program, on the recommendation of the students and their possible supervisors. The supervisory committee will consist of at least three members. Two, including the supervisor, must be from within the department/program. A third member, whose scholarly interests include the area of the student's main interest, may be from outside the department/program. One member may be appointed from outside the University with the permission of the Associate Vice-President & Dean of Graduate Studies. If the need arises, the membership of a supervisory committee will be subject to change by the same procedures involved in its appointment. Supervisory committee members, including supervisors, may not resign without the department's/program's approval.

The duties of the Ph.D. supervisory committee will be as follows:

- to assist in planning and to approve the student's program of courses and research;
- to approve the thesis proposal;
- to decide, within departmental regulations, on the timing of the comprehensive examination and, where applicable, of the language and other examinations;
- to maintain knowledge of the student's research activities and progress;
- to give advice on research, usually through the student's supervisor;
- to provide the student with regular appraisals or progress or lack of it;

- to perform such other duties as may be required by the department;
- to report on the above matters annually, in writing, on the approved form to the department, which in turn will report to the Faculty Graduate Committee on Admissions and Study;
- to initiate appropriate action if the student's progress is unsatisfactory, including any recommendation that the student withdraw, for approval by the department and the Faculty Committee on Graduate Admissions and Study;
- to decide when the student is to write the thesis and give advice during this process;
- to act as internal examiners for the student's thesis;
- to act as members of the examination committee for the final oral defense when so appointed.

The supervisory duties of the department/program will be as follows: to provide all Ph.D. students in its doctoral program with copies of the complete departmental regulations of the program (such regulations are subject to approval by the Faculty Committee on Graduate Curriculum and Policy); to approve the membership and work of the supervisory committee; and, when necessary, to make changes in the membership; to report this membership to the Faculty Committee on Graduate Admissions and Study; at least once a year to review each student's course grades and research progress, as reported by the supervisory committee; to conduct comprehensive examinations; to conduct or arrange for language examinations when these are required; to attest to the Faculty Committee on Graduate Admissions and Study that all departmental and University requirements for the degree have been satisfied; to name any departmental representatives to the examination committee for the final oral defense of the thesis; to replace any members of the supervisory committee, including the supervisor when on leave of absence or, if necessary, when on research leave.

Part-time students must have their course grades and research progress reviewed at least once a year by the supervisory committee.

4.6 Program Duration

The minimum time in which to complete a Ph.D. program at McMaster is three calendar years beyond the bachelor's level or two calendar years beyond the master's level. However, the minimum time may be reduced by up to one year for graduate work beyond the Master's level taken in a university or research institution approved by the Faculty Committee on Graduate Admissions and Study.

Completion of the Ph.D. degree is normally limited to six years from initial registration in a regular doctoral program at McMaster. The time for completion of the Ph.D. program for those admitted to a part-time program is normally limited to eight years from initial registration at McMaster as a Ph.D. student.

Each student's progress is reviewed annually by the department, and on a more frequent basis by the supervisory committee. A student whose work is unsatisfactory may at any time be required to withdraw from the University.

In those cases in which a student does not manage to complete the degree requirements before the end of the time limit specified above, the University has no further obligation to provide supervision. Upon consultation with the department and on its recommendation the student will be shown as having been "withdrawn in good standing due to time limit".

If a completed thesis is submitted, and is acceptable to the department, the student can be readmitted in order to defend the thesis. Students who have been withdrawn in good standing should be aware that they may be required to complete additional course work before being permitted to proceed to a defense of the thesis. In all cases, the department must first declare that the submitted thesis is ready for defense before the student will be readmitted.

At the time of readmission, the student will be required to pay a fee (equivalent to one year's tuition), to compensate for the costs of the defense and subsequent processing of the thesis.

5. FINANCIAL MATTERS

5.1 Fees for Graduate Students

(The Board of Governors reserves the right to amend fees after the printing of this statement.)

These regulations apply to tuition and student fees. They cover the various charges which would be incurred for reasons of late payment or late registration. The 2009-2010 schedule of fees is in effect for a period of September 1, 2009 to August 31, 2010 and applies to all graduate students whether registered in regular or part-time degree programs.

2009-2010 SCHEDULE OF FEES (Excluding M.B.A.)

REGULAR FEES

New Students (Term 1)	REGULAR FEES			
	Fall	Winter	Spring	Total
Canadian Fees				
Regular Tuition Fee	\$ 1855	\$ 1855	\$ 1855	\$ 5565
Part-time Fees	\$ 928	\$ 928	\$ 928	\$ 2784
Visa Fees				
Regular Tuition Fees	\$ 4426	\$ 4426	\$ 4426	\$ 13278
Part-time Fees	\$ 2272	\$ 2272	\$ 2272	\$ 6816
Returning Students (Term 2 or greater) in September 2009				
Canadian Fees				
Regular Tuition Fees	\$ 1787	\$ 1787	\$ 1787	\$ 5361
Part-time Fees	\$ 893	\$ 893	\$ 893	\$ 2679
Visa Fees				
Regular Tuition Fees	\$ 4426	\$ 4426	\$ 4426	\$ 13278
Part-time Fees	\$ 2272	\$ 2272	\$ 2272	\$ 6816
Discounted Fees				
	\$ 893	\$ 893	\$ 893	\$ 2679

SPECIAL PROGRAM FEES

Program	Canadian	International	Per
ADMI	\$ 2500	\$ 2500	Half course
Advanced Neonatal Nursing Diploma	\$ 10816	\$ 10816	Year
Health Services and Policy Research Diploma	\$ 3574.38	\$ 3574.38	One-time fee
M.E.E.I. (Full-time)	\$ 14976	\$ 22896	Year
M.E.E.I. (Part-time)	\$ 7488	\$ 11448	Year
M.E.P.P. (Full-time)	\$ 13026	\$ 13275	Year
M.E.P.P. (Part-time)	\$ 6687	\$ 6816	Year
Master of Communications Management	\$ 3000	\$ 3000	Course
Master of Engineering Design (Full-time)	\$ 13026	\$ 13275	Year
Master of Engineering Design (Part-time)	\$ 6687	\$ 6816	Year
Nuclear Technology Diploma	\$ 950	\$ 950	Half course
Occupational Therapy/Physiotherapy	\$ 7800	\$ 25000	Year
Rehabilitation Science-Online	\$ 1250	\$ 2000	Half course
UNENE	\$ 2500	\$ 2500	Half course

MISCELLANEOUS

	Insurance	Fees
Graduate Students Association (Annual)		
Full-time	\$163.00	\$ 51.40
Part-time	\$163.00	\$ 31.05
HSR Bus Pass (Annual) Full-time only	\$154.05	
Sports Complex Fee (3 terms)	\$ 32.49	
Student Services (Annual) - Full-time	\$107.49	
Part-time	\$ 53.73	
Administrative Services - Full-time	\$ 20.04	
Part-time	\$ 10.05	
GSA Building Fee (Annual)	\$ 30.00	
Graduate Application Fee	\$ 90.00	
Late Registration (Annual)	\$ 50.00	
Late Document Fee	\$ 50.00	
Payment Arrangement Default Fee	\$ 35.00	

(Miscellaneous fees are not refundable)

Notes:

Students promoted to a Doctoral program from a Master's program will be considered as new admissions for the purpose of time limits for completion of the degree requirements, eligibility for financial assistance, and fees assessment.

Some Visa students may be eligible to pay Canadian fees depending on various immigration policies, and the Ministry Funding Manual. Visa students in Term 7 or greater of a Master's program or Term 13 or greater of a Ph.D. program will pay Canadian fees.

Most students will pay regular fees. Part-time fees apply only to those students originally offered admission to a part-time program. The part-time fees will allow registration in up to 3 half courses per academic year. Students registering in more than 3 half courses will be assessed full-time fees. In situations where a student in a part-time program completes the degree or withdraws from the university, fees for the academic session will be assessed by the number of terms or number of half courses (whichever is the greater).

Students who have been registered as full-time for longer than the normal period of funding eligibility (as defined in Section 5.2.1) may request to be assessed discounted fees. Such requests will be approved if all of the degree requirements (e.g. course work, comprehensive examinations, an accepted proposal and all

laboratory field research) except the writing of the thesis have been completed. It will be necessary for the department chair (and for Ph.D. students, the supervisory committee) to verify that the requirements have been met, and to approve a schedule for the remainder of the work.

A fee is charged for each course taken on the basis of Section 2.1.4 by persons who are not registered graduate students. The minimum fee is \$859 for Canadian students and \$2143 for Visa students. The fee for certain courses may be higher.

Students on leave of absence do not pay tuition fees but do pay miscellaneous fees. Students who have "withdrawn in good standing due to time limit" do not pay fees until readmission. See Section 5.1.3 (Readmission Tuition Charges). Students admitted in January or May, will have a slightly different schedule of fees.

For M.B.A. fees refer to the M.B.A. Calendar available from the DeGroot School of Business.

Enquiries should be referred to the School of Graduate Studies, 905 525-9140 Ext. 23679. E-mail: askgrad@mcmaster.ca.

5.1.1 Payment of Fees

In order to register a student must either:

- (a) pay by cash or cheque, full tuition and all additional fees for the full year;
or
- (b) have been offered and accepted a teaching assistantship and/or scholarship whose sum less appropriate taxes and deductions exceeds the amount of tuition and all other miscellaneous fees. Fees will be deducted from the student's monthly pay;
or
- (c) have made special arrangements with Financial Services.

5.1.2 Nonpayment of Fees or Charges

Students with outstanding accounts at the end of the academic year will:

- (a) not receive academic results; and
- (b) not be permitted to register for the next academic year until the account is settled.

5.1.3 Readmission Tuition Charges

Students who do not register and pay tuition for any academic session are considered to have withdrawn. These students and those who have been withdrawn in good standing due to time limit are required to apply for readmission. Students who were withdrawn in good standing due to time limit and are successful in gaining readmission will be assessed a full year's fees at the discounted rate (currently \$2487 for Canadian fees) and the existing application fee, and will not be eligible for a refund. The readmission fee covers registration until the next academic session.

Students who withdrew voluntarily or did not register for an academic session and wish to apply for readmission must pay a full year's fees at the current rate of the last category (regular, part-time or discounted) in which they were registered and the existing application fee and will not be eligible for a refund. Readmissions in this category are not eligible for the part-time rate unless the student was registered in a part-time program at the time of withdrawal.

5.1.4 Refund of Fees

A student who completes the degree requirements prior to the end of the academic year will be entitled to a refund. (**Note:** This does not apply to students who are readmitted.) The refund is based on the

number of full months remaining in the academic year at the time when the academic change form is received by the School of Graduate Studies. The refund schedule for students withdrawing from the University is less generous and can be obtained from the Business Office (Financial Services), Gilmour Hall, Room 209, 905 525-9140 Ext. 23190.

5.2 Financial Assistance

5.2.1 Financial Support for Full-time Students

The University provides four types of financial support to full-time students. They are teaching assistantships, graduate/research scholarships, and endowed scholarships and bursaries. A student's letter of offer from the University will include all details of financial support.

Teaching Assistantships are provided to many graduate students offered admission to regular full-time programs. Duties vary according to department but will usually consist of tutorials, lab demonstrations and marking. A full teaching assistantship consists of 260 hours of work over two terms and for 2009-2010 is valued at \$9880.

The University provides graduate scholarship awards to most regular graduate students in Ph.D. programs and in some Master's programs. These students must be full-time as defined in section 2.4. Such scholarships are awarded annually based upon academic merit. A Ph.D. student is normally eligible for her/his first four years. Students in Master's programs are usually supported for their first three to six terms depending on the department.

The endowed scholarships and bursaries have various conditions and amounts attached to them. A full listing may be found in section 8 of this Calendar. Eligibility conditions as stated above also apply.

All incoming students and currently enrolled students are automatically eligible and considered for all four types of financial assistance subject to the above eligibility conditions. No separate application is required.

Additional funding may be available through the Office of Student Financial Aid & Scholarships. Please see Section 7.2.5.

6. ADDITIONAL UNIVERSITY REGULATIONS AFFECTING GRADUATE STUDENTS

6.1. Academic Integrity

The following brief statement is excerpted in part from the McMaster University Academic Integrity Policy. For guidance on how to proceed in the case of suspected academic dishonesty, please consult the Office of Academic Integrity and the complete policy at <http://www.mcmaster.ca/academicintegrity>. The Associate Deans of Graduate Studies are available for confidential consultations on matters related to academic integrity.

ACADEMIC WORK

Academic work includes any academic paper, term test, proficiency test, essay, thesis, research report, evaluation, project, assignment or examination, whether oral, in writing, in other media or otherwise and/or registration and participation in any course, program, seminar, workshop, conference or symposium offered by the University.

For graduate students, comprehensive/qualifying exams, any research work, and thesis work (a thesis proposal, or thesis draft, or draft of one or more chapters) also constitute academic work and must adhere to standards of academic integrity.

ACADEMIC DISHONESTY

Definition

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage.

Wherever in this policy an offence is described as depending on “knowingly,” the offence is deemed to have been committed if the person ought reasonably to have known.

Students (Undergraduate and Graduate)

Students are responsible for being aware of and demonstrating behaviour that is honest and ethical in their academic work. Such behaviour includes:

- following the expectations articulated by instructors for referencing sources of information and for group work;
- asking for clarification of expectations as necessary;
- identifying testing situations that may allow copying;
- preventing their work from being used by others, e.g., protecting access to computer files; and
- adhering to the principles of academic integrity when conducting and reporting research.

Students are responsible for their behaviour and may face penalties under this policy, if they commit academic dishonesty.

Graduate Students

Graduate students, having been deemed admissible to higher studies, are expected to be competent in the acknowledgement of other people’s work, whether that work is in print or electronic media.

Graduate students are expected to understand the demands of ethical conduct of research and reporting research results. All graduate students are responsible for familiarizing themselves with the definition of research misconduct in the University’s policy, namely, “a researcher must be honest in proposing, seeking support for, conducting, and reporting research; a researcher must respect the rights of others in these activities.”

6.2 Code of Conduct

McMaster University is a community dedicated to furthering learning, intellectual inquiry, and personal and professional development. Membership in the community implies acceptance of the principle of mutual respect for the rights, responsibilities, dignity and well-being of others and a readiness to support an environment conducive to the intellectual and personal growth of all who study, work and live within it.

The *Code of Conduct* outlines the limits of conduct considered to be consonant with the goals and the well-being of the University community, and defines the procedures to be followed when students fail to meet the accepted standards.

Copies of the *Code of Conduct* may be obtained from the website at <http://www.mcmaster.ca/policy/student.htm>

6.3 Appeal Procedures

The University has a responsibility to provide fair and equitable procedures for the lodging and hearing of student complaints arising from University regulations, policies and actions that affect them directly. The procedures described in the Student Appeal Procedures are intended to provide a mechanism to remedy injustices and may culminate in a hearing before the Senate Board for Student Appeals.

Students are strongly encouraged, however, to pursue any complaint or grievance through informal channels, before following the formal procedures. Experience has shown that many complaints can be resolved satisfactorily through informal communication.

A graduate student should consult with the Chair of his/her Supervisory Committee (or the Department Graduate Advisor where no committee exists), the Department Chair and/or the Associate Dean of Graduate Studies before beginning the formal appeal process.

Students should seek remedies for their grievances as promptly as possible and must do so within the time limitations set out in Section II of the Student Appeal Procedures.

A Master’s or doctoral thesis is specifically excluded from the re-read procedures identified in the Student Appeal Procedures, as is a Ph.D. comprehensive exam. If a student does poorly in any of these examinations, the original examining committee is required to allow the student a second opportunity at the examination after at least a week. If the student fails on that second attempt, no further “re-read” of the examination is permitted.

Copies of the Student Appeal Procedures may be obtained from the website at: [http://www.mcmaster.ca/policy/Student_Appeal_Procedures_2009_\(09\)sep_01.pdf](http://www.mcmaster.ca/policy/Student_Appeal_Procedures_2009_(09)sep_01.pdf)

6.4 Ownership of Student Work

In Canada, the author is the immediate owner of the copyright in an original work, except when the author is employed to create such material. ‘Copyright’ is an exclusive property right to publish, produce, reproduce, translate, broadcast, adapt or perform a work, as defined in the Copyright Act (R.S.C. 1985, c. C-42, as amended). For work done by a graduate student, McMaster has the following policies related to the interpretation of copyright and other aspects of intellectual property rights. These policies distinguish in general between items done solely by the student and those undertaken as part of a joint research effort.

In the former case, the intellectual property is primarily the student’s, but the University reserves certain rights as detailed in the remainder of this section. In the latter case, the intellectual property rights involve the student, the research supervisor, (and possibly other individuals as well), the University, and on occasion the financial sponsor of the research. If the work is anticipated to have commercial possibilities, it is recommended that the parties involved agree in writing beforehand on the sharing of any financial returns. The Associate Deans of Graduate Studies are available for confidential consultations on matters of ownership of student work involving faculty and/or other individuals.

6.4.1 Examinations, Reports and Papers Done as Part of Course Requirements

When work that is eligible for copyright is submitted to meet a requirement of a course, the University acknowledges the student’s ownership of the copyright, but places the following conditions on the submission of the work to meet course requirements.

- The original physical document becomes the property of the University. This applies particularly to examination answer scripts, and may also be applied to term papers and other course work.
- Except for examination scripts, the University receives a royalty-free, non-exclusive licence to make copies of the work for academic purposes within the University, and to circulate the work as part of the University library collection.

6.4.2. Theses and Master's Project Reports

As with other papers, the University recognizes that the student holds copyright to the finished thesis. Copies of the thesis shall have on them in a prominent place on the title page the international copyright notice.

The student is required to sign a licence to the University library (and for Ph.D. students an additional licence to the National Library). (See Section 2.7.3 above. These licences grant the two libraries permission to reproduce the thesis and to circulate it, but do not affect ownership of the copyright.)

However, the University also recognizes that the ideas in the thesis will often arise from interaction with others. In some cases, this interaction will have been solely with the thesis supervisor; in other cases, a larger research team will have been involved. For this reason, it is understood that the copyright refers only to the written document of the thesis. The ideas, or commercial exploitation of the work may or may not be the exclusive property of the student. For the student who has worked closely with a supervisor, or as part of a research group, the rights to publish, patent, or commercially exploit the results of the research are shared with the supervisor and/or the research group, and with the University. In those cases in which the work has been supported in part by research grants or contracts, there may be other conditions affecting any patent or commercial exploitation. (The student should be made aware of any such conditions before work begins.)

6.4.3 Computer Programs

Computer programs written as part of employment duties, as for example by a teaching assistant, are the property of the employer, as specified in the Copyright Act. Computer programs written as part of course work, a project or a thesis may also have value as a potentially marketable intellectual property. The University recognizes that such software may arise in two different ways, and accordingly has two policies. In setting forth these policies, it is understood that in those cases in which software development draws upon other software owned or licensed by the University, the terms and conditions of the licence or purchase must be followed.

- (a) Where a student develops such software at the direct request of a supervisor, and under supervision, it is assumed that there is joint ownership of the intellectual property rights. In such cases, it is recommended that the individuals involved co-author a working paper documenting the software, rather than including it as an appendix to a thesis or report. Prior agreement between the student and supervisor that this is to be the case would be helpful, but is not mandatory.
- (b) Where a student develops such software on his/her own, as for example for an independent project in a course, copyright remains with the student. As a condition of using University computing facilities, the student is required to grant the University a royalty-free licence to use the software. This includes the right of the University to distribute copies of the software to McMaster faculty, staff, and students for the University's administration, education and research activities. This licence does not include the right to use the software for commercial purposes or to distribute the software to non-McMaster people.

6.4.4 Research Data

As with computer software, the University recognizes that research is conducted and data are acquired in two different fashions. When the data are acquired as part of a joint or collaborative effort, such as one relying on the equipment within a laboratory, they are not solely the property of the student, although some of the data may ultimately appear in tables or appendices in a completed thesis. As a general rule, such data are the joint property of the student and the research supervisor, either of whom has the right to make them available to

other individuals as well. Both student and supervisor are responsible for insuring that proper acknowledgement of the contributions of the student, supervisor, and other members of the research team is made when the data are released in any form.

When the data are acquired through the student's individual effort, and without the use of University laboratories or funding, then they are usually the property of the student making that effort. However, exceptions may occur when the student collects data using research instruments, including interview schedules and questionnaires, developed wholly or in part by the research supervisor or by some other person or agency. In such instances the right to ownership and/or use of the data may be shared among the parties involved. Given the range of possible alternatives it is not possible to set absolute guidelines in advance covering all such situations. Consequently, it is recommended that students and supervisors make clear agreements in advance concerning the ownership and use of data collected in this fashion. Ownership of data may also be affected by the terms of a research contract that has supported the work.

6.4.5 Equipment

If University resources have been applied to the construction or design of equipment, it is not the property of the student, but of the University. Equipment constructed or designed as part of course or thesis work is the property of the student if the work, materials, and workroom space have been provided by the student or other non-University source. Ownership of newly constructed equipment may also be specified in a research contract that has supported the work.

6.5 McMaster University Policy for Academic Accommodation of Students with Disabilities

McMaster University is committed to ensuring that each student is afforded an academic environment that is dedicated to the advancement of learning and is based on the principles of equitable access and individual dignity. To this end, the University has a Centre for Student Development and is continuously making improvements to its facilities to maximize access for all students. The School of Graduate Studies, along with the relevant academic department(s) and the Centre for Student Development, encourages academically qualified students to investigate the full range of possibilities at McMaster.

As with all applicants, those with disabilities are expected to select graduate programs that are appropriate for their skills and abilities. Material provided to applicants by departments should describe specific program requirements, including the nature of research and/or course work, to ensure that the applicant is aware of the expectations for successful completion of the program. Students with pre-existing disabilities, as well as students who become disabled after their admissions to graduate studies, may require special support services and accommodations in order to complete their programs successfully. The University will take reasonable steps to provide such services and accommodations that do not compromise the quality and integrity of the student's academic program. Self-identification is voluntary and confidential, and access to information must be approved by the applicant. To facilitate accommodation, however, McMaster University urges applicants to declare any disabilities, as well as to provide details concerning accommodations provided by their previous educational institutions, at the time of application. Such declaration is encouraged particularly in cases where it is felt that the disability may have affected past academic performance, and/or where accommodation may be required in order for the student to complete his/her graduate program. Applicants who have been identified and who are offered admission will need to consult with their Department/Program Chair and the Centre for Student Development as early as possible, and preferably prior to

enrolment, to identify and implement an appropriate accommodation plan. At all times, concern for maintaining the dignity of the individuals involved will be paramount. Failure to disclose a disability at the time of admission, however, may delay or otherwise compromise the accommodation process.

Special services and accommodations are provided on an individual basis, are disability specific, and are consistent with the academic objectives of the course and program. McMaster University's *Policy for Academic Accommodation of Students with Disabilities* outlines the steps that must be taken in order to arrange for such services and accommodations (see Sections 31-34 inclusive). The full policy is available from the Centre for Student Development.

6.6 Student/Faculty Non-Disclosure Agreements

The School of Graduate Studies encourages the cooperation of faculty with the private sector. Often cooperation will permit the involvement of graduate students. When this happens, it is not unusual for a company to protect its interests by asking the faculty member and the student to sign a confidential Non-disclosure Agreement. Such agreements, even those signed only by the faculty member but referring to student involvement, can restrict conditions for a number of matters important to students, such as their wish to publish research results, the thesis defense, and the deposit of the thesis with libraries. In many cases, the restrictions are reasonable and do not clash with academic principles that require the presentation of research findings for peer assessment.

In those instances where a Non-disclosure Agreement has been signed, a supervisor must notify the Associate Vice-President & Dean of Graduate Studies in writing of the Agreement, giving a brief description of its contents and assessing the impact on the thesis defense or dissemination of the thesis.

Students are advised to discuss any non-disclosure waivers or comparable agreements with the department chair, graduate advisor, or the School of Graduate Studies, before signing.

It has been common practice, in cases where a corporation wishes to protect its interests in a discovery, to delay placing copies of a thesis in libraries for up to twelve months after the oral defense, but not for longer periods.

It has not been common practice in these same cases to limit attendance at oral defences to only examination committee members; nor has it been common practice to have examination committee members agree to non-disclosure agreements. The pertinent guiding principle is that oral defences are public events.

Students in doubt about how these norms of academic activity apply to their circumstances should approach the Associate Vice-President & Dean of Graduate Studies.

6.7 Conflict of Interest Guidelines, School of Graduate Studies

6.7.1 General

There shall be no prohibition on the grounds of family relationship against the admission of persons as full- or part-time graduate students or against the eligibility for financial awards of such persons. Faculty members normally shall not take part in any proceedings at any level which affect the graduate standing of a spouse or other relative (including admission, financial assistance, promotion, courses of instruction, supervisory, thesis and examining committees). It is understood that the merits of each individual shall be the overriding consideration in all such cases.

6.7.2 Conflict of Interest in the Evaluation of Graduate Students

All faculty members responsible for the evaluation of graduate students have a general responsibility to the University to ensure that they are not in a position of conflict of interest (or the appearance of a conflict of interest) in their obligations to the University with regard to the nature of their relationships with graduate students. Specifically, a faculty member may not be involved in the evaluation of a graduate student if the faculty member has a close family relationship with the student (including spouse, parent, child, sibling, niece/nephew or spouses of the foregoing), if the faculty member is, or has been engaged to be married to the student, or if the faculty member has (or has had) an intimate personal relationship with the student. Evaluation includes grading course work or examinations (including the defense of a thesis) and supervision, whether as the principal supervisor or as a member of a supervisory committee.

A faculty member should question the propriety of evaluating a graduate student if there exists a distant family relationship with the student, or if the faculty member and the student maintain or have had a business relationship or any other relationship which should reasonably give cause for concern.

Questionable cases should be referred to the Associate Vice-President & Dean of Graduate Studies for a decision.

6.8 Student Academic Records

Student academic records are the property of the University. The University has developed procedures designed to protect the confidentiality of student records. A student may have access to her or his file, but documents received from a third party in confidence will not be disclosed.

Transcripts are issued only with the consent of the student.

6.9 McMaster University Workplace and Environmental Health and Safety Policy

McMaster University is committed to provide and maintain healthy and safe working and learning environments for all employees, students, volunteers and visitors. This is achieved by observing best practices which meet or exceed the standards to comply with legislative requirements as contained in the Ontario Occupational Health and Safety Act, Environmental Protection Act, Nuclear Safety and Control Act and other statutes, their regulations, and the policy and procedures established by the University. To support this commitment both McMaster University and its employees are responsible jointly to implement and maintain an Internal Responsibility System directed at promoting health and safety, preventing incidents involving occupational injuries and illnesses or adverse effects upon the natural environment.

The University is responsible for the provision of information, training, equipment and resources to support the Internal Responsibility System and ensure compliance with all relevant statutes, this policy and internal health and safety programs. Managers and Supervisors are accountable for the safety of workers within their area, for compliance with statutory and University requirements, and are required to support Joint Health and Safety Committees. Employees are required to work in compliance with statutory and University requirements, and to report unsafe conditions to their supervisors.

Contractors and subcontractors undertaking to perform work for McMaster University must, as part of their contract, comply with all relevant workplace and environmental health and safety statutes and to meet or exceed the University's Workplace and Environmental Health and Safety Program requirements.

In addition to the above stated managerial responsibilities, Deans, Directors, Chairs, Research Supervisors and other Managers are also accountable for the safety of students, volunteers and visitors who work and/or study within their area of jurisdiction. Students are required by University policy to comply with all University health, safety and environmental programs.

Implementation:

The authority and responsibility for the administration of procedures and programs to provide for the implementation of this policy is assigned to the Office of the Vice President, Administration.

The Risk Management Support Group is responsible for facilitating the development, implementation and auditing of the Health and Safety Programs effective under this policy. This is achieved through the implementation of a risk management system that is directed at supporting the Internal Responsibility System through the application of best practices for the management of occupational, environmental, public health and safety related risks.

The Office of the Vice President, Administration will provide reports to the University Board of Governors concerning the status and effectiveness of the Workplace and Environmental Health and Safety System and any notices of violation issued to the University regarding breaches of workplace health and safety or environmental protection statutes.

6.10 Inter-University Cooperation

It is possible for a graduate student registered at McMaster University to take a graduate course at another Ontario university for credit toward the McMaster degree. To do so, the student must complete the form for an Ontario Visiting Graduate Student (available from the School of Graduate Studies website) and describe the course to be taken, the term in which it will be taken, and the reasons for taking the course. Approval of the student's Department Chair and Supervisor are required before the form is submitted for approval to the School of Graduate Studies, which will send it to the host university. The course selected must be required for the student's program, must be a graduate level course, and must not be available at McMaster University. Auditing of courses, or registration for "extra" courses is not permitted.

7. GENERAL INFORMATION

7.1 Housing and Conference Services and Hospitality Services

7.1.1 Off-Campus Housing

The Off-Campus Resource Centre (OCRC) is available to assist students in their search for suitable housing in the Hamilton area. The office maintains available rental listings as well as area maps, information brochures, contact details for local legal clinics, and free access to phones for setting up appointments for viewings. Note that GSA members have unlimited access to the HSR (city transit) simply by showing their student card. Staff are available year-round to assist students with housing/tenant issues. Listings are available for perusal in the office lobby and on their website. The Off-Campus Resource Centre is located on the lower level of the Student Centre, Room B112. Office hours are Monday-Friday, 8:30-4:00. Enquiries: 905 525-9140 Ext. 24086.

Email: macoffcampus@mcmaster.ca
Website: <http://www.macoffcampus.ca>

Graduate Student Housemate Connector. Visit <http://www.macoffcampus.ca> to register and link up with other grad students who are looking for someone to live with.

7.1.2 On-Campus Housing

Admission to residence will be granted to graduate students only after all full-time traditional undergraduate students have been accommodated. There are no bed spaces reserved for graduate students. Graduate students may inquire in September about the possibility of on-campus accommodation after traditional students have moved in. Inquiries should be directed in-person to Residence Admissions, Commons Building, Room 101 or telephone at 905 525-9140 Ext. 24342, Email: resadm@mcmaster.ca
Website: <http://housing.mcmaster.ca>

7.1.3 McMaster Community Homes Corporation

McMaster Community Homes Corporation owns and operates Cotton Mill Estates, a multi-residential complex located in Dundas, Ontario. The complex is located adjacent to conservation authority lands, with shopping, schools and professional services within walking distance. McMaster University is also within walking distance of about one mile.

McMaster Community Homes Corporation offers both market rent units and those for which occupants pay rent based on their monthly income. Waiting time depends on family composition and can be lengthy, so interested students should apply as soon as possible.

McMaster Community Homes Corporation welcomes applications from McMaster students. Under municipal regulations, application for subsidized units are made through Fengate Property Management. For applications or assistance, contact the property managers at 905 578-3833, or by email at scnph@bellnet.ca, or McMaster's Off-Campus Housing Office.

7.1.4 Hospitality Services

McMaster Hospitality Services is a self-supporting department dedicated to providing you with healthy, nutritious and flavourful food. We are pleased to offer the ease and security of our "Mac Express" debit meal card plans; this handy feature of campus meal plans means you no longer have to worry about carrying cash. There are two Off-Campus Meal Plans available for your convenience:

Freedom Plan

The Freedom Plans allows you to determine the size of your account. It can be set up with an initial deposit of \$100 or more, so you can spend as much or as little as you want. You decide how much of a deposit you want to make and when you want to add more money. This plan also gives you a 5% discount on most food purchases at our dining locations on-campus. The Freedom Plan is virtually risk-free. It is fully refundable, very flexible, and can be increased at any time.

Term Plan

Our Term Plan is designed to save you money and stretch over a designated period of time. This plan is non-taxable, saving you both the PST and GST on your purchases (13%), and can be purchased at a minimum rate of \$200 which runs for a period of four weeks from time of purchase. You may purchase additional weeks at the time of initial purchase, or prior to the expiry date of your Term Plan at a rate of \$50 per week.

As this is a non-taxable plan, under government tax regulations, it is also considered non-refundable and non-transferable (except upon complete withdrawal from the University, subject to a minimum charge of four weeks). The Term Plan cannot be used to dine at Off-Campus vendors and is designed for your personal use only. Due to government tax regulations, applicable taxes will be assessed and deducted from your Term Plan for purchases of non-food items. All monies must be used by the end of the purchased term. We encourage you to monitor your purchases, as any unspent monies at the end of the purchased term will be lost.

For more information on meal plans, or to set up your account, visit our Mac Express Centre, located in the Commons Building, Room 128 or call Ext. 27448 or email express@mcmaster.ca

Our goal is to make your university dining experience exciting and fun, at the same time providing you with high quality food services, variety and good value. You can find a wide selection of entrées around campus daily, as well as fantastic promotions. We offer vegetarian choices, international food menus, healthy options, quick snacks and made-to-order entrées. With 16 locations across campus, Hospitality Services offers an environment for every individual, from traditional fare at *Commons Marketplace* to the upscale environment of the *East Meets West Bistro*, to the all-vegetarian selection at *Bridges Café*. Centrally located in the McMaster University Student Centre, *La Piazza* is based on an open, marché-style concept and offers diverse dishes throughout the day.

Our newest location, *bymac*, is located in the state-of-the-art David Braley Athletic Centre and features the latest in dining trends. Including a Pizza Pizza and a full-serve Tim Hortons, this will also be the site of Freshens' innovative new juice concept. Yet another first, brought to you by Mac.

With a Mac Express Off-Campus Freedom Plan, you can treat yourself to a meal out. Current participating vendors include the local Boston Pizza, East Side Mario's, Kelsey's, Pita Pit, Pizza Pizza, and Quarters Pub. Your Mac Express Meal Plan may be used only to purchase food, non-alcoholic beverages, and to pay gratuities. The full purchase value, including taxes, will be deducted from your account.

To find out more about all of the Hospitality Services locations and opportunities, please visit our website at <http://hospitality.mcmaster.ca>.

7.1.5 Conference Services

On campus accommodation is available for summer students, visitors and conference delegates between May and August. Hospitality Services and meeting facilities can also be arranged. As well, any non-academic events/functions can be arranged through Conference Services. For further information, contact: 905 525-9140 Ext. 24781/24783 or Fax 905 529-3319 or Email: meet@mcmaster.ca Website: <http://conference.mcmaster.ca>

7.2 Counselling Services

7.2.1 Employment and Equity Support Services

McMaster's Employment and Equity Support Services aims to identify and eliminate any discrimination, either directly or indirectly, in employment policies and procedures and to set goals and timetables to achieve a workforce that is representative of the diversity in our community. The University works to ensure fair treatment and equality of opportunity for all employees, paying particular attention to women, aboriginal peoples, visible minorities, sexual minorities and persons with disabilities who have traditionally been disadvantaged in the workplace.

Employment and Equity Support Services includes initiatives and activities that ensure selection procedures focus on job related criteria. The unit also looks at ensuring accommodation of individual needs such as accessibility for persons with disabilities, alternative working arrangements such as job sharing or flexible hours, and enrichment opportunities such as job shadowing or temporary assignments are available to help promote employment equity. Issues raised by staff such as child care problems, or other barriers to employment opportunities can be dealt with through consultation.

For more information or advice to individuals or groups with specific equity questions please contact the Manager, Employment and Equity Support Services, 905 525-9140 Ext. 28660.

7.2.2 Human Rights and Equity Services

The Human Rights and Equity Services office implements the Sexual Harassment and Anti-Discrimination Policies. We provide a range of services to students, staff and faculty, administrators, supervisors and student employee groups. Our services include:

Consultation and Advice

We provide confidential consultations on human-rights-related issues of all kinds. We will listen to what you have to say, discuss your options with you, and intervene (in most cases) only if you wish us to intervene.

Awareness and Education

We raise awareness and provide education with regard to harassment, discrimination, accommodation (of religious beliefs and disabilities of all kinds) and other human-rights related issues. We will work with you, your organization or group to design programs to address specific situations.

Resolution of Complaints

We will meet with campus members who feel that they have been subjected to harassment or discriminatory behaviour based on a human rights ground. We can offer guidance as to the options the person has available to address the concern, including the dispute resolution processes under the Sexual Harassment and Anti-Discrimination policies.

The office is located in McMaster University Student Centre, Room 212. We are open from 8:30 a.m. to 4:30 p.m.
Enquiries: 905 525-9140 Ext. 27581, Elaine Hay
Fax: 905 522-7102 or Email: hres@mcmaster.ca
Website: <http://www.mcmaster.ca/hres>

7.2.3 Centre for Student Development

The Centre for Student Development (CSD) is a resource for all McMaster students. It offers services in several main areas: personal counselling, academic skills (including writing skills and English as a Second Language), services for students with disabilities (including ATLAS, a program for students with Learning Disabilities) and Leadership Training. ALL contact with CSD is confidential. We are located in MUSC-B107, Ext. 24711, Website: <http://csd.mcmaster.ca>

Personal Counselling

Students are encouraged to seek assistance from the Centre if they experience any type of personal, emotional, social, or mental health concerns.

Academic Skills

The Centre offers workshops, small group seminars and individual counselling on a wide range of academic skills matters. Academic Skills Concerns include:

Advanced Learning strategies (e.g. note taking, lecture and reading)
Time management, personal organization and study habits
Exam-taking skills (e.g. multiple choice, exam preparation)
Academic writing skills development

For more information, please visit <http://csd.mcmaster.ca/academic>.

Services for Students with Disabilities

The Centre for Student Development can provide advice to current and potential students and applicants with disabilities. The Centre assists students with issues concerning the accessibility of campus facilities, the provision of special equipment and alternative media formats, and other issues. It provides supports for students with chronic medical and mental health disabilities and students who are deaf or hard of hearing. It also offers counselling, advice, support, and workshops to help students meet their educational objectives. For more information, visit <http://csd.mcmaster.ca/sswd>.

Assistive Technology Learning and Academic Support (ATLAS) Program, Commons Building, Room B104

ATLAS provides the following services for students with learning disabilities:

Assistive Technology - The ATLAS Programme offers assistive technology training and support for software packages to help students with their reading, writing and organizational skills. In addition, computer stations with assistive technology software are available in the lab for students to use.

Learning Strategies - Students can learn various reading, writing, time management, test preparation and study strategies from our Learning Strategist. Support is also offered to assist students to understand the nature of their learning disability. For more information, drop by our new lab in Commons Building, B104. Tel. 905 525-9140 Ext. 24354
Website: <http://csd.mcmaster.ca/atlas>

Dr. Mary E. Keyes Leadership Program

The Centre for Student Development has designed a Leadership Certificate for those students who want to take on leadership roles on campus, in their community, or in their current or future workplace. The goal of the Leadership Certificate is to assist students in learning the skills necessary to become responsible leaders who are able and willing to work with others collaboratively and effectively. The Certificate is comprised of course required and elective workshops, community service, and a short, written component. Please note that this certificate does not qualify for credit towards undergraduate degrees. For more information and to register for the workshops, please visit our website at <http://csd.mcmaster.ca/leadership>.

International Student Services (ISS):

ISS assists international students, visiting scholars, post-doctoral fellows and faculty in their adjustment to a new cultural and educational environment. The office provides three core services:

- Advising, information and orientation for newly arrived international students on issues such as immigration, external agencies, foreign governments, consulates and embassies, as well as referrals to other campus resources. The ISS office administers the mandatory University Health Insurance Plan (UHIP) for all international students and their dependents living in Ontario
- Through MacAbroad, ISS implements and administrates all international exchange programs for incoming and outbound graduate and undergraduate students, as well as Work / Study / Teach / Intern / Volunteer Abroad opportunities
- ESL Services: ISS offers ESL support for students whose native language is not English, through day or evening and other programs

For more information on any of the programs run by ISS, please visit <http://oisa.mcmaster.ca>, or go in person to Gilmour Hall, Room 104. ISS also be reached at (905) 525-9140, Ext. 24748, iss@mcmaster.ca.

Peer Helper Program

Peer Helpers are full- or part-time undergraduate and graduate student volunteers who play an integral role in delivering programs and services at the Centre for Student Development (CSD) and Career Services at McMaster. All faculties and levels of study are represented within the Peer Helper Program. Peers are trained and supervised by professional staff and assist students with academic, disability, personal and career needs. The Peer Helper Program represents one of the premier student personal and professional development opportunities at McMaster and offers Peer Helpers in many different areas of academic, career, and personal life at the University. For more information, please visit our website at <http://csd.mcmaster.ca/peerhelper>.

7.2.4 Career Services

Career Services provides programs and services to meet the career planning and employment search needs of McMaster students. The Centre assists students to acquire the skills necessary to make informed career choices and successfully navigate the rapidly changing and competitive labour market.

Career Services offers assistance on a one-on-one or small group basis in all phases of the career and educational planning and work search process. Students can meet individually with Career Counsellors who can guide discussion on the topic of career exploration and help identify values, strengths and interests moving towards a more refined career direction. Students can also obtain help in preparing résumés or curriculum vitae, planning effective work search strategies and achieving success in employment interviews.

The Career Resource Centre offers a wealth of information about major employers of university graduates and government employment initiatives and also makes available materials related to career planning, other graduate programs and work search. In addition, Career Services' job posting system, Online Student Career and Recruitment (OSCAR), can be accessed 24 hours a day to search for employment opportunities and remain informed on various campus events and workshops.

Career Services is open from 9:00 a.m. to 4:30 p.m. daily. Extended hours are available on Tuesday until 7:00 p.m. We are located in Gilmour Hall, Room 110. Information about our services can also be found online at <http://careers.mcmaster.ca> or by calling 905 525-9140 Ext. 24254.

7.2.5 Student Financial Aid & Scholarships

The Office of Student Financial Aid & Scholarships administers government- and institutionally-funded financial aid programs to assist McMaster students who demonstrate financial need.

Programs of specific importance to graduate students include, but are not limited to, the following:

- Canada-Ontario Integrated Student Loans (OSAP)
- Other government-funded programs (Bursaries for Students with Disabilities, Canada Study Grant for the Accommodation of Students with Permanent Disabilities, Child-Care Bursary, Canada Study Grant for Female Doctoral Students, Part-Time Canada Student Loans/Canada Study Grant, Canada Access Grant for Students with Permanent Disabilities and the Ontario Work-Study Program)
- Emergency Loans
- Bursaries

Graduate students are invited to consult the current Undergraduate Calendar for further information. Scholarship enquiries should be directed to the School of Graduate Studies.

The Office of Student Financial Aid & Scholarships provides service on a drop-in basis in Gilmour Hall, Room 120, Monday to Friday, 9:00 a.m. to 12 noon and 1:00 p.m. to 4:00 p.m. Information is also available online (<http://sfas.mcmaster.ca>), via email (osap@mcmaster.ca) or by calling 905 525-9140 ext. 24319.

7.2.6 Ombuds Office

The Ombuds Office is a neutral, confidential service dedicated to ensuring the fair treatment of all members of the McMaster community.

The office is designed to provide an alternative, independent, and informal method of resolving disputes within the University. To do so, the office provides information, advice and assistance in the resolution of University related complaints and concerns of both an academic

and non-academic nature. Academic issues could include: difficulty with a supervisor, grade appeals, academic dishonesty, and status in a program. Non-academic issues might involve registration, fees/financial, codes of conduct and concerns about services on campus. Information about the Office is available online at <http://www.mcmaster.ca/ombuds>. The Office is located in the University Student Centre, Room 210. Tel. 905 525-9140 Ext. 24151 Email: ombuds@mcmaster.ca

7.3 Health Services

7.3.1 Ontario Health Insurance Card

The Ontario Ministry of Health provides comprehensive health insurance covering physician services and hospital care through an individual registration system called the Ontario Health Card. To be eligible for an Ontario Health Card, you must have permanent residency status in Ontario. Applications are available at the Ontario Ministry of Health office at 119 King St. West (10th floor, Ellen Fairclough Bldg.), Hamilton, ON L8N 4C8. Three pieces of identification are required (e.g. birth certificate, driver's licence). Enquiries: 905 521-7100. To avoid being billed for medical services, students must have their Ontario Health Card available when they seek medical care. Health Insurance cards from other Canadian provinces will be accepted.

7.3.2 University Health Insurance Plan

The Ontario Ministry of Health does not extend health coverage to Visa students. The University has developed a plan called the University Health Insurance Plan (UHIP). Insurance coverage is mandatory for all fully registered Visa students. All fully registered students must arrange payment for a full-year's premium at registration in September. The premium assessed depends upon the number of dependents requiring insurance coverage. Cards can be picked up at the beginning of the term. Contact info: Tel. 905 525-9140 Ext. 24748, Gilmour Hall 104 Email: iss@mcmaster.ca

7.3.3 Campus Health Centre, Student Health



The health care team at Campus Health Centre provides primary medical care to students. Our services include medical assessment and treatment of your illness or injury, annual health examinations, allergy injections and immunizations, dressing changes, and lab tests. We also provide services relating to sexuality choices, birth control counselling, low cost sale of birth control products, emergency contraceptive pill, pregnancy testing, screening for sexually transmitted diseases, HIV prevention, testing and counselling, and complementary health services. Our medical team is also available to speak with you about mental health issues.

Services are provided by appointment, while urgent issues are assessed by a registered nurse. Please see our website for clinic hours. For enquiries and/or appointments call 905 525-9140 Ext. 27700, MUSC B101.

Fax: 905 546-1663 Website: <http://www.mcmaster.ca/health>

The Health and Wellness Centre of Campus Health develops and coordinates comprehensive health education services which facilitate the student and the campus community in achieving optimal health and wellness. We provide current health information and support in a non-judgemental environment to help you make informed decisions. Our health education staff is available to individuals or groups to address your questions and/or concerns about health and lifestyle issues and includes such topics as disease prevention, relationships, sexuality, contraception options, nutrition and body image, stress and emotional health. DVDs, computer programs, a lending library of books, and reference material are available in our resource room.

Tel. 905 525-9140 Ext. 23312, MUSC-B106

Website: <http://www.mcmaster.ca/health>

7.3.4 Workplace Safety and Insurance Board Coverage for Graduate Students

In the event of injury arising out of employment duties, graduate students paid by the University as employees are eligible for benefits under the Workplace Safety and Insurance Act. Employment duties include work that is performed as part of a teaching assistantship or a research assistantship. Graduate students are not eligible for Workplace Safety and Insurance Board benefits if an injury occurs in connection with work that is unpaid or is supported by a scholarship. Most students' thesis research falls into this second category.

If an injury that occurs in connection with a graduate student's research or other academic activities results in a delay in completion of the degree requirements, the School of Graduate Studies will consider, on an individual case basis, requests to extend the time limits for scholarship and T.A. support. All injuries must be reported to your supervisor immediately. An Injury/Incident Report form must be completed. To find this form and more information about incident reporting visit <http://www.workingatmcmaster.ca>.

7.3.5 Environmental and Occupational Health Support Services

Environmental and Occupational Health Support Services (EOHSS) provides services to McMaster University management, faculty, staff and students in areas of occupational safety and health, risk management and insurance. The department assists students, staff and faculty in providing a safe and healthy environment through policy, consultation, training and audits. The following areas of loss prevention and loss mitigation programs are part of the department's mandate:

- Occupational Health and Safety
- Biosafety
- Fire Safety
- Emergency Preparedness
- Hazardous Waste Management
- Workplace Safety and Insurance Management

Graduate students, while employed by the University as teaching assistants or research assistants, must comply with the legal duties of the Ontario Occupational Health and Safety Act (OHSA).

When performing unpaid research or work supported by a scholarship, the students are exempt from the OHSA but the University's Workplace and Environmental Health and Safety policy applies. The policy specifies that graduate students must comply with McMaster University's safety rules and regulations. Students will be held

accountable for performance in this area and failure to comply may lead to immediate denial of access to facilities and subsequently to a requirement for the student to withdraw involuntarily from his/her academic program if they are no longer able to meet their academic obligations (see also Section 1.3). The graduate student should discuss safety and environmental concerns with the supervising faculty member.

EOHSS (Ext. 24352) is an additional resource available to help the graduate student to fulfill specified responsibilities.

7.4 Student Associations

7.4.1 Graduate Students Association

The Graduate Students Association (GSA) of McMaster University is a non-profit corporation representing all students, registered in the School of Graduate Studies, excluding MBA students, in matters dealing with the University excluding employment. The GSA's mandate is to promote the welfare and interests of graduate students.

The GSA provides representatives to a variety of University committees, interacts with other student groups at McMaster and elsewhere, and provides intellectual, athletic and social opportunities to enhance the graduate school experience. Students registered in the School of Graduate Studies are required to pay the dues set by the Association and these dues must be paid by the students at registration. The annual dues are used to support activities and programs provided by the GSA.

The annual dues include enrolment in a health plan which includes drug reimbursement, accident benefits, access to ancillary health services such as physiotherapists, and emergency travel medical benefits. Coverage is automatic once a student is registered. Family coverage is available by paying an additional premium to the GSA. Opt-outs are permitted under certain conditions. (Deadlines apply.)

A University Transit Pass is offered by the GSA, at a nominal fee, for any full-time graduate student. The pass allows travel on the Hamilton Street Railway (HSR) transit system which offers service to McMaster from Ancaster, Dundas and Stoney Creek, as well from the lower and "mountain" areas of Hamilton.

The GSA offers several grants and awards, including the GSA Travel Assistance Grants. The Graduate Students Association Bursary was established in 1999 to provide a bursary for a full- or part-time student based on financial need. The GSA Millennium Award for Community Service was established to recognize the commitment of graduate students to the community-at-large through volunteer activities. The TA Excellence Award, first awarded in 1986, recognizes the role graduate students have in undergraduate education at McMaster.

Graduate Students Recognition Day, an event co-sponsored by the GSA and the School of Graduate Studies, showcases the research activities of graduate students through poster presentations and prizes, awards excellence in research and communication, and recognizes the contribution of supervisors and non-academic staff to a successful graduate student. This annual event has traditionally been held in early March.

In addition, the GSA organizes a variety of social events and seminars throughout the year, the first being the TA Day Welcome BBQ. Career Day is always a popular event as are the summertime BBQs at the Phoenix Bar and Grill, owned and operated by the GSA.

The GSA Softball and Soccer Leagues offer summer fun and fitness. Financial support for departmental academic/social activities organized by graduate students is also available.

Contact the GSA for further information at 905 525-9140 Ext. 22043 or Email macgsa@mcmaster.ca. Website: <http://www.mcmaster.ca/gsa>

7.4.2 McMaster University Alumni Association

Following convocation, all graduates of McMaster University automatically become members of the McMaster Alumni Association (MAA) and join our over 135,000 alumni living in 125 countries. The Association's mission statement addresses a number of goals: support of McMaster University, involvement of alumni, recognition of alumni achievements, alumni services and benefits, alumni communication, and involvement of current students.

Our Alumni outreach program creates connections in geographic areas like Brantford, Vancouver, Ottawa, Toronto and Singapore. Other branches create connections among Mac grads who share a common interest or affinity, like the M.S.U. Alumni Branch.

The MAA also offers programs in the Hamilton area. The McMaster Alumni Connection Luncheon Series brings high profile speakers to downtown Hamilton to talk with McMaster alumni and friends, and the Albert Lager Event Series expands your educational relationship with Mac into a lifelong affair by providing fun and unique opportunities to enjoy lectures, trips and seminars. A number of events are geared to specific groups of alumni, including the 'Life after Mac' event series for new graduates; the Family Series to involve the kids and the Women's Series designed to inspire and empower women. Alumni weekend each June welcomes alumni celebrating their reunions and Homecoming each October is a great time to come back and cheer on our Marauders.

The Association also gives its members the chance to obtain unique or discounted products or services through its Services and Benefits portfolio. Alumni can experience fantastic trips, get unique McMaster merchandise, get a McMaster credit card, receive high-quality home and auto insurance at group rates, or investigate the other services offered through the MAA.

The McMaster Alumni Association also acts as your advocate, with representatives on the University Senate and Board of Governors. These representatives, along with other elected alumni, compose the MAA Board of Directors which, along with hundreds of other alumni volunteers, provides alumni programming in conjunction with the Office of Alumni Advancement. You can reach both the Office and the Alumni House, or by phone at 905 525-9140 Ext. 23900, toll free 1-877-217-6003, by fax at 905 524-1733, by email at alumni@mcmaster.ca, or through the web at <http://www.mcmaster.ca/ua/alumni/>.

7.5 Other University Services/Facilities

7.5.1 Transportation and Parking Services

Travel to and from the University on foot, bicycle, by transit and in carpools is encouraged. **Campus parking facilities are limited and the availability of spaces cannot be assured.** Parking regulations are in effect at all times and University parking permits (monthly, yearly or daily) are required for all motor vehicles.

McMaster is well-served by Hamilton's distinctive blue-yellow HSR bus fleet and GSA members automatically have unlimited access to the HSR simply by showing their student card. **GO Transit** provides frequent and direct services to campus from the Lakeshore corridor and the Highway 407 corridor.

There is a comprehensive **cycling** network on and around campus, and lots of bike racks. **SWHAT** (Student Walk Home Attendant Team) is a student program offering escorted walks home on campus and to the surrounding neighbourhood. The University also provides a web-based ride-matching program to assist people to find carpool partners to share the costs of driving and reduce the demand for parking at McMaster.

Graduate students may apply for parking in zones 6 or 7. Central campus evening permits are also available and are valid after 4:30 p.m. weekdays and all day on weekends. Arrangements can be made for disabled parking passes.

Students may apply online, by mail (application available for download from our website) or in person. All applications must include payment in full and are subject to approval by the Parking Office.

Further details regarding permit prices, parking information and the complete rules and regulations can be obtained on our website.

Carpool

Information can be found at
<http://sustainability.mcmaster.ca>

Parking Office

E.T. Clarke Centre
Tel. 905-525-9140 Ext. 24232
Email: parking@mcmaster.ca
<http://parking.mcmaster.ca>

7.5.2 Bookstore and Post Office

The McMaster University Bookstore is located in the lower level of Gilmour Hall; a Health Sciences branch is located in the Health Sciences Centre. The Bookstore Board, responsible to the AVP Student Affairs, on which faculty, students, and staff are represented, gives advice on operating policies and procedures to the AVP and to the Director of the Bookstore.

The Bookstore is divided into six departments: Texts, General Books, General Merchandise, Microcomputer Centre, Health Sciences Bookshop, and Custom Courseware. In stock are 5,000 texts and text reference titles and over 40,000 general book titles. Charge facilities are available. Any book not stocked may be ordered at the Special Order desk.

The Text Buyer will answer questions concerning text adoptions and laboratory manuals. Supplementary reading material is stocked in General Books and questions should be directed to the General Book Buyer. The Health Sciences Bookstore Manager will handle requests for health-related general books and Health Sciences texts.

Questions concerning Custom Courseware should be directed to ccw@mcmaster.ca. Donna Shapiro, Director.
Enquiries: 905 525-9140 Ext. 24751. Email: bookstr@mcmaster.ca
Fax: 905 572-7160 Website: <http://titles.mcmaster.ca>

A Post Office is located in the Bookstore and is open Monday to Friday from 9:00 a.m. to 4:00 p.m. Enquiries: Ext. 24220.

7.5.3 Day Care Facilities at McMaster

Two day care centres, one on- and one off-campus, serve the McMaster community. The McMaster Students' Union Child Care Centre has space for 45 children aged eighteen months to six years. McMaster Children's Centre Incorporated is an on-campus centre with spaces for 67 children aged eighteen months to five years of age. Both centres are open from Monday to Friday inclusive (holidays excepted). Hot meals are provided at noon and morning and afternoon snacks are served.

Both centres are licensed, have Contracts for Subsidy with the City of Hamilton and are fully staffed with qualified Early Childhood Educators. Special summer programs are offered by the McMaster Students' Union Child Care Centre.

Further information may be obtained from:

McMaster Students' Union Child Care Centre
1145 King Street West
Hamilton, Ontario L8S 1L9
Phone: 905 526-1544 Fax: 905 529-3208
Email: dthomson@msu.mcmaster.ca
Website: <http://www.msu.mcmaster.ca/daycare/>

McMaster Children's Centre Incorporated
Sheila Scott House
Lower Level Wentworth House
McMaster University
Hamilton, Ontario L8S 4K1
Phone: 905 526-1222 Fax: 905 526-0735
Email: mcmcc@mcmaster.ca
Website: <http://www.mcmaster.ca/mcmcc>

7.5.4 University Chaplains

The campus chaplains work independently of university offices and offer a wide range of services to the McMaster community. The three chaplains (Protestant ecumenical, Christian Reformed, and Roman Catholic) are available for personal counselling and pastoral direction to all students, staff, and faculty of the University, regardless of religious affiliation. Normally at least one of the chaplains is available during the day, and appointments are either not required or can be obtained within a day.

Through study groups, retreats, worship, discussions and informal gatherings, the Chaplaincy seeks to create a welcoming environment for the McMaster community.

Feel free to drop by for a tea or coffee in MUSC-231, or contact us at any time, at 905 525-9140 Ext. 24207 or at chaplain@mcmaster.ca.

7.5.5 Athletics and Recreation

The Department of Athletics and Recreation provides a wide variety of opportunities for students involved in high performance athletic competition, intramural and club competition as well as recreation, fitness, instructional and outdoor recreation programs.

A diverse program of recreational opportunities are available for those who wish to keep fit, compete at their own individual level, and enjoy sports and active living opportunities of their choice.

Access to the Athletic Facilities on campus is open to all McMaster students.

In 2006 McMaster opened the new David Braley Athletic Centre. The facility features one of the largest fitness centres in Canada (17,000 square feet), a cycling studio, fitness studio, two multipurpose studios, new locker rooms, two additional gymnasiums (seven gymnasiums in total), a 200-metre indoor track, international squash courts and an indoor climbing wall.

McMaster Athletics and Recreation facilities also include a 50-metre pool, an outdoor 400-metre track, dance studio, activity studio and North American squash courts.

The Department of Athletics and Recreation ALTITUDE program utilizes the 50-foot Alpine Tower and Team Development Course. The first of its kind in Canada, it includes over 30 climbing routes, rope ladders, swinging logs, a giant swing and low ropes elements.

Many different club activities are available, along with instructional assistance. Off-campus field trips in canoeing, rock climbing, horseback riding, hiking and many other opportunities are offered.

A highly developed intramural program is a very popular outlet for student activity. Intramurals run from early fall until late spring and provide students with a competitive environment that fosters social interaction.

The varsity program at McMaster fields 41 teams competing at the club, provincial (OUA) and national (CIS) level.

Highly skilled coaches help McMaster student-athletes achieve their potential while competing against other universities in Ontario and across Canada.

The outstanding efforts of McMaster's student-athletes and the social involvement of student supporters are focal points of student life on campus.

Varsity events are a major source of school spirit for competitors and spectators alike.

The Department of Athletics and Recreation takes pride in the quality programs and services provided to the McMaster community, and urges all members of the community to take advantage of its facilities and programs.

Enquiries: (905) 525-9140 Ext. 24464 (Recreation)
Ext. 24463 (Athletics)

Fax: 905-526-1573

Website: <http://www.athrec.mcmaster.ca>

Email: reconline@mcmaster.ca (Customer Service)

Jeff Giles, Director of Athletics and Recreation

7.5.6 Personal Property of Students

Students' personal property is their responsibility and is on the University premises at their risk at all times. McMaster University assumes no responsibility nor does it insure against the loss of or damage to such property.

However, Security and Parking Services operates the central Lost and Found for the campus. When items are received, they are entered into a database, so both reported lost and found items can be matched up. Security will store found items up to 30 days after they are received. If your name, student number or telephone number is anywhere on the item, Security will do their best to get in touch with you by phone, email or letter.

Security Services is available 24 hours a day, 365 days a year. Security Services is located on the 2nd floor of the E.T. Clarke Centre. Contact us by phone 905 525-9140 Ext. 27093/23366
Email: seclost@mcmaster.ca
On-line service available at:
http://www.mcmaster.ca/security/lost_found.htm

7.5.7 Security Services

McMaster Security Services' primary responsibility is the protection of persons and property within the McMaster community. Security Services is located in Room 201, E.T. Clarke Centre. The office is open 24 hours a day. Telephone calls are always answered personally, for emergencies or for general information at Ext. 24281.

Security Services co-ordinates with other University services to make McMaster a safe and secure environment. Uniformed Special Constables patrol the campus on foot, bike and car. Security Services works under an agreement with Hamilton Police Services to provide both security and police services on the campus.

Security Services is a proactive department that is constantly developing and changing to meet the needs of the McMaster community.

Please visit our website for more information, <http://www.mcmaster.ca/security> or call us at 905 525-9140 Ext. 24281.

Personal Safety Tips:

- Walk Safe, Walk SWHAT
- Walk in groups, for safety sake
- Plan your route
- Walk in well travelled areas
- Be aware of alternate routes and safe places
- Walk with confidence, with your head up
- Report anything suspicious immediately to Security Services at Ext. 24281
- Familiarize yourself with the location of emergency phones

Emergency Telephones

Identified by red poles with blue lights. These poles have **Emergency** printed on all sides. In addition, all campus extension phones allow you to call Security by dialing "88".

- Outside lines 905 522-4135

- Campus pay phones (*no coins required*)

- Elevators are all equipped with phones which contact Security
905 525-9140 Ext. 24281

7.6 Special Resource Services/Facilities

7.6.1 The University Library / J. Trzeciak, University Librarian

The University Library System consists of Mills Memorial Library (Arts); the H.G. Thode Library of Science and Engineering; the Health Sciences Library housed in the Health Sciences Centre; and the Innis Library in Kenneth Taylor Hall, Room 108, which contains a collection of Business materials. Enquiries: 905 525-9140 or 905 529-7070 Ext. 22533 for Mills Library; Ext. 24256 for Thode Library; Ext. 22327 for the Health Sciences Library; Ext. 27385 for the Innis Library. Complete information on Library services and resources and access to the on-line catalogue, MORRIS, can be found on the Library's web page at <http://library.mcmaster.ca>.

The current collection contains over 2 million volumes, approximately 1,579,000 microform items, 150,000 maps and aerial photos and 12,383 linear feet of archival material. There is a substantial collection of government publications and current periodical print titles, approximately 5,000. The library also subscribes to over 51,250 electronic resources, including 13,235 online journals and 37,700 e-books.

The Library is a member of the prestigious Association of Research Libraries, an organization of 122 major research institutions in the United States and Canada that are distinguished for the depth and breadth of their collections. Association members work cooperatively to extend the research support capability of each library within the context of an international research network. The current strengths of McMaster's Library collections reflect the University's commitment to maintain rigorous acquisitions policies to support the diverse programs of graduate research. Particular areas of collections strength include Biology, British History, Chemistry, Classics, Economics, English Literature, Geography, Geology, Nuclear Physics, and Religious Studies.

The library offers a variety of services to graduate students. Research help is available in person and online. IT assistance is available in the campus libraries. The Library Data service provides access and assistance using data sets. Instruction sessions are available on general research skills and on specific subjects. Students also have access to Interlibrary loan facilities and direct borrowing privileges in universities across Canada.

The William Ready Division of Archives and Research Collections on the lower level of Mills houses rare books, manuscript materials, and special book and archival collections which afford many opportunities for original research. The main strength in rare books is in eighteenth-century British literature and society. Also of importance are the Italian Renaissance books in the Caselli collection. The Division has a rare book collection of approximately 35,000 pre-1800 volumes. One annual fellowship in Eighteenth Century Studies is offered jointly with the American Society for Eighteenth Century Studies.

The Division houses growing collections of material printed after 1800. Notable among the authors represented are Samuel Beckett, Edmund Blunden, Charles Dickens, Robert Graves, Leigh Hunt, Henry James, D.H. Lawrence, Iris Murdoch, Mervyn Peake, the Powys brothers, Ezra Pound, Siegfried Sassoon, H.G. Wells, and Virginia Woolf. Subject concentrations in the collections cover such areas as literary and historical works relating to World War I, World War II, British pacifism, Anglo-Irish literature, children's literature, imprints of the Hogarth Press, Canadian poetry, imprints of Canadian publishers, and more than 4,000 Canadian pamphlets.

The archival section houses significant source materials, including the papers of Pierre Berton, Vera Brittain, Anthony Burgess, Matt Cohen, Arnold Edinborough, Marian Engel, Robert Fulford, Susan Musgrave, Peter C. Newman, John Robert Colombo, and Farley Mowat. A strong collection of Canadian radical materials contains papers from the Canadian Union of Students, the Student Union for Peace Action, and other Canadian groups, including significant materials from Quebec. The archives of the McClelland and Stewart and Macmillan of Canada publishing companies are supplemented by the papers of Clarke Irwin Ltd., Peter Martin Associates, Copp Clark, and Key Porter Books.

Records of early industrial firms are represented by the General Steel Wares Archives. The Division is also collecting material on Canadian labour movements and now has the archives of United Steel Workers of America Local 1005, U.S.W.A. District 6, Hamilton and District Labour Council, United Electrical Radio and Machine Workers Local 504, various CUPE locals, and the Service Employees International Union.

As a result of an ongoing project to preserve church records, the Division has amassed statistical and financial records for over 100 parishes in the Anglican Diocese of Niagara. Material concerning the history of McMaster University is also being collected.

Various publications describing the collections in the Division are available, and detailed indices can be consulted. Finding aids can be viewed on the Ready Divisions web page accessible via the Library Gateway at <http://library.mcmaster.ca>.

The Bertrand Russell Archives occupy quarters within the Division. The Archives are comprised primarily of 250,000 original documents, both correspondence and manuscripts. Most of this material has never been published and affords prime opportunities for original research. The papers are supplemented by a complete collection of Russell's books, his 2,400 periodical writings, secondary literature, and ancillary archives. There are also tapes, photographs, films and medals. Additional archival material of equal importance was secured in 1972, and Lord Russell's library was acquired in 1978.

The University Library is a member of both the DLI (Data Liberation Initiative) and the ICPSR (Inter-University Consortium for Political & Social Research). The DLI is a cooperative project between Statistics Canada and other federal government departments and Canadian universities. The ICPSR archives social science data from around the world at its office at the University of Michigan. ICPSR supports the specific needs of current research and facilitates the emergence of new fields of study. The Library Data Service (formerly Data/Text Centre) assists researchers in the access and use of DLI and ICPSR data. Users may consult the Library Data Service web page at http://library.mcmaster.ca/datatext/data_text_services.htm.

7.6.2 The McMaster Museum of Art and the University Collection, C. Podedworny Director and Curator

The Museum is a cultural meeting place, actively developing relationships and fostering exchange between artists and McMaster's diverse community.

McMaster University boasts an impressive permanent collection of more than 6,000 works of art. The McMaster Museum of Art, founded in 1967, houses that collection and presents national and international exhibitions of works by a range of artists, from groundbreaking contemporary visionaries to historical masters. More than 20 exhibitions annually are presented in the state-of-the-art facility's five galleries, and complemented by visiting artist talks, panel discussions, workshops, publications and other related programs.

Highlights of McMaster's permanent collection:

- the Herman Levy Collection including paintings by Monet, van Gogh, Caillebotte and Pissarro
- the Denner Wallace Collection of early 20th century German prints
- 20th century European modernist and contemporary art

- European Old Master paintings
- Inuit art from Cade Dorset
- Canadian historical and contemporary art

Museum hours: Tuesday/Wednesday/Friday, 11 am - 5 pm;
Thursday, 11 am - 7 pm; Saturday, 12 - 5 pm

Admission: Free for students, seniors and members. Otherwise by donation.

Enquiries: 905-525-9140 Ext. 23241

Email: museum@mcmaster.ca

Website: www.mcmaster.ca/museum



Re-Mediations Exhibition, Winter 2007
McMaster Museum of Art

7.6.3 Centre for Leadership in Learning

The Centre for Leadership in Learning (CLL) is a resource centre for people who teach at McMaster. A warm invitation is extended to teaching assistants (tutors, demonstrators and markers) and faculty members to make full use of the Centre's services.

The general mandate of the Centre is to support and enhance the teaching and learning environment at McMaster University. Specific goals and activities are:

1. **To support the identification and reward of good teaching.**
Example activities include designing teaching awards, assistance with teaching dossiers and research on teaching evaluation.
2. **To orient new teachers to their role at McMaster.**
Example activities:
 - (a) T.A. Day. A workshop and welcome program for teaching assistants. Offered each September prior to the start of classes, this day includes 14 to 18 workshops on various aspects of the teaching assistant's role. Most workshops are led by senior T.A.s who have been hand-picked for their teaching skills and positive attitude toward students.
 - (b) New Faculty Orientation. Programs designed to help new faculty members get a good start with teaching at McMaster.
3. **To enable the circulation of teaching and learning insights.**
Example activities include publication of ideas from McMaster instructors in newsletters, symposiums, seminars and the World Wide Web. The CLL also helps make it possible for people to attend conferences on teaching and learning. A variety of practical workshops are offered throughout the terms.
4. **To support the development of the next generation of university teachers.**
McMaster, through the CLL, is one of the leaders in this area. This contributes to McMaster's reputation as a strong Graduate School, and enhances the employment prospects of its Ph.D. graduates. Activities include:

- (a) **Advanced workshops on T.A. Day for experienced teaching assistants.**
- (b) **Six-week (3 hours per week) non-credit courses on teaching (e.g., Making Presentations, Designing Instruction, Leading Effective Discussions).** These courses are designed for graduate students who are currently teaching or about to apply for or take up their first position as a faculty member or non-academic professional.
- (c) **Education *750—a graduate credit course on the Principles and Practice of University Teaching.** This course includes both discussion of the literature (using a problem-based learning approach) and practical workshops on topics such as lecturing, working in small groups, course design and test construction. Completion of this course fulfills many of the requirements for the University Teaching Program described below.
- (d) **The University Teaching Program.** This program is designed for those who wish to deepen their understanding of teaching and learning in higher education and develop some of the non-research skills required of a faculty member. Participants engage in activities in their own department, in the university, and with the Centre for Leadership in Learning (CLL). When the requirements are met in the three areas of Theory, Skills, Supervision/Service, completion of the University Teaching Program is recorded on the student's transcript.

5. **To encourage and support innovation in teaching and learning.**

Example activities include supporting the teaching and learning grant program which funds course development projects, consulting with instructors on course design and methods, maintaining a library related to university teaching and learning, and conducting research on the evaluation of educational technology.

For more information please visit the Centre for Leadership in Learning in T-13, Room 124
Enquiries 905 525-9140 Ext. 24540. Email: horvath@mcmaster.ca
Website: <http://www.mcmaster.ca/cll>



Burke Science Building

7.6.4 Centre for Continuing Education T. Taylor-O'Reilly/Director

Located on the 2nd floor of the Downtown Centre at 50 Main Street East, Hamilton, the Centre for Continuing Education provides quality professional education to individuals and corporate clients in order to enhance careers and foster workforce development. They specialize in Certificate and Diploma programs, and corporate training. Workshops for professional development and computer training are also available. Computer training is also offered in an e-learning format.

All CCE Certificate and Diploma programs have been approved for advanced credit toward undergraduate degrees by the Senate of McMaster University. Certificate and Diploma programs include Accounting, Addiction Studies, Case Management, Certified Clinical Research Associate, Family Mediation, Human Resources, Marketing, Management Studies (including specialties in Business Analysis, Project Management and Sourcing Management), Metallurgy of Iron and Steel, Public Relations, Police Studies, and Web Design and Development.

For details, please contact the Centre for Continuing Education at 905 525-9140 Ext. 24321, by email at conted@mcmaster.ca or at <http://www.mcmastercce.com>.

7.6.5 McMaster Media Production Services

MPS provides a wide range of print, new media and communication services to the McMaster Community. Hours are 8:30 a.m. to 4:30 p.m., Monday through Friday all year round. Contact extension 22301 or visit <http://www.media.mcmaster.ca> for more information.

Printing Services

MPS Printing Services produces a full assortment of products: everything from business cards to brochures to books. Customer Service is located in Gilmour Hall B117 across from Titles Bookstore. Services include:

- B&W and Full Colour Digital Printing
- Traditional Offset 1 to 4 Colour Printing
- Full Bindery Services

Creative Design, Videoconferencing, Photographic and CCW Services

Located in HSC-1G1, in Mediashop.com (Health Sciences Bookstore), the MPS Creative/Media team stands ready to help with a variety of graduate student's needs. Our services include:

- Custom illustration, copywriting, graphic and web design
- Large format poster printing and lamination
- State-of-the-art videoconferencing services
- On-location or in-studio photography
- Passport and portrait photos
- Traditional photographic lab services and digital archiving
- OCR and document archiving
- Custom Courseware development

7.6.6 Office of International Affairs (OIA) M.W.L. Chan, Associate Vice-President, International Affairs

McMaster University has become increasingly involved around the world in exchange agreements, institutional linkages and externally-funded international programs concerned with collaborative research, education and human resource development, and with improving the delivery of services in many sectors such as business, environmental protection, community health, engineering, technology development and transfer. The Office of International Affairs (OIA) has taken on an expanded international role that seeks to coordinate and facilitate McMaster's expertise in a highly complex and changing global environment.

The activities of the OIA include recruiting of international students, the coordination of research and graduate training projects with partner institutions, the marketing of our expertise from international projects as well as coordinating and facilitating our international alumni development and advancement.

OIA facilitates international collaboration and coordinates activities that bring McMaster closer to the University's vision of being acclaimed internationally for its research and education quality.

For more information on the Office of International Affairs, call 905 525-9140 Ext. 24700, or visit our website at <http://www.mcmaster.ca/oia>. We can also be reached by fax at 905 546-5212 or by email at oia@mcmaster.ca.

7.6.7 University Technology Services (UTS)

Welcome to McMaster! Our purpose is the discovery, communication and preservation of knowledge. In our teaching, research and scholarship, we are committed to creativity, innovation and excellence; we hope that this guide will assist you to access the technology tools and information you need to achieve your goals while at McMaster University. For assistance, kindly contact the Service Desk at helpline@mcmaster.ca or at 905 525-9140 Ext. 24357.

Your computing identity at McMaster is called your MAC ID. Please go to <http://www.mcmaster.ca/uts/macid> and select the link "Student MAC ID." Follow the instructions to activate your MAC ID. You will use your MAC ID for most computing services.

UTS provides a range of computing services such as:

- MUGSI - McMaster University Gateway to Student Information
- Academic computing facilities located in Arthur Bournes, Burke Science, Health Sciences Centre, John Hodgins Engineering, and Kenneth Taylor Hall
- Access to the Internet from the computing facilities
- High speed laser printing in the computing facilities on a fee-for-service basis
- An Email account on the UnivMail Server
- MacConnect - ports and wireless connections for internet access for your laptop on campus
- Software Depot is a repository software
- Provides site-licensed software such as SPSS

For a complete description of all of these services and managing your MAC ID visit the MAC ID homepage at <http://www.mcmaster.ca/uts/macid/>.

Graduate student specific information on services provided by UTS is available at <http://www.mcmaster.ca/uts/>. Computing help, advice and assistance pages for technology are also available at <http://www.mcmaster.ca/uts/>.

7.7 Research Facilities

7.7.1 McMaster Institute for Energy Studies (MIES) David P. Jackson, Acting Director

McMaster has a long and distinguished track record in energy matters. MIES was founded in 1980 in the Faculty of Engineering as an interdisciplinary institute for the study of energy extraction, transformation, generation, transportation and end-use. In the following years the Institute also developed a focus on policy and economics. Internally, MIES provides a forum for cooperation and interdisciplinary interactions between McMaster faculty members in the energy area and acts as a point of contact at McMaster for energy-related opportunities and to communicate them to the McMaster community. It encourages and fosters an interdisciplinary systems approach to the solution of energy problems in order to establish a credible capability for the assessment and evaluation of energy systems, thus providing authoritative advice to governments and industry. The research activities of MIES faculty include vertical axis wind turbines, improved solar cells, nuclear safety and fuel cycles, solid oxide and PEM fuel cells, supercapacitors, energy and air pollution, and conservation and demand management; details are given on the MIES website.

Email: jacksond@mcmaster.ca
Fax: 905 529-1975
Website: <http://energy.mcmaster.ca>

7.7.2 Brockhouse Institute for Materials Research J.S. Preston, Director

The Brockhouse Institute for Materials Research (BIMR) — named in honour of McMaster Professor and 1994 Nobel laureate Bertram Brockhouse — supports interdisciplinary materials-based research at McMaster and other Canadian universities. The Institute was one of the first materials research centers in North America and is the largest such institution in Canada. Researchers within the Institute are recognized as leaders in electron microscopy, crystal growth, polymer synthesis, processing and characterization, X-ray characterization, and materials discovery and refinement.

Over 120 faculty from McMaster and other Canadian universities are members of the Institute which houses centralized facilities for electron optics, scanning probe microscopy, optical microscopy, crystal growth, X-ray characterization, and ultrafast laser applications. Graduate students working with members of the Institute have access to these facilities, each of which is supported by expert technical staff. In many cases, students will have the opportunity to become fully trained in the use of the equipment. The Institute also runs a lively weekly seminar on the frontiers of materials-based research, and several workshops through the year. The Institute plays an important role, enabling larger, more significant research projects to be effectively addressed. The Institute does this by providing access to specialized equipment, technical support and a pool of talented potential collaborators across disciplines.

7.7.3 Institute for Molecular Biology and Biotechnology J. Gaudie, Acting Director

The vision of MOBIX, the McMaster Institute for Molecular Biology and Biotechnology, is to develop a world-class centre for life science and translational research. MOBIX makes use of the most recent advances in basic and applied molecular biology and develops these findings into diagnostic and therapeutic interventions in human health.

MOBIX consists of a series of centres, set up within the institute, each with its own experimental and development goals and all sharing the common vision. The Institute also houses the MOBIX Lab, a central facility that provides molecular biology expertise and services to the research community, both inside and outside McMaster.

MOBIX is administered by a board that includes the directors of the centres. One of the board members is elected to chair the board for a three-year period. The Chairman of the Board is responsible to the community at large through the Vice-President Research for the operation of the Institute. The Institute has been established in partnership with the University, Hamilton hospitals, government and industry to facilitate collaboration and communication across several areas of research. In the area of translational research, the Institute focuses on the development of molecular approaches for the detection and elucidation of pathogenic mechanisms and therapeutic interventions in chronic and acquired human disease, including cancer and infectious diseases. Rapidly moving research from concept to clinical trials is a priority. Working closely with local hospitals, the Institute provides opportunities for the implementation of new therapeutic initiatives. Opportunities for commercialization are encouraged. The Institute is proud of its capacity to move a research idea from the proof of concept stage through pre-clinical developments into clinical trials in a seamless fashion. The Institute provides opportunities for internationally renowned scientists to come to McMaster to continue their work. Challenging learning opportunities are also provided for undergraduate, graduate and postdoctoral trainees at the Institute.

The Institute currently supports four Centres, providing the opportunity for cross fertilization among the Centres. Other Centres will be introduced as the Institute develops.

Antimicrobial Research Centre

The field of infectious disease and antimicrobial therapy is being transformed at present by the growing availability of the complete genome sequences for several microbes including bacteria, fungi and protists. This information will drive the research of this Centre in the area of infectious diseases for the next several decades.

Centre for Gene Therapeutics

The mission of this Centre is to investigate, create and implement approaches utilizing the delivery of genes as therapeutic agents in the treatment of human and animal disease. This entails basic investigations to target gene product involvement, creation of vector systems for appropriate delivery of therapeutic genes and rapid translation of promising medicines to the clinical setting.

Functional Genomics Centre

The field of functional genomics seeks to define the biochemical and biological functions of the protein products of genes on a genome-wide scale. The mission of the Centre is to develop new technologies and to exploit recent advances in gene expression profiling, bioinformatics and proteomics to discover gene function and to integrate this knowledge into genetic pathways that regulate organismal development and physiology. A major focus of our research is to use functional genomic technologies to identify new genetic markers and molecular therapeutic targets associated with human diseases, especially cancer.

Centre for Environmental Genomics and Biotechnology (CEGeBio)

The mission of the Centre for Environmental Genomics and Biotechnology (CEGeBio) is to provide automated tools to the study of environmental, evolutionary and genomics issues with the aid of modern biotechnology tools. With high throughput instruments, research in these fields can be accomplished at a faster rate, in greater depth and with greater precision. With these instruments we can analyze the consequences of and the changes in gene expression in organisms as a response changes within the environment. The purpose of the centre is to bring the power of the technologically revolutionary methods of genomics to bear on important environmental problems in biology.

Website: <http://www.science.mcmaster.ca/mobix/>

7.7.4 McMaster Institute of Applied Radiation Sciences (McIARS) **J.F. Valliant, Acting Director** **K. Trollip, Administrator**

McIARS is an interdisciplinary research institute. Its members are drawn primarily from the Faculties of Science, Engineering and Health Sciences at McMaster. Faculty at other universities are also involved. The common focus is on the uses of radiation. Applications include analytical techniques, isotope chemistry, medical diagnosis and therapy, study of radiation effects in living systems and on materials and in protection of the environment and humans. Collaborative and contractual links outside McMaster include those with government, healthcare and industry. There is also a network of formal and informal partnerships internationally and across Canada.

Members of McIARS use a wide variety of facilities throughout McMaster's campus and in Hamilton's network of academic healthcare institutions. There are three core facilities at the heart of McIARS. These are the McMaster Nuclear Reactor, McMaster Accelerator Laboratory and licensed laboratories for handling high levels of radioactive materials.

McMASTER NUCLEAR REACTOR (MNR) **C. Heyssel, Director, Nuclear Operations and Facilities** **M.P. Butler, Manager, Reactor Operations** **A.E. Pidruczny, Manager, Laboratory Services**

A pool type research reactor has been in operation on the McMaster campus since 1959. The fuel is uranium alloy enriched in ^{235}U . The coolant and moderator are ordinary water under forced circulation. The reactor currently runs at 3 MW power, with a peak flux of about 7×10^{13} neutrons $\text{cm}^{-2}\text{s}^{-1}$, for about 70 hours per week.

The core is supported by a bridge spanning a two-section pool so that the reactor may operate in either section. In one pool, two eight-inch and four six-inch diameter beam tubes extend from the reactor core to the experimental space outside the pool walls. Provision has been made for irradiation within or adjacent to the core in both operating positions. In addition, three pneumatic rabbit loops permit rapid transfer of short-lived radioactive material from the core to laboratories located in the Reactor Building or adjacent Nuclear Research Building.

A hot cell and a gamma irradiation unit are located adjacent to the pool. An underwater pass-through is provided to move radioactive material from the reactor pool to the hot cell and then to the gamma facility. The hot cell is equipped with remote manipulators and shielding to handle sources of 10 kilocurie (370TBq) ^{60}Co equivalent.

The reactor is housed in a reinforced concrete building designed for low air leakage. Access for personnel is through the Nuclear Research Building which provides hot laboratories (see below) and other specialized equipment for nuclear research.

The Nuclear Reactor is used by many departments within the Faculties of Engineering, Health Sciences and Science, and is important to graduate work at McMaster University. Undergraduates in Science and Engineering also use the facility for senior labs and projects. The research applications include the use of neutron activation analysis, through the Centre for Neutron Activation Analysis, for a wide variety of materials. Isotopes are produced for biological, medical and industrial applications. Beams are used to measure crystal and magnetic structures, make studies in nuclear physics and measure features of materials with size from 50 to 500 Å. There are also neutron radiography facilities.

As well as McMaster faculty and their graduate students, researchers from across Canada and from many other countries make use of the reactor facilities.

McMASTER ACCELERATOR LABORATORY**S.A. McMaster, Manager**

The accelerator laboratory houses three charged particle accelerators, a gamma ray irradiation facility and a variety of other radiation related apparatus. The main areas of application at present are in biology and medicine, although the facilities remain available for materials analysis and other applications.

A KN van de Graaff with a maximum 3 MV terminal voltage is used most frequently to accelerate protons onto lithium. Neutrons from this accelerator are used to develop new biological and physical techniques for radiation accident dosimetry. A Tandatron (2 stage, 1.25 MV per stage) accelerator, capable of producing about 1 mA is used as a source of neutrons for *in vivo* body composition studies, particularly of trace toxic elements. A third accelerator, also a KN, is being configured as Canada's first radiobiological microbeam. This will permit studies in which single particles are directed onto single cells and the impact on target and surrounding cells can be assessed.

The Taylor source is a gamma irradiation facility based on 1 kCi (40 TBq) ¹³⁷Cs. There are also x-ray, gamma ray and neutron sources, together with a wide range of radiation detection and metrology equipment.

RADIOISOTOPE LABORATORIES**M.E. Bahen, Laboratory Supervisor****D.M. Tucker, Senior Health Physicist**

The High Level Facility consists of a suite of licensed laboratories, related infrastructure and services with controlled access, Health Physics supervision, full contamination monitoring and capacity to handle active effluents. This unique facility is approved for work using radioactive isotopes. Located within the laboratories is the counting room for the neutron activation analysis laboratory (see above). Radioisotope Chemistry is currently conducting research on the design and development of novel radio pharmaceuticals. Radiation Biology research focuses on the development of technology to detect radiation damage and to understand better the risks associated with exposure to ionizing radiation for accident and emergency response.

7.7.5 Ontario Centres of Excellence

McMaster University participates in all five Ontario Centres for Excellence--Centre for Communications and Information Technology, Centre for Earth and Environmental Technologies, Centre for Energy, Centre for Materials and Manufacturing, Centre for Photonics. Since their inception in 1987, the Centres have helped to promote the economic development of Ontario through directed research, commercialization of technology and training for highly qualified personnel.

Centre for Communications and Information Technology (formerly CITO) is focused on fostering innovation in the communications and information technology sectors. It acts as a trusted agent, creating a framework within which productive partnerships between Ontario's academic, industrial and business communities can be created. Communications and information technologies touch a vast array of applications. The Centre for Communications and Information Technology invests in research that has potential impact in areas as diverse as: Wireless and wireline communications; the Internet and packet switched networks; Images, audio/video and graphics; human-computer interaction; computer hardware, devices and semiconductors; information storage, management and retrieval; health and medicine; software design, development and management; Network planning and administration; Education and learning; Security.

Centre for Earth and Environmental Technologies (formerly CRESTech), helps Ontario firms and organizations grow by finding solutions for their innovation challenges. Innovation and commercialization services, offered in partnership with Ontario's

university and college community, will help firms and organizations to: clarify innovation plans and medium-term challenges; assemble partners and resources to develop solutions; build collaborative R&D teams to develop technology; access early-stage commercialization support; engage students as future employees to build your organization.

Centre for Energy. The mandate of the Centre for Energy, launched in January 2005, is to invest and promote leading edge research and development in energy markets, new energy systems and emerging technology. Its goal is to bring these ideas to the market place in order to provide Ontarians with viable, affordable long-term energy supplies while improving its net impacts on the environment--and in the process, helping build a strong, competitive energy sector in the province. The Centre invests in research and research collaborations that: accelerate the development of new energy technologies; help integrate new technologies into the energy system, and; help industry develop information systems to manage energy markets.

Centre for Materials and Manufacturing. The overriding objective of the Centre for Materials and Manufacturing is to support research and training within the materials and manufacturing sectors to maximize their impact on the sustained economic growth and well being of the Province of Ontario. The Centre fulfills this mandate within its sectors by developing relationships and connections between people and organizations in Ontario's post-secondary and industrial communities to accelerate new innovations and commercialize new advances through R&D activities. The Centre offers: an interactive network of industry and academic participants, plus value-added services for network members; access to post-secondary research capabilities including facilities, equipment, personnel and experienced research teams; creative students trained in leading-edge knowledge and technology areas; opportunities to participate in a broad range of research initiatives including consortia and collaborative projects; extensive intellectual property and project management expertise; technology and know-how for commercialization and licensing; the ability to link, involve and leverage the resources of other R&D institutions and government agencies.

Centre for Photonics (formerly PRO) is focused on supporting Ontario-based research and development in photonics--the generation and harnessing of light and other forms of radiant energy. Key application areas include: Medicine - including innovative imaging technologies that offer an unprecedented view into living tissues and new minimally invasive therapies that use lasers, or other energy sources, to destroy diseased tissue without the need for major surgery; Optical communications, processing and sensing - already light is used to transfer data across networks at high speed. Ongoing research is discovering ways to tap into photonic capabilities to better transfer, store and process information -- at the speed of light; Materials technology - photonic technologies can be used to induce chemical reactions and manipulate matter to create useful materials. Laser micromachining also allows materials to be shaped and manipulated at the micro scale and can be used in the growing micro electromechanical systems (MEMS) field.

7.7.6 Centre for Emerging Device Technologies**R. Kleiman/Director**

The Centre for Emerging Device Technologies (CEDT) was established in 1987 to enhance research into new semiconductor devices and device structures associated with optical communications, sensor technologies and flat-panel displays. The objectives of integrated optics are to attain improved performance of communications systems as a result of integrating semiconductor light sources, modulators, detectors, waveguides and optical switches on the same substrate. Integrated optical systems are being developed on III-V semiconductor, Silicon and Lithium Niobate platforms by affiliated research groups. Materials research issues associated with these technologies are also being studied. For example, novel structures have been designed, fabricated and characterized including strained layer distributed feedback quantum well lasers with integrated modulators and the first ever InP-based digital optoelectronic switch.

Recent developments in photonic devices involve research into broadband optical sources, white light sources, long wavelength sources and tunable lasers that all have important applications for environmental, medical and biochemical sensing.

In the last several years, new research programs have been established in MicroElectroMechanical Systems (MEMS) and microfluidics that utilize the unique facilities of the CEDT. These have also opened up new opportunities in developing new device technologies and device platforms that integrate not only photonic capabilities, but also mechanical, fluidic and electronic ones to create sophisticated devices for Lab-on-a-Chip and other demanding applications. New programs in photovoltaics based on III-V semiconductors, nanowires and organic materials are actively being pursued to develop low cost, high efficiency renewable energy sources.

The CEDT houses extensive state-of-the-art equipment required for such research. A molecular beam epitaxy (MBE) system is available for the growth of a wide range of III-V semiconductors with elements (Al, Ga, In) (N,P,As,Sb) and dopants for n-and p-type layers. Other facilities include chemical vapor deposition (CVD) for optical thin films and device passivation, reactive ion etching (RIE) used in device fabrication and metal/dielectric deposition systems. Full photolithography capabilities (mask aligner, photoresist spinner, mask design, etc.) are available for patterning down to the 1 micron scale and electron beam lithography is available for patterning down to the 10nm scale. A holographic facility is available for producing distributed feedback lasers. A large range of materials and device characterization facilities is available: double crystal x-ray diffractometer, photoluminescence (300K and 15K and wavelength range of 700-5000nm), an FTIR suite, an ellipsometry suite, low temperature Hall effect, electrochemical C-V profiler, device parameter analyzers, optical spectrum analyzers, etc.

The CEDT membership includes 40 faculty members spanning 8 departments at McMaster University from the faculties of Engineering and Science, users from other Canadian universities and numerous industrial affiliates. There are typically 40 graduate students as well as several postdoctoral fellows and visiting scientists actively carrying out research within the Centre. There are 4 highly trained staff members who are vital to the mission of the Centre in training students and maintaining the facilities.

7.7.7 R. Samuel McLaughlin Centre for Research and Education in Aging and Health Larry Chambers, Director

The R. Samuel McLaughlin Centre for Research and Education in Aging and Health is the focal point for activities related to research and education in aging and health in the Faculty of Health Sciences. Partnerships have been developed with community agencies covering a wide network of services and through this collaboration reciprocal benefits are achieved.

Research is promoted in four research theme areas through activities such as workshops, conferences, newsletters, and seed funding in health promotion; the aging brain; mobility, aging and participation; and pharmacology and therapeutics.

Education objectives ensure integration of aging and health content into the schools and departments of the Faculty of Health Sciences in undergraduate, postgraduate, and continuing education. Another educational objective is the promotion and enhancement of community-based, collaborative education across the continuum of care including acute care, long term care, primary care, and community care.

Community Liaison activities develop and maintain collaboration between researchers and educators in the Faculty of Health Sciences and community organizations about health and health care issues related to aging and health. Strategies are developed to disseminate research findings, provide educational opportunities for health

researchers and care providers, promote best-evidence practice, and collaborate in health service research.

For further information contact: The R. Samuel McLaughlin Centre for Research and Education in Aging and Health, c/o Mary Gault, Downtown Centre, 50 Main Street East, Hamilton, Ontario
Tel. 905 521-2100 Ext. 22547 Email: gault@mcmaster.ca

7.7.8 McMaster Institute of Environment and Health B. Newbold, Director

The McMaster Institute of Environment and Health (MIEH) was formed in 1991 to conduct research, education and service programs to deal with the environmental problems relating to human health.

Through the MIEH network, the Institute has mobilized interdisciplinary, collaborative research projects in the areas of convergence of health and environmental ethics; environmental contaminants and human and animal reproduction; environmental cancer epidemiology; environmental health policy; analysis and evaluation; environmental quality (air, water, land, soil, etc.) and human health at all life stages and in a variety of locales; environments as determinants of and pathways to health; nutritional, social and health effects of fish and wildlife consumption in the Great Lakes Basin; respirable air particulates; risk and human health; risk assessment and communication for environmental health issues; social-psychological effects of potential and perceived environmental threats; social construction of chemical toxicity; and work, communities and health.

MIEH's education program includes organizing and sponsoring workshops and conferences as well as hosting a seminar series. The Institute also offers a Post-Professional Diploma Program in Environment and Health (valued at 31 1/4 undergraduate credits) designed to provide new and/or upgraded skills and knowledge in the principles and practice of environmental health. Faculty also contribute to several undergraduate programs through departments in Science, Social Sciences and Health Sciences.

Its service program involves responding to requests from sponsors, partners, groups and individuals from government, industry, NGOs and community groups for advice and consultation on environmental health issues. For further information please contact:

MIEH, 1280 Main Street West, BSB-333
Hamilton, Ontario L8S 4K1
Tel. 905 525-9140 Ext. 23521; Fax 905 524-2400
Website: <http://www.mcmaster.ca/mieh>

7.7.9 Centre for Health Economics and Policy Analysis J. Abelson, Director

CHEPA is a university-based centre engaged in interdisciplinary research, knowledge transfer and education. The Centre's mission is to promote a collegial and supportive interdisciplinary environment fosters excellence in acquiring, producing and communicating socially-relevant knowledge in the fields of health economics and health policy analysis. CHEPA research focuses on the development of new methods and the evaluation of various dimensions of health, health care and health systems. CHEPA researchers lead research programs in the determinants of health and health inequalities, equity in health systems, health care financing and funding, health human resources and health professions, health technology assessment, knowledge transfer and exchange, public and community engagement, patient-centred care and shared decision-making, and values and ethics in health policy.

Centre faculty and staff participate in undergraduate, and graduate, and professional education programs for students from various disciplines including health sciences, economics, sociology, geography, and political science. CHEPA faculty provide Master's and Doctoral training in health economics and policy analysis, offered through disciplinary programs in the Department of Economics and interdisciplinary programs in Health Policy and Health Research

Methodology. Each year, CHEPA awards a doctoral fellowship to an incoming student enrolled in a Ph.D. program at McMaster University whose field of research is health economics or health policy analysis.

The Centre, funded by the Ontario Ministry of Health, McMaster University, and other sources, reports to the University Senate through the Faculty of Health Sciences. Current Centre membership is drawn from the Departments of Clinical Epidemiology and Biostatistics, Economics, Health Aging and Society and Political Science and from the School of Geography and Earth Sciences, and School of Business. The Centre's programs and activities are available to faculty, staff, and students from all parts of the University.

Members at the Centre participate extensively in collaborative research with colleagues at McMaster, other universities and the Ontario Ministry of Health. In addition, CHEPA organizes conferences, workshops, and seminars and other research-related events, produces and distributes research documents, provides supplemental library and other services for its members, and sponsors visits by researchers.

Enquiries: 905 525-9140 Ext. 22122; Fax 905 546-5211
Email: CHEPA@mcmaster.ca; Website: <http://www.cheпа.org>

7.7.10 McMaster Institute for Polymer Production Technology

A.E. Hamielec, Director
J.F. MacGregor, Associate Director
S. Zhu, Associate Director

We live in a "materials world." Polymeric materials have tremendous impact on every aspect of our lives: plastics, elastomers, fibres, paints, adhesives, coatings, super absorbents, contact lenses, dental fillings, medical implants, controlled release systems, drug/gene delivery carriers, microelectronic devices, etc. We consume more polymers than all other synthetic materials combined.

The McMaster Institute for Polymer Production Technology (MIPPT) places a major emphasis on polymer materials and reaction engineering. The institute does cutting edge research on both fundamental issues and industrial applications. It also works with polymer companies for development projects as well as provides measurement and testing services. The institute has state-of-the-art equipment and facilities that include a unique high-pressure CSTR reactor system for catalytic polymerization of olefins and a triple detector array high-temperature GPCV 2000. The institute's facilities allow the preparation and complete analysis of lab-scale polymer samples.

The faculty and staff members associated with the institute integrate levels of polymer research from the basic understanding of polymerization mechanisms to the industrial control of polymer plants, from the designed synthesis and characterization to the evaluation of material's application properties. The faculty members collaborate extensively with experts worldwide.

One of the institute's mandates is to provide first-class interdisciplinary training for Ph.D. and M.A.Sc. students, postdoctoral fellows, and visiting scholars from all over the world. The faculty members have an outstanding reputation in supervision and training of highly qualified personnel. Many former trainees have become university professors and the others are employed by major polymer, pharmaceutical and chemical companies.

Examples of the institute's current projects include: development of catalyst supports and continuous reactor systems for controlled/living radical polymerization processes; development of low volatile-organic-compound printable and curable polyethylene materials; study of

materials compatibility and interfacial interactions for fabricating low-cost plastic thin-film transistors; preparation of high-performance non-biofouling biomaterials by surface-grafting of biomimetic polymers for biomedical devices.

7.7.11 Research Institute for Quantitative Studies in Economics and Population **B.G. Spencer, Director**

The Research Institute for Quantitative Studies in Economics and Population is an interdisciplinary program based in the Faculty of Social Sciences. Its purpose is to encourage and facilitate faculty research in economics and other areas of the social sciences, with special emphasis on the analysis of population and the relationships between population change and changes in the economy and society.

The Institute's research associates number about forty faculty members from various departments of the University and interdisciplinary cooperation is encouraged.

The Institute issues a series of reports known as QSEP Research Reports. These reports, or abstracts of them, are distributed widely in North America and other parts of the world. The QSEP Research Institute has been in existence since 1981. Enquiries: 905 525-9140 Ext. 22781; Fax 905 521-8232; Email: qsep@mcmaster.ca
Website: <http://socserv2.mcmaster.ca/qsep>.

7.7.12 Centre for Peace Studies

The Centre for Peace Studies supports multidisciplinary research and teaching in the area of peace and conflict studies. Centre research and teaching focus on six areas: social movements against war and injustice; pacifism and non-violence; ethnicity, nationalism and self-determination; human rights; reconciliation and peace-building; and health initiatives as peace initiatives.

The Centre annually sponsors the independently endowed Bertrand Russell Peace Lectures, the Mahatma Gandhi Lectures on Non-violence, has organized several international conferences, initiated a number of scholarly publications, and has a wide range of international contacts, especially in Central America, Central East Europe, Southeast Asia, and the Middle East.

The Centre's office is open during regular office hours.
Email: peace@mcmaster.ca, Fax 905 570-1167
Website: <http://www.humanities.mcmaster.ca/~peace>

7.7.13 Bertrand Russell Research Centre

The Bertrand Russell Research Centre was established in July 2000 to undertake research on the life, work, and times of Bertrand Russell, whose papers are held in the Mills Memorial Library. It continues the work of the former Bertrand Russell Editorial Project in publishing a critical, annotated edition of Russell's unpublished books and his shorter public writings. Twenty volumes in this series have already been published. In addition, the Centre publishes a journal, *Russell*, and has started a scholarly electronic edition of Russell's massive correspondence. It is also involved in producing a major documentary film about Russell. The Russell Centre hosts visitors to the University who are working on Russell and provides opportunities for students to undertake research on Russell and to work as research assistants on the Centre's various research projects.
Email: duncana@mcmaster.ca Fax: 905 577-6930 Ext. 24896
Website: <http://www.humanities.mcmaster.ca/~russell/>

7.7.14 Centre for Advanced Polymer Processing and Design (CAPPA-D)*

J. Vlachopoulos, Director
A. Hrymak, Associate Director

The mandate of the Centre for Advanced Polymer Processing and Design is to advance knowledge, educate graduate students, and transfer technology to industry in the area of polymer processing. Polymer processing involves the integration of various engineering and scientific disciplines and encompasses the formulation, conversion and shaping operations applied to polymeric systems. The Centre's current research projects include process equipment design, studies of flow and heat transfer, polymer material characterization and end-product properties. The focus is on extrusion, rotomolding, injection molding and blown film.

CAPPA-D deals with the fabrication of plastics into products such as plastic film, automotive plastic parts, foams, piping, bottles, containers for appliances, and process optimization using computer-aided simulation.

Graduate students involved in CAPPA-D research projects are registered in the Department of Chemical Engineering.

*(Part of McMaster Manufacturing Research Institute)
Website: <http://mmri.mcmaster.ca>

7.7.15 McMaster Manufacturing Research Institute S. Veldhuis, Director

The McMaster Manufacturing Research Institute (MMRI) is one of the largest University-based manufacturing research institutes in Canada with academic programs that compete favourably with existing international research institutes. MMRI provides outstanding educational opportunities to undergraduate and graduate students. The research focus areas of MMRI are machining, metal forming, polymer processing, computer-aided design/computer-aided metrology (CAD/CAM), robotics, sensors and control, non-conventional metal cutting processes, casting, and micromanufacturing.

MMRI is interdisciplinary with the participation of faculty members from the departments of Mechanical Engineering, Chemical Engineering, Materials Science and Engineering and Electrical and Computer Engineering, as well as the involvement of the School of Business. MMRI also provides a vehicle for University-Industry interaction in the field of Manufacturing Engineering. The Institute promotes, encourages, and performs fundamental and applied research, in cooperation with its industrial partners in the manufacturing industry.

The formation of the McMaster Manufacturing Research Institute has created a focus for high profile research activities and state-of-the-art facilities in manufacturing engineering and facilitates the teaching and training of graduate students and post-degree professionals. MMRI laboratories provide both cutting-edge facilities and technologies in machining, metal forming, polymer processing, robotics and automation and CAD/CAM. Email: mmri@mcmaster.ca; Fax: 905 572-7944; Website: <http://mmri.mcmaster.ca>

7.7.16 GM Canada Centre for Automotive Materials and Corrosion / D.S. Wilkinson, Director

This GM Canada Centre for Automotive Materials and Corrosion (GM-CAMC) provides a focal point for research on materials for light weight fuel-efficient vehicles. The automobile, as we currently know it, will undergo greater change over the next decade or so than at any time since the invention of the internal combustion engine. These changes

are largely dependent on new materials—for light weight structures, advanced power train systems and interactive vehicle systems and sensors. The GM Canada for Automotive Materials and Corrosion is at the forefront in developing new technologies in a number of these areas, with its primary focus on vehicle structures. The research undertaken by members of the centre involves collaboration with GM Canada serving as the lead partners, along with Novelis, Arcekor-Mittal and others. A major area of current research emphasis involves the development of materials for light weight structural components involving magnesium, aluminum and steel. In the case of both magnesium and aluminum, a novel technique known as thin strip casting is being studied. This research extends from modeling of solidification and thermodynamic analysis of metastable phase formation to the relationship between texture, second phase particles and sheet metal forming. This research makes significant use of the experimental facilities in the Department of Materials Science and Engineering and the Brockhouse Institute for Materials Research while advanced computational capability is offered through SharcNet.

7.7.17 McMaster Steel Research Centre G.A. Irons, Director

The worldwide steel industry faces significant challenges, and technological advancement is a key to the sector's prosperity. Canada's steel sector is efficient and technologically sophisticated and in 2000 McMaster established the Steel Research Centre to address industry needs through partnership for research and training. The Centre's research falls into three main areas that amplify industrial development efforts and advance business interests:

- Leading edge research on primary iron and steelmaking, including waste use and environmental impact
- Development of advanced structural steels along with related coating and fabricating processes
- Introducing powerful new process control philosophies to steel mill operations

Resources from McMaster's Materials Science and Engineering, Chemical and Mechanical Engineering Departments are committed to meet these goals. Some projects will use expertise in the McMaster Manufacturing Research Institute, as well as the sophisticated analytical tools of the Brockhouse Institute of Materials Research, providing graduate students with a wide range of options to develop original research of interest to the steel sector.

Member companies not only include steel producers but also their suppliers, consultant engineers, and manufacturers who fabricate or further process steel. All member companies participate in the research through semi-annual meetings of the Centre's Review Groups and Board, which guide the research directions. Students are encouraged to make presentations at these meetings, where the atmosphere is very supportive. Direct involvement by industrial members also affords opportunities for graduate students to carry out challenging work on full scale production processes, with the real chance of producing industrially important results. Transferring technology to member companies through research reports, continuing education programs for steel engineers and metallurgists, and by preparing highly qualified graduates to enter the industry is key to making a successful impact.

Website: <http://mcmasteel.mcmaster.ca>

8. FELLOWSHIPS, SCHOLARSHIPS, BURSARIES AND OTHER AWARDS

8.1 Policy on the Terms of Graduate Awards

It is the desire and intent of the University to determine the recipients of graduate scholarships, prizes, and fellowships on the basis of academic merit or other achieved merit. Graduate Council, on behalf of the University Senate, therefore requests those who propose new awards to keep this principle in mind. Awards based on student need are nevertheless appropriate for graduate students. However, if such new awards are proposed, they should be termed bursaries as distinct from scholarships.

8.2 Fellowships and Scholarships Tenable at the University

Unless otherwise indicated, interested applicants should inquire about these Fellowships and Scholarships at the Departmental, Program or Graduate Studies Office.

8.2.1. Canada Graduate Scholarships - Michael Smith Foreign Study Supplements Program

The Canada Graduate Scholarships - Michael Smith Foreign Study Supplements - A Tri-Agency (SSHRC, NSERC and CIHR) program will support high-calibre Canadian graduate students in building global linkages and international networks through the pursuit of exceptional research experiences abroad. By accessing international scientific research and training, recipients will contribute to strengthening the potential for collaboration between Canadian universities and affiliated research institutions and universities, or other research institutions outside of Canada. This foreign study supplements program is available to Canadian citizens or permanent residents who hold a Joseph-Armand Bombardier, Alexander Graham Bell or Frederick Banting and Charles Best Canada Graduate Scholarship (CGS) at the master's or doctoral level or a Vanier CGS at the doctoral level. Supplements of up to \$6,000 will be awarded to active CGS Master's, CGS Doctoral or Vanier CGS holders to help offset the costs—including travel accommodation—of undertaking research studies outside Canada for a defined period (no less than three months and no more than six months).

8.2.2 Canadian Institutes of Health Research (CIHR) - Canada Graduate Scholarships Master's Awards

The objective of the Government of Canada's Canada Graduate Scholarships program is to help ensure a reliable supply of highly qualified personnel to meet the needs of Canada's knowledge economy. The Canada Graduate Scholarships Master's Awards administered by CIHR are intended to provide special recognition and support to students who are pursuing a Master's degree in a health related field in Canada. These candidates are expected to have an exceptionally high potential for future research achievement and productivity. CIHR's contribution to the amount available for this initiative is subject to availability of funds voted annually to CIHR by parliamentary appropriations, and the conditions that may be attached to them.

8.2.3 Commonwealth Scholarship and Fellowship Plan

The Government of Canada, through the International Council for Canadian Studies, offers scholarships to citizens of Commonwealth countries other than Canada. The Scholarships, which are normally awarded for advanced study or research, are open to graduates of a recognized university and during their tenure are intended to cover the expenses of the holders' travel, living, and study. Winners of Canadian Commonwealth Scholarships will not be permitted to hold other major awards. An applicant must submit six copies of the application form and supporting documents to the appropriate agency in the country of origin. The closing date for applications varies with

the country of origin but is usually in the autumn preceding the session at which the award is to be taken up. The address of the agency and closing date for receipt of applications may be obtained from the Registrar of the applicant's home university.

8.2.4 Heart and Stroke Master's Awards

The Heart and Stroke Foundation of Ontario is continuing to offer a limited number of Master's Studentship awards to highly qualified candidates who have completed, or are in the last of a Baccalaureate degree. Candidates will undertake full-time training in cardiovascular/cerebrovascular research under an identified academic supervisor. This is a research-based Master's studentship award, but it is not limited to individuals pursuing a Master's of Science degree. Candidates must not hold another major award concurrently. The awardees may not have held a prior faculty appointment. Graduates possessing a medical degree must apply to the national HSF Fellowship program.

8.2.5 Heart and Stroke Health Services/Population Health Research Master's Studentship Awards

A key priority of the Heart and Stroke Foundation of Ontario is to become a leading funder of health services/population health research. Given this priority, HSFO is excited to invest in these areas to increase capacity and impact by offering up to two Master's Studentship awards annually to highly qualified candidates who have completed, or are in the last year of a Baccalaureate degree and who have gained acceptance into a Master's program. Applicants must undertake training in health services and/or population health research in a cardiovascular/cerebrovascular field.

8.2.6 Imperial Order Daughters of the Empire War Memorial Scholarships

A maximum of eight annual scholarships for study in Canada and in the Commonwealth are offered annually by the Imperial Order Daughters of the Empire. Candidates must be Canadian citizens and must hold a first degree from a recognized university in Canada.

Application forms and additional information are available at all Canadian universities or from the Head Office, IODE, Suite 254, 40 Orchard View Blvd., Toronto, Ontario M4R 1B9. The closing date for applications is December 1.

8.2.7 Sir John A. Macdonald Graduate Fellowship in Canadian History

Established in 1965 in commemoration of the 150th anniversary of the birth of Canada's first Prime Minister, this fellowship is awarded annually by the Government of the Province of Ontario to stimulate graduate study and research in the field of Canadian history.

Only Canadian citizens residing in Ontario are eligible to apply. Applications must be submitted by early March.

8.2.8 Natural Sciences and Engineering Research Council of Canada

Postgraduate Scholarships

Natural Sciences and Engineering Research Council of Canada Postgraduate Scholarships are tenable at McMaster University. The University will normally allow winners to hold a full or half Teaching Assistantship.

Industrial Postgraduate Scholarships

Natural Sciences and Engineering Research Council of Canada Industrial Postgraduate Scholarships are tenable at McMaster University. These scholarships are for the first and second year or third and fourth year of graduate work. The scholar is expected to spend a minimum of 20% of research time at the sponsoring company on activities related to the thesis project.

8.2.9 Ontario Graduate Scholarships

The Province of Ontario offers scholarships (in conjunction with McMaster University) currently valued at \$5,000 per term to students in or entering graduate programs. Winners of Ontario Graduate Scholarships may hold a full Teaching Assistantship.

8.2.10 Ontario-Quebec Exchange Fellowship

The Provincial governments offer fellowships for Master's and doctoral students. Application forms and additional information are available from the School of Graduate Studies or Ministry of Education and Training, Student Affairs, P.O. Box 4500, 189 Red River Road, Thunder Bay, Ontario P7B 6G9. Applications must be submitted by the end of January.

8.2.11 Petro-Canada Inc. Graduate Research Award Program

The Petro-Canada Inc. Awards are given to support and encourage graduate research in specialized fields of study relating to the petroleum industry. Up to four awards will be made to students in graduate programs leading toward a master's or doctoral degree working in the applied, natural, and social sciences, and business administration. These awards are tenable for one year at any university or college which is a member or affiliated member of the Association of Universities and Colleges of Canada. Application forms are available from the Awards Division, Association of Universities and Colleges of Canada (AUCC), 350 Albert Street, Suite 600, Ottawa, Ontario K1R 1B1. Applications must be submitted by February 1.

8.2.12 J.H. Stewart Reid Memorial Fellowship

The Canadian Association of University Teachers (CAUT) offers an annual award. The field of graduate study is unrestricted, but the fellowship is available only for doctoral studies. Application forms and further information may be obtained from the Awards Officer, Canadian Association of University Teachers, 2675 Queensview Drive, Ottawa, Ontario K2B 8K2. At present, applications must be submitted by April 30.

8.2.13 Social Sciences and Humanities Research Council of Canada

The Social Sciences and Humanities Research Council of Canada offers fellowships for study leading to a doctoral degree in the Humanities or the Social Sciences. At McMaster, winners of this award may hold a Teaching Assistantship.

8.2.14 Trudeau Foundation Doctoral Scholarships

The annual Trudeau Foundation Doctoral Scholarships competition in the social sciences and humanities is open to Canadian citizens and landed immigrant status pursuing full-time doctoral studies in Canada, and exceptionally to Canadians pursuing full-time doctoral studies at foreign institutions. Foreign nationals pursuing doctoral studies at Canadian institutions will also be supported, with a preference for candidates from the developing world. Although priority will be accorded to Canadian citizens and landed immigrants, up to one fourth of the total number of Trudeau Scholars may be foreign nationals. The Trudeau Scholars Program seeks candidates at the level of the most competitive scholarship programs worldwide. To be eligible for consideration by the Foundation, candidates must be applying to the first year of a doctoral program, or registered in the first or second year of such a program. Candidates will be considered by the Foundation only if they have been nominated by a university. A candidate must be enrolled in or have completed a degree program at the nominating institution, or must be enrolled in or applying to a doctoral program there.

8.2.15 Vanier Canada Graduate Scholarships (Vanier CGS)

Canada is building a world-class research capacity by attracting top-tier doctoral students, both nationally and internationally, who will positively contribute to our economic, social and research-based growth for a prosperous future. To promote this world-class excellence, the Government of Canada has launched the Vanier Canada Graduate Scholarships (Vanier CGS) program. This

prestigious program awards 500 international and Canadian doctoral students with three-year scholarships. The Vanier Canada Graduate Scholarships (CGS) program is administered by Canada's three research granting councils [the Canadian Institutes for Health Research (CIHR), the Natural Sciences and Engineering Research Council (NSERC), and the Social Sciences and Humanities Research Council (SSHRC)]. The Vanier CGS program reaffirms Canada as a global centre of excellence in research and education. The program supports Canada's science and technology policy direction, which capitalizes on people, strengthens knowledge and encourages entrepreneurial advantages to build a competitive Canada. The Vanier CGS program aims to attract and retain world-class doctoral students by supporting students who demonstrate a high standard of scholarly achievement in graduate studies in the social sciences and humanities, natural sciences and engineering, and health; as well as leadership skills. Both Canadian and international students are eligible to be nominated for a Vanier Canada Graduate Scholarship. A Vanier Canada Graduate Scholarship is valued at \$50,000 per year, for up to three years.

8.3 Fellowships and Scholarships Awarded by the University

Unless otherwise indicated, winners of all of the following Fellowships and Scholarships may normally hold a full Teaching Assistantship. Nominations for these awards normally come from departments, not individuals. These awards are available only to full-time graduate students.

ONTARIO GRADUATE SCHOLARSHIPS IN SCIENCE AND TECHNOLOGY (OGSST)

The Ontario Government, in partnership with the private sector, rewards excellence in graduate studies in science and technology through the Ontario Graduate Scholarships in Science and Technology. The program has been funded for a ten-year period, starting in 1998.

8.3.1 The Bank of Montreal Graduate Scholarship in Science and Technology

Established in 2001 by the Bank of Montreal under the Ontario Graduate Scholarships in Science and Technology initiative. To be awarded to a graduate student in the Faculty of Health Sciences or Science enrolled in an approved Master's or Doctoral program in science and technology at McMaster University who has maintained an overall average of at least A minus as defined by OGSST.

8.3.2 The Boates Family Graduate Scholarship in Science and Technology

Established in 2000 by Mr. Hugh Boates under the Ontario Graduate Scholarships in Science and Technology initiative. To be awarded to a student in the Faculty of Health Sciences enrolled in an approved Master's or Doctoral program in science and technology at McMaster University who has maintained an overall average of at least A minus as defined by OGSST. Preference will be given to students involved in leukemia research.

8.3.3 The Canada Life Assurance Company Graduate Scholarship in Science and Technology

Established in 2002 by Canada Life Assurance Company under the Ontario Graduate Scholarships in Science and Technology initiative. To be awarded to a student enrolled in a Department of Kinesiology approved research Master's or Doctoral program in science and technology at McMaster University who has maintained an overall average of at least A minus or equivalent during each of their last two full years of study at a postdoctoral level. Preference will be given to students conducting research in the Institute for Health Promotion, Disease Prevention and Rehabilitation. Value: \$15,000

8.3.4 The Domtar Graduate Scholarship in Science and Technology

Established in 1999 by Domtar Inc. under the Ontario Graduate Scholarships in Science and Technology initiative. To be awarded to a Faculty of Engineering student enrolled in an approved Master's or Doctoral program in science and technology at McMaster University who has maintained an overall average of at least A minus as defined by OGSST. Preference will be given to students conducting research related to the pulp and paper industry.

8.3.5 The General Motors Graduate Scholarship in Science and Technology

Established in 1999 by General Motors of Canada under the Ontario Graduate Scholarships in Science and Technology initiative. To be awarded to students enrolled in a research master's or doctoral program related to Automotive Engineering. These scholarships are tenable for two years and are currently valued at \$15,000 per annum.

8.3.6 Heart and Stroke Foundation of Ontario Graduate Scholarship in Science and Technology

Established in 2000 by the Heart and Stroke Foundation of Ontario under the Ontario Graduate Scholarships in Science and Technology initiative. To be awarded to students enrolled in a research master's or doctoral program in the areas of heart disease and stroke research. These scholarships are tenable for up to two years and are currently valued at \$15,000 per annum.

8.3.7 The McMaster Alumni Association Scholarship in Science and Technology

Established in 1999 by the McMaster Alumni Association under the Ontario Graduate Scholarships in Science and Technology initiative. To be awarded to a student enrolled in an approved research Master's or Doctoral program in science and technology at McMaster University who has maintained an overall average of at least A minus or equivalent during each of their last two full years of study at a post-secondary level. This scholarship is tenable for two years.

8.3.8 The Raymond Moore Graduate Scholarship in Science and Technology

Established in 1999 through the estate of Raymond Moore under the Ontario Graduate Scholarships initiative. To be awarded to students enrolled in an approved research Master's or Doctoral program in science and technology at McMaster University. Students must be eligible under the regulations of the Ontario Graduate Scholarships in Science and Technology. The value of the award is a maximum of \$15,000 and may be tenable for two years. To be awarded by the School of Graduate Studies.

8.3.9 The Nortel Networks Graduate Scholarship in Science and Technology

Established in 1999 by Nortel Networks under the Ontario Graduate Scholarships in Science and Technology initiative. To be awarded to students enrolled in a research master's or doctoral program in the disciplines of Electrical Engineering, Computer Engineering, Computer Science, Software Engineering and Engineering Physics. These scholarships are tenable for up to two years and are currently valued at \$15,000 per annum.

8.3.10 The Raymond W. Peirce Scholarship in Science and Technology

Established in 1999 by Raymond W. Peirce (Class of '49), under the Ontario Graduate Scholarships in Science and Technology initiative. To be awarded to a student enrolled in a research master's or doctoral program in Physics and Astronomy. These scholarships are tenable for two years and are currently valued at \$15,000 per annum.

8.3.11 The David and Grace Prosser Scholarship in Science and Technology

Established in 1999 by David L. Prosser (BScH '45 and MSc '46) under the Ontario Graduate Scholarships in Science and Technology initiative. To be awarded to students enrolled in the Faculty of Science in an approved research master's or doctoral program. Preference will be given to Chemistry students. These scholarships are tenable for two years and are currently valued at \$15,000 per annum.

8.3.12 The Shell Canada Graduate Scholarship in Science and Technology

Established in 1999 by Shell Canada under the Ontario Graduate Scholarships in Science and Technology initiative. To be awarded to Faculty of Science students enrolled in a research master's or doctoral program. Preference will be given to students conducting research in areas related to the gas and oil industry. These scholarships are tenable for two years and are currently valued at \$15,000 per annum.

8.3.13 The Sun Life Financial Graduate Scholarship in Science and Technology

Established in 1999 by Sun Life Assurance Company of Canada under the Ontario Graduate Scholarships in Science and Technology initiative. To be awarded to Faculty of Health Sciences students enrolled in an approved Master's or Doctoral program in science and technology at McMaster University who have maintained an overall average of at least A minus or equivalent during each of their last two full years of study at a postsecondary level. These scholarships are tenable for two years.

8.3.14 The Varian Canada Graduate Scholarship in Science and Technology

Established in 2003 by Varian Canada under the Ontario Graduate Scholarship in Science and Technology initiative. To be awarded to a student enrolled in a research Master's or Doctoral program in Chemistry at McMaster University who has maintained an overall average of at least A minus during each of the last two full years of study. To be awarded by the School of Graduate Studies upon the recommendation of the Department of Chemistry. The scholarship is tenable for one year (renewable) and is valued at \$15,000 per annum.

8.3.15 The Ann Poucher Windsor Graduate Scholarship in Science and Technology

Established in 1999 through the estate of Anne Hamilton in memory of her mother Mary Ann Poucher Windsor, under the Ontario Graduate Scholarships in Science and Technology initiative. To be awarded to students enrolled in an approved research Master's or Doctoral program in science and technology at McMaster University. Students must be eligible under the regulations of the Ontario Graduate Scholarships in Science and Technology. The value of the award is a maximum of \$15,000 and may be tenable for two years. To be awarded by the School of Graduate Studies.

ONTARIO GRADUATE SCHOLARSHIPS (OGS)

The Ontario Graduate Scholarships, valued at \$15,000 annually, are awarded through a province-wide competition. As of May 2001, one-third of the funding for each award is to be provided from University or private donors. McMaster is establishing named awards for donors who contribute to this scholarship program.

8.3.16 The H.G. Bertram Foundation Ontario Graduate Scholarship

Established in 2002 by The H.G. Bertram Foundation to contribute to the funding of Ontario Graduate Scholars at McMaster University within the Faculties of Humanities or Social Sciences. In keeping with the original terms of the trust indenture establishing the Bertram

Foundation, consideration will be given to deserving students who have received the greater part of their public and secondary school education in the schools of the Town of Dundas or surrounding area.

8.3.17 The Nick DiPietro Ontario Graduate Scholarship

Established in 2007 by Nick DiPietro, B.Sc. (Class of '79), MBA (Class of '82). To contribute to the funding of Ontario Graduate Scholarships for students in the Department of Biochemistry and Biomedical Sciences who are engaged in stem cell research.

8.3.18 The Ellen Louks Fairclough Memorial Ontario Graduate Scholarship in Political Science

Established in 2004 to commemorate the life of The Right Honourable Ellen Louks Fairclough, P.C., C.C., F.C.A., L.L.D., F.R.C.G.S., D.H., U.E., Canada's first female federal cabinet minister and lifelong advocate for women's rights. To be awarded to a student enrolled in a graduate program in Political Science who holds an Ontario Graduate Scholarship. Preference will be given to a student with an interest in Canadian public policy.

8.3.19 The Murray and Gwen Ford Ontario Graduate Scholarship

Established in 2002 by Mrs. Gwynneth Ford in memory of Dr. Murray J.S. Ford, to contribute to the funding of Ontario Graduate Scholars at McMaster University within the Faculty of Humanities. Preference will be given to a student studying in the Department of Philosophy, the Department of History, or the Department of English.

8.3.20 The Gray/Vinall Ontario Graduate Scholarship

Established in 2000 by Mr. Kerry Gray (Class of '77 and '82) to contribute to the funding of Ontario Graduate Scholars at McMaster University. Preference will be given to a student pursuing graduate studies in the School of Business.

8.3.21 The Great West Life Ontario Graduate Scholarship

Established in 2002 by Great West Life Assurance Company to contribute to the funding of Ontario Graduate Scholars at McMaster University. The scholarship will be given to a graduate student conducting research that has a direct impact on health care issues relevant to the insurance industry and is linked to the Centre for Health Promotion and Rehabilitation. If there is no such student winning the scholarship in a particular year, the scholarship will be given to a student in Kinesiology or, if there is also no student in Kinesiology, then awarded to a student in another department in the Faculty of Social Sciences.

8.3.22 The HAH Ontario Graduate Scholarship

Established in 2005 by Edwin S. and Iris L. Hunt. To contribute to the funding of Ontario Graduate Scholarship in the Faculties of Humanities and Social Sciences.

8.3.23 The Hamlin Family Fund Ontario Graduate Scholarship

Established in 2002 by the Hamlin Family Fund of the Hamilton Community Foundation to contribute to the funding of Ontario Graduate Scholars at McMaster University within the Faculties of Humanities and Social Sciences.

8.3.24 The Louis Hotz Ontario Graduate Scholarship

Established in 2002 by the Hotz Group of Companies in honour of Louis Hotz in recognition of his 80th birthday, to contribute to the funding of Ontario Graduate Scholars at McMaster University. Preference will be given to graduate students studying in the Department of Kinesiology and working in the Mac Turtles program in the Centre for Health Promotion and Rehabilitation.

8.3.25 The C.D. Howe Memorial Foundation Ontario Graduate Scholarship

Established in 2008 by the C.D. Howe Memorial Foundation to contribute to the funding of two Ontario Graduate Scholarships in the Department of Economics. Preference will be given to students pursuing a Master of Arts in Economic Policy.

8.3.26 The Dr. Ronald V. Joyce Ontario Graduate Scholarship in Humanities

Established in 2003 by Dr. Ronald V. Joyce (Class of '98) to contribute to the funding of one Ontario Graduate Scholarship at McMaster University. Preference will be given to students pursuing graduate studies in the Faculty of Humanities.

8.3.27 The Dr. Ronald V. Joyce Ontario Graduate Scholarships in Science

Established in 2003 by Dr. Ronald V. Joyce (Class of '98) to contribute to the funding of two Ontario Graduate Scholarships to be awarded annually at McMaster University. Preference will be given to students pursuing graduate studies in the Faculty of Science.

8.3.28 The Dr. Ronald V. Joyce Ontario Graduate Scholarships in Social Sciences

Established in 2003 by Dr. Ronald V. Joyce (Class of '98) to contribute to the funding of two Ontario Graduate Scholarships to be awarded annually at McMaster University. Preference will be given to students pursuing graduate studies in the Faculty of Social Sciences.

8.3.29 The Geraldine Linton Ontario Graduate Scholarship

Established in 2002 by Mrs. Geraldine Linton to contribute to the funding of Ontario Graduate Scholarships at McMaster University. Preference will be given to a student in the Faculty of Health Sciences.

8.3.30 The Lyons Ontario Graduate Scholarship in New Media and Communication

Established in 2000 by Edward and Margaret Lyons to contribute to the funding of Ontario Graduate Scholarships at McMaster University. To be awarded to a graduate student in the Faculty of Humanities who holds an Ontario Graduate Scholarship. Preference will be given to a student who is conducting research in either the area of multimedia or the area of human communications.

8.3.31 The Lyons Ontario Graduate Scholarship in Social Sciences

Established in 2001 by Edward and Margaret Lyons to contribute to the funding of Ontario Graduate Scholarships at McMaster University, within the Faculty of Social Sciences.

8.3.32 David Oliver Mackey Ontario Graduate Scholarship

Established in 2005 by Mr. Geoffrey Mackey (B.A. '75, M.A. '76) in honour of his father, David, to contribute to the funding of Ontario Graduate Scholarships within the Faculty of Social Sciences at McMaster University.

8.3.33 The Veda Jacqueline Thompson Mackey Ontario Graduate Scholarship

Established in 2005 by Mr. Geoffrey Mackey (B.A. '75, M.A. '76) in honour of his mother, Veda, to contribute to the funding of Ontario Graduate Scholarships within the Faculty of Humanities at McMaster University.

8.3.34 The J.B. McArthur Ontario Graduate Scholarship

Established in 2005 by Joseph B. McArthur, son of J.B. McArthur, a 1905 graduate of McMaster University, who conscientiously served his alma mater for forty-two years as President of the McMaster Alumni Association (1911), member of McMaster's Senate (1911-1913) and member of McMaster's Board of Governors (1931-1953). To contribute to the funding of Ontario Graduate Scholarships in the Faculty of Humanities at McMaster University.

8.3.35 The Ira McDonald (Construction) Ontario Graduate Scholarship in Engineering

Established in 2007 by Dale McDonald, B.A. (Class of '73) and Emily McDonald, B.C. (Class of '75) and Ira McDonald Construction Limited to honour the memory of their father Ira. To be awarded by the School of Graduate Studies to a student registered in an engineering graduate program. Preference will be given to students enrolled in Civil Engineering.

8.3.36 The A. Boyd McLay Ontario Graduate Scholarship

Established in 2001 by Dr. Robert Summers-Gill in honour of A. Boyd McLay (Ph.D., F.R.S.C.), a member of the Department of Physics and Astronomy from 1930-1967, to contribute to the funding of Ontario Graduate Scholarships at McMaster University. To be awarded to a graduate student in the Faculty of Science who holds an Ontario Graduate Scholarship. Preference will be given to a student who is conducting research in Physics and Astronomy.

8.3.37 The Frank C. Miller Ontario Graduate Scholarship

Established in 2002 by Mr. Frank C. Miller to contribute to the funding of Ontario Graduate Scholarships at McMaster University. Preference will be given to a student in the Faculty of Humanities or Social Sciences.

8.3.38 The R. Edward Munn Ontario Graduate Scholarship

Established in 2003 by Dr. R. Edward Munn (Class of '41) to contribute to the funding of Ontario Graduate Scholars at McMaster University within the Faculty of Science and the Faculty of Social Sciences. Preference will be given to a student pursuing graduate studies in the School of Geography and Geology with a specialization in environmental issues.

8.3.39 The Sammon Munroe Ontario Graduate Scholarship

Established in 2007 by Professor Sheila Sammon and Mr. Robert Munroe, B.A. (Class of '72) to contribute to the funding of Ontario Graduate Scholarships at McMaster University. To be awarded to a student enrolled in the Faculty of Social Sciences. Preference will be given to a student in the School of Social Work program.

8.3.40 The Ontario Graduate Scholarships

Established in 2002 to contribute to the funding of Ontario Graduate Scholars at McMaster University.

8.3.41 The Ontario Graduate Scholarship in Science

Established in 2001 to contribute to the funding of Ontario Graduate Scholarships within the Faculty of Science at McMaster University. Preference will be given to students pursuing graduate work in Physical Science.

8.3.42 The Patterson-Wilson Ontario Graduate Scholarships

Established in 2004 by the bequest of Laurence Cholwill to contribute to the funding of Ontario Graduate Scholarships at McMaster University. Up to four to be awarded by the School of Graduate Studies to graduate students in the Faculty of Humanities.

8.3.43 The Penny Family Ontario Graduate Scholarship

Established in 2006 by the Penny family to contribute to the funding of Ontario Graduate Scholarships at McMaster University, School of Social Work. To be awarded by the School of Graduate Studies, on the recommendation of the School of Social Work, to an outstanding scholar who is likely to make distinguished contributions to the study of social policy and social justice.

8.3.44 Research in Motion Ontario Graduate Scholarship

Scholarship(s) will be awarded to graduate students in University faculties conducting research in the area of mobile communications, in conjunction with the Ontario Graduate Scholarship (OGS) program. The scholarship will be awarded by the University on the basis of scholastic excellence and a demonstrated interest in mobile communications.

8.3.45 The George and Alice Rivett Ontario Graduate Scholarship

Established in 2002 through the bequest of George Rivett to contribute to the funding of Ontario Graduate Scholarships at McMaster University. To be awarded to a graduate student as part of an Ontario Graduate Scholarship in any graduate program.

8.3.46 The Scotiabank Ontario Graduate Scholarships in Medical Sciences

Established in 2004 by Scotiabank to contribute to the funding of Ontario Graduate Scholarships at McMaster University. Two scholarships to be awarded to students who are enrolled in the Graduate Program in Medical Sciences within the Faculty of Health Sciences. Value: \$15,000 each

8.3.47 The Tayce Wakefield Ontario Graduate Scholarship

Established in 2001 by Tayce Wakefield to contribute to the funding of Ontario Graduate Scholarships at McMaster University. To be awarded to a graduate student who holds an Ontario Graduate Scholarship in the Faculty of Social Sciences. Preference will be given to students pursuing graduate work in Political Science.

8.3.48 Thomson-Gordon Group Ontario Graduate Scholarship

Established in 2007 by Thomson-Gordon in memory of Koos Veldman, a valued business colleague. To contribute to the funding of Ontario Graduate Scholarships in the Faculty of Engineering. To be awarded to a graduate student in a Chemical Engineering or Mechanical Engineering program. Preference will be given to students doing research related to environmentally sustainable products and processes, and environmental engineering.

8.3.49 The Fred Vermeulen Ontario Graduate Scholarship

Established in 2006 by Fred Vermeulen of Vermeulen/Hind Architects, to contribute to the funding of Ontario Graduate Scholarships at McMaster University. To be awarded to a student enrolled in the School of Engineering Practice.

8.3.50 The Dr. Sally Weaver Ontario Graduate Scholarship

Established in 2002 by Dr. David Weaver in loving memory of Dr. Sally Weaver, Professor of Anthropology, to contribute to the funding of Ontario Graduate Scholarships at McMaster University. To be awarded to a student pursuing graduate work in the Department of Anthropology. In the event that there is consistently no student in Anthropology holding an Ontario Graduate Scholarship, the funds may be used for a student in an alternate graduate program in the Faculty of Social Sciences.

8.5.51 The Steve and Tina Wilson Ontario Graduate Scholarship

Established in 2008 by Steve and Tina Wilson to contribute to the funding of an Ontario Graduate Scholarship. To be awarded by the School of Graduate Studies to a graduate student at McMaster University conducting research in Music Cognition or Pedagogy. Preference will be given to a student holding an Ontario Graduate Scholarship who is supervised by a faculty member within the McMaster Institute for Music and the Mind.

MAJOR FELLOWSHIPS AND SCHOLARSHIPS (PRESTIGE)

The Scholarships Committee of Graduate Council recommends and awards these scholarships through the School of Graduate Studies.

8.3.52 The Ashbaugh Graduate Scholarships

Established in 1987 by the bequest of F.K. Ashbaugh in memory of Mary Eliza Kingston. The current value of the scholarships is \$11,000 and up to 10 may be awarded in any one year. The scholarships will be awarded to students entering full-time graduate studies.

8.3.53 The Eugene G. Bolotkin Scholarships

Established in 1991 with funds from the estate of Eugene G. Bolotkin, up to four scholarships, currently valued at \$11,000 and renewable, will be awarded annually to incoming or currently registered Canadian citizens or permanent residents in the Departments of Physics and Astronomy, Engineering Physics, Materials Science and Engineering, and Medical Physics and Applied Radiation. Students must be conducting research or be registered in the area of nuclear physics. The scholarships will be awarded to students demonstrating high academic achievement.

8.3.54 Dalley Fellowships

Several Dalley Fellowships are awarded annually. The funds for the Dalley Fellowships are provided from the estate of Edwin Marvin Dalley. A student who has been elected a Dalley Fellow may receive the award annually for a maximum of three years, provided performance in graduate studies is maintained at a high level. A student may be elected a Dalley Fellow either at the time of initial application or at the end of the first year of graduate study, but not later. A Fellow must intend to study for the Ph.D. degree at McMaster University. The Fellowships are currently valued at \$11,000 per annum.

8.3.55 The Richard Fuller Memorial Scholarships for Science

Established in 1991 with funds from the estate of Henrietta Osborne. The scholarships are currently valued at \$11,000 and two will be awarded by the Scholarships Committee of Graduate Council. Incoming or currently registered full-time graduate students in the Faculty of Science demonstrating high academic achievement are eligible for the award. The awards are renewable for up to three years.

8.3.56 H.G. Hilton Master's Scholarship

The income from a bequest in the estate of Hugh G. Hilton, at one time Chief Executive Officer of Stelco and member of the McMaster Board of Governors, supports a Master's scholarship. This is awarded annually and is tenable for one year, to an entering student intending research into Canadian industry or industrial problems. Nominations from departments which offer the M.A. will be given priority. Other things being equal, preference will be given to deserving children of employees or former employees of Stelco Ltd.

8.3.57 The Harry Lyman Hooker Senior Fellowships

The Harry Lyman Hooker Senior Fellowships are made possible through a bequest from the estate of Harry Lyman Hooker. These awards are given to Canadian citizens or permanent residents who are entering the first year of a Master's or Doctoral program at McMaster University in those Business, Humanities or Social Sciences disciplines or fields of study that receive funding from the Social Sciences and Humanities Research Council (or its successor). Doctoral awards are valued at \$24,000 in each of the first four years that the student continues to remain registered in good standing in the doctoral program he or she originally entered at this University. Master's awards are valued at \$18,000. The award is for one year only for students in a one-year Master's program. A student in a two-year Master's program may receive \$6,000 per term for each of the first two terms of his/her second year, provided that he/she remains registered in good standing in the Master's program he/she originally entered at McMaster University.

In the case of both doctoral and Master's awards, funding beyond the first year is conditional upon the Hooker Award holder applying for all scholarships for which he/she is eligible, including Canada Graduate Scholarships, Social Sciences and Humanities Research Council Doctoral Fellowships, and Ontario Graduate Scholarships. In cases where a Hooker Award winner also receives another fellowship or monetary award from any source, the Hooker Award will be reduced in accordance with the schedule below. Winners will additionally be offered their choice of a Full or Half Teaching Assistantship in each year that they hold the Hooker Award.

Hooker Fellowship - Master's (Year 1):

OGS @ \$15,000 + Hooker @ \$5,000 = \$20,000

CGS @ \$17,500 + Hooker @ \$5,000 = \$22,500

Hooker Fellowship - Doctoral:

OGS @ \$15,000 + Hooker @ \$10,000 = \$25,000

SSHRC Doctoral @ \$20,000 + Hooker @ \$10,000 = \$30,000

Hooker award winners who enter a McMaster Ph.D. program with a Canada Graduate Scholarship will receive no funds from the Hooker fund in Years I-III, but are guaranteed a minimum total income in Year IV of \$35,000.

8.3.58 The Lorne F. Lambier, Q.C., Scholarship

The Lorne F. Lambier, Q.C., Scholarship was established in 1984, and is awarded annually to a graduate student in a master's or doctoral program in health sciences or life sciences whose research is directed toward the understanding and/or cure of cancer. The award has a current value of approx. \$5,000 and is made by the Scholarships Committee of Graduate Council on the basis of departmental nominations. The scholarship is normally awarded for one year, but may be renewed at the discretion of the Scholarships Committee for an additional year.

8.3.59 The Mutual Group Graduate Scholarship

Established in 1991 with funds from the Mutual Group, this scholarship is currently valued at \$11,000. The scholarship is available to all incoming or currently registered graduate students in any program or faculty (including M.B.A. students). The selection will be made on the basis of high academic achievement and preference will be given to students in the wide general fields of Health or Business. The award is not renewable.

8.3.60 The Philomathia Foundation Graduate Fellowships

Established in 2008 by the Philomathia Foundation. Valued at \$17,500 each, these fellowships will be awarded by the Scholarship Committee of Graduate Council to incoming full-time graduate students who have demonstrated high academic achievement. Each year, two fellowships will be awarded, one to a graduate student in the Faculty of Engineering or the Faculty of Science and one to a graduate student in one of the following faculties: Business, Health Sciences, Humanities, and Social Sciences. These awards are tenable for one year.

8.3.61 Clifton W. Sherman Graduate Scholarships for Doctoral Study in Science and Engineering

The Clifton W. Sherman Graduate Scholarships for Doctoral study in Science and Engineering are awarded each year. The awards are currently valued at \$11,000 each.

OTHER SCHOLARSHIPS AND FELLOWSHIPS

The School of Graduate Studies awards these scholarships on the recommendation of the Chair of the department.

8.3.62 Mildred Barrett Armstrong History Fund

Established in 2006 by a bequest of Mildred Barrett Armstrong. To be awarded to graduate students for scholarships, travel to and presentations at conferences, and archival research. Awards will be made by the School of Graduate Studies on the recommendation of the Department of History.

8.3.63 The Ann C. Beckingham Graduate Scholarship

Established in 2004, in memory of Dr. Ann C. Beckingham, who was a faculty member in the School of Nursing (1988-1997) and strongly believed in education, particularly related to aging and health. Scholarships will be awarded by the School of Graduate Studies to a graduate student registered to practice nursing in Canada and studying in the field of Gerontology.

8.3.64 Buddha Dharma Kyokai Scholarship Fund

Established in 2001 by the Buddha Dharma Kyokai Foundation of Canada to support Buddhist studies in Canada which will enable advanced graduate students at McMaster and other universities to study Buddhism for one year, or possibly longer, at an appropriate university in Japan. To be awarded by the School of Graduate Studies.

8.3.65 Desmond G. Burns Graduate Scholarship

The income from the estate of Desmond Gerald Burns has been designated as a scholarship for research leading to the M.Sc. or Ph.D. degree in Physics in Mathematical or Theoretical Physics. The scholarship will be awarded on the recommendation of the Chair of the Department of Physics and Astronomy.

8.3.66 The Bill Carment Memorial Scholarship in Social Development

Established in 2005 by family, friends and colleagues, in memory of Dr. D.W. (Bill) Carment, formerly faculty member of the Department of Psychology and later, Director of the McMaster Centre of Continuing Education. To be awarded by the School of Graduate Studies on the recommendation of the Chair of the Department of Psychology to a graduate student who has demonstrated excellent progress in his/her research training and who is pursuing a career in the area of social development.

8.3.67 The CN Graduate Scholarship in Rehabilitation Science

Established in 2007 with a generous gift from CN. A variable number to be awarded to graduate students in the School of Rehabilitation Science conducting research on the prevention of work-related injuries. Awards of \$10,000 will be made by the School of Graduate Studies on the recommendation of the School of Rehabilitation Science.

8.3.68 The James Robertson Carruthers Memorial Award

Established in 2000 in memory of James Robertson Carruthers (Class of '74) by Mrs. Jessie Carruthers. The award is available to students enrolled in an approved research master's or doctoral program in the Faculty of Humanities. Preference will be given to students studying in the field of Canadian History in the Department of History. To be awarded by the School of Graduate Studies on the recommendation of the Chair of History. Value: \$1,000.

8.3.69 COM DEV Microwave Fellowships

These fellowships were established in 1987 by COM DEV to encourage research in the field of microwave signal processing. One or two are awarded to M.Eng. candidates each year by the School of Graduate Studies on the recommendation of a selection committee. Candidates will be assessed on the basis of academic record, especially in microwave and signal processing courses, and the proposed research, which should have the potential to provide a significant contribution to the advancement of theoretical and/or practical microwave engineering. The award will consist of \$1,000, plus substantial additional support for research and thesis expenses. (Details are available from the Chair of the Department of Electrical and Computer Engineering.) If the thesis is completed within 24 months of the beginning of the program, and is rated by the Department as being of high quality, COM DEV will award an additional \$1,000.

8.3.70 Eva Eugenia Lillian Cope Graduate Scholarship

Established in 2006 by a bequest of Eva Eugenia Lillian Cope. To be awarded to a graduate student in the Faculty of Health Sciences conducting research on allergies and allergic related diseases. Awards of \$25,000 will be made by the School of Graduate Studies on the recommendation of the Faculty of Health Sciences.

8.3.71 The Dante Cosma Graduate Memorial Scholarship

Established in 1997 by family, friends and colleagues of Dr. Dante Cosma, in recognition of his years of service in the Faculty of Engineering at McMaster University, and to his support of engineering students in their pursuit of higher education. To be awarded to a graduate student in the Faculty of Engineering by the School of Graduate Studies on the recommendation of the Dean of Engineering. Preference to be given to a student studying metallurgy.

8.3.72 The Dawes Memorial Fellowship for Graduate Studies in Physics

The Dawes Memorial Fellowship has been established by the family of Henry Franklin Dawes, head of the Department of Physics from 1911 to 1947, to keep fresh the memory of the important part he played in developing the physics program at McMaster. This fellowship has a current value of \$1,200. It will be awarded by the School of Graduate Studies on the recommendation of the Chair of the Department of Physics and Astronomy.

8.3.73 The Frank Dennee Scholarship

Established in 1995 with funds from the estate of Frank Dennee, a Hamilton philanthropist. One annual scholarship in the amount of the accrued interest in the trust fund will be awarded by the School of Graduate Studies on the recommendations from the departments to entering or currently registered Canadian students in the Departments of Engineering Physics or Physics and Astronomy. Preference will be given to graduate students in the area of nuclear science or nuclear engineering.

8.3.74 Departmental Research Scholarships

Several hundred to be awarded by departments to students entering or continuing in a full-time graduate program, these awards are funded through the research grants of research supervisors. These scholarships are normally awarded to students in the Faculties of Engineering, Health Sciences, and Science.

8.3.75 The Richard Fuller Memorial Awards (History)

The Richard Fuller Memorial Scholarships for History

The Richard Fuller Memorial Scholarships for History were established in 1991 with funds from the estate of Henrietta Osborne. They are to be awarded to in-course Ph.D. candidates on the basis of their performance. The scholarships have a current maximum value of \$1,500 and are renewable (to a maximum of 3 years). Two may be awarded each year by the School of Graduate Studies on the recommendation of the Chair of the Department of History.

The Richard Fuller Memorial Scholarships for History (Research)

The Richard Fuller Memorial Scholarships for History (Research) were established in 1991 with funds from the estate of Henrietta Osborne. They are to be awarded to Ph.D. students who are commencing thesis research and require support for archival research. The scholarships have a current maximum value of \$5,000 and a varying number may be awarded annually by the School of Graduate Studies on the recommendation of the Chair of the Department of History.

8.3.76 The GSA Millennium Award for Community Service

Established in 2001 by the Graduate Students Association through its contribution to Canada's "Our Millennium" Project. To be awarded annually in January to two graduate students who demonstrate commitment to the community-at-large through volunteer activities. Eligible students (registered with the School of Graduate Studies during the winter term) are required to submit a letter of application with two reference letters to the Graduate Students Association. The School of Graduate Studies will award the prizes on the recommendation of a GSA selection committee. Value: \$250 each

8.3.77 The Ahmed Ghobarah Scholarship

Established in 2002 by Dr. Ahmed Ghobarah, Professor in Civil Engineering and Joe Ng, JNE Chair in Design, Construction and Management in Infrastructure Renewal and Department Chair (1989-1995). To be granted to a graduate student from a developing country enrolled in a research master's or doctoral program in Civil Engineering at McMaster University who demonstrates academic excellence. Preference will be given to a student conducting research in structural engineering. To be awarded by the School of Graduate Studies on the recommendation of the Chair of the Department of Civil Engineering.

8.3.78 The Abby Goldblatt Memorial Scholarship

Established in 1999 by Marvin Goldblatt in memory of his brother, Abby. To be awarded annually to a graduate student who demonstrates academic excellence in the study of Early Judaism. The award will be made by the School of Graduate Studies on the recommendation of the Chair of Religious Studies.

8.3.79 The Ronald K. Ham Memorial Scholarship

This scholarship has been established in memory of Dr. Ronald K. Ham, an Engineering Physics graduate from the University of Toronto and former faculty member at McMaster University in the Department of Metallurgy and Materials Science and a member of the Institute for Materials Research.

One or two awards will be made annually to top visa students entering M.Eng. studies in the Department of Engineering Physics. Each award may be renewed once only. The Chair of the Department of Engineering Physics will recommend candidates for approval by the School of Graduate Studies.

8.3.80 The A.E. Hamielec Graduate Student Award

Established in 2001 by alumni and friends, this prize has been established to recognize the valuable contributions that Dr. A.E. Hamielec has made to the Department of Chemical Engineering, and his pioneering efforts in the field of polymer reaction engineering developed through the McMaster Institute for Polymer Production Technology (MIPPT). The prize will be awarded to the graduate student deemed to have presented the best seminar during the annual Chemical Engineering Graduate Student Seminar Day as selected by a selection committee. The funds will be used toward travel and registration costs for the student to present the work at a conference. Value: \$500

8.3.81 The Joan Heimbecker Memorial Scholarship

This scholarship was established in 1994 through funds donated in memory of Joan Heimbecker, a graduate student in Human Biodynamics, and is awarded by the School of Graduate Studies on nomination from the Department of Kinesiology. The award is available to students registered in a McMaster graduate program in Human Biodynamics to help support their graduate education.

8.3.82 The C.D. Howe Memorial Foundation Fellowship in Economic Policy

Established in 2008 by the C.D. Howe Memorial Foundation. To be awarded, on the recommendation of the Chair of the Department of Economics, to a graduate student pursuing a Master of Arts in Economic Policy.

8.3.83 The Robert H. Johnston Graduate Scholarship

Established in the year 2005 to honour the memory of Robert H. Johnston, historian of Russia, and normally to be awarded to an incoming Ph.D. student in Twentieth Century European history. To be awarded by the School of Graduate Studies on the recommendation of the Department of History.

8.3.84 The R. Samuel McLaughlin Gerontological Health Research Fellowships

Up to two Fellowships per year will be awarded to Canadian citizens or permanent residents qualified to pursue an academic career in gerontological health research. Fellows must be enrolled in a Master of Science or Doctor of Philosophy program in the Faculty of Health Sciences. Stipends depend on qualifications and experience and normally will be similar to those offered by national funding agencies.

The Fellowship amount is based on Medical Research Council and Ministry of Health of Ontario guidelines for post professional stipends for those who are eligible, which is defined to include those holding degrees in professions such as nursing, medicine, physiotherapy, occupational therapy, etc. Others normally receive graduate student rates at levels similar to NSERC and MRC. The awards, which may be renewed once, will be made by the University on the recommendation of the Dean of the Faculty of Health Sciences acting on the advice of the Chair of the Fellowship Committee of the R. Samuel McLaughlin Centre for Gerontological Health Research.

8.3.85 McMaster Graduate Scholarships

Several hundred to be awarded by the School of Graduate Studies, upon a department's recommendation, to students entering or continuing in full-time graduate study.

8.3.86 The Louis Minden Scholarship in Health Sciences

Established in 1995 with funds from the estate of Mr. Louis Minden. To be awarded to a graduate student in the Faculty of Health Sciences by the School of Graduate Studies on the recommendation of the Associate Dean of Graduate Studies (Health Sciences). This award is currently valued at \$3,000, is once renewable and preference will be given to a graduate student pursuing research in preventive medicine.

8.3.87 The Robert John Morris Scholarship

Established in 1996 in memory of Robert John Morris, to be awarded to a graduate student working in the area of nuclear engineering or advanced energy systems. The scholarship, currently valued at \$6,000, will be awarded by the School of Graduate Studies on the recommendation of the Dean of Engineering.

8.3.88 The James A. Morrison Memorial Scholarship in Chemistry

This award was established in 1987 in memory of Professor Emeritus James A. Morrison who, until 1987, was Professor of Chemistry and Director of the Institute for Materials Research from 1969 to 1986. The award will be given to a graduate student in the Department of Chemistry by the School of Graduate Studies on the recommendation of the Chair of the Department. Preference will be given to students undertaking research in the area of physical chemistry.

8.3.89 Rose C. Mosgrove Scholarship

Consisting of the remission of fees for one year, the Rose C. Mosgrove Scholarship is awarded to graduates of a Nursing program from any university or community college in Ontario who enrol in the Nursing program. Applications should be made to the Chair of the Graduate Curriculum and Policy Committee, Faculty of Health Sciences.

8.3.90 The Fergus Mills Scholarship

Established in 2008 by Dr. Edward Mills in honour of his father, Fergus Mills. To be awarded by the School of Graduate Studies, on the recommendation of the Assistant Dean for Health Research Methodology, to a student enrolled in a graduate program in Health Sciences who is committed to research which will help people in a developing country. Preference to be given to a student with an academic or research background related to Africa with further preference given to a student enrolled in the Health Research Methodology program.

8.3.91 The Milos Novotny Fellowship

Established in 1991 by Milos Novotny, a former graduate student at McMaster University from 1968-72. To be awarded to students in or entering the graduate program in the Department of Mathematics and Statistics who show outstanding potential or have demonstrated excellence in their studies and research. Preference may be given to students in classical analysis. Awarded by the School of Graduate Studies on the recommendation of the Department Chair. Several awards will be made annually. The current value of each award is \$1,000 to \$5,000.

8.3.92 Alvin Irwin Ogilvie Graduate Scholarship

This scholarship was established in 1984 and is available to students registered in Ph.D. programs in the Faculties of Humanities and Social Sciences. The award is valued at \$6,000 and is made annually by the Scholarships Committee of Graduate Council on the basis of departmental nominations.

8.3.93 Ontario Graduate Fellowships

The Ontario Graduate Fellowships were established in 2005 with funds from the government of Ontario to fund exceptional graduate scholars at McMaster University. These awards are open to all Canadian permanent resident graduate students, the maximum value is \$4,000 per term and these awards are made by the Scholarships Committee of the School of Graduate Studies.

8.3.94 The Ontario Power Generation Graduate Scholarship

Established in 2003 by the Ontario Power Generation, to support the education of a student registered in the M.Sc. program in Health and Radiation Physics. To be awarded by the School of Graduate Studies on the recommendation of the Medical Physics and Applied Radiation Sciences Unit. Value: \$21,500

8.3.95 The Julian F. Pas Memorial Scholarship in Chinese Religions

Established in 2000 in loving memory of Dr. Julian Pas (Ph.D. '73). To be awarded to a student in a Master's or Doctoral program in Religious Studies. The School of Graduate Studies will award the scholarship on the recommendation of the Department of Religious Studies, taking into consideration academic achievement and a demonstrated interest in Chinese Religions (Taoism, Chinese Folk Religion or Chinese Buddhism).

8.3.96 The Arthur W. Patrick Scholarship

This scholarship was established in 1986 in honour of Arthur W. Patrick, former Dean of Arts, Head of the Department of Romance Languages, and Professor of French. It is to be awarded annually to the incoming graduate student deemed most academically deserving by the Department of French. The value of the award is approximately \$700.

8.3.97 The Dr. George Mackay Paul Scholarship

Established in 2007 by his family, on the occasion of the 80th birthday of Dr. George Paul, Professor Emeritus. The scholarship is to be awarded, on the recommendation of the Department of Classics, by the School of Graduate Studies, to a graduate student who has demonstrated a high level of achievement at the end of the first year of his or her graduate studies.

8.3.98 The W.E. Rawls Memorial Scholarship

Established in 1990 by family and friends to honour the valuable contribution of Dr. Rawls to cancer research as Professor in the Faculty of Health Sciences, founder and co-ordinator of the McMaster Cancer Research Group, Director of the Molecular Virology and Immunology Program and Past President of the National Cancer Institute. Eligible nominees are students registered in the Faculty of Health Sciences, regardless of departmental affiliation and currently conducting research in molecular virology and oncology, including applications in clinical epidemiology and biostatistics. The award will be made by the School of Graduate Studies on the recommendation of the Health Sciences Scholarship Committee.

8.3.99 Edna Elizabeth Ross Reeves Scholarships

These scholarships were established in 1982 to assist female students in the Departments of English and History with travel costs associated with their doctoral research. Each year one to four scholarships, currently valued at up to \$2,500, will be awarded by the School of Graduate Studies on the recommendation of the Departments of English and History.

8.3.100 Richard A. Rempel Graduate Scholarship in History

Established in the year 2000 by family, friends and colleagues, to honour Richard A. Rempel's contribution to graduate supervision in the M.A. and Ph.D. programs in History. To be awarded annually by the School of Graduate Studies to a currently registered M.A. or Ph.D. student upon the recommendation of the Department of History.

8.3.101 The Douglas C. Russell Memorial Awards**The Douglas C. Russell Memorial Scholarships**

The Douglas C. Russell Memorial Scholarships were established in 1972 to be made available to students registered in the graduate programs in the Faculty of Health Sciences which offer a doctoral degree. Two scholarships are available annually to first class students entering a graduate program in the Faculty of Health Sciences. The scholarships are currently valued at \$13,000 and may be held only once. These prestigious awards will be made on the basis of merit by the University on the recommendation of the Dean of Health Sciences and will be noted on the student's transcript.

The Douglas C. Russell Memorial Bursaries

Two bursaries, valued at \$4,000 each, will be awarded annually to students entering or enrolled in a Ph.D. degree-granting graduate program in the Faculty of Health Sciences to enable them to commence or continue graduate studies. The Bursaries may be held only once. These awards will be made by the University on the recommendation of the Dean of Health Sciences. These bursaries are based on need and will not be recorded on the student's transcript.

8.3.102 The E.B. Ryan Scholarship

Established in 1997 using funds raised by a performance of the play *Letter from Wingfield Farm*, this scholarship is to be awarded to in-course graduate students from the Faculties of Social Sciences and Health Sciences conducting research on aging. This award, valued at a maximum of \$2,000, is awarded by the School of Graduate Studies on the recommendation of a committee comprised of at least the Director and the Co-ordinator of the Office of Gerontological Studies.

8.3.103 The Shelley Saunders Scholarship in Anthropology

Established in 2008 by Shelley Saunders. A variable number of scholarships are to be awarded, on the recommendation of the Department of Anthropology, by the School of Graduate Studies, to graduate students who have demonstrated a high level of achievement. Preference will be given to students who are studying Skeletal Biology or Physical Anthropology.

8.3.104 The Dr. Denis Shaw Memorial Award

Established in 2004 by friends, colleagues and former students in memory of Dr. Denis Shaw. To be awarded to a graduate student in the School of Geography and Earth Sciences to attend the annual meeting of the Geochemical Society or a similar organization. Selection will be made by the School of Graduate Studies on the recommendation of the Director of the School of Geography and Earth Sciences. Preference will be given to a Ph.D. student in Geochemistry.

8.3.105 Shell Canada Graduate Research Fellowships in Chemical Engineering

These fellowships were established by Shell Canada in 1983 to encourage excellence in research in Chemical Engineering. Up to two awards, normally valued at \$3,000 each, will be made each year: selection is based on the candidate's research achievements and potential. Recipients will be graduate students in Chemical Engineering, normally in their first or second year of Doctoral study.

Awards are renewable once, subject to maintaining a high level of research progress. Awards will be made by the School of Graduate Studies on the recommendation of the Chair of the Department of Chemical Engineering.

8.3.106 The Krishna Sivaraman Memorial Scholarship

Established in 2004 in loving memory of Dr. Krishna Sivaraman. To be awarded to a student in the Master's or Doctoral program in Religious Studies. The School of Graduate Studies will award the scholarship on the recommendation of the Chair of the Department of Religious Studies, taking into consideration academic achievement and a demonstrated interest in Hinduism and Indian Philosophy.

8.3.107 The Dr. Walter Smeltzer Memorial Scholarship

Established in 2000 by Mrs. Grace Smeltzer in memory of her husband, Dr. Walter William Smeltzer, researcher and professor in Materials Science at McMaster University from 1959 to 1992. To be awarded to a student in the Department of Materials Science and Engineering (MSE) who is deemed to have submitted the most outstanding graduate thesis over the previous two-year period. Ph.D. theses will be recognized in even-numbered years, and Master's theses recognized in odd-numbered years. The School of Graduate Studies will award the scholarship on the recommendation of the Department of Materials Science and Engineering. Value: \$1250

8.3.108 The Stelco-McMaster Graduate Fellowship

Established in 1996 by McMaster in recognition of Stelco's ongoing commitment to McMaster graduate students. One scholarship, currently valued at \$12,000, to be awarded annually to the graduate student demonstrating the most promising research in Ferrous Metallurgy. This scholarship will be awarded by the School of Graduate Studies on the recommendation of the Chair of Materials Science and Engineering.

8.3.109 The United Empire Loyalists (Hamilton Branch) Scholarship

Established in 2004 by the United Empire Loyalists' Association of Canada (Hamilton Branch) to support research in Canadian History. The award to be made by the School of Graduate Studies on the recommendation of the Department of History to a graduate student conducting archival research in Canadian History for the period 1750 to 1850.

8.3.110 The John H.T. Wade Scholarship

Established in 1986 by Dr. John H.T. Wade, who made valuable contributions over many years as a professor and Chair of Mechanical Engineering and as acting Dean of Engineering. The scholarship of \$500 will be awarded to an entering Master of Engineering student in the Department of Mechanical Engineering studying in the area of Thermofluid Sciences and will be based on her or his academic entrance qualifications. The scholarship is awarded annually by the School of Graduate Studies on the recommendation of the Chair of Mechanical Engineering.

8.3.111 The Howard P. Whidden Graduate Scholarship

This scholarship was established in 1987, and is open to non-Canadian students from countries of the British Commonwealth. This prestigious award is open to students who qualify for admission into any graduate program that extends to the doctorate, although the student's initial registration may be at the Master's level. The award is once renewable contingent upon satisfactory academic performance. It will be awarded at the discretion of the School of Graduate Studies and is currently valued at \$5,000.

8.3.112 The Dr. Vivian Wood Graduate Scholarship

Established in 2003 by Vivian and Albert Wood and the School of Nursing to support the education of a graduate student enrolled in the Nursing Program at McMaster. The scholarship is tenable for up to two years provided the recipient maintains a high level of progress and academic achievement. The scholarship will be made by the School of Graduate Studies on the recommendation of the Coordinator of the Graduate Nursing Program.

8.4 Medals, Prizes and Other Awards Awarded by the University

These awards are available only to full-time graduate students.

8.4.1 The Robert B. Anderson Memorial Prize for Leadership and Excellence

This prize has been established in memory of Robert B. Anderson, Professor in the Department of Chemical Engineering from 1965 to 1987, to perpetuate the spirit of human compassion and research excellence that he so clearly demonstrated during those years. The prize will be awarded annually to a worthy graduate student on the recommendation of the Department of Chemical Engineering. Approximate value: \$500.

8.4.2 The Norm Archer Endowed Prize

Established in 2002 by Professor Archer's Ph.D. students and the Faculty of Business in honour of Professor Archer's outstanding contribution to his students at the Michael G. DeGroot School of Business. To be awarded to a student entering level 3 of the Ph.D. program in Business Administration in the fields of Management Science or Information Systems who, in the judgment of the Michael G. DeGroot School of Business, has demonstrated the highest degree of commitment, excellence and integrity in scholarship, in both courses taken and in research. The prize will be awarded at the discretion of the awards committee and may not be awarded annually. Value: \$1,000.

8.4.3 The Judge Hugh C. Arrell Memorial Prize in Social Work

This prize was established through the generosity of friends and associates of the late Judge Hugh C. Arrell, formerly Judge of the Juvenile and Family Courts, Hamilton. An award will be made annually at Fall Convocation on the recommendation of the Director of the School of Social Work, to the M.S.W. graduate who submitted the best Thesis to meet the requirements of the program.

8.4.4 Myra Baillie Academic Grant

Established in 2005 by the Surgical Associates in memory of Myra Baillie. To be granted to a graduate student in any degree program who attains an "A" average and demonstrates financial need. Preference will be given to a mature female graduate student.

8.4.5 Ronald Bayne Gerontology Award

Established in 1999 by Barbara Bayne to honour Dr. Ronald Bayne's valuable contribution to the study of Gerontology at McMaster University. To be awarded by the School of Graduate Studies on the recommendation of the Director of the Office of Gerontological Studies to any graduate student in the Faculties of Humanities or Social Sciences conducting research in the field of aging.

8.4.6 Buchanan's Bounty Trust Book Prize

This award was established by Mr. Walter A. Buchanan of Winnipeg in 1963 to provide a book fund for graduate students in English and History at several Canadian universities including McMaster. Awards are made annually to one or more graduate students in English or History programs at McMaster.

8.4.7 The Ezio Cappadocia Graduate Prize in European History

Established in 1998 by Dr. Ezio Cappadocia, Chair of the Department of History from 1970 to 1977. This prize honours excellence in graduate course work in European History. Currently valued at \$250, the prize is awarded annually by the School of Graduate Studies to an M.A. graduand on the recommendation of the Chair of the Department of History.

8.4.8 Dr. John H. Chapman Memorial Prize in Communications Engineering

Donated by Spar Aerospace Limited, Toronto, in memory of the late Dr. John H. Chapman; these awards have been provided in recognition of Dr. Chapman's work and contribution in satellite communications, which resulted in his becoming known as "*the father of Canada's space programs.*"

A prize of \$1,500 is open to McMaster graduates entering a graduate program in the Communications Research Laboratory of the Department of Electrical and Computer Engineering, McMaster University. The award will be made annually by the School of Graduate Studies on the recommendation of the Director of the Communications Research Laboratory.

8.4.9 The David S. Daly Academic Grant

Established in 2005 by David Daly '82 (M.A., Economics). To be granted to a student pursuing graduate work in the Department of Economics who attains an "A" average and demonstrates financial need.

8.4.10 The Karl Freeman Prizes in Biochemistry Graduate Seminars

Established in 2001 by Karl Freeman, Chair of the Department of Biochemistry from 1973 to 1979 and acting chair for six months during 1982. To be awarded to graduate students in the Department of Biochemistry who are deemed to have presented the most outstanding graduate seminars. The School of Graduate Studies will award the prizes on the recommendation of the Department of Biochemistry.

8.4.11 The Dr. Ronald J. Gillespie Prize in Inorganic Chemistry

Established in 2009 by friends and colleagues in honour of Prof. Ronald J. Gillespie, F.R.S., F.R.S.C., F.R.S.C. (U.K.), F.C.I.C., C.M., in recognition of 50 years of significant contributions to research and scholarly teaching in the Department of Chemistry at McMaster University. To be awarded by the School of Graduate Studies to a student enrolled in a Ph.D. program in inorganic chemistry, who in the judgment of a selection committee comprised of the Associate Chair of Chemistry responsible for graduate studies and inorganic chemists within the Department of Chemistry, demonstrates outstanding scholastic achievement and innovative research that embraces elements of fundamental inorganic chemistry.

8.4.12 Governor General's Gold Medal

The Gold Medal will be awarded to the graduate student who achieves the highest academic standing in his/her graduate degree program. All students who have completed a graduate degree since the time of the last competition shall be automatically eligible. The School of Graduate Studies will select the winner and the award will be made at the Autumn Convocation.

8.4.13 The Anne Hall Memorial Prize

The Anne Hall Memorial fund was established in 1989 by family and friends in memory of a very special physiotherapist who died prior to completing her doctoral studies in Medical Sciences at McMaster. An amount of \$500 will be available yearly to a physiotherapy graduate student enrolled in the Faculty of Health Sciences at McMaster University or to a student registered in the M.Sc. in the Physiotherapy program. The funds are to be used to enable travel to a professional conference to present a paper or poster during an academic year.

8.4.14 Betty Horricks Research Endowment Fund

Established in 2005, to be awarded on an annual basis to a graduate student registered in the Molecular Biology Genetics and Cancer Program with preference given to a student beginning research in the area of bone marrow and blood cancer.

8.4.15 The Alfred Hunter Memorial Award

Established in 1995 in memory of Dr. Alfred A. Hunter, professor at McMaster from 1984-1993 and Chair of the Sociology Department from 1986-1993, by his family and friends. The award will be presented at the fall convocation by the School of Graduate Studies on the recommendation of the Chair of the Department of Sociology to a Ph.D. graduate in recognition of academic excellence. The award's current value is \$1,000.

8.4.16 Robert Joyner Doctoral Student Publication Prize

Established in 1993 in honour of Dr. Robert C. Joyner, Dean of the Faculty of Business from 1974-1979, under whose leadership the doctoral program was initiated. To be awarded annually to a student in the doctoral program in business administration who, in the judgement of the Faculty of Business Graduate Awards Committee, publishes or has accepted for publication the best research paper in that year. Value \$250

8.4.17 The David Alan Reid Kay Memorial Prize

This prize has been established in memory of David Alan Reid Kay, Professor in the Department of Materials Science and Engineering from 1969 to 1997 to perpetuate the spirit of service to the university and materials community, as well as research excellence for which he was so well known. The prize will be awarded annually to a graduate student registered in Materials Science and Engineering based on the criteria above by the School of Graduate Studies on the recommendation of the Chair of the Department of Materials Science and Engineering.

8.4.18 The H.W. McCready Graduate Prize in History

The Department of History established this graduate prize to honour the memory of the late Dr. H.W. McCready, Chair of the Department of History from 1961 to 1964 and Messecar Professor of History from 1973 to 1975. The prize, currently valued at \$500, is awarded annually at the Fall Convocation to a worthy M.A. graduand on the recommendation of the Chair of the Department of History.

8.4.19 The Aileen McPhail Memorial Prize

Established in 1989 in memory of Aileen McPhail, Associate Professor in Nursing (McMaster University) and Director of Nursing Services (Chedoke-McMaster Hospital, McMaster Division), by her family and friends. To be awarded annually by the School of Graduate Studies on recommendation of the Co-ordinator of the Clinical Health Sciences (Nursing) Program to a worthy student who holds the RN. Preference will be given to those who have indicated an interest in the study of Oncology.

8.4.20 Thomas Neilson Scholarship

The Neilson Scholarship will be awarded to the Biochemistry graduate student deemed to show the greatest potential as an independent scientist at the time of transfer to the Ph.D. program.

The Neilson Scholarship will be awarded by the School of Graduate Studies on the recommendation of the Departmental Graduate Admissions Committee based upon performance in the program with particular emphasis upon the overall academic standing, supporting letters, contributions to teaching, the seminar presentation, the transfer report, research contributions and publications. The award will not necessarily be given every year and may be given twice in a given year. Value: \$1,000.

8.4.21 The Lee Nielson Roth Award

Established in 1986 by Judith L. Roth (Nielson '53) in memory of her son, Lee. The award, currently valued at \$1,000, is made annually to a doctoral student in Medical Sciences, Biochemistry, or Biology of high academic standing who is working in the area of cancer research.

8.4.22 The Social Work Alumni Anniversary Award

Established by the Alumni of the School of Social Work in 1993, in recognition of the 25th anniversary of the School. The award is designed to promote social work study at the graduate level in the fields of practice and policy. The successful recipient will be a graduate of McMaster's B.S.W. program, have received the highest mark in the Personal Statement section of the application process, and have been admitted as a full-time student in the M.S.W. program.

8.4.23 The Radisav Stevanovic Memorial Book Award

Established in 2005 in memory of the late Radisav Stevanovic, to provide a book fund for graduate students in French and Engineering Physics. Two awards will be made annually by the School of Graduate Studies on the recommendation of the Chairs of the respective departments. Eligible students will not hold major scholarship and demonstrate a keen interest in reading. Value: Two awards at \$250 each.

8.4.24 The John H.T. Wade Medal

Established in 1986 by Dr. John H.T. Wade, who made valuable contributions over many years as a professor and Chair of Mechanical Engineering and as Acting Dean of Engineering. The medal is awarded to a student in Mechanical Engineering on the basis of his or her contribution to Mechanical Engineering as exemplified by the Master of Engineering thesis submitted within the academic year. The medal is awarded annually by the School of Graduate Studies on the recommendation of the Chair of Mechanical Engineering.

8.4.25 Friends of E.M. Wightman Essay Prize

The income derived annually from a trust in memory of Edith M. Wightman provides funds for an award, established in 1985-86, to be made annually for the purchase of books for a graduate student registered in an M.A. course in the Department of History for "that essay, written by an M.A. student, which is adjudged best to display a combination of imagination and originality with a comprehensive and accurate command of relevant scholarship."

The judging committee, to be appointed by the Chair of the History Department, would include at least one professor of Ancient History, and would be instructed to give particular consideration to essays utilizing interdisciplinary approaches and/or incorporating archaeological materials or methodologies.

8.4.26 The Wingfield Graduate Scholarship

Established in 1994, using funds raised by a performance of *Letter from Wingfield Farm*, with the support of Cresmount and Markey Dermody Funeral Homes, Fortino's Supermarkets, The Firan Foundation, the Ross and McBride Law Firm and Copies Plus. This scholarship is to encourage the study of gerontological issues in Social Work and is awarded by the School of Graduate Studies on the recommendation of the School of Social Work. This scholarship will be awarded annually early in the second term to an M.S.W. student whose thesis is in the area of gerontological social work, based on the student's marks from the completion of the first term courses and on the quality of the student's research proposal. Applications are to be submitted to the Director, School of Social Work by February 1, along with a copy of an approved research proposal.

8.5 Travel Grants

8.5.1 GSA Travel Assistance Grants

GSA Travel Assistance Grants are funded from the proceeds of the Graduate Students Association Development Fund, which received contributions from graduate students and the University. Travel Assistance Grants are designed to enable graduate students to travel to undertake research or present at conferences relevant to their field of study. A minimum of 10 awards of \$500 will be awarded each term. Grants are administered by the School of Graduate Studies and reviewed by a committee of the Graduate Students Association (GSA).

Applications may be obtained by contacting the GSA, Wentworth House, Room 109A or the School of Graduate Studies Office.

8.5.2 The James F. Harvey and Helen S. Harvey Travel Scholarship

Established in 1995 with funds from the estate of Helen S. Harvey. James F. Harvey was a member of the first McMaster graduating class in Hamilton in 1935. This travel scholarship will enable students to engage in research requiring travel. The candidates will be selected and the scholarship awarded on the basis of academic performance in any program. Up to three awards, normally valued at \$1,000 each, will be available each year. Awards will be made by the School of Graduate Studies on the recommendation of departments. Please note that "conference travel" is not permitted.

8.5.3 The Mary Margaret Scammell Travel Scholarship

Established in 1994 by family and friends in memory of Mary Scammell, this scholarship currently valued at \$600 is awarded by the School of Graduate Studies on the nomination of the Department of Religious Studies. This award is available to students registered in or admitted to a McMaster graduate program in Religious Studies to help support travel costs associated with thesis research or language study.

8.5.4 The Albert Shalom Travel Scholarship (Philosophy)

Established in 1994 by family, friends and colleagues of Albert Shalom, Professor of Philosophy at McMaster University from 1966 to 1991. Currently valued at \$550, it is to be awarded by the School of Graduate Studies on the recommendation of the Department of Philosophy. The award is available to graduate students registered in a Philosophy program to help support travel costs associated with study overseas as part of their graduate program.

8.5.5 The Edith M. Wightman Travel Scholarship

This scholarship, established in 1984 through funds bequeathed by the late Edith M. Wightman, Professor of History, and valued at \$1,000, is awarded by the Scholarships Committee of the School of Graduate Studies on nomination from the Department of History, Classics, or such other departments as may from time to time have eligible students. The award is available to students registered in or admitted to a McMaster graduate program in ancient history or archaeology, to help support travel costs associated with thesis research or sponsored archaeological projects in Europe and the Mediterranean.

8.5.6 The Yates Scholarship Fund

Established in 1963 by the bequest of William Henry Yates, this Fund has been used latterly to assist upper-level doctoral students with research activities and conference travel when a paper is being delivered. Assistance is normally available only to full-time doctoral students in their third or fourth year of study who have passed comprehensives. The support available is limited. Application should be made to the Associate Vice President & Dean of Graduate Studies, through the Research Supervisor. Further details are available from the Associate Vice President & Dean of Graduate Studies' Office.

8.6 Bursaries Awarded by the University

All bursaries have financial need as an integral component and as a necessary requirement. Bursaries marked with an asterisk (*) were partially funded by the Ontario Ministry of Education and Training Student Opportunity Trust Funds Program and are therefore available only to students who are considered residents of Ontario as defined by the Ontario Student Assistance Program (OSAP).

8.6.1 The Laura Babiski Memorial Bursary

Established in 2000 in loving tribute to Laura Babiski, Clinical Lecturer, Occupational Therapy, in the School of Rehabilitation Science from 1991 to 2000. This bursary is to be awarded by the School of Graduate Studies on the recommendation of the School of Rehabilitation Science to a student in Year II of the Master of Clinical Health Sciences, Occupational Therapy Program, who has achieved excellence in mental health practice, demonstrated by passion for this practice area, compassion for individuals with serious mental illness and their families, recognition, advocacy and action for system change and demonstrates financial need.

8.6.2 Barkley's of Avonmore Bursary

The Barkley's of Avonmore Bursary was established in 1977 through the generosity of Fred Barkley to assist a student from a "Third World" country to pursue advanced studies at McMaster University. Each year the Associate Vice President & Dean of Graduate Studies will identify a worthy graduate student from one of the "Third World" countries to receive this award.

8.6.3 The Oded Bar-Or Bursary

Established in 2007 by the Bar-Or family in memory of Oded Bar-Or, founder of the Children's Exercise and Nutrition Centre (CENC). To be granted by the School of Graduate Studies on the recommendation of the Director of the CENC to a graduate student who demonstrates financial need and is enrolled in Medical Sciences, Rehabilitation Science, or Kinesiology, and is conducting research in pediatric exercise and/or pediatric nutrition. Preference will be given to students conducting research at the CENC of McMaster Children's Hospital.

8.6.4 The Sidney L. Blum Bursary

Established in 1989 by friends and associates in memory of Sidney L. Blum. To be awarded by the School of Graduate Studies, on the recommendation of the Student Financial Aid and Scholarships Office, to any graduate student in good standing in the Master's program of the School of Social Work.

8.6.5 E.G. Brooman Bursary in Chemistry

Established in 1995 with funds from the estate of Mr. E.G. Brooman, a staff member in the Department of Chemistry from 1967 to 1987. This bursary is to be awarded by the School of Graduate Studies, on the recommendation of the Chair of the Department of Chemistry, to a graduate student registered in a graduate program in Chemistry.

8.6.6 CIBC Graduate Bursaries in Breast Cancer

Established in 2004 by CIBC under the McMaster Student Opportunity Fund II initiative in support of CIBC's belief that all students should have the opportunity to pursue their educational goals. To be granted first to students enrolled in a graduate program in the Faculty of Health Sciences who demonstrate financial need and are conducting thesis research in the field of breast cancer and alternatively to students who are conducting thesis research in the field of women's health, obstetrics, gynaecology or medical oncology. Preference will be given to full-time graduate students who have demonstrated academic excellence.

8.6.7 The William H. Fleming Bursaries

Established in 2005 by bequest of William H. Fleming. To be granted to undergraduate or graduate students in any program who demonstrate financial need.

8.6.8* The Gwen George Graduate Bursaries

Established in 1997 in loving memory of Gwen George by her family and friends under the McMaster Student Opportunity Fund initiative. Preference to be given to second year Master's students in any graduate program leading to a Ph.D. in the Faculty of Humanities or Faculty of Social Sciences at McMaster who have demonstrated financial need.

Demonstrated leadership and service to McMaster University and/or the Hamilton-Wentworth and surrounding communities will be a consideration. These bursaries are to be awarded by the School of Graduate Studies.

8.6.9 The Walter Gibbins Memorial Travel Bursary

This award was established in 1994 in honour of Dr. Walter Gibbins, who received his Ph.D. in Geology at McMaster in 1974. A well-known geologist, Walter held the position of Arctic District Geologist for the Department of Indian Affairs in Northern Development, based in Yellowknife. It is to be awarded annually to a graduate student in Earth Sciences by the School of Graduate Studies on the recommendation of the Chair of the School of Geography and Earth Sciences. This award will help support travel costs to deliver a paper at an international research conference.

8.6.10 The Graduate Students Association Bursary

Established in 1999 by the Graduate Students Association at McMaster University under the McMaster Student Opportunity Fund initiative. To be granted to a full- or part-time graduate student in one of the following Faculties: Engineering, Health Sciences, Humanities, Science, Social Sciences or the Ph.D. program in Business. The bursary will be awarded annually by the School of Graduate Studies on the recommendation of the Graduate Students Association.

8.6.11* Manske-MacLean Bursaries in Chemistry

The initial funds for these awards were realized through the sale of specimens (alkaloids and related compounds), from the research collections of the late R.H.F. Manske (1901-1977) and the late D.B. MacLean, and were augmented by a generous donation from Merck-Frosst, Montreal. R.H.F. Manske, B.Sc., M.Sc. (Queen's), Ph.D. (Manchester), D.Sc.Hon. (McMaster) conducted pioneering research in alkaloid chemistry and was founding editor of "The Alkaloids", a definitive and ongoing series in this area of chemistry. D.B. MacLean was introduced to alkaloid chemistry by Manske at the Research Laboratories of the Dominion Rubber Co. The study of alkaloids and related heterocycles became the focus of his research at McMaster, which he joined in 1954. He was Professor Emeritus in the Department of Chemistry. These bursaries are to be awarded to graduate students in Chemistry by the School of Graduate Studies on the recommendation of the Chair of the Department of Chemistry.

8.6.12* The Robert John Morris Graduate Studies Bursary

Established in 1996 by family, friends and colleagues of Robert John Morris. To be granted to graduate students in good academic standing who demonstrate financial need. Whenever possible, preference will be given to Engineering students studying in the area of nuclear engineering or advanced energy systems or students in the Faculty of Humanities or Faculty of Social Sciences.

8.6.13 The John C. Munro Hamilton International Airport Bursary

Established in 1997 by The John C. Munro Hamilton International Airport. To be granted to graduate students in the Faculties of Business, Engineering, Science or Social Science who demonstrate financial need. Preference will be given to graduate students who are conducting research related to commercial transportation issues and policy, specifically the role of transportation in stimulating regional economic development and trade.

8.6.14 Passi Bursary

Established in 1997 by Chitra and Narendar Passi under the McMaster Student Opportunity fund initiative in the belief that all students should have the opportunity to pursue their educational goals. To be granted by the School of Graduate Studies upon the recommendation of the Chair of Religious Studies to a graduate enrolled in the Department of Religious Studies who demonstrates financial need and is studying Hinduism and Jainism.

8.6.15 Purchasing Management Association of Canada - Hamilton District Bursary

Established in 2007 by the Purchasing Management Association of Canada - Hamilton District. To be granted to a student enrolled in the Supply Chain Management specialization of the MBA program who demonstrates financial need.

8.6.16 Raynsford-Eatock Graduate Travel Bursary in Greek Studies

Established in 2006 in memory of Marilyn Raynsford-Eatock through funds bequeathed by her father, Frederick Raynsford. It is awarded to students enrolled in a graduate program in Classics to help support travel costs for research on the ancient Greek world, including: participation in archaeological excavations, study programs at foreign schools, intensive summer programs in papyrology or epigraphy, and museum or archival work in specialist libraries. To be awarded by the School of Graduate Studies on the recommendation of the Chair of the Classics Department. Current value: \$4,000

8.6.17 The Monica Scarabello Memorial Bursary

Established in 1997 by colleagues and friends in memory of Monica Scarabello. To be granted to a student who demonstrates financial need and is enrolled in a Master of Science program in the Department of Biology. Preference is given to graduate students who have demonstrated research excellence. This bursary is to be awarded by the School of Graduate Studies on the recommendation of the Chair of Biology.

8.6.18 The School of Rehabilitation Science Graduate Bursary

Established in 2004 by the School of Rehabilitation Science through the generosity of its alumni and friends under the McMaster Student Opportunity Fund II initiative. To be granted to a student in the graduate program in Rehabilitation Science who demonstrates financial need. The bursary will be granted by the School of Graduate Studies on the recommendation of the School of Rehabilitation Science.

8.6.19 The Marion Northcott Schweitzer Travel Bursaries

Established in 1994 by Marion N. Schweitzer, who is an alumna of the Class of 1933 – the first class to have all the courses at McMaster University in Hamilton – in gratitude for the opportunity given her to provide travel bursaries to students enrolled in the Department of English and Cultural Studies doctoral program. The travel bursaries will enable students either to engage in research requiring travel or permit students to deliver papers at academic conferences. The candidates will be selected and the bursary awarded on the basis of academic performance in the doctoral program to date. The bursaries will be awarded by the School of Graduate Studies on the recommendation of the Department of English and Cultural Studies.

8.6.20* The Stelco Graduate Bursaries

Established in 1996 by Stelco – a market-driven, technologically advanced group of businesses committed to maintaining leadership roles as steel producers and fabricators – in support of graduate students pursuing their educational goals. These bursaries will be awarded by the School of Graduate Studies to students enrolled in any graduate program who demonstrate financial need. Preference may be given to graduate students in the Faculty of Engineering.

8.6.21 Catherine Jane Stephenson Memorial Bursary

Established in 2005 by Jean and Bruce Stephenson in memory of their daughter, Catherin Jane Stephenson, a 1978 graduate of McMaster University. To be granted to a student in the School of Graduate Studies, enrolled at the Master's or Ph.D. level in biology and who demonstrates financial need. Preference will be given to students whose research is located in Northern Canada, including northern parts of the provinces.

8.6.22 Dr. John Thomas Memorial Bursary

Established in 1996 in memory of Dr. John Thomas by family, friends and colleagues. The bursary fund will assist graduate students enrolled in the Department of Philosophy or the Faculty of Health Sciences who demonstrate financial need. To be awarded by the School of Graduate Studies with preference given to students studying medical or applied ethics.

8.6.23 The Diane and Colin Wood Bursary in Respiratory Health

Established in 2008 by Diane Wood and Colin Wood, B.Comm (Class of '78). To be granted by the School of Graduate Studies, on the recommendation of the Director of the Firestone Institute for Respiratory Health, to a graduate student who demonstrates financial need and is conducting research in the area of chronic obstructive pulmonary disease (COPD). Preference will be given to students studying emphysema.

8.6.24 The Cecil and Yvette Yip Graduate Bursaries

Established in 2003 by Dr. Cecil Yip (Class of 1959) and Mrs. Yvette Yip to recognize and encourage graduate students whose innovative work in the physical sciences and engineering crosses formal disciplinary boundaries. Preference will be given to students in any graduate program in the Faculty of Science or the Faculty of Engineering whose thesis research demonstrates excellence in integrating engineering science within the study of biology. The students must also demonstrate financial need to be eligible. A variable number of bursaries are to be awarded by the School of Graduate Studies.

8.7 Faculty of Business Awards List

The Faculty of Business has several awards either given by the Faculty or tenable in its programs. A list follows below. Details are available from the DeGroote School of Business M.B.A. Calendar or visit the website at <http://www.degroote.mcmaster.ca/MBA/registration.html>.

The University reserves the right not to grant an award in the absence of a suitable candidate, and to limit the number of awards when there are too few suitable candidates. The University also reserves the right to withdraw, or amend the terms of, any award, and to suspend granting of an award or to adjust the stated value of an award in years in which insufficient investment income is available due to fluctuations in investment markets. In the event a student withdraws from the MBA program before completion of the full Year 1 or full Year 2 courses, any scholarship monies granted must be paid back in full before the withdrawal becomes official.

The AIC Scholarship
 The Alumni MBA Scholarships
 The Avery Award
 The Alexander and Jack Bart Memorial Bursary
 The Basu Medal
 Joyce Borden-Reed/Computershare Scholarship
 Canadian College of Health Service Executives Scholarship
 Canadian Tire Scholarship in eBusiness
 J.I. Case Scholarship
 The Maria Chan Scholarship for International Studies in Business
 City of Hamilton Economic Development Department MBA Scholarships

The Allan and Lynne Cole M.B.A. Award
 The Courtyard Group MBA Scholarship
 The John Deere Foundation Graduate Scholarships in MINT
 DeGroote School of Business M.B.A. Entrance Scholarships
 The DeGroote School of Business Scholarship in Electronic Business
 The DeGroote School of Business Scholarship
 Ford of Canada M.B.A. Travelling Fellowship
 The GE Fund Graduate Bursaries in Electronic Business
 The Angela Gregoris MBA Bursary
 Allan J. Greve - St. Joseph's Healthcare Medal
 The Guerino and Anna Maria Marinucci Academic Grant
 The Victor & Helen Harshaw Fellowship in Business Administration
 D.M. (Mike) Hedden Gold Medal
 Kathryn Huget Leadership Award
 Harish Jain Human Rights in Employment Bursary
 The Jan Kelly Marketing M.B.A. Scholarship
 The Labatt Breweries of Canada Academic Grant
 The Litvak Medal in Marketing
 G.J. Lozinski Foundation Scholarship
 The MBA Class of 1988 Greg Brophy Memorial Scholarship in
 Principled Leadership
 M.B.A. Co-op Leadership Achievement Award
 The M.B.A. Games Board of Directors Bursary
 Mutual Group Graduate Scholarship
 Ontario Graduate Fellowship
 Ontario Graduate Scholarships
 The Otis Canada Bursaries in the MBA Program
 The Rob MacIsaac Leadership Award
 The McKinley Perrin M.B.A. Academic Grant
 The Peirce Family Academic Grant
 The Purchasing Management Association of Canada - Hamilton
 District Bursary
 Royal LePage Commercial Inc. Scholarship
 Lillian Russell Award
 The William J. Schlatter Scholarship
 The R.J. Spence Memorial Medal
 Kathryn Ann Williamson Bursary
 The Women in Capital Markets, Heather L. Main Memorial
 Scholarship
 Zonta Club of Hamilton Scholarship

8.8 External Agency Awards to McMaster Graduate Students

8.8.1 Alcan Research Fellowships

The Aluminum Company of Canada Limited offers a fellowship, currently valued at \$18,000 at the master's level and \$20,000 at the doctoral level, to full-time graduate students at McMaster registered in pure or applied sciences related to Alcan's activities. The fellowship is renewable for one year at the Master's level and two years at the doctoral level. In deciding the award both the student's academic record and potential to pursue research of an industrial nature will be taken into account. Alcan will establish contact with the student shortly after his/her appointment. Where appropriate, a closer working relationship may be developed between the award holder and Alcan Laboratories.

8.8.2 Centre for Health Economics and Policy Analysis Studentship (CHEPA)

The Centre for Health Economics and Policy Analysis provides 2-3 awards annually to McMaster graduate students who have an interest in Health Policy Analysis and/or Health Economics. The awards provide students with an opportunity to gain research experience and skills in an inter-disciplinary environment, by working on their own projects or ongoing projects of the Centre or its Faculty. Contact Doris Hutchinson at 905 525-9140 Ext. 22018.

8.8.3 The E.S. Garnett Bursary in Medical Imaging

Established in 1996 with funds donated to Chedoke-McMaster Hospitals Foundation by the Christie Group Ltd., the E.S. Garnett Bursary in Medical Imaging is awarded annually to a graduate student at McMaster University whose area of research is related to medical imaging and will be based on the potential excellence of the student.

The selection for the bursary, currently valued at \$2,000, will be made by the Chedoke-McMaster Hospitals Foundation on the recommendation of the Scientific Review Committee. Contact: Chair of Radiology - Chedoke-McMaster Hospitals.

8.8.4 The United Nations Association of Hamilton & District Graduate Bursary

The United Nations Association of Hamilton & District commemorated its 50th Anniversary in 1995 by establishing a bursary, currently valued at \$500, for graduate students in any program who are undertaking field training or volunteer work among other cultures in regions distant from McMaster University or regions difficult to access.

Students will demonstrate in the letter of application an awareness of how their activity relates to current United Nations endeavours. The student's current Curriculum Vitae and a letter from the student's faculty advisor are also required. Student academic performance will be taken into account. Selection will be made by the Hamilton Community Foundation. Contact the Hamilton Community Foundation at 905 523-5600.

8.9 General Awards List

8.9.1 The Association of Universities and Colleges of Canada (AUCC) Registry

The Association of Universities and Colleges of Canada (AUCC) maintains a registry of scholarships. For a complete list of scholarships tenable at this and other universities across Canada, students may refer to the guide published by Association of Universities and Colleges of Canada, 350 Albert St., Suite 600, Ottawa, Ontario, Canada K1R 1B1.

8.9.2 The International Council for Canadian Studies (ICCS) and Foreign Government Awards

The International Council for Canadian Studies (ICCS) administers the Foreign Government Awards Program. Through this program, the following foreign governments offer awards to Canadian graduate students each year: Colombia, Finland, France, Germany (DAAD), Mexico, Spain, Poland. Application forms and detailed information for the Foreign Government Awards Program may be obtained from the School of Graduate Studies or the Program Officer, Foreign Government Awards, International Council for Canadian Studies (ICCS), 325 Dalhousie Street, Suite 800, Ottawa, Ontario, Canada K1N 7G2. Enquiries: (613) 789-7828, Fax: (613) 789-7830.

8.10 Health-Related Research Awards List

Awards in support of health-related research are available from numerous institutions. A partial listing follows below. McMaster students should direct enquiries to the Health Sciences Graduate Programs Office.

Alzheimer Society
 Canadian Cancer Society
 Canadian Cystic Fibrosis Foundation
 Canadian Liver Foundation
 Canadian Nurses Foundation
 Heart and Stroke Foundation of Canada
 Multiple Sclerosis Society
 Muscular Dystrophy Association
 Ontario HIV Treatment Network
 Ontario Mental Health
 Ontario Respiratory Care Society
 The Savoy Foundation

9. GOVERNING BODIES

9.1 Board of Governors

The Board of Governors of McMaster University is composed of 37 members in addition to several honorary governors. The Chancellor, the President and the Chair of the University Planning Committee are *ex officio* members of the Board. In addition to 11 members elected by the Board itself from the community, other governors are elected or appointed to the Board by various constituencies: one by the Divinity College, five by the Alumni Association, three by the Senate, four by the teaching staff, two by the non-teaching staff, one by the undergraduate students, one by the graduate students, and six by the Lieutenant Governor in Council.

Except for matters assigned to the Senate under The McMaster University Act (1976), the government, conduct, management and control of the University and of its property, revenues, business and affairs are vested in the Board. Recommendations from the Senate concerning senior University appointments, faculty appointments, and major changes in University programs that have significant financial implications are presented for final approval by the Board.

Board members serve on several Standing Committees. Of major importance is the Board's Finance Committee which exercises general supervision over the financial affairs of the University. It examines financial statements and reviews budgets and makes recommendations thereon to the Board. Capital expenditures and investment policies are considered, and adequate financial controls to implement policies and decisions adopted by the Board are established.

The other Standing Committees of the Board of Governors are: Audit; Bylaws; Committee on University Advancement; Executive; Human Resources Committee; Nominating; Pension Trust; Planning and Building; Remunerations; University Planning Committee; Board-Senate Hearing Panel for Sexual Harassment/Anti-Discrimination, and Board-Senate Research Misconduct Hearings Panel.

Board representatives also serve on the Senate.
Website: <http://www.mcmaster.ca/univsec>

9.2 Senate

The University Senate consists of approximately 65 members, including the Chancellor, the President (Chair), the Vice-Presidents, the Associate Vice President & Dean of Graduate Studies, the Faculty Deans, three members from the Board of Governors, four members from the Alumni Association, and 32 faculty members. In addition, there are 12 student members, one graduate and one undergraduate from each of the six Faculties. The students are elected by and from the students in their respective Faculties.

The Senate has ultimate responsibility for determining academic policy, which includes new academic programs, changes in curriculum, standards for admission to the University, matters arising in connection with the award of scholarships and prizes, examination policy, academic regulations, procedures for student appeals, criteria and procedures for granting tenure and promotion to faculty members, the codes of conduct for students and so on.

Website: <http://www.mcmaster.ca/univsec>

9.3 Graduate Council

The Graduate Council is a deliberative, administrative, and executive body responsible directly to Senate but otherwise autonomous. Its membership consists of the Chancellor, the President and Vice-Chancellor, the Provost and Vice-President (Academic), the Associate Vice President & Dean of Graduate Studies (Chair), the Associate Deans of Graduate Studies, the Faculty Deans, the University Librarian, the University Registrar, the Secretary of Senate, the Vice-President (Research and International Affairs), the Graduate Registrar and Secretary of the School of Graduate Studies, eighteen faculty members (three from each faculty), and twelve graduate students (two from each faculty).

The responsibilities of the Graduate Council have been specified in some detail by Senate and are outlined in the By-laws of the Senate of McMaster University and the Senate Resolutions. The more significant ones may be summarized by noting that it regulates matters concerning graduate work of common concern to the entire University, acts upon recommendations concerning graduate work from each Faculty upon matters of particular concern to that Faculty, reports to Senate on graduate matters, recommends candidates for graduate degrees, stipulates conditions for the awarding of graduate scholarships, and stipulates the departments eligible to offer graduate work.

9.3.1 Executive Committee of Graduate Council

The Executive Committee of Graduate Council is composed of the Associate Vice President & Dean of Graduate Studies (who acts as Chair), the Associate Deans of Graduate Studies as Deputy Chairs, the President and Vice-Chancellor, the Provost and Vice-President (Academic), one faculty member from each Faculty, and the Graduate Registrar and Secretary of Graduate Studies.

The Executive acts as nominating committee, academic policy committee, and on any other matters put before it by Graduate Council or the Associate Vice-President & Dean. This body acts on behalf of Council in instances where there is some urgency (e.g., during the summer months when there are no regularly scheduled meetings).

9.3.2 Scholarships Committee of Graduate Council

The Scholarships Committee of Graduate Council is composed of the Associate Deans of Graduate Studies (who act as co-chairs) and fourteen faculty members (representing all six faculties).

This committee is responsible for acting upon all recommendations and applications for internal endowed fellowships and scholarships, and external scholarships. Many of the scholarships listed in section 8 refer to the Scholarships Committee in its capacity as a selection committee.

9.4 Standing Committees

9.4.1 Faculty Graduate Curriculum and Policy Committees

Each of the six Faculties has a Committee on Graduate Curriculum and Policy which is responsible for dealing with matters of policy and curriculum affecting the Faculty, including new developments, course changes, changes in degree requirements, and new programs and fields of study arising from departmental proposals. The Faculty then acts upon the recommendations of this committee.

9.4.2 Faculty Graduate Admissions and Study Committees

For each Faculty, there is also a Committee on Graduate Admissions and Study responsible for determining admissibility of any applicant on the recommendation of the department, approving each student's course program, reviewing annually the progress of each student, making necessary decisions thereon, recommending awarding of degrees, deciding upon applications from students for special consideration, and acting as a hearings committee for student appeals and cases of alleged academic dishonesty.

The Secretary of all Committees, to whom business items may be addressed, is the Graduate Registrar and Secretary of Graduate Studies.

10. DEGREE PROGRAMS

Approved degree programs of instruction and research are described in Section 10. The majority of these programs are described under the titles of the departments or schools offering them. However, there are some programs listed, notably those in Health Research Methodology, Nursing, Medical Sciences, and Statistics which cut across departmental lines. Section 11 lists the various interdisciplinary/collaborative areas of research which provide opportunities for graduate study but which are not formally approved degree programs.

Section 12 describes the various graduate diploma programs offered by McMaster. These diplomas consist of course work only in a minimum of four half courses from a predefined list. The diplomas are usually a subset of a larger program and are therefore highly specialized.

The title "Distinguished University Professor", which appears under several program headings, is bestowed upon those faculty who have made a distinguished contribution to the University through research, scholarship, and education.

The courses listed in this Calendar represent the graduate teaching and research interests of each department. Not all courses, however, will be offered each year. Students should check with the department concerned.

Anthropology	50	Computational Engineering and Science	91
Biochemistry	52	Computer Science	95
Biology	54	Cultural Studies and Critical Theory	100
Biomedical Engineering	57	Earth and Environmental Sciences	130
Business Administration	60	Economic Policy	103
Chemical Biology	65	Economics	103
Chemical Engineering	69	eHealth	106
Chemistry	72	Electrical and Biomedical Engineering	109
Civil Engineering	75	Electrical and Computer Engineering	109
Classics	80	Engineering Design (see Walter G. Booth SEP)	220
Cognitive Science of Language	84	Engineering Entrepreneurship and Innovation (see Walter G. Booth SEP)	222
Communications Management	86	Engineering Physics	116
Communication and New Media	89	Engineering and Public Policy (see Walter G. Booth SEP)	223
		English	122
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		Materials Science	157
		Mathematics	161
		Mechanical Engineering	164
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		Medical Sciences	173
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		Nursing	181
		Occupational Therapy	186
		Philosophy	189
		Physics and Astronomy	190
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Political Science	196	Sociology	212
Psychology	199	Software Engineering	88
Radiation Sciences (Medical Physics/Radiation Biology)	171	Software Engineering and Virtual Systems Design	88
Rehabilitation Science	201	Statistics	216
Religious Studies	205	Work and Society	219
Social Work	208		



ANTHROPOLOGY

The Department of Anthropology offers programs leading to the M.A. and Ph.D. degrees.

Enquiries: 905 525-9140 Ext. 24424
Website: <http://www.socsci.mcmaster.ca/anthro>

Staff / Fall 2009

PROFESSORS

Ellen Badone, B.A., M.A. (Toronto), Ph.D. (California, Berkeley)
/ Joint appointment with Religious Studies
Aubrey Cannon, B.A. (Simon Fraser), Ph.D. (Cambridge) / Chair
John Colarusso, B.A. (Cornell), M.A. (Northwestern), Ph.D. (Harvard)
/ Joint appointment with Modern Languages
Laura Finsten, B.A. (Western), M.A. (Calgary), Ph.D. (Purdue)
Ann Herring, B.A., M.A., Ph.D. (Toronto)
Wayne Warry, B.A., M.A. (McMaster), Ph.D. (Australian National)

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Dawn Martin-Hill, B.A., M.A., Ph.D. (McMaster) / Director, Indigenous Studies Program
Kostalena Michelaki, B.A. (Greece), M.A., Ph.D. (Michigan)
Tina Moffat, B.A. (Toronto), M.A., Ph.D. (McMaster)
Hendrik Poinar, B.Sc., M.Sc. (California), Ph.D. (Germany)
Petra Rethmann, B.A. (Vienna), M.A. (Munich), Ph.D. (McGill)

ASSISTANT PROFESSORS

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Tracy Prowse, B.Sc., M.A. (Alberta), Ph.D. (McMaster)
Kee Yong, M. Phil., Ph.D. (CUNY)

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/ Religious Studies
Henry Schwarcz, B.A. (Chicago), M.S., Ph.D. (California Institute of Technology), F.R.S.C. / School of Geography and Earth Sciences

ADJUNCT MEMBERS

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Ronald Hancock, B.Sc., M.Sc. (New Zealand), Ph.D. (McMaster)
Andrew Martindale, B.A. (Toronto), M.A. (Trent), Ph.D. (Toronto)
/ Anthropology, University of British Columbia
Trudy Nicks, B.A., M.A., Ph.D. (Alberta) / Curator, Royal Ontario Museum
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/ Anthropology, University of Western Ontario
Gary Warrick, B.A. (McMaster), M.A. (Simon Fraser), Ph.D. (McGill)
/ Contemporary Studies, Wilfrid Laurier

PROFESSORS EMERITI

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David J. Damas, A.B. (Toledo), A.M., Ph.D. (Chicago)
Harvey A. Feit, B.A. (Queen's), M.A., Ph.D. (McGill)
Edward V. Glanville, B.A., Ph.D. (Dublin)
Christopher R. Hallpike, B.Litt., D.Litt, D.Phil. (Oxford)
Richard J. Preston, A.B., M.A., Ph.D. (N. Carolina)
William L. Rodman, B.A. (Sydney, Australia), M.A., Ph.D. (Chicago)

Areas of Specialization

Ph.D. students conduct fieldwork in many parts of the world. The study of European societies is a new area of interest in the Department. The Department's Ph.D. students have recently engaged in research in Spain, Western Samoa, Nepal, Mesoamerica, Italy, India, Mexico, Chile, Belize, Antigua, Uganda, Zimbabwe, Argentina, the Virgin Islands, Jamaica, as well as in various provinces of Canada.

The McMaster Anthropology Department offers degrees in Archaeology, Cultural Anthropology, Physical Anthropology, and the Anthropology of Health. More specially, it defines itself in terms of topical areas and issues that its faculty and graduate students investigate. The main fields of inquiry of members of the Department include: anthropology of health, applied anthropology, archaeological history, complex societies, ethnohistory, indigenous studies, material culture, molecular anthropology, osteology and socio-environmental studies.

The Anthropology of Health draws together core anthropology faculty and students interested in human biology, medical and physical anthropology. This program takes advantage of the many links to other health research areas at McMaster and beyond.

Admission and program requirements conform to the general University regulations at the front of this Calendar.

Upon arrival at McMaster a graduate student will either select or be tentatively assigned a faculty advisor from the Department. Together, the student and the advisor will determine the individual program of study to be followed. This program must be ratified by the Department Chair and the Graduate Committee.

M.A. Degree

The M.A. program is intended to be holistic in scope, but students may specialize in any of the major fields of Anthropology, including Cultural, Physical, Archaeology, Anthropology of Health, and Linguistic Anthropology.

Students admitted to the M.A. program have the option of doing coursework and then writing a comprehensive exam, writing a Major Research Paper (MRP), or writing a scholarly thesis which demonstrates ability to conduct original research. In consultation with his or her supervisor, an M.A. student must choose between these three options by January 15 of the year of initial registration as a graduate student.

Twelve months' residence or the equivalent in part-time study is required. While students taking their M.A. by examination or Major Research Paper can expect to fulfill all requirements within 12 months, those electing to write a thesis normally extend their period of residence to 24 months. All M.A. students are normally required to complete the department graduate research workshops.

A. M.A. with Thesis

Students who choose to write an M.A. thesis are required to take 4 half courses. Three of these courses must be selected from courses open only to graduate students (i.e. courses numbered 700). A minimum of 2 half courses should be taken in the student's sub-discipline. The thesis must be defended in an oral examination.

B. M.A. with Comprehensive Examination or Major Research Paper Option

Students who choose the comprehensive examination or Major Research Paper (MRP) option are required to take six half-courses. At least 4 of these courses must be selected from courses open only to graduate students (i.e. courses numbered 700). A minimum of two half courses should be taken in the student's sub-discipline.

Ph.D. Degree

The Department offers a Ph.D. degree in the fields of Cultural Anthropology, Archaeology, Physical Anthropology and Anthropology of Health.

Admission to the doctoral program is competitive and is normally also dependent upon completion of the requirements for the M.A. degree in Anthropology.

1. The Ph.D. student will be required to obtain a minimum average of B+ in all graduate coursework required for the Ph.D. The minimum course requirement for students entering with a completed M.A. in Anthropology is normally four graduate half-courses beyond the level of the M.A. Students promoted from within our M.A. program (after completing coursework but before completing the thesis, comprehensive examination or MRP), are required to take a total of eight half-courses in the program over the course of their enrolment. In the rare cases in which Ph.D. students are admitted directly from a Bachelor's degree, they will normally be required to take four half-courses at the graduate level. This course requirement will normally be met by taking seminars within the department. Reading courses or courses outside the department may be substituted for seminars on the recommendation of the student's supervisor and approved by the Graduate Committee. All Ph.D. students are required to complete the department graduate research workshops.
2. A Ph.D. candidate must demonstrate proficiency in a language other than English. The candidate's supervisory committee, in consultation with the Graduate Committee, must approve the candidate's choice of a language and the appropriate criteria for demonstrating proficiency.

Proficiency may be demonstrated by obtaining a grade of B+ or better in a University course in the language chosen. Students who wish to demonstrate proficiency without taking a university course may elect to take a translation examination. Details of the translation examination criteria are available from the Graduate Committee.
3. Ph.D. candidates will take a Comprehensive Examination designed to test the breadth of their knowledge of the sub-discipline of anthropology in which they are conducting research. The examination has both a written and oral component and is intended to go beyond an assessment of the student's factual knowledge, to demonstrate ability in relational thinking at a general abstract level and preparedness to undertake dissertation research.
4. All Anthropology Ph.D. candidates are required to have exposure to field work.
5. Doctoral candidates will be required to submit a scholarly thesis on an approved subject and to defend it during a final oral examination.

Courses

Courses marked with an asterisk (*) are half courses. Any one reading course may not be taken more than twice. Candidates will consult the Department Chair concerning course offerings in any one year.

CULTURAL

- *700 / Problems in Contemporary Anthropological Theory
- *701 / Readings in Cultural Anthropology
- *702 / Contemporary Problems in Anthropology
- *704 / Introduction to the Anthropology of Religion
(Same as Religious Studies *781)

- *709 / Medical Anthropology
- *713 / Contemporary Problems in the Anthropology of Health
- *717 / Readings in the Anthropology of Health
- *719 / Area Ethnology (Open)
- *720 / Topics in Political Culture (Same as Globalization *720)
- *722 / Research Design in Anthropology
- *723 / Ethnohistory of First Nations in Canada
- *724 / Contemporary First Nations in Canada
- *725 / Seminar in Political Anthropology
- *728 / Applied Anthropology
- *734 / Indigenous Peoples Within Nation States
- *735 / Power, Agency and Discourse
(Same as Peace Studies *701)
- *737 / Studies in Museology and Material Culture
- *782 / Diasporas, Transnationalism and Religious Identities
(Same as Globalization *782 and Religious Studies *782)
- *784 / Anthropological Approaches to Catholicism
(Same as Religious Studies *783)
- *785 / Myth and the Interpretation of Oral Tradition
(Same as Religious Studies *784)
- *788 / Topics in Anthropological Approaches to Islam
(Same as Religious Studies *788)
- *796 / Ritual and Symbolic Healing (Same as Religious Studies *786)
- *799 / Death: Rituals and Meanings in Cross-Cultural Context
(Same as Religious Studies *785)

ARCHAEOLOGY

- *710 / Topics in Archaeology
- *714 / Readings in Archaeology
- *730 / Applied Archaeological Sciences
- *731 / Settlement Archaeology
- *732 / Analytical Methods in Archaeology
- *736 / Archaeological Research Design
- *738 / Archaeology and History

PHYSICAL

- *705 / Advanced Skeletal Biology
- *711 / Advanced Topics in Physical Anthropology
- *715 / Readings in Physical Anthropology
- *718 / From Cradle to the Grave: Anthropological Demography
- *721 / Ancient Molecules and Preservation of the Past
- *739 / Anthropology of Infectious Disease
- *740 / Biocultural Synthesis

Other courses that might be of interest are the following:

HEALTH, AGING AND SOCIETY COURSES

*710 / Multidisciplinary Perspectives on Aging

Through in-depth analysis of specific multidisciplinary issues, students will select and integrate gerontological knowledge about the social, psychological, health, cultural, and other aspects of aging.

*711 / The Health Care System and the Older Person

This course provides interdisciplinary analysis of priority issues relating to the health care system and the older person. In a problem-based self-directed and small group learning format, topics studies are health policy, models of care, comparative ways of life and the industry/government interface.

BIOCHEMISTRY

The Department of Biochemistry & Biomedical Sciences provides facilities for students intending to proceed to the M.Sc. and Ph.D. degrees.

Enquiries: 905 525-9140 Ext. 22064

E-mail: bbsgrad@mcmaster.ca

Fax: 905 522-9033

Website: <http://www.fhs.mcmaster.ca/biochem>

Staff / Fall 2009

PROFESSORS

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 Mickie Bhatia, B.Sc. (McMaster), Ph.D. (Guelph) / Canada Research Chair
 Eric D. Brown, B.Sc., M.Sc., Ph.D. (Guelph) / Chair / Canada Research Chair
 John P. Capone, B.Sc. (Western), Ph.D. (McMaster)
 Radhey S. Gupta, B.Sc. (Agra), M.Sc. (New Delhi), Ph.D. (Bombay)
 John A. Hassell, B.Sc. (New York), Ph.D. (Connecticut)
 Paul G. Higgs, B.A., Ph.D. (Cambridge) / Joint appointment with Physics and Astronomy / Senior Canada Research Chair
 Justin R. Nodwell, B.Sc., Ph.D. (Toronto)
 Gerard D. Wright, B.Sc., Ph.D. (Waterloo) / Senior Canada Research Chair
 Daniel S-C. Yang, B.Sc., M.Sc. (Alberta), Ph.D. (Pittsburgh)
 Boris S. Zhorov, Ph.D. (Pushchino), D.Sc. (Kiev)

ASSOCIATE PROFESSORS

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 Russell Bishop, B.Sc., Ph.D. (Alberta)
 Lori Burrows, B.Sc., Ph.D. (Guelph)
 Cecile Fradin, B.Sc., M.Sc. (Ecole Normale Supérieure, Paris, France), Ph.D. (Univ. Pierre et Marie Curie, Paris, France) / Joint appointment with Physics & Astronomy / Canada Research Chair
 Murray S. Junop, B.Sc. (Ryerson), Ph.D. (Western)
 Yingfu Li, B.Sc. (Anhui), M.Sc. (Beijing Agriculture), Ph.D. (Simon Fraser) / Joint appointment with Chemistry / Canada Research Chair
 Giuseppe Melacini, B.Sc., (Milan), Ph.D. (California, San Diego) / Joint appointment with Chemistry
 Joaquin Ortega, B.Sc. (Zaragoza), Ph.D. (Autónoma de Madrid)
 Bernardo L. Trigatti, B.Sc., Ph.D. (McMaster)
 Ray Truant, B.Sc., Ph.D. (Toronto)

ASSISTANT PROFESSORS

Tony Collins, B.Sc., Ph.D. (Edinburgh) / Part-time
 Brian Coombes, B.Sc., Ph.D. (McMaster)
 Bradley W. Doble, B.Sc., Ph.D. (Manitoba) / Canada Research Chair
 Jonathan Draper, Ph.D. (Sheffield) / Joint appointment with Pathology and Molecular Medicine
 Alba Guarné, B.Sc., M.Sc., Ph.D. (Barcelona)
 Michelle MacDonald, B.Sc., Ph.D. (McMaster)
 Nathan Magarvey, B.Sc. (Dalhousie), Ph.D. (Minnesota)
 Felicia Vulcu, B.Sc., Ph.D. (McMaster)
 Geoff Werstuck, B.Sc., Ph.D. (McMaster) / Joint appointment with Medicine
 Christopher Wynder, B.Sc. (Western), Ph.D. (Rockefeller) / Canada Research Chair

ASSOCIATE MEMBERS

Stephanie A. Atkinson, B.A. (Western), Ph.D. (Toronto) / Pediatrics
 Jonathan L. Bramson, B.Sc., Ph.D. (McGill) / Pathology and Molecular Medicine
 John D. Brennan, B.Sc., M.Sc., Ph.D. (Toronto) / Canada Research Chair / Chemistry
 Marie Elliot, B.Sc., Ph.D. (Alberta) / Biology
 Jack Gaudie, B.Sc. (McMaster), Ph.D. (London) / Pathology and Molecular Medicine

Mark Larche, Ph.D. (London) / Medicine
 Brian F. Leber, B.Sc., M.D., C.M. (McGill) / Medicine
 Karen L. Mossman, B.Sc. (Guelph), Ph.D. (Alberta) / Pathology and Molecular Medicine
 Gurmit Singh, B.Sc., Ph.D. (Dalhousie) / Pathology and Molecular Medicine
 Sheila K. Singh, B.Sc. (McGill), M.D. (McMaster), Ph.D. (Toronto) / Surgery
 Jeffrey Weitz, B.Sc., M.D. (Ottawa) / Medicine

PROFESSORS EMERITI

V.S. Ananthanarayanan, B.Sc., M.Sc., Ph.D. (Madras)
 Russell A. Bell, M.Sc. (Wellington), M.S. (Wisconsin), Ph.D. (Stanford), F.C.I.C. / Chemistry
 Luis A. Branda, B.Sc., D.Sc. (Montevideo, Uruguay)
 William W. Chan, M.A., Ph.D. (Cambridge)
 Richard M. Eband, A.B. (Johns Hopkins), Ph.D. (Columbia)
 Karl B. Freeman, B.A., Ph.D. (Toronto)
 Gerhard E. Gerber, B.Sc. (Western), Ph.D. (McMaster)
 Hara P. Ghosh, M.Sc., D.Phil. (Calcutta)
 Richard J. Haslam, M.A., D.Phil. (Oxford) / Pathology & Molecular Medicine
 Dennis R. McCalla, B.Sc. (Alberta), M.Sc. (Saskatchewan), Ph.D. (California Institute of Technology), F.C.I.C.
 Evert Nieboer, B.Sc., M.Sc. (McMaster), Ph.D. (Waterloo) / Toxicology

M.Sc. Degree

A candidate for the M.Sc. degree is required to spend at least one calendar year in full-time study at McMaster University. The candidate is required to complete satisfactorily no fewer than one full graduate course, which must be at the 700-level. The candidate must also present a thesis which will embody the results of original research. The thesis must be defended in an oral examination. The candidate will be required to participate in the departmental seminar program.

Ph.D. Degree

There is no minimum course requirement for the completion of a Ph.D. degree, unless a specific recommendation has been made by the student's supervisory committee. The candidate will be required to participate in the departmental seminar program. All Ph.D. candidates must pass a Comprehensive Examination, consisting of a seminar based on their thesis research and oral defense. Candidates must present a thesis which embodies the results of original research and high scholarship. This thesis must be defended in a Final Oral Examination.

Courses

The following 600-level courses offered for graduate credit consist of the corresponding 400-level undergraduate courses plus additional work, usually in the form of a written assignment. Courses marked with an asterisk (*) are half courses.

*6E03 / Gene Expression / M. Bhatia, B. Doble, C. Wynder

Recombinant DNA techniques: theory and applications to the study of gene function and evolution and to disease diagnostics and gene therapy. Current concepts of gene regulation at different levels.

*6EE3 / Advanced Topics in Gene Expression / R. Truant

A critical study of the literature from recent primary manuscripts on gene regulation and inter-related regulatory pathways. Emphasis is on the molecular and cellular biology of multiple pathways that interact to affect phenomena in biology and disease.

6H03 / Molecular Biology of Cancer / P.F.M. Whyte*(Same as Biology *6H03 and Molecular Biology *6H03)**

Cancer at the molecular and cellular level. Topics include: properties of cancer cells; activation of proto-oncogenes; function of oncoproteins; transgenic mouse models; tumour viruses; and tumor suppressor genes.

***6J03 / Biochemical Immunology / M. McDermott (Same as Medical Sciences *6J03 and Molecular Biology *6J03)**

This advanced course applies small group-based learning to immunological problems. Topics concern development of immunoassays, resistance to infection and immunity in health and disease.

***6N03 / Molecular Membrane Biology / R. Epand**

Properties and structures of membranes, molecular components of biological membranes and their interactions, strategies for signal transduction cascades, hormones, receptors.

***6Q03 / Biochemical Pharmacology / R.S. Gupta**

Introduction to the basic concepts of pharmacology. Mechanisms of action of antibacterial, antiviral, antifungal and anticancer drugs, toxins and how cellular resistance to such agents develop. Applications of drug-resistant mutants for genetic, biochemical pharmacological and cell biological studies.

***6S03 / Introduction to Molecular Biophysics / C. Fradin (same as Physics *6S03)**

A presentation of recent contributions made to the fields of molecular and cell biology by the use of physical approaches. In particular, the following topics are discussed: physical properties of biomolecules, protein folding, molecular motors, cell motion and cell adhesion. Emphasis on the critical evaluation of current research literature.

6Y03 / Genomes and Evolution / P. Higgs*(Same as Computational Engineering & Science *6Y03)**

Molecular evolution. Comparative analysis of genomes. Changes in gene content and gene order. Bacterial evolution and phylogenetics. Origins of organelles and their genomes. Comparison of the human genome with other species. Using microarrays and proteomics to study organisms at the whole genome level.

The following courses are restricted to graduate students:

***707 / Mechanism of Enzyme Action / G. Wright**

Sequence of molecular events occurring during catalysis by enzymes. Nature of intermediates and active site residues. Possible factors involved in rate-acceleration. Enzyme kinetics.

***709 / Signal Transduction: Dynamic Mechanisms of Action of Growth Factors and Nuclear Receptors / R. Truant (same as Medical Sciences *708)**

The topics covered will include: Ras and GTP binding protein families, MAP kinase cascades; T-cell and B-cell activation; nuclear receptors for steroid and thyroid hormones. The course will be based on recent review articles and important current papers.

***710 / Special Topics in Proteins / J. Ortega**

Topics in areas of advanced proteins will be discussed.

***711 / Special Topics in Biomolecular Sciences / T. Collins, D.W. Andrews**

Topics in biomolecular sciences will be examined using current research papers.

***712 / Special Topics in Membrane Biochemistry / Staff**

Topics in areas of advanced membrane biochemistry will be discussed.

***713 / Enzyme Catalytic Mechanisms / P. Berti**

An examination of enzymes' catalytic strategies, including strategies for promoting catalysis, enzymatic intermediates, co-factors, as well as the methods used to probe mechanism. Examples from the current literature will be used to demonstrate each concept.

***720 / Biochemistry Colloquium / J. Nodwell, A. Guarné**

Students present a major seminar dealing with their research and write a review article that illustrates its contribution to the current state of their field.

***723 / Topics in Molecular Biology / J. Hassell**

Critical examination of classic and current papers in molecular biology with the object of giving students practice in presenting and discussing research material. (Given in alternate years with Biology *723.)

***725 / Molecular Mechanisms of Membrane Functions / R. Epand, D.W. Andrews**

The molecular basis of the biological activity of membranes at an advanced level. Topics include: bioenergetics, transport, membrane biogenesis and turnover, signal transduction, cell surface interactions and membrane disorders.

***726 / Biophysical Chemistry of Membrane Structure / R. Epand, D.W. Andrews**

The emphasis of this course will be on biophysical aspects of membrane structure and function.

***727 / Proteins / J. Ortega**

The structure of proteins, primary to quaternary will be discussed. Topics include: physico-chemical basis of higher orders of structure and techniques of studying proteins.

***730 / Computational Biochemistry / B. Zhorov (Same as Computational Engineering & Science *738)**

The course will provide a brief introduction to biochemical databases, biological data mining and tools for sequences analysis. This will be followed by more detailed description of computational methods of molecular modeling, ligand docking, and analysis of ligand-receptor interactions. Facilities of the Educational Computing Lab will be used to train students on applying WWW resources of biological information and molecular modeling software in a biomedical lab.

***731 / Stem Cells and Regenerative Medicine / M. Bhatia**

Stem cells hold immense experimental potential as model systems for human disease and development that are difficult to ascertain in cell lines or in the mouse. Arguably, the most impactful role of human stem cells is for tissue repair that becomes damaged from diseases or injury; examples include diabetes and spinal cord injury. This utility of stem cells is heavily seeded in new approaches to the clinic called "regenerative medicine." However, there are many stem cell types that may be specific to certain applications, and new technologies involved with stem cell delivery and differentiation that require elucidation before these stem cell-based replacement therapies can be robustly brought to the bedside. The underlying biology that defines stem cells, and their potential applications to human health, will be discussed broadly to better define the current successes and future limitations of regenerative medicine using human stem cells.

The following course is available to graduate students for credit:

Education *750 - a graduate course on the Principles and Practice of University Teaching

This course includes both discussion of the literature (using a problem-based learning approach) and practical workshops on topics such as lecturing, working in small groups, course design, test construction, and teaching dossiers.

In addition, courses in other departments/programs, notably Biology, Chemistry, Medical Sciences, and Physics and Astronomy, may be allowed for graduate credit. Candidates should consult the Graduate Chair of the department or their research supervisor concerning such courses.

Research in Biochemistry

Our research encompasses all the major areas of modern biomedical research. Particular strengths include the molecular genetics of stem cells (including human and mouse embryonic stem cells), eukaryotic cell biology, antimicrobial research and structural biology. We have an exceptionally sophisticated equipment base in Canada which includes the first and only high throughput screening laboratory in Canada (<http://hts.mcmaster.ca/Home.html>), the Biophotonic imaging facility (<http://www.macbiophotonics.ca>) and the Canadian Centre for Electron Microscopy (<http://www.science.mcmaster.ca/biochem/faculty/Ortega/ccem.html>). These centralized facilities provide unique avenues for addressing important biomedical questions. Our faculty are supported by more than \$16 million in peer-reviewed research grants.

A detailed description of the research and recent publications of each faculty member is available on our website (<http://www.fhs.mcmaster.ca/biochem/>).

BIOLOGY

Facilities are available in the Department of Biology for students proceeding to the M.Sc. and Ph.D. degrees.

Enquiries: 905 525-9140 Ext. 23546
E-mail: biology@mcmaster.ca or biolgrad@mcmaster.ca
Website: http://www.science.mcmaster.ca/biology/biology_graduate_home.html

Staff / Fall 2009

DISTINGUISHED UNIVERSITY PROFESSOR

Christopher M. Wood, B.Sc., M.Sc. (British Columbia), Ph.D. (East Anglia) / Tier I Canada Research Chair, F.R.S.C.

PROFESSORS

André Bédard, B.Sc. (Montreal), Ph.D. (McGill) / Associate Chair
Ana R. Campos, B.A., M.Sc. (Rio de Janeiro), Ph.D. (Brandeis)
Patricia Chow-Fraser, B.Sc., M.Sc. (Waterloo), Ph.D. (Toronto) / Chair
Turlough M. Finan, M.Sc. (National), Ph.D. (Guelph)
G. Brian Golding, B.Sc. (Dalhousie), Ph.D. (Alberta) / Tier I Canada Research Chair
Delsworth G. Harnish, B.Sc., M.Sc. (Queen's), Ph.D. (McMaster) / Joint appointment with Pathology and Molecular Medicine
John A. Hassell, B.Sc. (Brooklyn, N.Y.), Ph.D. (Connecticut) / Joint appointment with Biochemistry and Pathology and Molecular Medicine
J. Roger Jacobs, B.Sc. (Calgary), M.Sc., Ph.D. (Toronto) / Associate Chair
Jurek Kolasa, M.Sc., Ph.D. (Poznan)
Colin A. Nurse, B.E.Sc. (Western), Ph.D. (Harvard)
Michael J. O'Donnell, B.Sc., Ph.D. (Toronto)
James S. Quinn, B.Sc. (Queen's) M.Sc., (Brock), Ph.D. (Oklahoma)
Andrew J. Rainbow, B.Sc. (Manchester), M.Sc. (London), Ph.D. (McMaster)
C. David Rollo, B.Sc., M.Sc. (Guelph), Ph.D. (British Columbia)
Herbert E. Schellhorn, B.Sc., M.Sc. (Guelph), Ph.D. (N. Carolina State)
Rama S. Singh, B.Sc. (Agra), M.Sc. (Kanpur), Ph.D. (California)
Elizabeth A. Weretilnyk, B.Sc., Ph.D. (Alberta)

ASSOCIATE PROFESSORS

Robin Cameron, B.Sc. (Waterloo), Ph.D. (McGill)
Juliet M. Daniel, B.Sc. (Queen's), Ph.D. (British Columbia)
Susan A. Dudley, B.Sc., M.Sc. (McGill), Ph.D. (Chicago)
Suleiman A. Igdoura, B.Sc. (Victoria), M.Sc. (Western), Ph.D. (McGill)
Grant McClelland, B.Sc. (Ottawa), Ph.D. (British Columbia)
Jonathon Stone, B.Sc., M.Sc., Ph.D. (Toronto)
Jianping Xu, B.Sc. (Jiangxi Agricultural University), M.Sc. (Nanjing Agricultural University), M.Sc., Ph.D. (Toronto)

ASSISTANT PROFESSORS

Jonathan Dushoff, B.A. (Pennsylvania), Ph.D. (Princeton)
Marie Elliot, B.Sc., Ph.D. (Alberta)
Ben Evans, B.Sc. (Tufts), M.Sc., M.Phil., Ph.D. (Columbia)
Bhagwati P. Gupta, B.Sc. (Banaras Hindu University, India), M.Sc. (Jawaharlal Nehru University, New Delhi, India), Ph.D. (Tata Institute of Fundamental Research, India)
Joanna Y. Wilson, B.Sc. (McMaster), M.Sc. (Victoria), Ph.D. (Woods Hole Oceanographic Institute/Massachusetts Institute of Technology)
Xu-Dong Zhu, B.Sc. (Nanjing), M.Sc. (Regina), Ph.D. (Toronto)

ASSOCIATE MEMBERS

Sigal Balshine, B.Sc. (Toronto), Ph.D. (Cambridge)
Martin Daly, B.A. (Toronto), M.A. (McGill), Ph.D. (Toronto) / Psychology
Reuven Dukas, Ph.D. (North Carolina) / Psychology
David J.D. Earn, B.Sc., M.Sc. (Toronto), Ph.D. (Cambridge)
Margaret Fahnestock, B.Sc. (Stanford), Ph.D. (Berkeley) / Psychiatry and Behavioural Sciences
Ashok K. Grover, B.Sc., M.Sc. (Delhi), Ph.D. (Calgary) / Medicine
Hendrik N. Poinar, B.Sc., M.Sc. (California Polytechnic State University), Ph.D. (Ludwig Maximilians University, Munich)
Elyanne Ratcliffe, B.Sc., Medical Program (McMaster), Medical Council of Canada Qualifying Exam Parts I and II, Residency, University of Toronto / Pediatrics
Henry Szechtman, B.Sc. (McGill), Ph.D. (University of Pittsburgh) / Psychiatry and Behavioural Neurosciences
Eva S. Werstiuk, B.Sc., Ph.D. (London, U.K.) / Medicine

ADJUNCT MEMBERS

Gary Chiang, B.Sc., M.Sc., Ph.D. (Toronto)
Tom Edge, B.Sc. (Guelph), M.Sc. (Ottawa), Ph.D. (Carleton) / National Water Research Institute-Environment Canada
David Galbraith, B.Sc., M.Sc. (Guelph), Ph.D. (Queen's)
Patricia Gills, B.Sc., M.Sc. (Guelph), Ph.D. (Waterloo) / National Water Research Institute-Environment Canada
Pierre Laurent, D.Sc. (France)
James C. McGeer, B.Sc., M.Sc., (British Columbia), Ph.D. (Scotland)
James Pringle, M.Sc. (New Hampshire), Ph.D. (Tennessee)
Glen VanDerKraak, B.Sc., M.Sc. (Manitoba), Ph.D. (British Columbia)
Susan Watson, B.Sc., M.Sc. (McGill), Ph.D. (Calgary)

PROFESSORS EMERITI

Douglas Davidson, B.Sc. (Durham), D.Phil. (Oxford)
Frank L. Graham, B.Sc. (Manitoba), M.A., Ph.D. (Toronto), F.R.S.C.
John N.A. Lott, B.Sc. (British Columbia), M.Sc., Ph.D. (California)
Richard A. Morton, M.S., Ph.D. (Chicago)
George J. Sorger, B.Sc. (McGill), M.S., Ph.D. (Yale)

M.Sc. Degree

The requirements for the M.Sc. degree appear under the Regulations for the Master's degree near the beginning of this Calendar. A candidate for the M.Sc. degree in Biology is required to spend at least one calendar year in full-time graduate study at McMaster University. Completion of the M.Sc. degree, however, typically requires two years of full-time study.

The M.Sc. candidate is required to complete satisfactorily not fewer than one full course in Biology or related fields, of which at least one half course must be at the 700 level. If a 600-level course is taken, it must be in Biology. The candidate is also required to present a thesis which demonstrates the ability to do original research. The candidate will be required to defend his/her thesis in the final oral examination. The Department may require the student to take additional graduate or undergraduate courses to remove program deficiencies.

Students in the M.Sc. program can be considered for transfer to a Ph.D. program after one year. Prior to transfer, the candidate must have completed a minimum of one graduate half course and obtained the average grade of B+ or better. Transfer from M.Sc. to Ph.D. will

be initiated by a mutual agreement between the student and supervisor. Enrolment in the Ph.D. program is dependent upon the successful completion of the transfer examination. The format of this examination shall follow exactly the procedure established for the comprehensive examination. The result of said examination will be valid as the required Ph.D. comprehensive examination.

(**Note:** Candidates for the M.Sc. degree who wish to complete the requirements in time for a particular convocation, should submit their theses to the Department a full two weeks ahead of the date given elsewhere in the calendar, in order to give their examiners adequate time to review their theses.)

Ph.D. Degree

For students entering the Ph.D. program with a M.Sc. degree there is no minimum course requirement but all students must complete a thesis. Students with a B.Sc. degree are required to complete a minimum of two 700-level half courses, plus a thesis. The Department may require students enrolled in the doctoral program to take graduate or undergraduate courses to remove program deficiencies. Candidates are required to plan their course requirements in consultation with their supervisory committee. There is no departmental foreign language requirement for Ph.D. candidates. Candidates for both M.Sc. and Ph.D. degrees are expected to participate regularly in departmental programs and activities (e.g. seminars). The candidate for the Doctoral degree must pass a Comprehensive Examination within the time limits required by the University. Graduate students entering the final year of the Ph.D. degree are required to present the results of their research project to the department during a public supervisory committee meeting. At this meeting students will present a comprehensive overview of the field of investigation in the form of a written report submitted to the supervisory committee and a 50-minute oral presentation describing the rationale, experimental approaches, and outcomes of their research project. A question period follows the presentation. In the Final Oral Examination, the candidate will be expected to defend his/her thesis which embodies the results of original research. The general requirements concerning the thesis appear earlier in this Calendar.

Courses

Courses marked with an asterisk (*) are half courses.

The following 600-level courses are offered for graduate credit and are available to senior undergraduate students. In each case, graduate students will have an extra required component in addition to the work required of undergraduate students. This extra required component will consist of seminar presentations, laboratory projects, oral critiques, and grant proposals, the particular nature varying amongst the various courses.

*6B03 / Plant Metabolism and Molecular Biology / E.A. Weretilnyk

Analysis of plant cell metabolism and the regulation of metabolism at the biochemical and molecular genetic level.

*6DD3 / Molecular Evolution / G.B. Golding, B. Evans, J. Stone

The study of how molecules change over time within and between species. The experimental data, techniques, and theories will be examined.

*6E03 / Population Genetics / B. Evans, R. Singh

Fundamentals of theoretical population genetics and their practical applications to understanding genomics, molecular evolution, human evolution, speciation and conservation biology.

*6EE3 / Human Diversity and Human Nature / R.S. Singh

The nature of genetic diversity in humans; the nature versus nurture debate in relation to genetic determinism and biological basis of behaviour.

*6H03 / Molecular Biology of Cancer / A. Bédard (Same as Biochemistry *6H03 and Molecular Biology *6H03)

Cancer at the molecular and cellular level. Topics include: properties of cancer cells; activation of proto-oncogenes; function of oncoproteins; proliferative signal transduction; transgenic mouse models of human cancer; and tumour viruses.

*6P03 / Medical Microbiology / P. Jayaratne

Microbial infectious diseases of humans: ecology, evolution, epidemiology, immunity, pathogenesis and the treatments of these diseases.

*6T03 / Neurobiology / M. Fahnstock, P. Reyes

Selected topics in neurobiology at the molecular and cellular level including growth factors and neuronal development, ion channels, neurotransmitter functions, learning and memory and neurological disorders.

*6U03 / Radiation Biology / A.J. Rainbow

The effects of radiation on biological material at the molecular, cellular, tissue and whole organism level. Applications of radiation in medicine and toxicology.

*6X03 / Environmental Physiology / M.J. O'Donnell, G. McClelland

Advanced physiology of animals with an emphasis on interactions with an adaptation to the environment.

*6Y03 / Ecology of Inland Waters / P. Chow-Fraser

Physical, chemical and biological inter-relationships of inland waters, including aspects of pollution.

700-level courses are restricted to graduate students.

*707 / Ecological Statistics / S. Dudley, J. Dushoff

This graduate course in statistics will introduce common multivariate methods used in ecology and to develop basic computer and interpretation skills necessary for their use. Students participate in teaching through analysis of data sets and individual presentations.

*709 / Special Topics in Biology / Staff

Studies requiring selection from specialized areas of research as approved by the Department.

*715 / Topics in Evolutionary Genetics / B. Evans, B. Gupta, G.B. Golding, R.S. Singh

An advanced treatment of population, evolutionary, and quantitative genetics including theoretical and experimental results, and focusing on geographic variation, divergence and speciation.

*716 / Advanced Topics in Ecology I / B. Evans, S. Balshine, P. Chow-Fraser

Advanced topics in Behavioural Ecology, Landscape Ecology, or Conservation Biology, will be examined through a series of readings, lectures, seminars and discussions. Within disciplines the participants will tackle a focal theme reflecting current research in the area. Focus will be determined by the teaching staff. Topics will cycle depending upon interest among graduate students and availability of faculty.

*717 / Advanced Topics in Ecology II / S. Dudley, J. Stone, G.B. McClelland

Advanced topics in one of the following areas: Evolutionary Ecology and Development or Physiological Ecology will be examined through a series of readings, lectures, seminars and discussions. Within disciplines the participants will tackle a focal theme reflecting current research in the area. Focus will be determined by the teaching staff. Topics will cycle depending upon interest among graduate students and availability of faculty.

720 / Bioinformatics /*(Same as Computational Engineering & Science *720)**

This course will introduce students to the basics of elementary sequence analysis. This will include DNA/protein database design and access; homology detection; sequence alignment; phylogeny reconstruction; pattern analysis and other topics in computational biology.

***721 / Topics in Molecular Evolution / R.S. Singh**

A molecular approach to problems of the origin of life, evolution of cells, diversity and phylogeny of modern organisms, and dynamics of genes in populations.

***723 / Topics in Molecular Genetics / A. Bédard, J. Daniel, X-D. Zhu**

The emphasis in Topics in Molecular Genetics is on novel control mechanisms of gene expression, genome and macromolecules quality control and recent progress in genomics/proteomics. The histone code, chromatin silencing, the maintenance of genome/proteome integrity, microRNAs, RNA interference, non-sense mediated mRNA decay, the recent developments in the field of genomics/proteomics and cell signaling are examples of topics discussed in this course. The emphasis will be on the molecular biology of eukaryotes.

***724 / Molecular Ecology / J.P. Xu**

This course will survey current topics on the use of molecular genetic techniques to study aspects of population biology and ecology. Staff lectures, student presentations, and joint discussions of the current literature will be used.

***726 / Integrative Physiology / G.B. McClelland, C.M. Wood, M.J. O'Donnell, C.A. Nurse**

This course will be a mixture of formal lectures, discussion groups and student presentations examining the integration of physiological and biochemical processes from the level of genes, cells, organs, systems and whole organisms.

***727 / Cellular and Molecular Physiology / C.A. Nurse, M.J. O'Donnell**

This course will combine formal lectures, discussion groups and student presentations to examine membrane transport processes, and mechanisms of intracellular homeostasis using various techniques including patch clamp electrophysiology, heterologous expression systems, single cell spectrofluorometry, and Ussing chambers.

***728 / Environmental Physiology / M.J. O'Donnell, G.B. McClelland, C.A. Nurse, C.M. Wood**

This course, in lecture, seminar, and discussion format, will examine the influence of natural and anthropogenic environmental stressors on the physiology of aquatic and terrestrial animals, with an emphasis on homeostasis, acclimation, and adaptation at all levels from the gene to the whole organism.

***730 / Management of Aquatic Ecosystems and Resources / P. Chow-Fraser**

Emerging issues in the management of water and aquatic resources are complex and include problems of supply and demand, water quality for human consumption and recreational use, contaminant loading of aquatic biota, maintenance of ecosystem integrity, and the competing and sometimes conflicting riparian land use. Because these issues are cross-disciplinary, traditional single-discipline approaches are inappropriate. This course adopts an "ecosystem approach" towards management of aquatic resources and will consider the main socio-economic, physico-chemico-biological factors that affect aquatic ecosystems.

***731 / Microbial Pathogenesis, Symbiosis and Host Interactions / R. Cameron, T. Finan**

Analysis of the molecular basis of pathogenic and symbiotic interactions requires an understanding of the contributions from both host and microbe. The course will discuss current research on the interactions of microbes (bacteria, fungi, protozoa) and viruses with their animal and plant hosts.

***742 / Molecular and Metabolomic Responses of Plants to Environmental Perturbations / R. Cameron, E. A. Weretilnyk**

This new course will examine how plants respond to various environmental stresses, both biotic and abiotic. The molecular perception and signalling pathways involved and the metabolomic changes that allow the plant to adapt to, tolerate or resist a particular perturbation will be discussed (examples - disease, cold, drought). This course will also address an emerging and important topic in plant biology, the ability of plants to respond to multiple stresses.

***751 / Fish Physiology / C.M. Wood**

A seminar course covering selected topics in theoretical and applied aspects of the physiology of fishes, emphasizing adaptation to the environment, environmental toxicology and aquaculture.

***762 / Developmental Biology / J.R. Jacobs, A.R. Campos**

Recent progress in cellular and molecular aspects of metazoan development will be examined in lecture and seminar format. Particular emphasis will be placed on current controversies in the molecular basis of induction, signal transduction and genetic regulation of development in *Caenorhabditis*, *Drosophila*, and mouse models.

***764 / Ultrastructure of Cells / J.R. Jacobs**

Problems in studying cell ultrastructure by electron microscopy will be covered. Students design and carry out a study of cell ultrastructure.

***775 / Molecular Microbiology and Microbial Genomics / M. Elliott, T. Finan**

Topics of this course are current research on bacteria and fungi using molecular genetic, biochemical, bioinformatics, and genomic methods to study natural biodiversity, cell structure, cell-cell interactions and metabolism in laboratory model organisms and natural ecosystems.

The following course is available to graduate students for credit:

Education *750 - Principles and Practice of University Teaching

This course includes both discussion of the literature (using problem-based learning approach) and practical workshops on topics such as lecturing, working small groups, course design, test construction and teaching dossiers. Permission of the student's supervisor and supervisory committee must be obtained before the student is allowed to register for this course.

(NOTE: Students should consult the Biochemistry and/or the Medical Sciences graduate program sections of this Calendar for additional course selections.)

Facilities for Research

In addition to general research facilities in Biology, the Department has available: facilities for use of radio-isotopes, tissue culture laboratories, constant temperature rooms, growth chambers, a research greenhouse, an aquatic facility, and animal rooms. The laboratories are equipped with advanced instrumentation, including analytical and preparative ultracentrifuges, confocal and electron microscopes, interference and fluorescence microscopes, radio-isotope counting facilities, a microspectrophotometer, recording spectrophotometer, etc. The Institute for Molecular Biology and Biotechnology provides oligonucleotide synthesis products, sequencing and other services. Research opportunities are augmented by the Computing and Information Services, a 200 curie Caesium-137 gamma source, collaboration with the National Water Research Institute (Canada Centre for Inland Waters) and by the Royal Botanical Gardens whose 1880 acres of varied lands and water areas adjoin the McMaster University campus.

A detailed description of the research and recent publications of each faculty member is available on our website (see above) and in a brochure which may be obtained by writing to the Chair, Department of Biology, McMaster University, 1280 Main Street West, Hamilton, Ontario, Canada, L8S 4K1.

BIOMEDICAL ENGINEERING

The recently created McMaster School of Biomedical Engineering (MSBME) offers programs leading to the M.A.Sc. and Ph.D. in Biomedical Engineering. The mandate of the School is to conduct interdisciplinary research and educational programs of internationally recognized excellence within a unique collaborative environment that leverages our existing expertise in medical sciences and engineering and that links current and emerging areas of molecular, medical and engineering research. The School is an equal partnership between the Faculties of Engineering and Health Sciences and also involves the Faculty of Science. Students will be accepted into the programs from both life/health science and engineering/physical science backgrounds.

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Website: <http://bme.mcmaster.ca>

Staff / Fall 2009

DISTINGUISHED UNIVERSITY PROFESSORS

John B. Bienenstock, M.B., B.S. (U.K.), M.R.C.P., F.R.C.P.(C), F.R.C.P., F.R.S.C. / Pathology and Molecular Medicine
 John L. Brash, B.Sc., Ph.D. (Glasgow), P.Eng., D.Hon.Caus. (Paris Nord), F.B.S.E., F.R.S.C. / Chemical Engineering
 Simon S. Haykin, B.Sc., Ph.D., D.Sc. (Birmingham), F.I.E.E.E., F.R.S.C. / Electrical and Computer Engineering
 John F. MacGregor, B.Eng. (McMaster), M.S., Ph.D. (Wisconsin), FASA, P.Eng., F.C.A.E. / Chemical Engineering
 Henry P. Schwarcz, B.A. (Chicago), M.S., Ph.D. (California Institute of Technology), F.R.S.C. / Geography and Earth Sciences

PROFESSORS

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 M. Jamal Deen, B.Sc. (Guyana), M.S., Ph.D. (Case Western Reserve), F.I.E.E.E., F.E.I.C. / Electrical & Computer Engineering
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 Shiping Zhu, B.Eng. (Zhejiang), Ph.D. (McMaster), P.Eng. / Materials Science and Engineering

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 Alan Wassyng, B.Sc. (Hons.), M.Sc., Ph.D. (Witwatersand) / Computing and Software

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 Qiyin Fang, B.S. (Nankai), M.S., Ph.D. (East Carolina) / Engineering Physics
 Troy Farncombe / B.Sc., (Calgary), M.Sc., Ph.D. (British Columbia) / Radiology
 Deda C. Gillespie, B.Sc. (Yale), Ph.D. (California-San Francisco) / Psychology, Neuroscience and Behaviour
 Geoffrey B. Hall, B.Sc., M.Sc. (Guelph), Ph.D. (McMaster) / Psychiatry and Behavioural Neurosciences

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 David G. Jones, B.Sc. (Western), Ph.D. (Stanford) / Electrical and Computer Engineering
 Michael D. Noseworthy, B.Sc., M.Sc., Ph.D. (Guelph) / Electrical and Computer Engineering
 Alexandru Patriciu, B.Sc., M.Sc. (Univ. Graiova, Romania), M.Sc. Mech. Eng., Ph.D. (Johns Hopkins) / Electrical and Computer Engineering
 Ponnambalam Selvaganapathy, B.S. (Madurai Kamaraj), M.S., Ph.D. (Michigan) / Mechanical Engineering
 Noam Soreni, B.A., M.D. (Jerusalem) / Psychiatry and Behavioural Neurosciences
 Gregory R. Wohl, B.Sc., M.Sc., Ph.D. (Calgary)

ASSOCIATE CLINICAL PROFESSORS

Myrna Dolovich, B.Eng. (McGill), P.Eng. / Medicine
 Dinesh Kumbhare, B.S., M.D. (Dalhousie), M.Sc. (McMaster) / Medicine

ASSISTANT CLINICAL PROFESSORS

Justin de Villiers de Beer, Ch. B., M.B. (Cape Town) / Radiology

ADJUNCT MEMBERS

Shelley Boyd, B.Sc., M.Sc., M.D. (Toronto)
 Mark Haacke, B.Sc., M.Sc., Ph.D. (Toronto)
 Lyndon Jones, B.Sc. (Wales), Ph.D. (Birmingham)

M.A.Sc. Degree

A candidate is required to complete successfully at least three one-term courses, and present a thesis embodying an original contribution to biomedical engineering. The thesis must be defended in an oral examination.

Ph.D. Degree

The general regulations for the Degree Doctor of Philosophy appear earlier in the Calendar. The minimum course requirement for this degree is at least six half courses beyond the baccalaureate degree or three half courses beyond the M.A.Sc. degree. A candidate is also required to pass the Ph.D. Comprehensive Examination which is designed to test breadth of knowledge and ability to synthesize and integrate ideas from within and peripheral to the candidate's research area. The Comprehensive Examination will normally take place between 6 and 18 months after the candidate first registers in the Ph.D. program. The candidate must present a thesis embodying an original contribution to biomedical engineering. A supervisory committee determines when a candidate is ready to write the thesis and ascertains whether the quality is satisfactory. The candidate must defend the thesis at a Final Oral Examination.

The School of Biomedical Engineering has a series of seminars given by outside speakers as well as speakers from McMaster. Attendance of students (both Master's and Ph.D.) at these seminars is required.

Courses

All graduate courses offered by the School of Biomedical Engineering are one term courses (half courses). Please note that not all courses are offered each academic year. It is advised that students speak with their graduate supervisor concerning the appropriateness of their background for any course in which they are interested. One-term courses (half courses) are indicated by an asterisk (*). Half-term (quarter courses or modules) are indicated by a pound (#) sign.

*701 / Biomedical Engineering (Core)

An introduction to biomedical engineering. The biological, chemical, electrical, and mechanical principles involves the design and operation of medical devices and bioprocesses. The research themes of the School of Biomedical Engineering are emphasized: biomaterials and tissue engineering; biomedical imaging; biomedical technology (e.g. biophotonics and medical robotics); bioprocessing.

*702 / Foundations of Magnetic Resonance / G.R. Moran

This course will provide the foundations of Nuclear Magnetic Resonance (NMR) and the basics and some applications of Magnetic Resonance Imaging (MRI). A major part of the course will be the mandatory attendance of the Waterloo NMR Summer School in Waterloo, Ontario. Assignments, tests, and exams will be administered locally. The student/supervisor is responsible for the cost of attendance (registration and accommodation) of the summer school.

*703 / Analysis, Calibration and Correction of Artifacts in Magnetic Resonance Imaging / C. Anand

Incorporation of systematic errors in the standard model of Magnetic Resonance Imaging. Analysis of the resulting artifacts, methods of calibration and correction.

*704 / Gene Therapy for Bioengineers / G. Hortelano

An analysis of the technology of gene therapy, specifically intended to students with a bioengineering background. The principles of gene delivery, and specific targeting of genetic material to different organs through the use of viral and non-viral vectors will be covered. Particular emphasis will be given to the use of polymers to develop DNA formulations suitable for gene therapy. The application of various gene therapy strategies in selected individual diseases of big impact to the health care systems will be discussed. This course will be based on review articles and original papers.

*705 / Medical Imaging for Physical Scientists / M. Noseworthy

Each week in this course an invited radiologist will speak on the current state of the art in a particular area of diagnostic medical imaging (e.g., musculoskeletal radiology, neuroradiology, interventional radiology, etc.). They will outline the approaches they use to diagnose and grade disease and the limitations of the technology, as they see it from a clinical perspective. This presentation will be followed (on a different day) by a synopsis and open discussion on how the technology is used, the limitations, and potential avenues or approaches on how students would improve the technology for better assessing disease.

*799 / Independent Study in Biomedical Engineering / Staff

This course allows students to undertake advanced study in selected topics relevant to their thesis research. The student identifies a topic and studies under the guidance of a faculty member who has the relevant expertise. The pertinent literature is examined critically.

The following courses are cross-listed under other departments/ programs.

*6BC4 / Modeling of Biological Systems (*Same as ECE *6BC4*)

*6BE4 / Medical Robotics (*Same as ECE *6BE4*)

*6I03 / Introduction to Biophotonics (*same as Engineering Physics *6I03*)

*6TN3 / Image Processing (*Same as ECE *6TN3*)

*6T03 / Applications of Chemical Engineering in Medicine (*Same as Chemical Engineering *6T03*)

*6U03 / Unit Operations and Processes in Environmental Engineering (*Same as Chemical Engineering *6U03 and Civil Engineering *6U03*)

*6Z03 / Interfacial Engineering (*Same as Chemical Engineering *6Z03*)

*730 / Fluid Mechanics (*Same as Chemical Engineering *730*)

- #731 /** Introduction to Electron Microscopy (*Same as Materials Science #731*)
- #732 /** Analytical Electron Microscopy (*Same as Materials Science #732*)
- *733 /** Computational Fluid Dynamics (*Same as Chemical Engineering *733*)
- *742 /** Membrane Based Bioseparations (*Same as Chemical Engineering *742*)
- *764 /** Computational Vision (*Same as ECE *764*)
- *766 /** Pattern Recognition (*Same as ECE *766*)
- *772 /** Neural Networks: Theory and Design (*Same as ECE *772*)
- *780 /** Biomaterials and Tissue Engineering (*Same as Chemical Engineering *780*)
- *791 /** Sensory and Neuromuscular Engineering (*Same as ECE *791*)
- *792 /** Medical Visualization (*Same as ECE *792*)
- *793 /** Cardiopulmonary Engineering (*Same as ECE *793*)
- *796 /** Models of the Neuron (*Same as ECE *796 and Computational Engineering and Science *796*)
- *797 /** Speech and Audio Processing (*Same as ECE *797*)

Additional courses that are relevant to Biomedical Engineering are offered by the following departments/programs.

Biochemistry Courses

- *6E03 /** Recombinant DNA Technology and Gene Expression
- *6EE3 /** Advanced Topics in Gene Expression
- *6H03 /** Molecular Biology of Cancer
- *6J03 /** Biochemical Immunology
- *6Y03 /** Genomes and Evolution
- *707 /** Mechanism of Enzyme Action
- *710 /** Special Topics in Proteins
- *711 /** Special Topics in Biomolecular Sciences
- *712 /** Special Topics in Membrane Biochemistry
- *723 /** Topics in Molecular Biology
- *725 /** Molecular Mechanisms of Membrane Functions
- *726 /** Biophysical Chemistry of Membrane Structure
- *727 /** Proteins

Biology Courses

- *6T03 /** Neurobiology
- *6U03 /** Radiation Biology
- *720 /** Bioinformatics

Chemistry Courses

- #713 /** Bioanalytical Chemistry and Biosensors
- #738 /** Biophysical Analytical Techniques

Engineering Physics Courses

- *719 /** MEMS Devices: Design, Fabrication, and Applications

Medical Physics Courses

- *770 /** The Physics of Applied Medical Imaging
- *772 /** Medical Health Physics

Medical Sciences Courses

- *703 /** Gene Therapy
- *704 /** Cell Physiology
- *705 /** Neurochemistry
- *706 /** Topics in Cardiovascular Physiology
- *713 /** Physiology and Pathophysiology of the Gastrointestinal Tract
- *715 /** Advanced Immunology I
- *716 /** Advanced Immunology II
- *719 /** Electrophysiology of Excitable and Non-Excitable Membranes

- *729 /** Molecular and Cellular Pathology
- *732 /** Vascular Diseases, Haemostasis and Thrombosis I
- *733 /** Vascular Diseases, Haemostasis and Thrombosis II
- *742 /** Topics in Respiratory Physiology
- *755 /** Skeletal Muscle Cell Biology and Clinical Myology
- *756 /** Human Nutrition and Metabolism
- *758 /** Smooth Muscle Structure and Function I
- *765 /** Brain Imaging: Theory and Applications

Physics and Astronomy Courses

- *6S03 /** Molecular Biophysics

Research in Biomedical Engineering

Research in the School of Biomedical Engineering and its M.A.Sc. and Ph.D. programs has four main themes:

BIOMATERIALS AND TISSUE ENGINEERING

Research is ongoing in cardiovascular materials, ocular materials, biosensors, antibacterial materials, and bone-interfacing materials. Work in tissue engineering involves physiologic responses to biomaterials including inflammation, immunologic responses, coagulation, fibrosis, cell differentiation and infection. The use of encapsulation to isolate implanted cells from the host's immune system is also under investigation.

BIOMEDICAL IMAGING

Biomedical imaging research covers imaging of organs, tissues, cells and molecules in biological systems. Tissue and organ imaging research includes CT, SPECT, MRI, PET, and optical imaging. Facilities include SPECT/CT and PET for small animal imaging, and a small-bore MRI that can be used for clinical studies.

BIOMEDICAL TECHNOLOGY

This field groups together a number of activities encompassing medical instrumentation (including software aspects), medical devices (hearing, orthopedics), biosensors, biophotonics, BIOMEMS, and medical robotics (including telerobotics).

BIOPROCESSING

Bioprocessing relates to the science and technology associated with the large scale production of pharmaceuticals, vaccines, food and other bioproducts. Activities include genetic engineering, reactor design, and downstream processing operations such as separation and purification.

World class facilities are available in the conduct of this research. These include the facilities of the following Centres and Institutes at McMaster: Antimicrobial Research Centre, Institute for Molecular Medicine and Health, Institute for Molecular Biology and Biotechnology, Centre for Minimal Access Surgery, Brain-Body Institute, Henderson Research Centre, Juravinski Cancer Centre, Brockhouse Institute for Materials Research, Centre for Electrophotonic Materials & Devices, McMaster Manufacturing Research Institute, McMaster Institute for Applied Radiation Sciences, McMaster Institute for Polymer Production Technology.

BUSINESS ADMINISTRATION

The Faculty of Business offers programs leading to the M.B.A. and Ph.D. in Business Administration (fields in Management Science/ Systems and Human Resources) degrees.

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 Ph.D., colwell@mcmaster.ca
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Staff / Fall 2009

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 Christopher K. Bart, B.A., M.B.A. (York), Ph.D. (Western), CA / Strategic Market Leadership & Health Services Management / Principal, Directors College
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 M.W. Luke Chan, B.Sc. (PEI), M.A., Ph.D. (McMaster) / Finance & Business Economics / Associate V.P., Office of International Affairs
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 F. Isik Zeytinoglu, B.A., M.B.A. (Bogazici), M.A., Ph.D. (Pennsylvania) / Human Resources & Management

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 D. Wayne Taylor, B.A. (Toronto), M.P.A., Ph.D., P.Ad., P.Mgr. (York) / Strategic Market Leadership & Health Services Management
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 Ruhai Wu, B.A., M.S. (Tsinghua), M.S., Ph.D. (Texas) / Strategic Market Leadership & Health Services Management

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 Naresh C. Agarwal, B.A., M.A. (Delhi), Ph.D. (Minnesota)
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 Elko J. Kleinschmidt, Dip. Ing. (Staatliche Ingenieurschule – Hanover), M.B.A., Ph.D. (McGill) / Strategic Market Leadership & Health Services Management
 Winston H. Mahatoo, B.A. (London), B.Sc., M.Sc. (McGill), Ph.D. (Montreal) / Marketing
 John Miltenburg, B.Eng. Mgt., M.B.A. (McMaster), M.Eng. (Toronto), Ph.D. (Waterloo), P.Eng. / Operations Management
 William J. Schlatter, A.B., A.M., Ph.D. (Illinois), C.P.A.
 George W. Torrance, B.A.Sc., M.B.A. (Toronto), Ph.D. (SUNY at Buffalo), P.Eng. / Management Science
 William G. Truscott, B.S.E. (Princeton), M.B.A. (McMaster), D.B.A. (Indiana), P.Eng. / Production & Management Science
 George O. Wesolowsky, B.A.Sc. (Toronto), M.B.A. (Western), Ph.D. (Wisconsin) / Management Science

M.B.A. Degree

Students interested in the M.B.A. program can obtain full particulars covering admission and other regulations, as well as full course descriptions, from the M.B.A. Academic Calendar, which is available from the DeGroote School of Business, DSB-104, McMaster University, 1280 Main Street West, Hamilton, Ontario L8S 4M4. The calendar is also on the web page at www.degroote.mcmaster.ca.

The M.B.A. course program consists of 20 courses; ten in year one and ten in year two. Twelve of the 20 courses are core courses which all students are required to take. In year two students must elect a specialization and complete courses required for that specialization. They may also elect to take minors in certain subject areas. For specific information, see the M.B.A. Academic Calendar.

The above and following information relates to the program in effect Fall 2009. Any questions relating to program requirements in effect before September 2009 may be directed to the Manager, M.B.A. Programs in DSB-104.

Year 1 Courses

A600 / Financial Accounting and Reporting
A610 / Managerial Accounting
B600 / Organizational Behaviour

E600 / Economics
F600 / Managerial Finance
H600 / Human Resources Management
K603 / Information Systems Management
M600 / Marketing Concepts and Applications
O600 / Operations Management
Q600 / Applied Business Statistics

Year 2 Courses

ACCOUNTING AND FINANCIAL MANAGEMENT SERVICES

A701 / Intermediate Financial Accounting I
A702 / Intermediate Financial Accounting II
A703 / Advanced Financial Accounting
A717 / Seminar in Accounting Theory
A718/28/38 / Selected Topics in Accounting
A720 / Estate Planning
A721 / Management Accounting Information for Strategic Development
A723 / Accounting Information Systems
A724 / Controllorship
A727 / Financial Fraud and Market Surveillance
A730 / Canadian Taxation I
A732 / Financial Planning: The Tax Perspective
A733 / Canadian Taxation II
A740 / Strategic Management Accounting – Issues in Start-up and Growing Companies
A745 / Assurance
A750 / Financial Statement Analysis (*Same as F717*)

ORGANIZATIONAL BEHAVIOUR

B712 / Managerial Negotiations
B718/28/38 / Selected Topics in Organizational Behaviour
B730 / Strategic Management of Technology

BUSINESS ECONOMICS

E714 / Business and Economic Forecasting

eBUSINESS

K718/28/38 / Selected Topics in eBusiness
K723 / Data Mining and Business Intelligence
K724 / eBusiness Strategies
K725 / Business Process Re-engineering
K731 / Project Management
K735 / Managing the Implementation of Enterprise Systems
K736 / Management Issues in eHealth
K737 / Cases in eBusiness, Innovation and Entrepreneurship (*Same as Engineering Entrepreneurship & Innovation *726*)

FINANCE

F710 / Financial Economics and Quantitative Methods
F711 / Financial Institutions
F712 / Applied Corporate Finance
F713 / Security Analysis
F714 / Options and Futures: Theory and Applications
F715 / Portfolio Theory and Management
F716 / International Financial Management
F717 / Financial Statement Analysis (*Same as A750*)
F718/727/28/30 / Selected Topics in Finance
31/48/68
F720 / Small Business/Entrepreneurial Finance
F721 / Mergers, Acquisitions and Corporate Control
F722 / Market Trading and Risk Management
F723 / Fixed Income Analysis
F724 / Venture Capital (*Same as V705*)
F725 / Personal Financial Management
F726 / Behavioural Finance
F727 / Working Capital Management
F730 / Pension, Retirement and Estate Planning
F731 / Insurance and Risk Management
F732 / Personal Financial Planning and Advising
F733 / Financial Risk Management
F734 / Real Estate Finance and Investment

HUMAN RESOURCES AND MANAGEMENT

- H721 /** Recruitment and Selection
H723 / Compensation / Reward Systems
H718/28 / Selected Topics in Human Resources Management

INTERNATIONAL BUSINESS

- I731 /** International Business
I732 / Japanese Business

STRATEGIC MARKETING

- M713 /** International Marketing Management
M718/28/38 / Select Topics in Marketing
M721 / Business Marketing
M722 / Health Care Marketing (*Same as C741*)
M724 / Innovation and New Products
M727 / Marketing Communication
M731 / Marketing Research
M732 / Consumer Behaviour
M734 / Strategic Marketing analysis
M736 / Services Marketing
M740 / Corporate Reputation and Brand Management

SUPPLY CHAIN MANAGEMENT

- O701 /** Operations Modeling with Spreadsheets
O711 / Operations Analysis under Uncertainty
O715 / Simulation of Manufacturing and Service Systems
O718/28/38 / Selected Topics in Operations Management
O721 / Materials Management and Production Planning
O722 / Modern Manufacturing Strategy
O725 / Business Logistics
O726 / Methods for Quality Management
O727 / Service Operations Management
O734 / Supply Chain Management

BUSINESS ENVIRONMENT AND POLICY

- P700 /** Business, Government and the Global Environment
P714 / Total Quality Management
P715 / Entrepreneurship
P720 / Strategic Management
P722 / Legal Aspects of Business
P725 / Team Research Project in the Management of Innovation and New Technology
P727 / Strategic Knowledge Management
P731 / Crisis Management and Communications
P734 / Current Issues in Management of Innovation and New Technology
P737 / Profiting from Intellectual Capital
P745 / Corporate Governance

STRATEGIC BUSINESS VALUATION

- V700 /** Strategic Business Analysis and Valuation
V701 / Financial Reporting and Disclosure Analysis
V702 / Behavioural Finance
V703 / Financial Modeling and Valuation
V704 / Strategic Business Valuation Project
V705 / Venture Capital (*Same as F724*)

HEALTH SERVICES MANAGEMENT

- C711 /** Health Economics and Evaluation
C721 / Health Policy Analysis
C722 / Management of Population Health
C726 / Critical Issues in Health Services Management
C727 / Parma/Biotech Business Issues
C736 / Quality Management in Health Services
C741 / Health Care Marketing (*Same as M722*)

Topics covered in the Selected Topics courses will vary depending on recent developments in the subject area and the research interests of the instructor(s).

There is no thesis requirement for graduation in the M.B.A. program. However, a student in the second year may, with the prior approval of the appropriate instructor, Area Chair, and Associate Dean

(Academic) of Business, undertake an original paper, research study or project in an area directly associated with his/her program of study. Credit for one second year course will be granted upon satisfactory completion of the project.

In addition to the elective courses listed, students in Year 2 who wish to take graduate courses in other departments of the University as part of their M.B.A. program may do so provided they secure approval from the particular department concerned and the Manager, M.B.A. Programs, DeGroote School of Business.

Graduate students not registered in the Faculty of Business may enroll in M.B.A. courses only with the prior approval of the Faculty of Business and their department. Enquiries should be directed to the Manager, M.B.A. Programs, DeGroote School of Business.

Ph.D. Degree

The Faculty of Business offers a program leading to the Ph.D. in Business Administration, with fields in Finance, Human Resources (HR), Information Systems (IS), Management Science (MS), and Marketing.

The Finance field of study is designed to prepare and graduate students with theoretical and empirical training that is required to conduct significant academic research in finance. The topics of study include, but are not limited to, the pricing of securities, investment and risk management, corporate finance, and other financial decisions of individuals and firms. This field of study is intended for individuals who are interested in the field of Finance and in a career in university teaching and research, as well as research-based careers in the financial services sector. These may include fund management and investment banking. Typically, successful applicants will have a Master's degree in Business Administration, Economics, Finance, Mathematics or a related field.

The HR field is broad in scope and is concerned with all aspects of the employment relationship. The field has a strong research emphasis and is designed to prepare highly motivated individuals for academic careers as scholars in Organizational Behaviour, Human Resource Management, and Industrial Relations. A major strength of the field is that students can draw upon diverse faculty interests to develop a research program that suits their own objectives. It is intended for students with a Master's degree in business administration or in disciplines such as psychology, economics or sociology.

The IS field of study concerns the management, use and impact of information technologies in organizations. It is a multidisciplinary field by nature and draws upon theory and research from a wide variety of disciplines such as Organizational Behaviour, Strategy, Marketing, Psychology, Computer Science, and Information Studies. Recognizing the breadth of the field, students are free to adopt either qualitative or quantitative approaches to their research, as appropriate. The program is intended for students with a strong background and interest in information technology and an avid interest in managerial and behavioural aspects as opposed to technical orientations. It is intended for students with a Master's degree in Business Administration, Computer Science, and/or Information Systems.

The MS field is concerned with the development and application of quantitative modeling and systematic approaches to the solution of management problems. Areas of application for these techniques include operations management, logistics, and supply chain management. The field has a strong research emphasis and is designed to prepare highly motivated and capable individuals for making significant advances in management science knowledge. It is intended for students with Master's degrees in Business Administration or in disciplines such as Mathematics, Engineering, Science, and Computer Science.

The Marketing field of study is designed to prepare graduate students with a solid foundation in theoretical and empirical methodologies focusing largely on firm level research in the discipline of marketing. The doctoral student will work closely with the supervisor to conduct leading edge research in the discipline of marketing, which explores the processes and mechanisms by which value is created and delivered to the customer. The expectation is that this research will be published in top journals prior to graduation. The program is designed for students who have an interest in pursuing an academic career.

Application

Requests for application material should be sent to the attention of the Ph.D. Administrative Coordinator, DeGroot School of Business, McMaster University, Hamilton, Ontario, Canada, L8S 4M4. Admission decisions are based on previous academic performance, Graduate Management Admission Test (GMAT) or Graduate Record Examination (GRE) results, references, research interests and other relevant information.

Qualification Requirements

Admission to the Ph.D. program will be granted in accordance with the general regulations of the School of Graduate Studies as specified in the front of this calendar. Applicants normally must have a Master's degree with at least B+ standing, a minimum GMAT score of 600 or a minimum GRE score of the 80th percentile. Admission decisions are based on past academic performance, GMAT or GRE score, the strength of reference letters, the quality of the applicant's statement of research interests and goals, and matching of the applicants' research interests with the research expertise and interests of the faculty members.

Finance candidates must demonstrate competence in business management, finance, mathematics and economics.

HR candidates must demonstrate competence in a variety of subject areas in business management, including organizational behaviour, human resources management, labour relations, industrial and organizational psychology and economics. HR candidates must also demonstrate proficiency in topics appropriate to their selected concentration of study.

IS candidates must demonstrate proficiency in business management and information systems. Students must also demonstrate proficiency in statistics at a level sufficient for study and research in the IS field.

MS candidates must demonstrate proficiency in various subject areas in business management, including operations management and economics. They must also demonstrate proficiency in calculus, probability, matrix algebra, statistics and computer programming at a level sufficient for study and research in the MS field.

Marketing candidates must have demonstrated proficiency in any area of the natural sciences, social sciences or humanities. They are encouraged to demonstrate some competence in areas of business management and marketing. Students must also have demonstrated proficiency in mathematics or statistics at a level sufficient for study and research in the Marketing field.

For all fields, competence in the above subjects may be demonstrated by taking courses, by qualifying for credit for courses, or by passing waiver examinations; this normally will be done within one calendar year of admission.

Applicants whose native language is not English will be required to demonstrate English language proficiency by providing a valid TOEFL test score at the time of application. Successful applicants will normally achieve a score of at least 100 and a minimum of 22 in the reading component, 22 in the listening component, 26 in the speaking

component and 24 in the writing component on the Internet-Based Test (IBT); or 600 on the Paper-Based Test (PBT); or 250 on the Computer-Based Test (CBT). We may also consider the equivalent score on other recognized tests.

Applicants may be exempted from this requirement if they have completed a university degree where English was the language of instruction.

Applicants are responsible for making all arrangements regarding writing of the TOEFL test or other recognized tests and for ensuring the official score report is forwarded to the DeGroot School of Business in a timely manner.

Program Requirements

Because of the differing backgrounds of students entering the program and the differing areas of dissertation research, there will be variations in the course programs that students follow. A program will be chosen by the student with the approval of the student's supervisor and the Ph.D. Director. This program will be chosen to prepare the student for the comprehensive examinations and to provide appropriate background for the planned dissertation research. Most of the courses and seminars will be taken from within the School of Business. Where appropriate, and with the approval of the student's supervisor and Ph.D. Director, courses from other departments within the University or from other universities may be taken; such courses normally will be graduate courses. Graduate courses offered in other university departments are described elsewhere in this calendar.

Students must take a minimum of 6 to a maximum of 12 one-term courses. The exact number and mix of courses will depend on the background and research interests of the student as assessed by the student's supervisor and the Ph.D. Director. Students can receive exemptions for courses (if prior knowledge exists) or take additional courses as long as the total number does not exceed 12 courses.

All students in the program, regardless of field of study, take one common seminar course (B778).

For the Finance field, the four finance Ph.D. courses (F771, F772, F773 and F774) and F710 must be taken. In addition the following courses from the Department of Economics must be taken: 721, 722, 723, 761 and 762.

For the HR field, the four Ph.D. seminar courses (B779, B780, B781, B782) and two MBA or Ph.D. human resources courses (chosen from B712, B718, B720, B730, H721, H723 and B783) must be taken.

For the IS field, the two Ph.D. seminar courses (B780, B782), two IS Ph.D. courses (chosen from K778, K779, K791 and K792), and three MBA information systems courses (chosen from K723, K724, K725, K731, K735, K736, K737 and O734,) must be taken.

For the MS field, the five MS Ph.D. courses (Q771, Q773, Q780, Q781 and Q790), two MBA courses (O701, O711), and your choice of two MBA or Ph.D. courses (chosen from O715, O721, O722, O725, Q772, Q774, Q778, Q791, Q792, Q793, Q794 and O734) must be taken.

For the Marketing field, the two Ph.D. seminar courses (B780, B782), the four marketing Ph.D. courses (M771, M772, M773, M774), and two MBA marketing courses (chosen from M724, M731, M732, M734 and M736) must be taken.

In order to remain in the program, students must maintain a grade point average of at least B+ in their course work with no more than one failing grade (below B-) in a prescribed course. The student will be required to withdraw from the program if he/she receives a second failing grade.

Comprehensive Examination

All doctoral candidates must pass a comprehensive examination in their chosen field of study to demonstrate knowledge of the field and preparation for research. The comprehensive examination will test each student's knowledge of core material, familiarity with the relevant literature and knowledge of methodology required to do research in the field. In addition to the comprehensive examination, students must pass an oral defence of their dissertation proposals. The dissertation examination will take place in accordance with the regulations of the School of Graduate Studies.

Courses

With the permission of the Ph.D. Director, a limited number of MBA or other graduate students may take any of the Ph.D. courses listed below.

COMMON COURSE

B778 / Management Theory

The seminar provides a broad overview of the role of theory and theory building in management. The student will engage in systematic scientific inquiry pertaining to different schools of management relevant to business. The underlying theory of management driving each school of thought will be the focus of analysis. An attempt will be made to integrate the diverse schools of thought toward an inclusive theory of management that would serve as the backdrop for future management research and practice.

FINANCE

F771 / Financial Economics I

This course is an advanced course on financial- and capital-markets theory with an emphasis on discrete-time models. Topics include the expected-utility hypothesis, the state-preference framework, security-pricing models, portfolio theory and market efficiency.

F772 / Financial Economics II

This course extends FC1 to include continuous-time models of security valuation and, especially, option-pricing models. The course will also discuss corporate financial decision making, particularly capital structure and dividend policies.

F773 / Empirical Methods in Finance

This course examines empirical methods employed by researchers to test financial theories. Topics include the testing of asset-pricing models, the event-study methodology and the distribution of security returns.

F774 / Seminar in Finance

This course exposes students to a wide range of finance literature. All finance Ph.D. students are required to attend, but only those in their second year take it for credit. The course allows students to develop ideas for their dissertations. There will be presentations of papers by students and invited outside scholars. Students will provide critical evaluation of the presented papers.

HUMAN RESOURCES

B779 / Research Issues I

This course provides an exposure to core readings and emerging issues in human resources. A critical review and in-depth analysis of core articles and issues in HR will enable students to evaluate literature critically with an eye to appropriateness of design, methodology, analysis, interpretation and overall contributions to the field.

B780 / Research Methods and Design

This seminar provides an exposure to issues and techniques of questionnaire and survey development, instrument design and selection, psychometrics, and qualitative and quantitative methods in the context of a research project. A research proposal by the end of course is required.

B781 / Research Issues II

This seminar builds on B779 with a broadening and diversifying of students' exposure to core readings and issues in human resources. A critical in-depth examination of the primary research literature, focusing on appropriateness of design, analysis, interpretation, contribution and future directions, is undertaken.

B782 / Applied Multivariate Statistics

This course will introduce students to a variety of multivariate data analysis techniques that they are likely to use in analyzing data from their own research. The focus will be on issues related to the application of these techniques rather than their mathematical foundations. Topics to be covered include multiple regression, MANOVA, exploratory factor analysis, and structural equation modeling. A graduate level course in introductory/univariate statistics (e.g., Sociology *6Z03), or equivalent, would be a prerequisite to this course.

B783 / Selected Topics in Human Resources

This course will provide students with an opportunity to study selected topics in Human Resources, which are not covered in currently available courses. Topics will depend on the research interests and availability of faculty. The format of the course might be directed readings or in-class instruction, depending on the number of interested students.

INFORMATION SYSTEMS

K778 / Selected Topics in Information Systems/eBusiness

From time to time selected topics courses may be offered to take advantage of the research experience of a faculty member or a visiting scholar, where a similar course is not available on this topic area elsewhere at the University. Topics will be announced for the session they are offered.

K779 / Selected Topics in Information Systems/eBusiness II

From time to time selected topics courses may be offered to take advantage of the research experience of a faculty member or a visiting scholar, where a similar course is not available on this topic area elsewhere at the University. Topics will be announced for the session they are offered.

K791 / Knowledge Management Systems

The objective of this Ph.D. seminar course is to look at the state of the art in assessing, capturing and sharing organizational knowledge resources through information systems. The business environment is increasingly competitive and the rate of innovation is rising. Companies compete with each other in ways different from before. To this end, knowledge plays a unique role in building and conserving an organization's core competencies through knowledge networking. Knowledge management can be defined as a formal, directed process of determining what knowledge individuals within a company have that could benefit others in the company, then devising ways of making it easily available through knowledge-based systems. Prerequisite: K603 or permission of the instructor

K792 / Security, Privacy and Trust in eBusiness

This course discusses important security, privacy, and trust issues and addresses them from business, technology, and government regulation perspectives. Students are required to make seminar presentations and write a research paper on selected topics. Prerequisite: K603 or permission of the instructor

MANAGEMENT SCIENCE

Q771 / Stochastic Processes with Business Applications

Stochastic processes and their applications in modeling the business environment. Emphasis is on understanding and applying the concepts in modeling, rather than on a strictly mathematical approach. Markov chains, Poisson processes, "birth" and "death" processes, queuing systems, elementary renewal theory, and

diffusion processes are discussed. Individual student participation is also required in selecting, researching and presenting topics on stochastic process applications. Prerequisite: O711 or permission of the instructor.

Q772 / Networks and Graphs in Operations Research

An advanced course dealing with the optimization of network and graph models as well as their application to problems in transportation, location, inventory control, and distribution. Prerequisite: O711 or permission of the instructor.

Q773 / Optimization I

The course will cover topics in linear, integer and nonlinear programming. Concepts to be covered include convexity, duality, Karush-Kuhn-Tucker conditions, complexity and different algorithmic and heuristic approaches to solving optimization problems. A selection of application and theory papers will also be discussed. Software implementation issues will be highlighted via the use of a popular package called the General Algebraic Modeling System (GAMS).

Q774 / Optimization II

The course deals with constrained and unconstrained nonlinear optimization. After an introduction to basic methodology, advanced topics will be selected from: fractional programming, multicriteria programming, nondifferentiable optimization, Lagrangean relaxation, geometric programming, optimal control, stochastic programming, trajectory methods, and other techniques. The emphasis will be on the application of these methods in research studies. Prerequisite: Q773 or permission of the instructor.

Q778 / Selected Topics in Management Science/Systems

From time to time selected topics courses may be offered to take advantage of the research experience of a faculty member or a visiting scholar, where a similar course is not available on this topic area elsewhere at the University. Topics will be announced for the session they are offered.

Q780 / Management Science Research Issues I

This course provides an exposure to the core readings and emerging issues in management science. It is intended to bring Ph.D. students to the frontiers of knowledge in important topics in the management science field. In addition to the core readings, specific technical topics (e.g., discrete optimization, dynamic programming, game theory and scheduling) and new application areas (e.g., supply chain management and revenue management) that coincide with the research interests of the students will be discussed.

Q781 / Management Science Research Issues II

This course builds on the material covered in MS1. However, in this course the primary emphasis will be on developing Ph.D. students' research skills in their particular area of interest. This will be achieved by focussing on an in-depth study of specific management science technique(s) (e.g., game theory or dynamic programming) as applied to the solution of problems in an area of application (e.g., revenue management) that may be of interest to the student.

Q790 / Advanced Operations Management I

The first of two courses focusing on the use of operations research methodology to solve problems faced by operations managers. Three broad areas are covered: forecasting, single stage inventory systems (single and multi-item deterministic demand problems, single item stochastic demand problems), and deterministic production planning and control systems (MRP, JIT, theory of constraints, job shop scheduling). Prerequisite: enrolment in the MS/S field of the Ph.D. Program or permission of the instructor.

Q791 / Advanced Operations Management II

Three broad areas are covered: design of production lines, multi-stage production and distribution problems (including facilities location), and (stochastic) models dealing with the effect of variability in the production environment. The emphasis of the course might vary depending on the instructor. Examples of major subtopics are: assembly line balancing, design and performance evaluation of traditional versus flexible production lines and applications of queuing theory to production-inventory problems. Prerequisite: Q790.

Q792 / Statistical Methodologies for Quality Control

This course deals with a variety of statistical methodologies for quality control, assurance, and reliability. After a review of relevant statistical concepts, topics include process capability analysis, various forms of control charts, acceptance control, reliability concepts, and experimental design methods. The goal of the course is to give a solid introduction to current statistical methodology for quality control. Prerequisite: Permission of the instructor.

Q793 / Sequencing and Scheduling

This course deals with topics arising in operations management and control, typically in situations where scarce resources have to be allocated to activities over time. It concentrates on deterministic scheduling models. Main topics include complexity results and optimization and approximation algorithms for problems on single machines, parallel machines, open shops, flow shops, job shops, and resource-constrained project scheduling. Prerequisite: O600 or permission of the instructor.

Q794 / Inventory Theory

In-depth reviews are conducted on a number of important inventory models. These include models with: known and constant demand; known and time varying demand; continuous review with stochastic demand; periodic review with stochastic demand; single period models; and dynamic inventory models with stochastic demand. Prerequisite: O701 and O711 or permission of the instructor.

MARKETING

M771 / Marketing Foundations

This seminar will examine the extant research in the area of marketing management and marketing decisions. The course will cover among others issues such as market structure, competitive strategy, market analysis, contracts, attitudinal theories, marketing communication, firm performance and innovation.

M772 / Marketing Models and Modeling

This seminar will examine the theoretical models in marketing phenomena and techniques to develop analytical and empirical models explaining marketing decision making will be discussed and critiqued. The modeling techniques that will be discussed include Bass model, marketing channels, strategy and performance, innovation, new products, SEM, Conjoint, Panel Data, Diffusion, etc.

M773 / Inter-Organizational Research in Marketing

This seminar will focus on inter-organizational networks, relations and strategy. It will study these from an efficiency perspective with special attention to the behavioural, transaction cost and relational contracting schools of thought. The topics covered will incorporate the spectrum of institutional, analytical and methodological traditions in the area.

M774 / Special Topics in Marketing Strategy

This seminar will focus on specific areas in marketing strategy with an emphasis in form level analysis. Topics will vary.

CHEMICAL BIOLOGY

The Chemical Biology Program provides facilities for students intending to proceed to the M.Sc. and Ph.D. degrees.

Chemical Biology utilizes chemical tools and techniques to answer biological questions. The program will involve a multi-disciplinary investigation of phenomena at the interface between chemistry and biology. Working with faculty with broad-ranging expertise, students will learn skills in both the chemical and life-sciences areas, and appreciate how these complement each other to allow new insights into biological processes and systems.

The Chemical Biology program is administered by the Departments of Chemistry and Biochemistry & Biomedical Sciences and includes faculty members from the Departments of Biology, Physics & Astronomy, Medical Physics & Applied Radiation Sciences and Molecular Medicine & Pathology. The program offers degrees at the M.Sc. and Ph.D. level.

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Staff / Fall 2009

PROFESSORS

David W. Andrews, B.Sc. (Ottawa), Ph.D. (Toronto)
 John D. Brennan, B.Sc., M.Sc., Ph.D. (Toronto) / Director
 Michael A. Brook, B.Sc., Ph.D. (McGill)
 Eric D. Brown, B.Sc., M.Sc., Ph.D. (Guelph)
 Turlough M. Finan, M.Sc. (National), Ph.D. (Guelph)
 Radhey S. Gupta, B.Sc. (Agra), M.Sc. (New Delhi), Ph.D. (Bombay)
 Adam P. Hitchcock, B.Sc. (McMaster), Ph.D. (British Columbia), F.C.I.C.
 Brian E. McCarry, B.Sc. (British Columbia), Ph.D. (Stanford), F.C.I.C.
 Elizabeth A. Weretilnyk, B.Sc., Ph.D. (Alberta)
 Gerard D. Wright, B.Sc., Ph.D. (Waterloo)
 Daniel S-C. Yang, B.Sc., M.Sc. (Alberta), Ph.D. (Pittsburgh)
 Boris S. Zhorov, Ph.D. (Pushchino), D.Sc. (Kiev)

ASSOCIATE PROFESSORS

Alex Adronov, B.Sc. (McMaster), Ph.D. (Berkeley)
 Paul W. Ayers, B.Sc. (Lipscomb), Ph.D. (UNC Chapel Hill)
 Paul J. Berti, B.Sc. (Waterloo), M.Sc. (Ottawa), Ph.D. (McGill)
 Russell Bishop, B.Sc., Ph.D. (Alberta)
 Philip Britz-McKibbin, B.Sc. (Toronto), Ph.D. (British Columbia)
 Lori Burrows, B.Sc., Ph.D. (Guelph)
 Alfredo Capretta, B.Sc., Ph.D. (McMaster)
 Cecile Fradin, B.Sc., M.Sc. (École Normale Supérieure, Paris, France), Ph.D. (Univ. Pierre et Marie Curie, Paris, France)
 Paul H.M. Harrison, B.A. Hons. (Oxford), Ph.D. (Alberta), M.C.I.C.
 Yingfu Li, B.Sc. (Anhui), M.Sc. (Beijing), Ph.D. (Simon Fraser)
 James McNulty, B.Sc., M.Sc., Ph.D. (Toronto)
 Giuseppe Melacini, B.Sc. (Milano), Ph.D. (Milano, U. California San Diego)
 Justin R. Nodwell, B.Sc., Ph.D. (Toronto)
 Bernardo L. Trigatti, B.Sc., Ph.D. (McMaster)
 Ray Truant, B.Sc., Ph.D. (Toronto)
 John F. Valliant, B.Sc., Ph.D. (McMaster)
 Lesley A. Warren, B.Sc., Ph.D. (Toronto)
 Geoff Werstuck, B.Sc., Ph.D. (McMaster)

ASSISTANT PROFESSORS

Brian Coombes, B.Sc., Ph.D. (McMaster)
 Alba Guarné, B.Sc., M.Sc., Ph.D. (Barcelona)
 Murray S. Junop, B.Sc. (Ryerson), Ph.D. (Western)
 Nathan A. Magarvey, B.Sc. (Dalhousie), Ph.D. (Minnesota)
 Joaquin Ortega, B.Sc. (Zaragoza), Ph.D. (Autónoma de Madrid)

PROFESSOR EMERITUS

Richard M. Eband, A.B. (Johns Hopkins), Ph.D. (Columbia)

Admission into the Program

Students entering the Chemical Biology program may be admitted from a number of suitable undergraduate degrees (including the Life Sciences, Chemistry and Biophysics). Students with undergraduate degrees in other disciplines are also encouraged to apply although the Director of the Chemical Biology Program, in conjunction with the Admissions Committee, will be required to judge the candidate's suitability. A minimum B+ average (equivalent to 8.5/12) in the final two years of a four-year undergraduate degree is required for admission into our M.Sc. program. Students holding a B.Sc. with a minimum A- average (10.0/12) or already holding a M. Sc. degree may be admitted directly into our Ph.D. program but are required to pass a qualifying exam in the first year of study and a comprehensive examination in the second year of study.

M.Sc. Degree

Note that the Department of Biochemistry & Biomedical Sciences and other affiliated departments offer 12-week courses that are equivalent to one half of a full graduate course while the Department of Chemistry offers 6-week modules that are equivalent to one-quarter of a full graduate course. In addition to Chemical Biology courses (equivalent to one-half of a full graduate course), a mixture of courses from participating departments is encouraged.

A candidate for the M.Sc. degree is required to spend at least one calendar year in full-time study at McMaster University. The candidate is required to complete satisfactorily not fewer than one full graduate course which must be at the 700-level. All M.Sc. students must take CHBY *700 as a core course, and must also enroll in the CHBY *701 or CHBY *702 colloquium course. In addition to CHBY courses, other courses and/or modules may be selected from any of the participating departments. Other courses will be defined in consultation with the student's research supervisor, supervisory committee, and/or the Program Director. The minimum passing grade for any module or course is B-.

The candidate must also present a thesis which will embody the results of original research. The thesis must be defended in an oral examination. The candidate will be required to participate in the Chemical Biology seminar program.

Transfer to Ph.D. from the M.Sc. Program

Students who have satisfactorily completed the course requirements for the M.Sc. degree and have made satisfactory progress in their research may apply to the Program Director for transfer to Ph.D. studies, without first satisfying the M.Sc. thesis requirement. This is normally done by submission of a report detailing the student's research progress, projected research goals and successful completion of an oral examination.

Ph.D. Degree

Candidates for the Ph.D. degree must complete the CHBY *700 course if this course was not completed at the M.Sc. level. There are no other formal course requirements. All Ph.D. students must also enroll in either the CHBY *701 or CHBY *702 colloquium course. In addition to CHBY courses, other courses and/or modules may be selected from any of the participating departments. Other courses will be defined in consultation with the student's research supervisor, supervisory committee, and/or the Program Director. The candidate will be required to participate in the Chemical Biology seminar program. Every candidate must pass a Comprehensive Examination, normally taken between 18 and 20 months after beginning Ph.D. work

at McMaster. The Comprehensive Examination will consist of a seminar and oral defense. Candidates must present a thesis which will embody results of original research and give evidence of high scholarship. The candidate will be required to defend the thesis in a final oral examination.

Chemical Biology Program Colloquia and Seminars

All graduate students are expected to attend all program colloquia and seminars. M.Sc. students must register in one of the Chemical Biology Graduate Colloquium courses: CHBY *701 or CHBY *702. CHBY *701 is a non-credit course requiring students to present a seminar without an associated review, while CHBY *702 is a credit course involving both a seminar and an associated review.

Students enrolled in CHBY *701 will be given a PASS or FAIL grade for their colloquia. In cases involving a FAIL grade, students must repeat the colloquia, and in some cases extra work may be assigned to cover areas of weakness. CHBY *702 will be graded using the standard letter-grade format.

Students entering the Ph.D. program with an external M.Sc. degree must present one seminar during their first year of study. Ph.D. students who transfer from the M.Sc. program are required to take a total of two seminar courses (one prior to transfer and one after), but may take CHBY *702 only once.

Courses

The Chemical Biology program offers a number of unique courses that are designed to foster interdisciplinary and independent learning. All courses will be taught in the inquiry style, and will focus heavily on examination of the current literature at the interface of Chemistry, Biochemistry and Biology. All courses will be administered by a minimum of two faculty members from different departments involved in the program in an effort to provide complementary viewpoints on a given topic.

The Chemical Biology program offers graduate courses in the form of both "courses" (which are the formal equivalent of one-half of a full graduate course) and "modules" (which are the formal equivalent of one-quarter of a full graduate course). 600-level half courses are also available for credit, at the M.Sc. level only and with approval from the Program Director, to a maximum of one-half course (equivalent to two module credits).

Note that all students outside the program may take the Chemical Biology courses listed below with the permission of the instructor.

List of 600-level courses:

CHEMISTRY COURSES

- *6D03 / Organic Structure and Synthesis
- *6DD3 / Mechanistic Biological Chemistry
- *6P03 / Advanced Analytical Chemistry

BIOCHEMISTRY AND BIOMOLECULAR SCIENCES COURSES

- *6E03 / Recombinant DNA Technology and Gene Expression
- *6Q03 / Biochemical Pharmacology
- *6Y03 / Computational Biology

BIOLOGY COURSES

- *6B03 / Plant Metabolism and Molecular Biology

List of 700-level graduate courses and modules. Courses marked with a (+) sign may be taken more than once.

+*700 / Topics in Chemical Biology / E. Brown, A. Capretta

This course will set the tone for the Chemical Biology program and will be team taught by at least two instructors. The course will use topics from the current literature to provide an overview of Chemical Biology and will demonstrate the integration of chemical, biochemical and biological approaches to the solution of current problems of relevance to medicine, the environment and drug design. The focus of this course will vary from year to year; the integrative approach to chemical biology will remain the course goal each year.

+*701 / Chemical Biology Colloquium A

Students will prepare and present a seminar concerning a detailed examination of their own area of research. Participants will be required to provide a suitable background to the work and critically discuss salient aspects of the field. A question period will follow in order to provide a forum for discussion of the material presented. This is a non-credit course.

*702 / Chemical Biology Colloquium B

Students will present a seminar concerning a detailed examination of their own area of research and also prepare a review article describing the current state of their field. The review must provide suitable background to the area, the current state of the research within the field and an appraisal of possible future trends and directions. Students are encouraged to provide critical assessment of the material presented and use the format employed by the journal "Trends in Biochemical Sciences" or "Accounts of Chemical Research". Students will receive credit for this course.

COURSES OFFERED BY AFFILIATED DEPARTMENTS

Biochemistry & Biomedical Sciences Courses

*710 / Special Topics in Proteins

Topics in areas of advanced proteins will be discussed.

*711 / Special Topics in Biomolecular Sciences

Topics in biomolecular sciences will be examined using current research papers.

*720 / Biochemistry Colloquium

Students present a major seminar dealing with their research and write a review article that illustrates its contribution to the current state of their field.

*723 / Topics in Molecular Biology / J. Hassell

Critical examination of classic and current papers in molecular biology with the object of giving students practice in presenting and discussing research material. (Given in alternate years with Biology *723.)

*730 / Computational Biochemistry / B. Zhorov (Same as Computational Engineering & Science *738)

The course will provide a brief introduction to biochemical databases, biological data mining and tools for sequences analysis. This will be followed by more detailed description of computational methods of molecular modeling, ligand docking, and analysis of ligand-receptor interactions. Facilities of the Educational Computing Lab will be used to train students on applying WWW resources of biological information and molecular modeling software in a biomedical lab.

Biology Courses

*775 / Molecular Microbiology and Microbial Genomics

Topics of this course are current research on bacteria and fungi using molecular genetic, biochemical, bioinformatics, and genomic methods to study natural biodiversity, cell structure, cell-cell interactions and metabolism in laboratory model organisms and natural ecosystems.

Chemistry Courses**#703 / Numerical Methods and Computational Chemistry / R. Dumont**

This course introduces problems of computational chemistry and their solution via numerical methods. Simple programming is used to implement these solutions. Simulation of molecular dynamics, optimization of molecular geometries, and Hamiltonian diagonalization are treated.

+ #708 / Analytical Separation Science / B. McCarry, J. Terlouw

The principles and applications of modern chromatographic separations, including the interfacing of separations techniques with spectroscopic and mass spectrometric detectors. This course will focus primarily on gas chromatography and liquid chromatography, recognizing that these methods are still the principal separation techniques used today. The course will also discuss recent developments in chromatographic methods. Since the majority of the students who will take this course are non-specialists in this area, the course will focus on practical applications with a lesser emphasis on detailed theoretical aspects of chromatographic processes.

#716 / Transition Metal Chemistry**+ #724 / Solid State Chemistry / J. Barbier, J. Greedan**

This module presents a description of non-molecular crystal structures as applied to inorganic oxides, oxo-salts and minerals. Starting with the description of simple structure-types (e.g., cubic and hexagonal close-packings), it will be shown how the application of simple operations leads to the formation and the understanding of more complex structure. Another version of the course is concerned with the structure and properties of transition metal oxides. The interplay between crystal structure, electronic structure and a variety of physical properties, e.g., electrical transport, optical and magnetic properties is explored in detail.

+ #725 / Chemical Applications of Group Theory / A. Hitchcock, M. McGlinchey

The principles of group theory and its application to atomic and molecular electronic structure. Basic aspects: symmetry elements and operations; matrix representations; great orthogonality theorem; character tables; special groups. Techniques: reduction of representations; symmetry aspects of wave functions and quantum mechanical integrals; direct sum and direct product representations; projection operators; SALCs. Applications to Electronic Structure; atomic symmetry; angular momentum coupling; irreducible tensor methods; Wigner-Eckart theorem; p-MO theory; s- & p-treatments of small organic molecules; M.O. theory of organometallic compounds. The different instructors place emphasis on different applications of group theory in chemistry, such as molecular orbital theory of inorganic compounds, electronic spectroscopy, or vibrational spectroscopy.

#730 / Theory of Crystallography / J. Britten

The study of single crystals, how they diffract X-rays, and how the diffraction patterns can be analyzed to provide the molecular and crystal structures of organic, organometallic, and inorganic solids.

#731 / Diffraction Techniques / J. Barbier, J. Greedan

Neutron and Electron Diffraction. One half of this module presents an introduction to the techniques of electron diffraction and transmission electron microscopy (TEM) as applied to the structural investigation of non-molecular inorganic oxides and minerals. The other half introduces the technique of neutron diffraction with emphasis on the complementary relationship to X-ray diffraction. Magnetic neutron diffraction is included.

#736 / Molecular Structure Determination by Diffraction Methods / J. Britten

This module will show the student how to determine the structure of an unknown compound (preferably from the student's own research) using single crystal X-ray diffraction methods, how to prepare a report for publication, and how to critically examine published structures. Normally taken in conjunction with Chemistry 730.

#737 / Mass Spectrometry Instrumentation and Applications**#740 / Basic Theory of NMR / Hughes**

An introduction to the concepts and applications of pulsed Fourier transform nuclear magnetic resonance (NMR) spectroscopy. The module begins with a review of the basic NMR experiment and then proceeds to a description of the pulsed NMR technique and the use of Fourier transformation to generate the spectrum. The next section deals with a general description of the pulse NMR spectrometer and the parameters used in data acquisition and processing. The final section covers more traditional topics dealing with ^1H and ^{13}C chemical shifts, coupling constants and relaxation times with the emphasis on the structural information these parameters provide. This section will also illustrate some of the essential one-dimensional techniques used in analyzing NMR spectra (T_1 measurements, spin decoupling, NOE difference spectra and ^{13}C spectral editing).

#741 / Two-dimensional NMR Spectroscopy / Hughes

A general introduction to the theory and application of modern multi-dimensional NMR techniques. The material in this module begins with a detailed description of the one-dimensional pulse sequences (spin echo and INEPT) from which most of the two-dimensional techniques have evolved. This is followed by a discussion of the most frequently used two-dimensional NMR techniques for establishing ^1H - ^1H and ^1H - ^{13}C connectivities (COSY, TOCSY, HETCOR, HMQC, HMBC, etc.). Each method is discussed in terms of how each type of 2D spectrum is interpreted, what parameters are required for the optimum 2D spectrum and the advantages and disadvantages of each technique. The final section surveys some of the recent developments in this area.

#744 / Solid-State NMR and Materials**#749 / Introduction to Biomolecular NMR / A. Bain, Hughes**

The goal of this module is to provide the basic conceptual tools necessary to read critically the current literature in biomolecular NMR. A basic understanding of one and two-dimensional NMR is assumed. This module will focus on the product operator formalism analysis of the most common multinuclear 2D and 3D NMR pulse sequences used for investigating biomolecules in solution, particularly protein. After this course, students will be able to implement published experiments and/or design pulse sequences for their own research. The focus is on macromolecules in solution, but it will also include experiments useful for small ligands.

#754 / Physical Organic Chemistry

An introduction to basic concepts in physical organic chemistry and the study of organic reaction mechanisms: kinetics and thermodynamics; thermochemistry; isotope effects; acid/base catalysis; linear free energy relationships.

#757 / Current Topics in Biological Chemistry

An examination of current advances in biological chemistry. The goal of this module is to allow each student to achieve an overview of one sub-field of biological chemistry, selected from a list of important research areas. The fields generally address a biological problem from a chemical perspective.

#765 / Advanced Polymer Chemistry / A. Adronov, H. Stover

This course focuses on living polymerizations, including ionic polymerizations as well as living radical polymerizations such as Atom Transfer Radical Polymerization (ATRP) and Stable Free Radical Polymerization (SFRP). It also includes aspects of polymerizations in suspended phases and in interfacial systems.

+ #767 / Selected Topics in Polymer Chemistry / R. Pelton, H. Stover

The objectives of the course are to review selected active fields in polymer science. Examples of topics covered include: Amphiphilic Polymers: Synthesis, solution properties and interactions with surfaces; Newer analytical techniques in the characterization of polymers; New methods of polymer synthesis. Usually, an overview of the field is presented in a series of lectures. Students write a report on a specific topic in the area and make an oral presentation to the class.

#770 / Molecular Electronic Structure Theory

Modern theoretical and computational approaches to the electronic structure problem will be presented. Topics will include wave-function based methods (Hartree Fock, Configuration Interaction, Coupled Cluster, Many-Body (a.k.a. Moller-Plesset) Perturbation Theory), density-functional theory, and density-matrix based approaches. At the end of this course, students should be able to understand journal articles in quantum chemistry.

Research in Chemical Biology

The Chemical Biology Program focuses its resources on understanding the role that biomolecular interactions play in the control of biological function. Research carried out by faculty members in the program centre on examining the biological significance of biomolecular complexes and interactions and their role in biochemical regulation and control of biochemical pathways; the development and use of small molecules to probe biological function; and the development and use of physicochemical, computational and high throughput assay methods for studying biological systems.

The research interests of current faculty members include: protein targeting and apoptosis (D.W. Andrews); transition state analysis in biochemical systems (P.J. Berti); Biogenesis of the gram-negative cell envelope (R. Bishop); high-throughput fluorescence and mass spectrometric assay methods (J.D. Brennan); bioanalytical chemistry, metabolomics, cellulomics (P. Britz-McKibbin); novel therapeutic targets in antibacterial research (E.D. Brown); Bacterial adhesions and bio-film formation (L. Burrows); organic and medicinal chemistry, drug discovery (F. Capretta); Microbiological biochemistry and antimicrobial research, cell biology and gene regulation (B. Coombes); relationship between membrane properties and biological function (R.M. Epanand); microbial genetics and genomics of soil microorganisms (T. Finan); dynamics of single molecules inside biological systems (C. Fradin); structural and functional studies of DNA mismatch repair proteins and DNA segregation proteins (A. Guarne); molecular sequences and the early history of life (R.S. Gupta); bio-organic chemistry and biosynthesis (P.H.M. Harrison); analysis of bulk and surfaces using

electron beam and synchrotron radiation based spectroscopies and microscopes (A.P. Hitchcock); X-ray crystallographic studies of DNA double strand break repair proteins (M.S. Junop); molecular evolution of functional nucleic acids (Y. Li); natural product biosynthesis and drug discovery, metabolomics, small molecule/chemical signaling (N. Magarvey); environmental analytical chemistry, metabolomics and genotoxicology (B.E. McCarry); organic synthesis, chemical biology, anticancer drugs (J. McNulty); biological NMR, protein structure and dynamics, biomolecular interactions (G. Melacini); bacteria as multi-cellular organisms (J.R. Nodwell); protein quality control systems, electron microscopy studies of the HtrA family of proteases (J. Ortega); targeted genetic approaches to studying lipid transport and its role in complex disease (B.L. Trigatti); polyglutamine expansion diseases (R. Truant); medical applications of radioisotopes (J. Valliant); Microbial-Geochemical linkages (L.A. Warren); identification of physiological and metabolic traits associated with environmental stress tolerance in plants using genomics and metabolomics approaches (E. Weretilnyk); Diabetes mellitus; cardiovascular disease (G. Werstuck); microbiological biochemistry and antimicrobial research (G.D. Wright); protein crystallography, protein engineering, structure and function of anti-freeze and ice nucleation proteins (D.S.-C. Yang); computer-based molecular modeling (B. Zhorov). A more detailed description of current research projects for each faculty member and a list of their recent publications are available on individual websites.

Facilities for Research

Recent acquisitions funded by both the Provincial and Federal Governments (2000, \$13M, 2004, \$11M and 2006, \$20M) have provided state-of-the-art facilities for research in chemical biology. Research facilities include: Magnetic Resonance Facility, Regional Centre for Mass Spectrometry, Single Crystal X-ray Facility, Protein Preparation Facilities, cell culture facilities, computational facilities and extensive optical spectroscopy resources. In addition, McMaster University has the only academically-based high-throughput screening facility in Canada, which is capable of both enzyme and high content whole-cell screening. Individual faculty members also have their own equipment in their laboratories which they support and maintain. More information about our research facilities is available on individual departmental websites.



CHEMICAL ENGINEERING

The Department of Chemical Engineering offers complete facilities to students seeking the M.Eng., M.A.Sc. or Ph.D. degrees and for post-doctoral research. Part-time Ph.D. studies in Chemical Engineering are permissible.

Enquiries: 905 525-9140 Ext. 24292

E-mail: chemeng@mcmaster.ca

Fax: 905 521-1350

Website: <http://www.chemeng.mcmaster.ca>

Staff / Fall 2009

DISTINGUISHED UNIVERSITY PROFESSORS

John L. Brash, B.Sc., Ph.D. (Glasgow), D.Hon.Caus. (Paris Nord), F.R.S.C., P.Eng. / Emeritus

John F. MacGregor, B.Eng. (McMaster), M.S., Ph.D. (Wisconsin), FASA, P.Eng., F.C.A.E. / Emeritus

PROFESSORS

James M. Dickson, B.A.Sc., M.A.Sc. (Waterloo), Ph.D. (Virginia Polytech. Inst. and State Univ.)

Andrew N. Hrymak, B.Eng. (McMaster), Ph.D. (Carnegie Mellon), P.Eng., F.C.I.C.

Rafik Loufif, B.Sc., M.Sc. (Ain Shams University), Ph.D. (Western), M.B.A. (Toronto)

Vladimir Mahalec, Dipl. Ing. (U. of Zagreb, Croatia), Ph.D. (Houston)

Robert H. Pelton, B.Sc., M.Sc. (Guelph), Ph.D. (Bristol)

Heather Sheardown, B.Eng. (McMaster), Ph.D. (Toronto), P.Eng.

Christopher L.E. Swartz, B.Sc. (Cape Town), Ph.D. (Wisconsin-Madison)

Philip E. Wood, B.A.Sc. (Waterloo), Ph.D. (Caltech.), F.C.I.C., P.Eng.

Shipping Zhu, B.Eng. (Zhejiang), Ph.D. (McMaster), P.Eng.

/ Joint appointment with Materials Science and Engineering / Chair

ASSOCIATE PROFESSORS

Carlos Filipe, B.S. (Escola Superior de Biotecnologia, Portugal), Ph.D. (Clemson University)

Raja Ghosh, B.S., M.S. (Jadavpur University, India), D.Phil. (Oxford)

Kim Jones, B.A.Sc. (Waterloo), M.Sc. (Guelph), Ph.D. (Toronto)

David Potter, B.Sc., Ph.D. (Waterloo) / Joint appointment with the Walter G. Booth School for Engineering Practice

Michael Thompson, B.Sc., B. Eng., M. Eng. (McMaster), Ph.D. (Waterloo)

ASSISTANT PROFESSORS

Benoit Chachuat, B. Eng. (ENGEES, France), M.A.Sc. (Louis Pasteur University), Ph.D. (INPL, France)

Todd Hoare, B.Sc. (Queen's), Ph.D. (McMaster)

Prashant Mhaskar, B.T. (Indian Institute of Technology), M.S.

(Louisiana State), Ph.D. (University of California, Los Angeles)

ASSOCIATE MEMBERS

Michael A. Brook (Chemistry)

Joseph McDermid (Mechanical Engineering)

Judith West-Mays (Pathology and Molecular Medicine)

INDUSTRY PROFESSOR

Paul Szabo, B. Eng., M. Eng. (Bucharest, Romania)

ADJUNCT MEMBERS

Santiago Faucher, B.Sc. (Queen's), Ph.D. (McMaster)

Lyndon Jones, B.Sc. (U. of Wales), Ph.D. (Aston)

L. Kris Kostanski, M. Eng., Ph.D. (Technical University of Szczecin)

Theodora Kourti, Dipl. Eng. (Chemical) (Aristotle Univ., Greece), Ph.D. (McMaster)

Qiang Liu, B.S., M.S. (East China University of Science & Technology), Ph.D. (Laval)

Yiliang Wu, B.Sc. (Sichuan Univ.), M.Sc. (University of Science & Technology of China), Ph.D. (Tokyo Institute of Technology)

Honglu Yu, B. Eng., M. Eng. (Tsinghua University), Ph.D. (McMaster)

PROFESSORS EMERITI

Malcolm H.I. Baird, B.Sc. (Glasgow), Ph.D. (Cambridge), F.C.I.C., P.Eng.

Cameron M. Crowe, B.Eng. (McGill), Ph.D. (Cambridge), F.C.I.C.

Irwin A. Feuerstein, B.Chem.Eng. (City College of N.Y.), M.S. (Newark College of Eng.), Ph.D. (Massachusetts)

Alvin E. Hamielec, B.A.Sc., M.A.Sc., Ph.D. (Toronto), F.R.S.C., F.C.I.C., P.Eng., Honorary Doctor of Engineering (Waterloo)

Thomas E. Marlin, B.S. (SUNY at Buffalo), M.S. (Dayton), Ph.D. (Massachusetts)

Leslie W. Shemilt, O.C., B.A.Sc., Ph.D. (Toronto), M.Sc. (Manitoba), D. Eng. (Waterloo), D.Hon.C (Kracow), D.Sc. (McMaster), F.R.S.C., F.C.A.E., F.C.I.C., F.A.I.Ch.E., F.E.I.C., P.Eng.

Paul A. Taylor, B.Sc., Ph.D. (Wales), P.Eng.

John Vlachopoulos, Dipl.Chem.Eng. (National Tech. Univ. of Greece), M.S., D.Sc. (Washington, St. Louis), F.C.I.C., F.S.P.E., P.Eng.

Donald R. Woods, B.Sc. (Queen's), M.Sc., Ph.D. (Wisconsin), D.Sc. (Queen's, Guelph, McMaster), F.C.I.C., F.A.I.Ch.E., P.Eng.

M.Eng. and M.A.Sc. Degrees

There are three programs available to candidates for the M.Eng. and M.A.Sc. degrees:

A. PROJECT PROGRAM (M.ENG.)

A candidate is required to complete successfully at least six one-term courses. A major study report must be presented which demonstrates the ability to carry out independent study in design, analysis or experimentation and to reach a satisfactory conclusion in a reasonable time.

B. RESEARCH PROGRAM (M.A.Sc.)

A candidate is required to complete successfully at least four one-term courses, at least three of which should be at the 700-level. Students are required to present a thesis which constitutes an original contribution to chemical engineering. The thesis must be defended in an oral examination.

C. INTERNSHIP PROGRAM (M.ENG. OR M.A.Sc.)

The normal course requirement for research project internship is six one-term courses plus a research project carried out in industry or at least four half courses plus thesis carried out in industry. The thesis must be defended in an oral examination.

Full-time candidates for the M.Eng. or M.A.Sc. degrees are required to spend at least one academic year of graduate study at McMaster University. Part-time studies are also possible. All M.A.Sc. candidates must present a seminar lecture on a topic approved by the Department, and are required to attend the seminars.

The Department encourages interdisciplinary research that is related to the broad interests of chemical engineering. Students should be aware that many graduate courses offered in other departments may be taken for credit in their program.

Ph.D. Degree

The general Regulations for Degree Doctor of Philosophy appear earlier in the Calendar. The minimum course program for this degree is at least seven half courses, at least five of which should be at the 700-level, beyond the baccalaureate degree or three half courses, at least two of which should be at the 700-level, beyond the M.A.Sc. degree. A candidate is also required to take the Ph.D. Comprehensive Examination which is designed to test the breadth of knowledge and the ability to synthesize and integrate ideas from within and peripheral to the candidate's research area. The Comprehensive Examination will normally take place between 6 and 18 months after the

candidate initially registers in the Ph.D. program. A supervisory committee determines when a candidate is ready to write his thesis and then ascertains whether the quality of presentation is satisfactory. The student is required to defend the thesis at a Final Oral Examination.

The Department of Chemical Engineering arranges a series of seminars; graduate students are required to attend and participate in these seminars. Ph.D. students must present one seminar on their research work before they graduate.

Courses

The following courses are offered by the Department. Not all courses are available each year. Courses marked with an asterisk (*) are one-term (half) courses. The following 600-level courses are offered for graduate credit and are also available to senior undergraduate students:

*6B03 / Polymer Reaction Engineering / Staff

Kinetics of polymerization: step growth and chain-growth (free-radical, anionic, anionic coordination and cationic). Polymerization processes: solution/bulk, suspension, emulsion, gas-phase, slurry and reactive processing. Principles of polymer process and reactor design, optimization and control.

*6C03 / Statistics for Engineers / Staff (Same as SEP *6C03)

Linear regression analysis in matrix form, nonlinear regression, multiresponse estimation, design of experiments including factorial and optimal designs. Special emphasis on methods appropriate to engineering problems.

*6E03 / Digital Computer Process Control / C. Swartz

This course addresses key aspects of implementing control via discrete calculations using digital computers. Topics include discrete-time dynamic models, system identification, analysis of discrete-time systems, design of digital control systems, and model predictive control.

*6K03 / Reactor Design for Heterogenous Systems / Staff

Catalytic kinetics, mass transfer limitations, packed and fluidized bed reactors, two-phase reactors.

*6T03 / Applications of Chemical Engineering in Medicine / H. Sheardown (Same as Biomedical Engineering *6T03)

Applications of chemical engineering principles to biological systems and medical problems including examples from hemodynamics, blood oxygenation, artificial kidney systems, controlled drug release, biosensors and biomaterials.

*6U03 / Unit Operations and Processes in Environmental Engineering / Staff (Same as Civil Engineering *6U03, Biomedical Engineering *6U03 and Engineering *4U03)

Process capabilities, hardware and design equations of the physical, chemical, and biological processes used to improve water. Emphasis on processes such as bio-oxidation, clarification, coagulation, sludge dewatering, and disinfection.

*6X03 / Polymer Processing / M.R. Thompson

An introduction to the basic principles of polymer processing, stressing the development of models. Rheology of polymers, extrusion, molding, films, fibers, and mixing. Reactive processing.

*6Z03 / Interfacial Engineering / R.H. Pelton (Same as Biomedical Engineering *6Z03)

The physics and chemistry at the "nano" scale including interactions forces, colloids, surface active systems, wetting, adhesion, and flocculation.

The following courses are offered for graduate credit only:

*704 / Current Topics in Chemical Engineering / Staff

These topics differ from year to year depending on student interest.

*706 / Advanced Heat Transfer / R. L. Judd (Same as Mechanical Engineering *706)

Steady and transient conduction stressing formulation and approximate solution techniques. Convection heat transfer including compressible and incompressible flow. Radiation heat transfer including gray body radiation and radiation from gases and vapours.

*707 / Analytical Solutions in Transport Phenomena / S. Shankar (Same as Mechanical Engineering *707)

Solution of boundary value problems in conduction heat transfer; mass transfer analogy to heat transfer, ablative cooling; theory of solidification; boiling heat transfer.

*730 / Fluid Mechanics / Staff (Same as Biomedical Engineering *730)

Vectors, tensors, dyadics, Cartesian index notation, stress analysis. The conservation of mass, momentum and energy. Constitutive equations. Boundary layer flow theory. Potential flow. Stokes flow. Turbulence.

*733 / Computational Fluid Dynamics / A.N. Hrymak, P.E. Wood (Same as Biomedical Engineering *733)

The solution of the Navier-Stokes equations using finite volume and finite element methods. Primitive-variable formulations are presented and applied to the solution of incompressible flows. Example problems include boundary layer and internal flows with recirculation. Advanced topics include guiding strategies and boundary fitted coordinates. Extensions of basic methods to complex problems, which include a feature from the following list: turbulence, non-newtonian rheology and free surfaces (depending on class interest).

*742 / Membrane Based Bioseparations / R. Ghosh (Same as Biomedical Engineering *742)

Overview of bioseparation processes; introduction to membrane technology; principles of microfiltration; microfiltration based bioseparation processes; theory of ultrafiltration; ultrafiltration based bioseparation processes; nanofiltration -- theory and applications; bioseparation using membrane adsorbers; dialysis -- theory and applications; integrated processes e.g. membrane bioreactors; use of membranes in analytical biotechnology; membrane based drug delivery systems; biomimetic membranes.

*751 / Advanced Mathematics in Chemical Engineering / Staff

Finite difference methods for solving parabolic elliptic and hyperbolic partial differential equations. Convergence and stability of these methods. Methods of weighted residuals, including collocation, introduction to the finite element method. Applications to current chemical engineering problems.

*752 / Optimization of Chemical Processes / Staff (Same as Computational Engineering & Science *752)

Numerical techniques for achieving optimal performance of a chemical process. Topics in numerical linear algebra; optimality conditions; algorithms for unconstrained optimization; application to solution of nonlinear equation systems and least-squares problems; linear programming; algorithms for constrained optimization; dynamic optimization; interior-point methods; mixed-integer programming; global optimization. Application to process design, control, operation and scheduling.

*753 / Process Modeling and Optimization / V. Mahalec (Same as School of Engineering Practice *752)

Architecture of simulation programs, solution algorithms, integration of simulation models from different simulators. Steady-state and dynamic simulation via sequential modular and equation-oriented algorithms. Optimization of steady-state and dynamic performance,

sensitivity of the optimum, multi-objective optimization. Analysis of plant data, gross error detection, parameter estimation to match the plant performance. On-line monitoring and optimization of process performance.

***754 / Process Design and Integration for Minimal Environmental Impact / M. Sorin**
(Same as School of Engineering Practice *754)

The course focuses on integration of process units and on the design of Energy Utility Systems, Heat Exchanger Networks (HEN) and Water Distribution Systems and presents methodologies that lead to energy efficient, water saving and economically attractive designs. Methods for heat integration (HEN, utility selection, heat engines, heat pumps, refrigeration cycles, and pinch analysis), cogeneration and integrations with industrial sites, water and cooling minimization and their applications.

***761 / Multivariable, Stochastic and Adaptive Control of Chemical Processes / P. Mhaskar**

Introduction to control of multivariable chemical processes. Topics usually covered: dynamic-stochastic models, minimum variance and adaptive controllers, multivariable optimal control, nonlinear control, constraint handling for chemical process control and optimization, observers and inferential control.

***762 / Time Series Analysis and Process Identification / Staff**

Methods for modeling the dynamic-stochastic behaviour of a process and its disturbances using data collected from the process. Traditional methods for impulse and frequency response identification. Discrete transfer function and ARIMA time series models. Statistical methods for structure determination, parameter estimation, model validation, design of experiments, and analysis of closed-loop data. Use of models for forecasting, analysis, and control.

***764 / Process Control Design / Staff**

Techniques for designing control system structures; including modeling, flexibility, controllability, integrity, reliability, interaction and performance metrics, economic performance, and robustness. The key affect of process dynamics on performance is presented. Both decentralized multiloop and centralized model-predictive control are considered. Techniques are applied to selected process equipment and processes.

***765 / Multivariate Statistical Methods for Process Analysis and Monitoring / Staff**

This course is based around multivariate latent variable models which assume low dimensional latent variable structures for the data. Multivariate statistical methods including Principal Component Analysis (PCA), and Partial Least Squares (PLS) are used for the efficient extraction of information from large databases typically collected by on-line process computers. These models are used for the analysis of process problems, for on-line process monitoring, and for process improvement.

***770 / Selected Topics in Polymer Science and Engineering / S. Zhu**

Introduction and discussion of hot research topics and recent advances in the areas of polymer science and engineering, such as controlled/living radical polymerization, single site type of catalysts in olefin polymerization, polymer gels and network formation, etc., study of chemical engineering principles pertinent to these topics; and examination of industrial perspectives of the resulting polymer materials. Development of chemical engineering modeling and proposal writing skills and application to the polymer processes related to student's research work.

***772 / Polymer Rheology / Staff**

Rheology of thermoplastic melts, conservation, and constitutive equations. Viscoelasticity. Complex flows, die swell, melt flow instability. Continuum and molecular theories including reptation. The role of rheology in processing.

***773 / Advanced Concepts of Polymer Extrusion / M. Thompson**

Fundamental mechanics of solids-conveying, melting, pumping and mixing in extrusion. Modeling and practical topics in single-screw and twin-screw extrusion. Coverage of the application areas of extrusion as they exist at the present. Screw design principles, metallurgical concerns and manufacturing methods are discussed. Introduction to special topics in the field of extrusion.

***774 / Advances in Polymeric Materials / M. Thompson**

This course examines the growing field of polymer alloys, blends and composites. The student is introduced to the current principles and practice behind these advanced polymeric materials, looking at techniques of characterization as well as the properties generated in such materials. Often linked with both polymer blends and composites is the field of reactive processing, a maturing research area with much commercial utilization that uses polymer processing equipment (typically an extruder) as a reactor for the chemical modification of polymers.

***780 / Biomaterials and Tissue Engineering / H. Sheardown, K. Jones (Same as Biomedical Engineering *780)**

This course will provide an overview of the challenges and issues relating to the use of materials (primarily polymeric materials) in medical applications. The particular emphasis will be on the interface between the material and the native tissue. Surface characterization and modification of the materials will be discussed. Molecular biological techniques used in tissue engineering, tissue structure and biomimicry will also be covered. Tissue response to implanted biomaterials and tissue engineered constructs will be discussed.

***790 / Selected Topics in Colloid and Surface Science / R. Pelton**

This course is an in-depth analysis of an aspect of colloid and surface science of current interest. Topics from previous years include latex preparation and characterization, adhesion fundamentals, and hydrogels. Ideally, students should have taken at least one course in polymers as well as an interfacial engineering or interfaces course. Potential students with other backgrounds should consult the instructor. The learning experience will include analysis of recent papers, review lectures by the students and the development of a research proposal.

Research in Chemical Engineering

The Department of Chemical Engineering has world class research programs in the areas of process control, process simulation and optimization, polymer production technology, polymer processing and rheology, pulp and paper technology, membrane separation processes, mass transfer, fluid mechanics, bioengineering and biomedical engineering including biomaterials. The Department has institutes for process control, polymer production technology, polymer processing, and pulp and paper research, all of which have significant industrial involvement and support. The Department plays an active role in Materials and Manufacturing Ontario (MMO), one of the Centres of Excellence of the Province of Ontario. Members of the department also participate in the McMaster Manufacturing Research Institute, through the polymer processing group, CAPP-A-D.

The Department's facilities include a large unit operations laboratory, 16 research laboratories and a machine shop. Research equipment includes: a twin-screw extruder, specialized rheometers, particle image velocimetry, a laser doppler anemometer, high speed photographic equipment, gel permeation chromatographs, an automated Zeiss image analyzer, a micro electrophoretic device, gas-liquid chromatographs, membrane separation equipment, radioactivity counting equipment, an ellipsometer, and particle characterization equipment.

Specialized equipment utilized by members of the Process Control group includes a dedicated server and several workstations along with many PC's in an integrated network. Commercial and university-developed software is used to facilitate research in simulation, control, design, statistical process diagnostics and optimization.

The McMaster Institute for Polymer Production Technology operates within the Department and has facilities for the study of polymerization reactions in continuous systems, including state of the art polymer characterization equipment.

Other specialized facilities used in our research are available on campus in the Brockhouse Institute for Materials Research, and in the departments of Chemistry and Biology, e.g., scanning and transmission electron microscopes, electron microprobe analyzers, a scanning transmission EM (STEM), and environmental scanning EM, and an atomic force microscope.

The Chemical Engineering Laboratories occupy 1,560 square metres in the Engineering Building. They are located in close proximity to the facilities of other engineering departments, e.g., the mechanical testing equipment in Materials Engineering, and the fluid mechanics laboratories in Mechanical Engineering. Some of the Department's research in Biomedical Engineering is conducted in the Health Sciences Building close by.

CHEMISTRY

The Department of Chemistry provides facilities for students intending to proceed to the M.Sc. and Ph.D. degrees as described in the information below. The Department is also a participant in the interdisciplinary graduate program in Chemical Biology described earlier in this section of the Calendar.

Enquiries: 905 525-9140 Ext. 23489
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 E-mail: cosgrove@mcmaster.ca

Staff / Fall 2009

PROFESSORS

Jacques Barbier, Dipl. Ing. Chimiste (Paris), M.Sc. (Toronto), Ph.D. (A.N.U.)
 John D. Brennan, B.Sc., M.Sc., Ph.D. (Toronto) / Canada Research Chair
 Michael A. Brook, B.Sc. (Toronto), Ph.D. (McGill), M.C.I.C.
 Adam P. Hitchcock, B.Sc. (McMaster), Ph.D. (British Columbia), F.R.S.C., F.C.I.C. / Senior Canada Research Chair
 William J. Leigh, B.Sc., Ph.D. (Western), F.C.I.C.
 Brian E. McCarry, B.Sc. (British Columbia), Ph.D. (Stanford), F.C.I.C.
 Stephen A. Jarislowsky Chair in Environment and Health / Chair
 Gary J. Schrobilgen, B.Sc. (Dubuque, Iowa), M.Sc. (Brock), Ph.D. (McMaster), F.R.S.C.
 Harald D.H. Stöver, B.Sc. (Darmstadt), Ph.D. (Ottawa), M.C.I.C.
 Johan K. Terlouw, B.Sc., M.Sc., Ph.D. (Utrecht)

ASSOCIATE PROFESSORS

Alex Adronov, B.Sc. (McMaster), Ph.D. (Berkeley)
 Paul W. Ayers, B.Sc. (Lipscomb), Ph.D. (UNC Chapel Hill) / Canada Research Chair
 Paul J. Berti, B.Sc. (Waterloo), M.Sc. (Ottawa), Ph.D. (McGill) / Joint appointment with Biochemistry
 Philip Britz-McKibbin, B.Sc. (Toronto), Ph.D. (British Columbia)
 Alfredo Capretta, B.Sc., Ph.D. (McMaster)
 Randall S. Dumont, B.Sc. (Western), Ph.D. (Toronto), M.C.I.C.
 David J.H. Emslie, B.Sc., Ph.D. (Bristol)
 Gillian R. Goward, B.Sc. (McMaster), Ph.D. (Waterloo)

Paul H.M. Harrison, B.A.Hons.(Chem) (Oxford), Ph.D. (Alberta), M.C.I.C.
 Peter Kruse, Dipl. Chem. (Friedrich Schiller University Jena), Ph.D. (California-San Diego)
 Yingfu Li, B.Sc. (Anhui), M.Sc. (Beijing), Ph.D. (Simon Fraser) / Joint appointment with Biochemistry / Canada Research Chair
 James McNulty, B.Sc., M.Sc., Ph.D. (Toronto)
 Giuseppe Melacini, B.Sc. (Milan), Ph.D. (California-San Diego) / Joint appointment with Biochemistry
 Kalaichelvi Saravanamuttu, B.Sc., Ph.D. (McGill)
 John F. Valliant, B.Sc., Ph.D. (McMaster) / Joint appointment with Medical Physics and Applied Radiation Sciences
 Ignacio Vargas-Baca, B.Sc., M.Sc. (UNAM), Ph.D. (Calgary)

ASSISTANT PROFESSOR

Yurij Mozharivskij, B.Sc. (Lviv), Ph.D. (Iowa State) / Canada Research Chair

ASSOCIATE MEMBERS

Raman Chirakal (Radiology), B.Sc. (Kerala), M.Sc. (Brock), Ph.D. (McMaster)
 Richard M. Epand (Biochemistry), A.B. (Johns Hopkins), Ph.D. (Columbia)
 Robert H. Pelton (Chemical Engineering), B.Sc., M.Sc. (Guelph), Ph.D. (Bristol)
 Gerard D. Wright (Biochemistry), B.Sc., Ph.D. (Waterloo)
 Daniel S-C. Yang (Biochemistry), B.Sc., M.Sc. (Edmonton), Ph.D. (Pittsburgh)
 Shiping Zhu (Chemical Engineering/Materials Science), B.Eng. (Zhejiang), Ph.D. (McMaster)

ADJUNCT MEMBER

Yuning Li, Research Staff Xerox Research Centre of Canada, B.Sc., M.Sc. (Dalian), Ph.D. (Japan Advanced Institute of Science and Technology)

PROFESSORS EMERITI

Richard F.W. Bader, B.Sc., M.Sc. (McMaster), Ph.D. (M.I.T.), F.R.S.C., F.C.I.C. (*Research Active*)
 Alexander D. Bain, B.Sc. (Toronto), M.Sc. (British Columbia), Ph.D. (Cambridge), M.C.I.C. (*Research Active*)
 Russell A. Bell, M.Sc. (Wellington), M.S. (Wisconsin), Ph.D. (Stanford), F.C.I.C. (*Research Active*)
 Arthur N. Bourns, O.C., B.Sc., D.Sc. (Acadia), Ph.D. (McGill), D.Sc. (Acadia, McGill, New Brunswick, McMaster), LL.D. (Brock), F.R.S.C., F.C.I.C.
 Ronald F. Childs, B.Sc. (Bath University of Technology), Ph.D., D.Sc. (Nottingham), F.C.I.C. (*Research Active*)
 Peter T. Dawson, B.Sc. (Birmingham), Ph.D. (Cambridge)
 Ronald J. Gillespie, B.Sc., Ph.D., D.Sc. (London), F.R.S., F.R.S.C., F.R.S.C. (U.K.), F.C.I.C. (*Research Active*)
 John E. Greedan, B.A. (Bucknell), Ph.D. (Tufts), F.C.I.C. (*Research Active*)
 Orville E. Hileman, Jr., B.S.Ed. (Bowling Green State), Ph.D. (Case Institute of Technology), F.C.I.C. (*Research Active*)
 David A. Humphreys, B.Sc., M.Sc. (London), Ph.D. (McMaster), F.C.I.C.
 Gerald W. King, B.Sc., Ph.D., D.Sc. (London), F.R.S.C., F.R.S.C. (U.K.), C.Chem. (U.K.), F.C.I.C.
 Joseph D. Laposi, B.Sc. (St. Louis), M.S. (Chicago), Ph.D. (Loyola)
 Michael J. McGlinchey, B.Sc., Ph.D. (Manchester), F.C.I.C.
 Ian D. Spenser, B.Sc. (Birmingham), Ph.D., D.Sc. (London, McMaster), F.R.S.C., F.R.S.C. (U.K.), F.R.I.C., F.C.I.C. (*Research Active*)
 Richard H. Tomlinson, B.Sc. (Bishop's), Ph.D. (McGill), F.C.I.C. (*Research Active*)
 John Warkentin, B.Sc., M.Sc. (Manitoba), Ph.D. (Iowa State), F.C.I.C. (*Research Active*)
 Nick H. Werstiuk, B.Sc. (Alberta), M.A., Ph.D. (Johns Hopkins), F.C.I.C. (*Research Active*)

M.Sc. Degree

The minimum course requirement for the M.Sc. degree is four graduate modules or the equivalent, selected from Chemistry #701-790, 600-level courses (one module credit each), or extra-departmental graduate courses (usually two module credits each). A maximum of two instrumental modules (Chem #730, 736, 737, 740, 741) and a maximum of one 600-level course may be included in the minimum course requirement. Additional courses beyond the minimum requirement may be recommended by the supervisory committee. A student may apply one 600-level course for credit at the M.Sc. level. The minimum passing grade for any module or course is B-. M.Sc. candidates must also present a departmental research colloquium (see below). In addition, a thesis embodying the results of original research must be defended in a final oral examination.

Students who have satisfactorily completed most of the course requirements for the M.Sc. degree and have made satisfactory progress in their research may apply to the Department for transfer to the Ph.D. program, without first satisfying the M.Sc. thesis requirement. The transfer examination involves the submission and defence of a report detailing the student's research progress and projected research goals. This examination must be scheduled

Ph.D. Degree

The minimum course requirement for the Ph.D. degree is two graduate modules or the equivalent beyond the requirements for the M.Sc. degree. For students who have transferred from the M.Sc. program, the total minimum course requirement is, therefore, six graduate modules. Additional courses beyond the minimum requirement may be recommended by the supervisory committee.

A student who enters the Ph.D. program with an M.Sc. degree from another university must complete a minimum of two modules or the equivalent, and present a departmental research colloquium (see below).

Additional courses beyond the minimum requirement may be recommended by the supervisory committee. All Ph.D. candidates must pass a Comprehensive Examination concerned mainly with their major field of study. A thesis embodying the results of original research must be defended in a final oral examination. In their final year of study, Ph.D. students must present a departmental seminar on their research before defending their thesis.

Departmental Colloquia and Seminars

Regular attendance at departmental colloquia and seminars is expected from all graduate students. Specifically, attendance at colloquia is mandatory for M.Sc. Students and direct-entry Ph.D. students during the first two years of their program. These students must present a colloquium on their own research during their second year.

All Ph.D. students must also present their work in a departmental seminar during their final year of study before defending their thesis.

Courses

The Department of Chemistry offers graduate courses in the form of "modules", which are the formal equivalent of one-quarter of a full graduate course. 600-level half courses are also available for credit at the M.Sc. level only and with approval from the Department, to a maximum of one half course (equivalent to one module credit). Students are free to include Education *750 (Principles and Practice of University Teaching) in their program, but this cannot be counted toward their course requirements for the degree.

List of 600-level courses:

- *6A03 / Advanced Organic Chemistry
- *6B03 / Chemical Applications of Spectroscopy
- *6C03 / Solid State Chemistry
- *6D03 / Organic Structure and Synthesis
- *6DD3 / Mechanistic Biological Chemistry
- *6F03 / Surface Chemistry
- *6P03 / Advanced Analytical Chemistry
- *6PP3 / Polymer Chemistry
- *6Q03 / Advanced Quantum Chemistry
- *6R03 / Advanced Transition Metal Chemistry
- *6S03 / Advanced Main Group Chemistry

List of 700-level graduate modules:

Modules marked with a plus sign (+) may be taken twice for credit either because their content varies from year to year or because introductory material presented as one module is a prerequisite for an advanced module. Brief descriptions of all graduate modules are available on the departmental website (<http://www.chemistry.mcmaster.ca/graduate/courses.html>). Not all modules are offered in a given year—please consult the website for current courses.

COMPUTER APPLICATIONS IN CHEMISTRY

- #703 / Numerical Methods and Computational Chemistry
(Same as *Computational Engineering & Science* #773)
- #704 / Advanced Numerical Methods
- #705 / Computational Chemistry: An Introduction
(Same as *Computational Engineering & Science* #705)

RECENT DEVELOPMENTS IN CHEMISTRY

- + #706 / Special Topics in Chemistry

TOPICS IN ANALYTICAL CHEMISTRY

- + #708 / Analytical Separation Science
- + #710 / Electroanalytical Chemistry
- #711 / Chemometrics
- #712 / Environmental Analytical Chemistry
- #713 / Bioanalytical Chemistry and Biosensors
- #714 / Introduction to Modern Electrochemistry

TOPICS IN INORGANIC CHEMISTRY

- #715 / Organometallic Chemistry
- #716 / Transition Metal Chemistry
- #717 / Main Group Chemistry
- #718 / Symmetry, Physical Properties and Electronic Structure of Solids
- #720 / Inorganic and Organometallic Clusters
- + #722 / Fluorine Chemistry
- #723 / Radiochemistry
- + #724 / Solid State Chemistry
- + #725 / Chemical Applications of Group Theory
- #726 / Main-Group Materials Chemistry

PHYSICAL AND SPECTROSCOPIC METHODS IN CHEMISTRY

- #730 / Theory of Crystallography
- #731 / Diffraction Techniques: Neutron and Electron Diffraction
- #732 / Magnetochemistry
- #733 / Scanning Probe Microscopy
- #734 / Applications of Mass Spectrometry in Organic Chemistry
- #735 / Electron and Synchrotron Spectroscopies
- #736 / Molecular Structure Determination by Diffraction Methods
- #737 / Mass Spectrometry Instrumentation and Applications
- #738 / Biophysical Analytical Techniques
- #739 / Advanced Topics in X-ray Crystallography

TOPICS IN MAGNETIC RESONANCE

- #740 / Basic Theory of NMR
 #741 / Two-dimensional NMR Spectroscopy
 #742 / NMR Spectral Simulation
 #743 / Multinuclear NMR Spectroscopy of the Less Common Nuclides
 #744 / Solid-State NMR and Materials
 #747 / Protein Structure, Dynamics and Interactions by NMR
 #748 / Principles of Pulse and Two-Dimensional NMR
(Same as Computational Engineering & Science #748)
 #749 / Introduction to Biomolecular NMR

TOPICS IN ORGANIC CHEMISTRY

- #750 / Current Topics in Organic Chemistry
 +#751 / Reactive Intermediates
 #753 / Organic Photochemistry
 #754 / Physical Organic Chemistry
 #755 / Isotopes in Biological and Organic Chemistry
 +#756 / The Organic Chemistry of Silicon
 #757 / Current Topics in Biological Chemistry
 +#758 / Bio-organic Chemistry
 #759 / Nucleic Acids in Chemistry and Biology
 #760 / Principles of Organic Synthesis
 #761 / Problems in Organic Chemistry
 #762 / Conformational Analysis and Reaction Mechanisms

TOPICS IN POLYMER CHEMISTRY

- #765 / Advanced Polymer Chemistry
 #766 / Polymer Colloids
 +#767 / Selected Topics in Polymer Chemistry
 #768 / Novel Polymer Structures

TOPICS IN QUANTUM CHEMISTRY

- #770 / Molecular Electronic Structure Theory
(Same as Computational Engineering & Science #770)
 #771 / Concepts in Quantum Chemistry
(Same as Computational Engineering & Science #771)

TOPICS IN CHEMICAL THERMODYNAMICS

- #774 / Statistical Mechanics
(Same as Computational Engineering & Science #774)
 #775 / Stochastic Processes

TOPICS IN PHYSICAL CHEMISTRY

- #777 / Solid State Ionics: Applications in Electrochemistry
 +#778 / Solid State Surface Science
 +#779 / Molecular Vibrations
 #780 / Molecular Photophysics
 #782 / Topics in Photonics
 #783 / Materials Chemistry in Photonics - Selected Topics

GENERAL TOPICS IN CHEMISTRY

- #790 / History of Chemistry

Service Modules

The following modules will be offered as student demand dictates. These are technique-oriented modules for which no formal credit is offered.

- A. Modern Techniques in Handling Air-Sensitive Compounds
 B. Rudimentary Glassblowing

Research in Chemistry

The Department of Chemistry provides opportunities for research in a broad range of fundamental and applied research topics in six fields of Chemistry: Analytical and Environmental, Biological, Inorganic, Materials, Organic, Physical and Theoretical.

The research interests of current faculty members include: design, synthesis and study of functional polymers and carbon nanotubes (A. Adronov); theoretical chemistry and electronic structure theory (P.W. Ayers); theory and application of pulsed NMR experiments (A.D. Bain); crystal chemistry of oxide and mineral compounds (J. Barbier); transition state analysis in biochemical systems (P.J. Berti); biosensors, sol-gel biomaterials (J.D. Brennan); bioanalytical chemistry, metabolomics, cellulomics (P. Britz-McKibbin); silicon chemistry, silicone polymers and biomaterials (M.A. Brook); organic and medicinal chemistry, drug discovery (A. Capretta); quantum molecular dynamics and NMR spectrum simulation (R.S. Dumont); inorganic synthesis, redox chemistry, ligand design (D. Emslie); applications of advanced solid-state NMR techniques (G.R. Goward); structure-properties relations in metal oxides (J.E. Greedan); bio-organic chemistry and biosynthesis (P.H.M. Harrison); synchrotron radiation based spectromicroscopy of soft matter, environmental and biological samples; quasi-elastic and inelastic electron scattering of gases (A.P. Hitchcock); surface science of electronic materials, scanning probe microscopy and dissipative nanopatterning (P. Kruse); organic and organometallic photochemistry and Group 14 reactive intermediates (W.J. Leigh); DNA catalysis (Y. Li); environmental analytical chemistry and genotoxicology (B.E. McCarry); organic synthesis, chemical biology, anticancer drugs (J. McNulty); biological NMR, protein structure and dynamics, biomolecular interactions (G. Melacini); magnetocaloric and thermoelectric inorganic solids, ferromagnetic shape memory alloys (Y. Mozharivskiy); fundamentals and applications of nonlinear photochemical processes (K. Saravanamuttu); main group inorganic chemistry (G.J. Schrobilgen); polymer and colloid synthesis (H.D.H. Stöver); gas-phase ion chemistry (J.K. Terlouw); medical applications of radioisotopes (J.F. Valliant); main group inorganic and materials chemistry (I. Vargas-Baca).

A more detailed description of current research projects for each faculty member and a list of their recent publications is available on our departmental website (<http://www.chemistry.mcmaster.ca/research/index.html>).

Research in Chemical Biology

This interdisciplinary area of research is jointly supported by the Departments of Chemistry, Biochemistry & Biomedical Sciences and Biology. It is described earlier in this section of the Calendar.

Research in Chemical Physics

This interdisciplinary area of research is jointly supported by the Departments of Chemistry and Physics & Astronomy. It is described in section 11 of the Calendar.

Facilities for Research

The Department of Chemistry maintains four excellent research facilities with instruments that are available to all graduate students and researchers: the Magnetic Resonance Facility, the Regional Centre for Mass Spectrometry, the McMaster Analytical X-ray (MAX) Diffraction Facility and the Optical Spectroscopy Facility. In addition, individual faculty maintain a wide variety of minor research equipment in their own laboratories. Members of the Department also have access to a well-equipped machine shop, a glassblowing shop and a student machine shop for do-it-yourself projects.

The Magnetic Resonance Facility houses seven instruments including 700 MHz, 600 MHz, 500 MHz (x2), 300 MHz and 200 MHz (x2) NMR spectrometers with a variety of probes for solid and liquid samples at variable temperature. The McMaster Regional Centre for Mass Spectrometry houses six instruments covering a wide range of ionization sources (EI, CI, MALDI and ESI) and mass measurement techniques (sector, triple quadrupole and time-of-flight), as well as

GCMS and LCMS instrumentation. The McMaster Analytical X-ray (MAX) Diffraction Facility houses one Bruker SMART APEX2 system with a Mo sealed-tube source and low (88 K) - high (370 K) temperature capability; one Bruker SMART6000 system with a Rigaku Cu rotating-anode source; one Stoe Image Plate system with a Mo sealed-tube source. There are also two high- and low-resolution Cu powder diffractometers plus one PANalytical X'Pert system with monochromatic Cu $K\alpha_1$ and Co $K\alpha_1$ sealed-tube sources. The X-ray Facility is run from an unrestricted control room, so students can participate in or run their own structural analyses. The Optical Spectroscopy Facility houses a selection of instruments, primarily optical spectrometers including a IRaman spectrometer with two lasers, two infrared spectrometers (one a Fourier transform instrument), two UV-VIS spectrometers, a spectrofluorimeter, a polarimeter, and an electron paramagnetic resonance (epr) spectrometer.

A number of faculty in the Department are members of the Brockhouse Institute for Materials Research and, as such, have access to the extensive instrument facilities in that institute. They include the Canadian Centre for Electron Microscopy (high-resolution transmission and scanning electron microscopes, plus a scanning tunneling microscope and two atomic force microscopes), the Thermal Analysis laboratory, the Crystal Growth facility and the Materials Preparation facility. More information is available on the BIMR website (www.science.mcmaster.ca/bimr/). Several faculty in the Department (Hitchcock, Kruse, Stöver, Britten) are also active users of the Canadian Light Source Synchrotron Facilities in Saskatoon.

More information and a downloadable brochure about our research facilities, as well as virtual tours, are available on our departmental website (<http://www.chemistry.mcmaster.ca/facilities/index.html>).

CIVIL ENGINEERING

The Department of Civil Engineering provides facilities for students seeking the degree M.A.Sc., M.Eng. or Ph.D., and for post-doctoral research.

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 Website: <http://www.eng.mcmaster.ca/civil/>

Staff / Fall 2009

PROFESSORS

Brian W. Baetz, B.A.Sc., M.A.Sc. (Toronto), Ph.D. (Duke), P.Eng.
 Samir E. Chidiac, B.Eng., M.Eng., Ph.D. (McMaster), P.Eng.
 Gail Krantzberg, B.Sc. (McGill), M.Sc., Ph.D. (Toronto)
 Susan J. Masten, B.S. (Fairleigh Dickson), M.S.E. (West Virginia), Ph.D. (Harvard), P.E. (on leave)
 Stan Pietruszczak, B.Eng., M.Sc. (Warsaw), Ph.D. (Polish Academy of Science)
 Ghani Razaqpur, B.Sc. (American University of Beirut), M.Sc. (Hawaii), Ph.D. (Calgary), P.Eng., F.C.S.C.E. / Chair / Director, Centre for Effective Design of Structures
 K.S. Sivakumaran, B.Sc. (C.Eng.) (Sri Lanka), M.Eng. (Asian Institute of Technology), Ph.D. (Calgary), P.Eng.
 Dieter F.E. Stolle, B.Eng., M.Eng., Ph.D. (McMaster), P.Eng.
 Ioannis K. Tsanis, Dipl.Eng. (Thessaloniki), M.A.Sc., Ph.D. (Toronto), P.Eng.
 John C. Wilson, B.Eng., M.Eng. (McMaster), Ph.D. (Caltech.), P.Eng.

ASSOCIATE PROFESSORS

Paulin Coulibaly, B.A.Sc., M.A.Sc. (Nice), Ph.D. (Laval), P. Eng.
 Sarah Dickson, B.A.Sc., Ph.D. (Waterloo), P.Eng.
 Peijun Guo, B.Sc., M.Sc., Ph.D. (SWJTU), Ph.D. (Calgary), P. Eng.
 Yiping Guo, B.Sc. (Zhejiang), M.A.Sc., Ph.D. (Toronto), P. Eng.
 Michael Tait, B.E.Sc., Ph.D. (Western), P. Eng.

ASSISTANT PROFESSOR

Wael El-Dakhkhni, B.Sc. (Ain-Shans), M.Sc., Ph.D. (Drexel), P.E., P. Eng. / Martini, Mascarin and George Chair in Masonry Design

ASSOCIATE MEMBERS

Altaf Arain (School of Geography and Earth Sciences)
 J.S. Chang (Engineering Physics)
 Carlos Filipe (Chemical Engineering)
 James Smith (School of Geography and Earth Sciences)
 Spencer Smith (Computing and Software)
 Antonio Paez (School of Geography and Earth Sciences)

ADJUNCT MEMBERS

Tarek S. Aziz, B.Sc. (Cairo), M.S. (Carleton), D.Sc. (M.I.T.), P.Eng.
 Zafar Adeel, B.Sc. (Lahore), M.Sc. (Ames), Ph.D. (Carnegie Mellon)
 Tai Bui, B. Eng. (McMaster), M.Sc., Ph.D. (Idaho)
 John Emery, B.A.Sc., Ph.D. (British Columbia)
 Bassam Halabieh, B.Sc. (Louisiana), M.Sc. (UC Berkeley), Ph.D. (McMaster), P. Eng.
 Ahmad A. Hamid, B.Sc., M.Sc. (Ain Shams), Ph.D. (McMaster)
 Dean Inglis, B. Eng., Ph.D. (McMaster)
 Syed Moin, B.Sc. (Osamnia), M.S. (Nevada), Ph.D. (McMaster), P.Eng.
 Leila Raki, B.Sc., M.Sc. (Hassan II), Ph.D. (Ottawa)

PROFESSORS EMERITI

Robert G. Drysdale, B.Sc. (Manitoba), M.A.Sc., Ph.D. (Toronto), P.Eng., F.C.S.C.E., F.C.A.E.
 Ahmed Goharrah, B.Sc. (Cairo), M.Eng., Ph.D. (McMaster), P.Eng.
 Frederick L. Hall, A.B. (Amherst), M.S. (M.I.T.), Ph.D. (Chicago)
 Arthur C. Heidebrecht, B.Sc. (Alberta), M.Sc., Ph.D. (Northwestern), D.Sc., F.C.S.C.E., F.C.A.E., P.Eng.
 Robert M. Korol, B.A.Sc. (Toronto), M.A.Sc., Ph.D. (Waterloo), P.Eng., F.C.S.C.E.
 Gunhard Æ. Oravas, B.Eng., M.S. (Civ.Eng., Eng.Mech.), Ph.D. (Michigan)
 Alan A. Smith, B.Sc. (Glasgow), Ph.D. (Strathclyde), P.Eng., F.C.S.C.E., F.E.I.C.
 Wai K. Tso, B.Sc. (London), M.S., Ph.D. (Caltech.)

Applications from candidates holding degrees in Civil Engineering, Chemical Engineering, Mechanical Engineering, or Science (Honours) may be considered by the Department for graduate study and research in the areas of departmental interest.

On-line application available at:
<http://www.eng.mcmaster.ca/civil/academicrequirementsgs.htm>

Applicants must comply with the general regulations of the School of Graduate Studies as well as specific departmental regulations. The minimum academic requirement for admission to an M.A.Sc. degree and an M.Eng. degree is normally an average of B in the last two years of an applicant's undergraduate program.

Master's Degree

A candidate for the Master's degree may proceed by either a thesis (M.A.Sc.) or project (M. Eng.) program. In each case the candidate is required to spend at least one calendar year in full-time graduate study, or the equivalent in part-time graduate study at McMaster University. All full-time Master's candidates must register, attend and participate in CIV ENG 761—Graduate Seminar (Master's) for the first 6 terms (24 months) of study. Regulations for Master's examinations are available from the Department.

M.A.Sc. Degree

Candidates will be required to complete satisfactorily the equivalent of at least two full courses, of which at least one must be from within the Department of Civil Engineering at McMaster University. Additional course work may be prescribed if deemed necessary by the candidate's research supervisor. In addition to the above course requirements, all full-time Master's candidates must register, attend and participate in CIV ENG 761- Graduate Seminar (Master's) for the first 6 terms (24 months) of study. A dissertation must be presented which will embody the results of an original investigation; the dissertation is to be defended in an oral examination. This program is intended mainly for full-time candidates but may be taken on a part-time basis.

M. Eng. Degree

Candidates will be required to complete satisfactorily the equivalent of at least three full courses, of which at least 1.5 must be from within the Department of Civil Engineering at McMaster University. Additional course work may be prescribed if deemed necessary by the candidate's project supervisor. In addition to the above course requirements, all full-time Master's candidates must register, attend and participate in CIV ENG 761 - Graduate Seminar (Master's) for the first 6 terms (24 months) of study. A report must be presented on a project which demonstrates ability to carry out independent study and reach a satisfactory conclusion. The report must be approved by the department and presented orally to the department. This program is primarily intended for part-time M. Eng. candidates, but may be taken by full-time students.

Ph.D. Degree

Candidates will be required to complete satisfactorily the equivalent of at least two full courses in addition to the course requirement for an M.A.Sc. Degree, of which at least one must be from within the Department of Civil Engineering at McMaster University. Additional course work may be presented if deemed necessary by the candidate's research supervisor. In addition to the above course requirements, all full-time Ph.D. candidates must register, attend and participate in CIV ENG 762 - Graduate Seminar (Ph.D.) for the first 12 terms (48 months) of study.

The Ph.D. candidate will be evaluated by the Ph.D. Supervisory Committee after two academic terms in the Ph.D. program. This will be based on an evaluation of the candidate's ability to think, intellectual background, and general caliber as a doctoral student. The candidate must also pass a Comprehensive Examination which is normally taken in the second year of the doctoral program. The purpose of this examination is to test the candidate's acquisition of knowledge and maturity of approach to problems in the major field of study, as well as in appropriately chosen cognate subject areas. The detailed regulations governing these examinations may be obtained from the Department.

Part-time doctoral studies are permissible. Graduate students will also be required to present seminars related to their research topics.

Courses

Many courses in the Department are quarter courses (6 weeks) and are identified by a pound (#) sign. There are also several 700-level half courses (12 weeks) listed, identified by an asterisk (*). The quarter courses are designed to permit students to acquire a greater breadth of advanced level knowledge than would be possible where selections are limited to full or half courses. In addition, specialized advanced level material is made available to permit in-depth studies of particular subject areas. Students are also encouraged to include minor areas of study in addition to their major area.

600-level half courses are offered for graduate credit, and are also available to senior undergraduate students. A student will normally not be permitted to take more than two 600-level courses beyond a Bachelor's degree.

***6C03 / Environmental Impact and Sustainability / Staff**

Natural and urban ecosystems; environmental impact/assessment/legislation; energy and environmental audits; life cycle analysis; solid and hazardous wastes; air quality and control; sustainable infrastructure design.

6D04 / Geometric Highway Design / Staff

Design of various types and classes of streets and highways. Theory and practice in design of intersections, interchanges, arterial highways, and freeways. Design concepts.

***6G03 / Pavement Materials and Design / Staff**

Components of highway pavements; ground water and drainage for highway facilities; soil compaction and stabilization; aggregates; bituminous and concrete materials, flexible pavement design; concrete pavement design; interlocking pavement structures.

***6H03 / Analysis of Transportation Systems / Staff
(Same as Geog *6D03)**

An introduction to the use of models in transportation planning. Topics include data issues, the four-stage approach to modelling transportation systems, discrete choice models and contextual factors such as land use.

**6K04 / Modern Methods of Structural Analysis / Staff
(Same as Civil Engineering 4K04)**

Stiffness method; development and applications in structural analysis. Introduction to finite element method. Influence lines, elastic stability analysis of frames with and without sway effects. Application of computer programs.

6L04 / Design of Water Resources Systems / Staff

Investigation, planning, analysis, and design of water resources systems. Frequency analysis, design storms, urban drainage and analysis, floodplain analysis and flood control.

***6M03 / Hydrologic Modeling / P. Coulibaly
(Same as Earth Sc *6W03)**

Principles of numerical modeling and examination of selected hydrologic models.

***6U03 / Unit Operations and Processes in Environmental Engineering / Staff (Same as Biomedical Engineering *6U03 Chemical Engineering *6U03 & Engineering *4U03)**

The process capabilities, hardware, and design equations of the physical, chemical, and biological processes used to improve water. Emphasis is placed on processes such as bio-oxidation, clarification, coagulation sludge de-waterings, and disinfection.

The following courses are offered for graduate credit only:

#702 / Rehabilitation of Structures / Staff

Evaluation of the load carrying capacity of existing structures. Identification of the deficiencies in design and deterioration of structures. Criteria for selection and design of the most suitable rehabilitation system. Design details of selected rehabilitation system.

***703 / Finite Element Method / D.F. Stolle
(Same as Computational Engineering and Science *783)**

Theory of finite element method; formulation of finite elements; applications to solid mechanics, field and plate bending problems; algorithms for transient and nonlinear problems; introduction to hybrid and mixed finite elements; development of a finite element code.

***704 / Specialized Studies in Civil Engineering / Staff**

Studies selected from specialized areas of research or representing special areas of expertise available from visiting professors or others approved by the Department.

#705 / Specialized Studies in Civil Engineering / Staff

Studies of specialized research topics in the areas of structural engineering, computational mechanics, water and environmental engineering.

#713 / Theory of Elasticity / Staff

Cartesian tensors, transformation, invariants of stress and strain; tensor operations; equations of motion and equilibrium, in cartesian and polar coordinates, boundary conditions; constitutive equations for elastic materials; compatibility equation and Airy's stress functions; applications to planar and torsion problems.

***714 / Advanced Structural Mechanics / K.S. Sivakumaran**

2-D and 3-D analyses of stresses and strains. Principal stresses and maximum shear stress. Differential equations of equilibrium, compatibility conditions. Bending of unsymmetrical members. Shear centre. Shearing stresses due to bending in thin-walled open and closed members. Torsion of closed and open sections, warping, non-uniform torsion and warping stresses. Theory of plates— Rectangular and circular plates problems. Buckling of elastic columns. Flexural-Torsional buckling of beams. Axial-torsional buckling of columns. Plate buckling (local buckling), shear of buckling of plates.

#715 / Structural Stability / K.S. Sivakumaran

Introduction to structural stability, stability of rigid bodies, methods of analysis: energy methods, approximate methods, dynamic analysis of stability, elastic and inelastic stability of axially loaded columns, lateral bracing design, frame stability, lateral-torsional buckling of beams, stability of thin-walled open cross-sections, axial torsional buckling of columns and beams, stability of plates, local and post-buckling strength of plates, stiffened plates, application of plate girders and box-girders, introduction to buckling of shells and arches.

#716 / Structural Dynamics / M. Tait

Formulation of equations of motion; one degree-of-freedom systems: undamped, damped, free vibration, forced vibration, nonlinear systems; numerical techniques: time domain, frequency domain.

#717 / Dynamics of Structural Systems / Staff

Multi-degree-of-freedom systems: modal analysis, characteristics of Eigenvalue problems, applications; continuous systems; dynamic loads: earthquake and wind loading, vibrating machines, moving loads.

#718 / Random Vibrations / M. Tait

This course focuses on random processes and the application of random vibration theory to the field of Civil Engineering. Characterization of random processes and the input-response of linear structural systems subjected to stationary excitation will be investigated. Frequency domain analysis techniques using the power and cross spectral density functions will be discussed. Response of single/multi degree of freedom structures will be examined. A basic understanding of structural dynamics is recommended.

#720 / Behaviour and Design of Masonry Components / W. El-Dakhkhni

Introduction to masonry including properties and manufacture of materials, behaviour of masonry assemblages, design of plain and reinforced walls, columns and beams, design to avoid moisture problems.

#722 / Design and Construction of Masonry Buildings / W. El-Dakhkhni

This course deals with the overall design of masonry buildings including planning and selection of suitable layouts and consideration of construction requirements. Other topics: design of veneer walls, special requirements for ties and anchors, and integration of floor and wall systems.

#723 / Advanced Steel Design / Staff

Treatment of steel building frames: concentrically and eccentrically braced systems, shear links, energy dissipation concepts for cyclic-type loading. Low cycle fatigue, incremental collapse and shakedown. Applications to include plate girders, box girders. Problems in welded construction-weld defects, distortion, shrinkage, residual stresses, etc. Connection details including beam-column, HSS trusses. Stud girder systems and aspects of fire protection.

***724 / Tall Building Analysis and Design / Staff**

The course covers the structural engineering aspect of tall building analysis and design. The main emphasis is to discuss the behaviour of different frame systems under lateral loadings. The approach is to use approximate methods to illustrate the behaviour, and use computer modeling to verify the accuracy of the approximate methods.

#725 / Advanced Design and Analysis of Masonry / S.E. Chidiac

Apply computer-aided analysis including finite element methods, dynamic analysis, advanced design methods including earthquake design.

#728 / Introduction to Wind Engineering / M. Tait

This course will cover the basic concepts in wind engineering. Topics include: characteristics of wind; wind climatology; wind loading on structures; wind-induced building vibrations; code provisions for wind loading. A basic understanding of structural dynamics is recommended.

***730 / Earthquake Engineering / J.C. Wilson**

Engineering seismology; seismic design principles applied to building structures, and special facilities, code provisions for earthquakes; seismic design of concrete structures, special provisions; elastic and inelastic static and dynamic modeling.

***732 / Concrete Structures - Materials, Maintenance and Repair / S.E. Chidiac**

Portland Cement and its constituent phases; role of water in hydrated cement systems, hydration parameters, limiting hydration, state of water, porosity, engineering properties; structural models for C-S-H; hydration mechanisms: through solution, solid state; pore structure determination; engineering properties; role of admixtures and supplementary cementing materials; analysis of fresh and hardened concrete; durability; transport properties, relationships between transport properties and durability; in-situ evaluation of concrete structures; materials and techniques for repair; service life/durability design of concrete structures.

#733 / Investigation and Retrofit of Existing Masonry Buildings / S.E. Chidiac

Investigation techniques, collection and interpretation of data, condition evaluation and definition of problems, design of remedial measures, construction planning and details.

***734 / Advanced Prestressed Concrete: Analysis and Design / A. G. Razaqpur**

Analysis and design of (prestressed pre- and post-tensioned) structures, including statically indeterminate beams and frames, composite structures and time-dependent analysis. Serviceability and strength of structures under flexure, shear and torsion are presented. Prestress losses due to creep, shrinkage and relaxation are covered in detail.

***742 / Experimental Soil Mechanics / D.F. Stolle**

Concepts in classical and contemporary soil mechanics are reviewed for purposes of interpreting experimental results. Students are to conduct their own tests and interpret their findings.

***744 / Soil Dynamics / P. Guo**

Elastic-wave propagation in soils; representation of stress-strain relations in cyclic loading; laboratory and *in-situ* tests of dynamic soil properties; dynamic earth pressure on retain walls; dynamic bearing capacity of shallow foundations; liquefaction of saturated sand.

***746 / Theory of Plasticity / S. Pietruszczak**

Basic concepts of plasticity: yield criteria; isotropic and kinematic hardening; flow and deformation theories; fundamental postulates of plasticity; uniqueness of the solution. Elastic-perfectly plastic formulations: failure criteria (metals/ frictional materials); derivation of constitutive matrix. Isotropic strain- hardening models for cohesive-frictional materials: concepts of volumetric and deviatoric hardening. Modelling of the behaviour of brittle-plastic materials (concrete). Limit analysis: lower/upper bound theorems.

761 / Civil Engineering Seminar (Master's) / Staff

Each full-time Master's graduate student is required to prepare and present a seminar. The seminar topic shall be in an area related to their current research. A component of this course is the mandatory attendance of all full-time Master's students to supplementary seminars arranged by the Civil Engineering Department.

762 / Civil Engineering Seminar (Ph.D.) / Staff

Each full-time Ph.D. graduate student is required to prepare and present a seminar. The seminar topic shall be related specifically to their current research and highlight their research work. A component of this course is the mandatory attendance of all full-time Ph.D. students to supplementary seminars arranged by the Civil Engineering Department.

***770 / Advanced Groundwater Flow and Contaminant Transport / S. Dickson (Same as GEO *750)**

This course will cover the theory, equations, fundamental principles, and processes of the flow of fluids and transport of contaminants in soils and groundwater at an advanced level.

***773 / Physico-chemical Processes in Environmental Systems / S. Masten**

Physical and chemical principles of air and water pollution control and environmental contaminants in water, air and soils.

***774 / Environmental Hydraulics / I.K. Tsanis**

Similarity and dimensional analysis; turbulent diffusion and dispersion; turbulent jets and plumes; turbulent buoyant surface jets; hydrodynamic elements of mixing processes; outfall and diffuser hydraulics; discharge of wastewater into marine environment; and design of an outfall system in the Great Lakes.

***775 / Computational Hydraulics / I.K. Tsanis**

Review of methods and strategies used in computational hydraulics for the solution of algebraic, ordinary, and partial differential equations; flow in closed conduits (pipe networks); non-steady flow (water hammer); flood propagation in open channel; backwater curve analysis; groundwater flow (seepage under a dam); advective diffusion and dispersion.

***779 / Aquatic Chemistry / S. Dickson**

This course will cover chemical equilibrium, reaction thermodynamics, activity, acid-base chemistry, coordination chemistry, redox reactions, precipitation and dissolution and contaminant detection and quantification. It is recommended that students have a background in year 1 undergraduate chemistry.

#791 / Municipal Solid Waste Management / B.W. Baetz

Waste generation, collection, and transport; material reduction, reuse, and recycling; waste treatment, incineration and composting; landfill disposal; waste management planning.

#792 / Hazardous Waste Management / B.W. Baetz

Waste generation, classification, storage and transport; waste reduction, reuse, and recycling; plant audits for waste reduction; waste treatment and incineration; land disposal; household hazardous wastes; planning for hazardous waste management.

***798 / Uncertainty Analysis in Water Resources Engineering / Y. Guo**

This course introduces a variety of methods that can be used for environmental and water resources decision-making under various kinds of uncertainties. Following a brief review of probability and statistics, the focus of the course is on selected uncertainty analysis methods that can be used to assess the statistical properties of system outputs as a function of its stochastic inputs and parameters. Example water resources engineering problems are used in introducing the various methods.

***799 / Stormwater Management Modeling and Analyses / Y. Guo**

The course introduces various structural and non-structural stormwater management measures. The design and performance of some of the structural stormwater management measures are examined in detail. Modeling and analyses conducted for the planning, design and operation of stormwater management systems are the focus of this course.

Appropriate courses offered by other departments are also acceptable on the approval of the Chair.

Research in Civil Engineering

Current research activities in the Department of Civil Engineering can be described in terms of discipline areas grouped as follows: Computational Mechanics, Environmental and Water Resources, Structures and Earthquake Engineering.

The Department of Civil Engineering provides opportunities for research in a broad range of fundamental and applied research topics. Research in Civil Engineering includes: dynamics, earthquake engineering, applications to nuclear industry (T.S. Aziz); decision support systems for design of sustainable communities, municipal solid waste management planning (B.W. Baetz); durability/service life modeling of engineering materials, modeling heat and mass transfer in porous media, concrete technology, stone masonry (S.E. Chidiac); water resources engineering, statistical hydrology, environmental data analysis (P. Coulibaly); contaminant hydrogeology (S. Dickson); masonry, reinforced concrete design, building science (R.G. Drysdale); applied mechanics, dynamics of structures, earthquake engineering, rehabilitation of structures (A. Ghobarah); geomechanics, geotechnical engineering and finite element applications (P. Guo); uncertainty analysis in environmental hydrology and water resources engineering, watershed planning and stormwater management (Y. Guo); behaviour, design and seismic retrofit of masonry and concrete structures (A. Hamid); constitutive modeling of engineering materials, finite element applications (S. Pietruszczak); steel structures, composite material structures, finite element applications (K.S. Sivakumaran); geomechanics, finite element algorithms and applications, highway materials (D.F. Stolle); hydraulics, hydrodynamics of water bodies, air-water interaction, diffusion and dispersion of pollutants, environmental information systems (I.K. Tsanis); seismic bridge engineering, earthquake engineering, system identification (J.C. Wilson).

Facilities for Research

The creation of the McMaster University Centre for Effective Design of Structures links research and education to produce engineers who understand durability of material, possess advanced analytical skills, can identify client specific needs, and satisfy sustainability concerns including reduced maintenance and extended service life of structures. The construction process, building envelope design and building services are integrated parts of design.

Matching funding from the consulting engineering and construction industries (materials, design and contracting), the Province of Ontario and McMaster University have provided 9.9 million dollars over 5 years to finance changes which will differentiate McMaster from other universities and provide research and education suited to the changing needs of the 21st Century. When all positions are filled, the

creation of three endowed chairs and two other faculty positions will result in eleven full-time faculty in structures and mechanics plus several active part-time and emeritus faculty. Funding is being used to enhance support levels and increase the number of positions for graduate students, post-doctoral fellows and research engineers, and summer research assistants as well as direct support of research.

In addition to traditional areas of research in concrete, steel and analytical methods, the Centre has established the following four areas of research focus: Masonry, Remediation of Structures, Earthquake Engineering, and Enhanced Use of New and Under-Utilized Materials. Close collaboration with the construction industry is an essential feature of this new initiative.

STRUCTURES AND EARTHQUAKE ENGINEERING LABORATORY

Experimental research is conducted in the Applied Dynamics Laboratory, which is designed with a cellular box foundation strong floor measuring 25 m by 40 m. The special design features make the Applied Dynamics Laboratory a particularly suitable facility for large scale structural experimental research. Clear head room of over 12 m beneath a 10 tonne overhead crane permits full scale testing as well as scaled models of structures or structural components. The Laboratory has a large strong wall, which is used to provide reaction and support for load application equipment. The strong wall is capable of providing reaction for 100 tonnes at a height of 6 m.

The main hydraulic system is an MTS 90 GPM hydraulic power unit to operate a range of servo-controlled hydraulic actuators. This test equipment permits pseudo-dynamic testing through the use of a multi-actuator test system (2 to 4 actuators simultaneously) with capacities ranging from 450 kN to 1,400 kN and an advanced data acquisition system. This multi-actuator system permits the testing of a whole class of structural applications, which cannot be tested on a shake table.

The main hydraulic system is also used to power horizontal and vertical shake tables for seismic engineering studies. In addition to a selection of hydraulic jacks, computer controlled data acquisition equipment, MTS controller units (MTS 406 and MTS 407), load cells and displacement transducers, 3 fixed in-plane test machines with capacities between 2500 kN and 550 kN are available.

An Air-bag testing system and a full-scale rain penetration testing apparatus are also available for out-of-plane testing of walls and rain penetration evaluation of building envelop components.

A biaxial hanging platform, which can operate as a bi-directional shake table, is expected to be added to the lab in 2007. This system will complement the current shake table equipment and extend the lab's dynamic testing capabilities.

MATERIAL TESTING FACILITIES AND EQUIPMENT

An important aspect of design is the consideration of the material properties of concrete, including workability, durability, and mechanical properties. The material's laboratory at the ADL has loading devices for determining mechanical properties of materials, and equipment for determining the workability and durability of cementitious products such as concrete and masonry. The workability equipment consists of BTRHEOM rheometer, which can be used to measure the plastic viscosity and yield strength of fresh concrete; and slump rate machine, which also allows one to determine the rheological properties of fresh concrete by using a modified, more sophisticated slump test. The durability field/laboratory testing equipment consists of: torrent permeability tester to measure permeability coefficients of concrete; electronic moisture balance to accurately measure moisture uptake; rapid freeze-thaw cabinet to subject concrete specimens to harsh environmental conditions; and ultrasonic instrument TICO, which is a non-destructive testing method that allows measurement of elastic and strength properties of hardened concrete.

GEOTECHNICAL AND MATERIALS ENGINEERING

The geotechnical and construction materials laboratories are equipped with conventional triaxial, direct shear, consolidation (odometer) testing equipment. An MTS loading system is available for the cyclic or dynamic testing of soils and pavement construction materials. A state-of-the-art hollow cylinder apparatus can be used for advanced testing to investigate the fundamental behaviour of soils. The impact of freeze-thaw on soil behaviour can also be explored in the Geotechnical Laboratory. Moreover, various components and instrumentations for small-scale model tests are available so that various model tests can be carried out to investigate complicated soil-structure interaction problems. Computing facilities are available for finite element computations. In addition, field studies on construction projects have been a regular part of the research program.

The Construction Materials Laboratory is equipped for the characterization of a range of materials such as aggregates, asphalt cements, Portland cements and slags. In particular, the laboratory can perform resilient modulus testing for pavement aggregates and asphalt concrete, which makes the lab unique in Ontario. A concrete mixer with 0.12 m³ capacity, aggregate, shakers, and sample splitters are also parts of the concrete technology laboratory.

ENVIRONMENTAL AND WATER RESOURCES

A 18.8 m² graduate research lab was fully renovated and outfitted with state-of-the-art equipment in 2005. The renovations included new furnishing for the lab with space available for conducting bench-scale experimental studies. The new laboratory includes common areas available to all users (e.g., balances, sample preparation, fume hoods, and analytical equipment), as well as individual work spaces that can be assigned to graduate students for longer-term experiments.

An array of analytical equipment exists in the laboratory, including:

- two high performance liquid chromatographs (HPLC) equipped with an autosampler and full range of detectors (i.e., conductivity, ultra violet/visible, refractive index, fluorescence, and photodiode array detectors) and a computer for control and data acquisition purposes;
- a gas chromatograph (GC) equipped with an autosampler capable of handling solid-phase microextraction (SPME), an electron capture detector (ECD) and a flame ionization detector (FID) and a computer for control and data acquisition purposes;
- a spectrophotometer that can be employed in either a discrete sample or flow-through mode equipped with a computer for data acquisition;
- a fluorometer that can be employed in either a discrete sample or flow-through mode equipped with a computer for data acquisition;
- a PCR machine;
- a DGGE system;
- a gel documentation system;
- a mass spectrometer equipped with a computer for data acquisition purposes;
- a laser diffraction particle size analyzer;
- various pH, dissolved oxygen and conductivity meters;
- sieve shaker and a set of sieves

The lab is also well-equipped in terms of general instrumentation which serves as the basis for all research activities conducted in the lab. This instrumentation includes a water purification system, an autoclave, sample storage units, an ultrasonic cleaner, a laminar flow cabinet with flow control, an ultracentrifuge, balances, liquid and gas delivery systems, and a shaker table.

Supplementary laboratory equipment includes four fermenters equipped with computer control, two electrohydraulic discharge power supplies and reactors, water baths, digital cameras, data loggers, tipping bucket rain gauges, and pressure transducers. Field equipment includes water level tapes, pressure transducer/data loggers, high precision GPS, network of time domain reflectometry (TDR) systems for continuous soil moisture monitoring at three research sites, five weather stations, and 15 automated tipping bucket rain gauges, providing continuous record of meteorological data needed for hydrological model development and testing, flow meters and automatic samplers, fluid permeability test kit, and a research vehicle for fieldwork.

In addition to this in-house laboratory facility, extensive experimental facilities and support are available through Environment Canada's National Water Research Institute.

CLASSICS

The Department of Classics offers programs leading to the M.A. and Ph.D. in Classics.

Enquiries: 905 525-9140 Ext. 24311
 Fax: 905 577-6930
 E-mail: classics@mcmaster.ca
 Website: <http://www.humanities.mcmaster.ca/~classics/>

Staff / Fall 2009

PROFESSOR

Paul Murgatroyd, B.A., M.A. (Cambridge), Ph.D. (London)

ASSOCIATE PROFESSORS

Claude Eilers, B.A. (Saskatchewan), M.A. (McMaster), D.Phil. (Oxford)
 Michele G. George, B.A. (Toronto), M.A., Ph.D. (McMaster) / Chair
 Evan W. Haley, A.B. (Dartmouth), M.A., Ph.D. (Columbia) / Joint
 appointment in History / Graduate Advisor

ASSISTANT PROFESSORS

Sean Corner, B.A. (Oxford), M.A., Ph.D. (Princeton)
 Daniel McLean, B.A. (S. Carolina), Ph.D. (Pennsylvania)
 Spencer Pope, A.B. (Middlebury), M.A., Ph.D. (Brown)

LECTURER

Kathryn Mattison, B.A., M.A. (Toronto)

PROFESSORS EMERITI

Katherine M.D. Dunbabin, M.A., D.Phil. (Oxford)
 Howard Jones, B.A. (London), M.A., Ph.D. (Indiana)
 Peter Kingston, B.A., Ph.D. (London)
 George M. Paul, M.A. (Oxford), Ph.D. (London)
 Donald M. Shepherd, M.A. (Queen's), Ph.D. (Chicago)
 William J. Slater, M.A., Ph.D. (St. Andrews)

Candidates for the M.A. and Ph.D. degrees in programs offered by the Department of Classics must comply with the general regulations of the School of Graduate Studies and the specific regulations listed below.

M.A. Degree in Classics

ADMISSION

Applicants for the M.A. Program in Classics may be admitted as Regular Students if they are graduates with at least B+ standing of any Honours program taken at McMaster or other university, which includes:

1. At least 12 units of Greek and at least 12 units of Latin with an average of at least B in each language.
2. At least 30 additional units of Classical Civilization, Greek, Latin, Ancient History, or other courses approved by the Department of Classics, at least 12 of these units to be in upper-level courses.

Graduates without sufficient specialization may be admitted with the requirement that they complete extra prerequisite courses with a grade of at least B+.

Candidates will not be allowed to take a graduate course in a language or area in which the Department feels they do not have sufficient background. For graduate courses in Latin or Greek, the minimum requirement is 24 units of the language.

In exceptional cases, students who have less than two years of undergraduate coursework in the ancient languages may be accepted into the program, providing they are well qualified and have an undergraduate record of superior academic achievement; they will, however, have to do extra language courses beyond the required minimum while in the M.A. program.

PROGRAM REQUIREMENTS

The general requirements for the M.A. degree appear earlier in the Calendar. With the approval of the Department of Classics, candidates may take the degree either with or without thesis. A grade of at least B- is required in all courses.

Requirements for the M.A. degree with thesis are:

1. Eight half courses (one-term courses) offered by the Department, of which no more than two may be at the undergraduate level, and of which at least four must be graduate or undergraduate Latin or Greek. Six courses are completed in the first year of study and two additional language courses are taken in year two. A grade of at least B- is required in all courses.

Students who are admitted without the minimum entrance requirements in the ancient languages must take nine half courses to make up the deficiencies in their language preparation.

2. A comprehension test in French or German or Italian; exemption from this test may be granted to candidates who have completed an equivalent test at this or other universities.
3. A satisfactory thesis of approximately 80 pages on an approved topic.
4. An oral examination to defend the thesis.

Requirements for the M.A. degree without thesis are:

1. Six half courses offered by the Department, of which no more than two may be at the undergraduate level, and of which at least two must be graduate or undergraduate Latin or Greek.

Students who are admitted without the minimum entrance requirements in the ancient languages must take seven half courses to make up the deficiencies in their language preparation.

2. A project consisting of a major research paper to be written during the summer, under the supervision of a faculty member;
3. A comprehension test in French or German or Italian; exemption from this test may be granted to candidates who have completed an equivalent test at this or other universities.

Ph.D. Degree in Classics**ADMISSION**

Applicants for the Ph.D. Program in Classics may be admitted if they are graduates with either a grade of at least A- in at least two half courses or distinction in an approved thesis of an M.A. Program in Classics or Classical Studies (with sufficient Greek and Latin), taken at this University or of equivalent programs taken at other universities.

Graduates of other programs may be admitted in exceptional cases. Applicants without sufficient preparation may be admitted with the requirement that they complete extra prerequisite courses.

PROGRAM REQUIREMENTS

The general requirements for the Ph.D. degree appear earlier in the Calendar. A grade of at least B- is required in all courses and in Special Areas examinations.

Requirements for the Ph.D. degree are:

1. Four appropriate graduate half courses. These are the minimum requirements; candidates may be requested by their supervisor to take additional courses;
2. One comprehensive examination in each of Greek and Latin translation;
3. A language examination to demonstrate reading knowledge of two of the following languages: German, French, Italian; exemption from these tests may be granted to candidates who have completed equivalent tests at this or other universities;
4. Two comprehensive examinations, covering special areas of Greek and Latin literature or Ancient History or Classical Art and Archaeology; these are to be assigned by the supervisory committee in preparation for the thesis;
5. A thesis proposal approved by the Department with an oral defense;
6. Any other requirement established by the Department on admission;
7. A satisfactory thesis on an approved topic;
8. An oral examination to defend the thesis.

Courses

A limited number of the following courses will be offered in any year. All courses are half courses and are marked with an asterisk (*). Candidates should inform themselves of the availability of courses in advance.

LITERATURE

- *721 / Homer
- *722 / Greek Drama
- *724 / Hellenistic Poetry
- *728 / Greek Historical Writers
- *730 / Greek Philosophy
- *732 / Reading in a Selected Greek Author
- *733 / Pindar
- *747 / Topics in Classical Literature
- *751 / Roman Satire
- *754 / Vergil
- *755 / Horace
- *756 / Cicero
- *757 / Roman Historical Writers
- *758 / Roman Philosophy
- *760 / Catullus
- *761 / Roman Elegy
- *763 / Reading in a Selected Latin Author

ART AND ARCHAEOLOGY

- *725 / Topics in the Art and Archaeology of Antiquity
- *726 / Topics in the Iconography of Greek and Roman Art
- *735 / Topics in Greek Art and Archaeology

- *736 / Ancient Athens
- *737 / Topics in Hellenistic Art and Archaeology
- *767 / Topics in Roman Campania
- *770 / Topics in Roman Art and Archaeology
- *771 / Augustus and Rome
- *772 / Greek and Roman Mosaics
- *773 / Roman North Africa
- *780 / Independent Study in Classical Archaeology

ANCIENT HISTORY

- *713 / Greek and Roman Religion
- *734 / Sources and Methods in Ancient History
(Same as History *734)
- *739 / Topics in Late Roman Republican and Early Imperial History
(Same as History *739)
- *741 / Greek Inscriptions as a Reflection of Social Life
- *759 / Ancient Historiography (Same as History *735)
- *764 / Topics in Greek History
- *766 / Studies in the Social Life of Antiquity

Additional courses in classical studies may be available in the Departments of History, Philosophy, and Religious Studies. These may be taken for credit with the approval of the Department of Classics and the instructor.

COGNITIVE SCIENCE OF LANGUAGE

Based in the Department of Linguistics and Languages, the graduate program (M.Sc.; Ph.D.) in the Cognitive Science of Language is interdisciplinary and includes faculty from Humanities, Science, and Health Sciences. The program has a strong research orientation and has expertise in the areas of Linguistics, Cognitive Science, Sociolinguistics, Neurolinguistics, Forensic Linguistics, Applied Linguistics, Computational Linguistics, Digital Media and Cognition, and Psycholinguistics. The breadth of faculty research areas provides a rich environment for graduate training. The graduate program introduces students to the issues in those fields that form the nexus of cognitive science, linguistics, and languages and trains them in the research methods employed to study them. Our graduate programs provide flexibility so that students can optimize their studies around their own areas of interest.

Enquiries: 905-525-9140 Ext. 24388
 Fax: 905-577-6930
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 Website: <http://www.humanities.mcmaster.ca/~linguistics/>

Staff / Fall 2009**PROFESSORS**

- John J. Colarusso, B.A. (Cornell), M.A. (Northwestern), Ph.D. (Harvard)
- John F. Connolly, A.B. (College of the Holy Cross), M.A. (Saskatchewan), Ph.D. (London)
- Magda Stroinska, M.A. (Warsaw), Ph.D. (Edinburgh)

ASSOCIATE PROFESSORS

- Vittorina Cecchetto, B.A., M.A., Ph.D. (Toronto)
- Inga Dolinina Hitchcock, M.A., Ph.D. (Leningrad)
- Anna L. Moro, B.A., M.A., Ph.D. (Toronto)

ASSISTANT PROFESSORS

- Catherine Anderson, B.A. (McMaster), Ph.D. (Northwestern)
- Elisabet Service, B.A., M.A., Ph.D. (Helsinki)

PROFESSOR EMERITUS

- George Thomas, B.A., Ph.D. (London)

M. Sc. Degree

Applicants will be eligible for admission if they hold a four-year Honours undergraduate degree in one of the following disciplines, and fulfill McMaster's School of Graduate Studies general requirements (<http://www.mcmaster.ca/graduate>): Linguistics; Psychology, Neuroscience; Speech Sciences; Health Sciences; Communication Studies; Multimedia; Computer Science; and Engineering. Some applicants may require additional courses in core areas (e.g., linguistics or psychology) in order to be eligible for admission. Each application will be evaluated on an individual basis.

Coursework (2.5 courses plus additional requirements below)

*denotes half courses; #denotes quarter course modules

Required courses: COGSCIL *750 (or PSYCH *710)
COGSCIL *721 and *722
One of COGSCIL *730 or *731

plus the equivalent of one additional half course (within the Department of Linguistics and Languages or in another related department).

Additional requirements (these are **Pass/Fail** courses):
COGSCIL #741
COGSCIL #725

plus the M.Sc. Thesis. The thesis should be between 50-100 pages (excluding figures, tables and references), as appropriate for the project undertaken.

The M.Sc. Research project is a work of original research (empirical or theoretical) under the supervision of a participating faculty member and evaluated by an evaluating committee established by the Department. The thesis must be submitted by August of the second year of the M.Sc. Program.

Ph.D. Degree

The M.Sc. in the Cognitive Science of Language or an equivalent Master's degree is required for entrance into the Ph.D. program. Some applicants may require additional courses in core areas (e.g., linguistics or psychology) in order to be eligible for admission. Each application will be evaluated on an individual basis.

A. For students holding an M.Sc. in the Cognitive Science of Language

Students entering with the M.Sc. in the Cognitive Science of Language are required to complete the equivalent of two full courses. If the following courses were not included in the M.Sc. program they must be included in the Ph.D. program of study: COGSCIL *730, *731, *750; PSYCH *710.

Additional requirements (these are **Pass/Fail** courses):
COGSCIL #742
COGSCIL #726

B. For students entering without the M.Sc. in the Cognitive Science of Language

Coursework (four courses total plus additional requirements below)

Required courses: COGSCIL *750
PSYCH *710
COGSCIL *721 and *722
COGSCIL *730 and *731

plus additional courses to total four courses.

Additional requirements (these are **Pass/Fail** courses):
COGSCIL #726
COGSCIL #742

Ph.D. Comprehensive Examination

The Ph.D. comprehensive examination must be completed within two years of entering the Ph.D. program and is articulated in three phases:

Phase 1: Directed Reading: The student will develop a reading list in collaboration with the supervisor and the thesis supervisory committee.

Phase 2: Written Examination: In the Spring of the second year of the Ph.D. program, students will be required to sit for a comprehensive examination. If the student fails the examination, there will be one opportunity to rewrite the examination.

Phase 3: Oral Examination: Having passed the written examination, the student will be examined orally by the supervisory committee. If the student fails the examination, there will be one opportunity to re-take the oral examination.

Courses

*721 / Fundamentals of the Cognitive Neuroscience of Language

The course will examine a range of linguistic topics from the cognitive and cognitive neuroscience perspectives. Linguistic topics will include but not be limited to: phonetics, phonology, morphology, syntax, and semantics. The course will emphasize cognitive processing mechanisms for typical language as well as a range of developmental and acquired disorders of language processing. No single text will be used but rather selected readings that will include current research articles and book chapters.

*722 / Contemporary Issues in the Cognitive Neuroscience of Language

The course is a continuation of COGSCIL *721 and will examine current issues and controversies in the cognitive science and cognitive neuroscience of language areas. Linguistic topics will include but not be limited to: phonetics, phonology, morphology, syntax, and semantics. The course will emphasize cognitive processing mechanisms for typical language as well as a range of developmental and acquired disorders of language processing. No single text will be used but rather selected readings that will include current research articles and book chapters.

#725 / The Cognitive Science of Language Master's Lecture Series

The course is comprised of a series of one-hour lectures by established researchers in areas encompassed by the Cognitive Science of Language program. Talks will occur biweekly (i.e., fortnightly) and will be followed by a discussion period.

#726 / The Cognitive Science of Language Ph.D. Lecture Series

The course is comprised of a series of one-hour lectures by established researchers in areas encompassed by the Cognitive Science of Language program. Doctoral students will be expected to make at least one presentation in the series. Talks will occur biweekly and will be followed by a discussion period.

*730 / Language Analysis Methods: Phonology and Morphology

This course is a foundational course whose aims is to ensure that students are familiar with current approaches and issues in the areas of phonology and morphology. Students will work through complex cross-linguistic data from a variety of approaches in order to evaluate the effectiveness of particular theoretical models in handling phonological, morphological and morphophonological phenomena. Particular attention will be paid to phonological phenomena that are sensitive to morphological (morpheme) structure.

***731 / Language Analysis Methods: Syntax and Semantics**

This course is a fundamental course whose aim is to ensure that students are familiar with current approaches and issues in the areas of syntax and semantics. Students will work through complex cross-linguistic data from a variety of approaches in order to evaluate the effectiveness of particular theoretical models in handling syntactic phenomena and in how meaning is derived at the word, sentence or discourse level.

#741 / Research Proposal Development (Master's Thesis)

The course functions as a tutorial/mentor experience with the student developing a research protocol in consultation with the relevant supervisor.

#742 / Research Proposal Development (Ph.D. Thesis)

The course functions as a tutorial/mentor experience with the student developing a detailed protocol, in consultation with his/her supervisor, in preparation for the doctoral thesis.

***750 / Research Design and Methods**

The course will cover general quantitative and qualitative methods in language research, providing skills for independent planning of research projects. Specific topics will vary from one year to another, targeting, for instance, methods of psycholinguistic, neurolinguistic, sociolinguistic and applied linguistic research as well as corpus-based analysis, computational linguistics and phonetics.

Additional courses that can be used to fulfill the M.Sc. and/or Ph.D. program requirements:

Linguistics and Languages:

- *6D03 / Computers and Linguistic Analysis
- *6XX3 / Topics in Linguistic Theory
- *6B03 / Second Language Acquisition
- *6LB3 / Advanced Phonetics and Phonology

Psychology, Neuroscience and Behaviour:

- *710 / Statistics and Research Design
- *726 / Behavioural Neuroscience
- *729 / Physiological Psychology
- *730 / Quantitative Methods
- *734 / Neural Network Models for Cognition and Perception
- *711 / Advanced Statistics and Computational Methods I
(Same as Computational Engineering & Science #711)
- *712 / Advanced Statistics and Computational Methods II
- *713 / Special Topics in Psychology, Neuroscience and Behaviour I
- *714 / Special Topics in Psychology, Neuroscience and Behaviour II
- *715 / Special Topics in Psychology, Neuroscience and Behaviour III
- *716 / Special Topics in Psychology, Neuroscience and Behaviour IV

COMMUNICATIONS MANAGEMENT

The DeGroot School of Business provides complete facilities to students seeking the Master of Communications Management degree. This degree program is jointly offered by the DeGroot School of Business, McMaster University and the S.I. Newhouse School of Public Communications, Syracuse University.

Enquiries: 905 525-9140 Ext. 23603
 Email: mcm@mcmaster.ca
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Staff / Fall 2009**McMaster University****PROFESSORS**

Christopher K. Bart, B.A., M.B.A. (York), Ph.D. (Western), C.A. / Strategic Market Leadership and Health Services Management / Director, MINT Research Centre / Principal, Directors College
 Trevor W. Chamberlain, B.Sc. (California/Berkley), M.B.A., Dip. Acc. (McGill), Ph.D. (Toronto), C.A. / Finance/ Chair, Finance and Business Economics Area

ASSOCIATE PROFESSORS

Nick Bontis, B.A., Ph.D. (Western), Strategic Market Leadership and Health Services Management / Director, Commerce Program
 Kenneth R. Deal, B.S., M.B.A., Ph.D. (SUNY at Buffalo) / Strategic Market Leadership and Health Services Management
 Kevin Tasa, B.Comm. (Saskatchewan), M.Sc., Ph.D., (Toronto) / Human Resources and Management

ASSISTANT PROFESSORS

Terence (Terry) Flynn, APR, B.A. (Carleton), M.S., Ph.D. (Syracuse) / Strategic Marketing and Health Services Management / Academic Director, Master of Communications Management Program
 Alfred (Al) Seaman, B.B.A. (New Brunswick), C.M.A., Ph.D. (Queen's) / Accounting and Financial Management Services

Syracuse University**PROFESSORS**

Patricia H. Longstaff, B.A., M.A. (Iowa), M.P.A. (Harvard), J.D. (Iowa) / S.I. Newhouse School of Public Communications / Television, Radio and Film
 Elizabeth L. Toth, B.A. (Northwestern), M.A., Ph.D. (Purdue) / S.I. Newhouse School of Public Communications / Public Relations
 Maria P. Russell, B.A. (College of Saint Rose), M.A. (Syracuse) / S.I. Newhouse School of Public Communications / Chair, Public Relations Department and Director of New Initiatives in Public Relations Education / Academic Co-Director, Master of Communications Management Program

ASSOCIATE PROFESSORS

Dennis F. Kinsey, B.A., M.A. (Kent State), Ph.D. (Stanford) / S.I. Newhouse School of Public Communications / Public Diplomacy / Public Relations
 Brenda J. Wrigley, B.A. (Missouri/Columbia), M.S., Ph.D. (Syracuse) / S.I. Newhouse School of Public Communications / Public Relations

Program

This is Canada's first Master of Communications Management degree program, combining the best of advanced public relations management and business administration courses, designed specifically for the busy, working public relations professional. The program is designed to enable experienced mid-career, public relations executives and professionals to acquire critical management and advanced public relations abilities.

Recognizing the specialized needs, interest areas and professional time limitations of today's public relations practitioners, this program combines an intense and challenging educational experience with flexibility and an opportunity for students to set their own pace for acquiring this valuable degree.

This program is designed so that students may complete their master's degree in two years. To do so, students attend three on-site residencies per year (mid-October, mid-February, and mid-June) and register for six credits (two courses) each term. During the week-long residencies, faculty members present an overview of their entire course and guidelines for specialized study. Upon return to their own community, students complete readings and assignments at their own pace, meeting pre-determined deadlines with ongoing access to professors via a dedicated web-based student portal.

Admission Requirements

A maximum of 25 students will be admitted each year to this program. The admission decisions will be based on the following considerations:

- A Bachelor's degree from an accredited university with at least B average and 5 years of full-time professional experience in public relations or a related field, excluding time spent in internships. Non-degree applicants may also be considered for admission provided they have attained a senior level management position with at least 15 years of industry experience. No more than 5 non-degree students will be admitted per year.
- Graduate Record Examination (GRE) or Graduate Management Aptitude Test (GMAT) Score, unless the applicant has successfully attained/maintained the APR/ABC professional designation certified by the CPRS or the IABC respectively;
- Three letters of recommendation, including one from the current employer. (If the applicant is an independent consultant or counselor, this letter can be from a current client or business partner).
- A personal essay (typed; maximum 500 words) explaining interest and suitability for the program as well as potential for completing the program.
- A portfolio of samples of best work, particularly those which illustrate strategic management ability (e.g. public relations plans; marketing plans; crisis plans).
- Test of English as a Foreign Language (TOEFL) score for applicants whose native language is not English.
- A personal interview with the Academic Director or Admissions Committee, either in person or via teleconference. The purpose of this interview is to ensure that the applicant is fully aware of all aspects of the program and the commitment needed for successful completion.

Program Requirements

In order to graduate a student is required to complete 36 credits covering these four elements:

PUBLIC RELATIONS CORE (4 required courses; 12 credits)
(To be taught by faculty from Syracuse)

Organizational Public Relations
Public Relations Research
Communications Law for Advertising and Public Relations
Strategic Public Relations Management

MANAGEMENT CORE (4 required courses; 12 credits)
(To be taught by faculty from McMaster)

Financial Reporting and Management Accounting
Financial Management
Marketing Management
Strategic Management

ELECTIVES (two courses; 6 credits, or three courses; 9 credits)
(During the second term, students will vote for a total of three electives, which will be offered in the third term subject to the availability of instructors; taught by faculty from either Syracuse or McMaster faculty).

Branding for Public Relations Professionals
Communications Frontiers
Communication Theory
Communication and Conflict Resolution Skills
Negotiation: Theory and Practice
Conflict Resolution in Groups: Facilitation and Conflict Management
Interpersonal Conflict Resolutions Skills
Mediation: Theory and Practice
New Technologies in Communications

CUMULATIVE EXPERIENCE (6-credit thesis or 3-unit Professional Capstone Project)

Students in this program can choose either a thesis-based option or a professional capstone project option. Students choosing to complete a thesis will only require two electives while students choosing to complete a professional capstone project will require three electives to complete their degree.

Courses

PUBLIC RELATIONS CORE

*711 / Organizational Public Relations

The course focuses on how excellent public relations are carried out in organizations. Management theories applied to public relations, public relations roles and models, strategic management processes, theories of organizational effectiveness, and such organizational characteristics as participation and authority, culture, diversity, globalization, and change. The framework of excellence permits an examination of the history, research, social effects, and ethics of public relations.

*712 / Public Relations Research

Nature, formation, and communications of attitudes and public opinion in public relations settings. Application of methods for measuring attitudes, opinions, and public relations performances. Sampling, interviewing and data analysis techniques.

*713 / Communications Law for Advertising and Public Relations

A basic understanding of communications law as it relates to public relations. Students will gain knowledge in major areas of communications law; application of specific areas of communications law to public relations practice; management of legal risks faced in public relations; the role of public relations in a client's litigation strategy; and dealing with lawyers.

*714 / Strategic Public Relations Management

Relates management function of policy formation to the communication process of disseminating ideas and information to the organization's public. Applies management science techniques to communication planning and information dissemination.

MANAGEMENT CORE***721 / Strategic Management**

An integrative course that pulls together, through the concepts of "strategy", fundamentals learned in previous management courses. Business "fundamentals" are used to study full organizational issues. A basic premise is that functional area decisions cannot and should not be made in isolation. Such decisions need to be consistent in ways that provide an organization with a sustainable competitive advantage in the marketplace and enable the most effective and efficient achievement of the firm's short and long term goals. Case studies are used to assist students to learn how to analyze the competitive structure of industries, how to assess and choose the "best" strategies for organizations, and how to ensure that the various functional area decisions follow from and help facilitate, rather than obstruct, the realization of chosen strategies.

***722 / Financial Reporting and Management Accounting**

Accounting information is fundamental to business decisions. Managers are familiar with accounting systems and their potential for providing them with critical data and information about their organizations. Given this perspective, this course provides sufficient understanding of the accounting process and how to recognize the potential of accounting information to become a more effective manager. What accountants do and why they do it, not how they do it, is the focus.

***723 / Financial Management**

An introduction for the non-finance manager to the issues faced by the finance managers of large businesses. No prior knowledge of business finance is expected from the students. However, understanding of the basic accounting principles (balance sheet and income statements) is a prerequisite. The course begins by examining a corporation's responsibility to its various stakeholders – stockholders, employees, customers, and society. This leads to a well-defined objective of financial management. Various decisions and responsibilities of the financial manager consistent with the objective above are studied. These may be divided into two components: capital acquisition and its deployment. Key aspects of the financial environment and some methods of determining the financial health of a corporation are also studied.

***724 / Marketing Management**

The fundamentals of marketing and the management decision-making skills related to the design of marketing strategy. By the end of the course, students can: (1) understand the role that marketing plays in an organization; (2) analyze how the environment affects marketing strategy; (3) analyze how consumers make a purchase decision; and (4) design a marketing strategy for a product or service.

ELECTIVES***731 / Branding for Public Relations Professionals**

The word "brand" is everywhere. Each year 3,000 new brands enter a marketplace already cluttered with sagging older brands and filled with fickle consumers. Strong brands make companies profitable, yet remaining a top brand is tough. It's not just about selling a product but about creating a lifestyle or personality that truly engages people's emotions. In so doing, products and services become brands that forge strong connections and relationships with customers. Effective brand building involves the communications efforts of the entire organization. With this in mind, this course focuses on branding principles culled from a variety of new theories on the subject and case studies and interactive exercises to point out successful communications techniques in brand building.

***732 / Communications Frontiers**

Preparation for developing business, regulatory, and technical trends that will be part of the students' careers as communications managers. These trends include globalization and industry consolidation. Specific trends in broadcasting, print, satellite, cable, and the internet are examined. The class looks for evidence of some of these trends as they are experienced in public relations through an original research project.

***733 / Communication Theory**

An introduction to the process of interpersonal, group, and mass communication. Perception, attitude, opinion, and other principles of psychology, social psychology, and other social sciences related to the communication process are explored.

***734 / Communication and Conflict Resolution Skills**

Successful public relations managers need highly refined communication and conflict resolution skills in today's stressful and competitive business environment. This elective course helps students learn about practice, and further develop some key fundamental behaviours designed to establish powerful rapport with business personnel and clients, and to manage conflict creatively and constructively when it occurs. Core skills include reflective listening, matching and pacing, managing agreement (assertion), problem solving, and negotiation. Approaches to learning include theory presentation, skill demonstration, skill practice, and critique.

***735 / Negotiation: Theory and Practice**

Introduction to negotiation theory and the skills associated with successful practice. Explore tensions between distributive and integrative negotiation principles of interest-based negotiation. Importance of preparation, sources of power, role of culture, and ways to overcome dirty tricks and other barriers to successful negotiation. Interactive learning approach, using lecture, discussion, exercises, and simulations to build personal capacities for successful negotiating. Exercises include two-person to more complex multi-party negotiations, in both domestic and international cases.

***736 / Conflict Resolution in Groups: Facilitation and Conflict Management**

This workshop focuses on the role and competencies of the facilitator in effectively managing group process, group dynamics, and differences among group members. Among the subjects explored are contracting around role and outcomes, design of agenda and process, states of group development, observing and giving feedback about group dynamics, and managing conflict. Format provides opportunities for intensive practice, coaching by instructors and reflective work in a Personal Learning Plan.

***737 / Interpersonal Conflict Resolutions Skills**

Enhanced communication rapport building skills to interact more effectively and solve problems creatively. A foundational course that emphasizes reflective listening, problem solving, assertion and managing conflicts among needs and values. Includes theory, demonstrations, skill practice, and critique. Designed to have immediate and wide applicability in interpersonal and group settings.

***738 / Mediation: Theory and Practice**

Mediation theory and skills to facilitate the resolution of disputes and differences. Techniques of third-party intervention with individuals and groups. Learning approach includes lectures, simulations, demonstrations, and practice mediations in a variety of areas, including community, workplace, family and commercial settings. Participants receive the 25-hour skills training required of them as mediators.

***739 / New Technologies in Communications**

New communications technologies are emerging on the Web like blogs (web blogs) and podcasts. This course will deal with uses of these technologies, issues around social presence, privacy, and openness in communication. Students will learn to use these technologies and will run projects applying them to communication problems.

741 / Crisis Communications

This course will study how a crisis can best be managed using the fundamentals of crisis communications planning and tactics. It will examine the critical role played by communications professionals in developing strategies and executing programs that can be used if and when a crisis occurs. The course will also study the roles and responsibilities of both professions—public relations and the press—and the forces that drive each in times of crisis.

COMMUNICATION AND NEW MEDIA

The Department of Communication Studies and Multimedia offers a program leading to an M.A. degree in Communication and New Media.

Enquiries: 905 525-9140 Ext. 27603

Fax: 905 577-6930

E-mail: gradcnm@mcmaster.ca

Website: <http://csmm.mcmaster.ca/grad/contacts.html>

In addition to the faculty listed below, students in the M.A. program may select a supervisor from outside the department where appropriate.

Staff / Fall 2009

PROFESSOR

Graham Knight, B.A. (Kent), M.A., Ph.D. (Carleton)

ASSOCIATE PROFESSORS

Christina Baade, B. Mus. (Northwestern), M. Mus., Ph.D. (Wisconsin-Madison)

Robert S. Hamilton, M.F.A. (SAIC), M.F.A. (Jan van Eyck Academie)

Violetta Ignesi, B.A., M.A. (Western Ontario), Ph.D. (Toronto)

Andrew MacTavish, G.A. (Mount Saint Vincent), M.A. (Dalhousie), Ph.D. (Alberta)

Liss Platt, B.F.A. (Connecticut), M.F.A. (California-San Diego)

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ASSISTANT PROFESSORS

Faiza Hirji, B.A. (Simon Fraser), M.A., Ph.D. (Carleton)

David Ogborn, B.Sc. and B.A. combined (Mary), B.A. (Manitoba), M.A., Ph.D. (Toronto)

Christine Quail, B.A., M.A. (Pennsylvania), Ph.D. (Oregon)

Philip Savage, B.A. (Carleton), M.A. (Simon Fraser), Ph.D. (York)

M. A Degree

Admission to the program will be on a full-time basis only, starting in September of the academic year.

Admission to the M.A. degree program will normally require an Honour's Bachelor's degree (four-year degree) in a Communication Studies and/or Multimedia program, or its equivalent with a minimum grade point average of B+ (equivalent to a McMaster 8.5 GPA out of 12) in the last 10 one-term courses relevant to studies in communication and digital media.

Students holding Honours Bachelor's degrees (four-year degrees) from other disciplines including (but not limited to) linguistics, cultural studies, fine art and the social sciences may also be considered, if they can demonstrate sufficient training in Communication Studies and Multimedia to undertake studies at the graduate level.

Degree Requirements

The M.A. in Communication and New Media will typically be completed within twelve months. Students will take five 3-unit courses, in addition to a major research project (either a 40 page research paper or a combination of a smaller paper and a digital media project).

Course Requirements

Course requirements consist of a required core course in research methods relevant to communication studies and new media (CSMM 700; see Course Listing) and four additional courses from Course Listing. Students must achieve a grade of at least a B- in all courses they take for credit in order to qualify for the degree.

Major Research Project

In addition to the course requirements, students will complete a major research project under the supervision of a core faculty member. Students will be assigned a supervisor on entry into the program, but have the option of changing supervisors. Any change of supervisor must be submitted for approval to the departmental Graduate Committee by the end of February.

The major research project will be evaluated on a pass/fail basis by the project supervisor.

There are **two** options for the major research project:

1. A paper (approximately 40 pages) based on original empirical research.

This may consist of primary data gathering and analysis or analysis of secondary data. The paper will provide an opportunity to apply methodological skills acquired in the mandatory research methods course (CSMM 700) to theoretical and substantive issues taken up in other courses. A short proposal outlining the research should be completed and approved by the supervising faculty member by the end of Term II. A copy of the proposal and the supervisor's written approval and comments must be submitted to CSMM's Graduate Committee within one week of approval being given. The Graduate Committee may seek further clarification about the project if deemed appropriate.

2. A digital media product (e.g., a methodological tool, an educational application, or computer game related to communication skills) together with a shorter paper (approximately 15-20 pages) explaining the conception and development of the product.

The digital media product should reflect expertise and knowledge acquired during course work. A short proposal outlining the project must be completed and approved by the supervising faculty member by the end of Term II. A copy of the proposal and the supervisor's written approval and comments must be submitted to CSMM's Graduate Committee within one week of approval being given. The Graduate Committee may seek further clarification about the project if deemed appropriate.

Program Timetable

Students will normally be expected to take three courses in Term I and two courses in Term II. Preparation for the major research project will normally begin in Term II and be completed by the end of Term III.

Students are expected to complete all program requirements within 12 months of entry.

Courses

With the exception of CSMM 700, which will be offered every year, other 700-level course offerings will vary from year to year depending on student and faculty interest. All courses listed below run for one term.

***700 / Research Methods in Communication and New Media**

This course provides an overview of research methodology relevant to the study of human communication. Topics include formulation of a research problem and research questions, appropriate methods of data gathering (questionnaires, focus groups, interviewing, ethnography, digitalized document collection), and data analysis (quantitative and qualitative approaches).

***701 / Media, Gender and Performance**

This course examines how gendered identities are performed and/or constructed in complex social, historical, and cultural processes and conditions. Particular attention is paid to the impact of the media and mediation upon gender performance. Topics may include fashion, popular music, and queer genders.

***702 / Media and Social Issues**

An analysis of relationships between mass media and modern society. Topics may include ideology and agenda-setting in the news, representations of social problems (e.g., homelessness, violence), moral panics, media scandals, media and violence, media and racism, media and religion, media and social activism, etc.

***703 / New Media Arts: Theory and Practice**

This course examines the impact of new media technologies, ranging from cell phones to websites and interactive installations, on communication and culture from the perspective of both commercial and artistic applications.

***704 / Media, Discourse and Communication**

This course will investigate different forms of communication (e.g., print media, TV/radio news, television entertainment, reality TV, infomercials, advertisements, science shows), using the methods of discourse analysis, from both a quantitative and qualitative perspective. Data will be analyzed from the perspective of critical discourse analysis, which investigates how social relations and cultural identities are entrenched in verbal and non-verbal ways. The course will expose students to both psychological and socio cultural communication perspectives.

***705 / Media, Audiences and Interactivity**

This course explores the social, cultural, and economic effects of forms of audience impact and participation that arise in and around conventional and interactive media. The course will focus on a broad range of media, and draw upon a range of critical work such as studies of audience reception practices, cultivation analysis, fan culture, participatory culture, and theories of interactivity.

***706 / Technologies of Communication**

This course will examine technological dimensions of communication practices from various perspectives (e.g., actor-network theory, media ecology, science studies, material cultural studies, and policy formation). Topics may include: the debate over technological determinism; feminist critiques of technology; bio-technology as a communicative medium; technology and democracy; and media technologies in historical and cross-cultural perspective.

***707 / Theoretical and Ethical Issues in Communication**

This course examines selected topics, both theoretical (e.g., Habermas's discourse ethics and other normative ethical theories) and applied (e.g., truthfulness, role of mass media in a democratic society, ethics on the internet). The main focus will be to advance understanding of normative frameworks of media and communication as applied to both personal and professional interactions. Specific topics may vary from year to year.

***708 / Selected Topics in Communication and New Media**

This course consists of an examination of different aspects of communication and new media as determined by the course instructor.

***709 / Independent Study**

Students will undertake an in-depth examination of a particular topic of their choice under the supervision of a faculty member.

Students may also take ONE of the following 600-level courses for program credit:

***6C03 / Issues in Performance Studies**

This course serves to synthesize and expand students' engagement with issues studies in performance studies courses through the examination of writings that draw on anthropology, phenomenology, materialist analysis, psychoanalysis, gender theory, postmodernism, post colonialism and intercultural reception.

***6D03 / International Communication**

The relationship between globalization and the media is examined in light of the debates over cultural imperialism, information and technology flow, cultural hybridization, and the media's impact on socio-economic development.

***6E03 / Media and Promotionalism**

An examination of the media's role in the promotion of different interests, values, and patterns of behavior. Topics include advertising, public relations, social activism, and public information campaigns.

***6M03 / Communication, Culture and Technology**

This course surveys social patterns of reception and adaptation of communication technologies and their interaction with cultural constructions of (gendered) bodies, everyday life, organization of space and time, and other cultural distinctions.

***6N03 / News Analysis: Theory and Practice**

This course will examine how the mode of production of the news influences audiences' perceptions and values of social and political life. Specific emphasis will be put on gate keeping, agenda setting and headline transformation.

***6P03 / Social Activism and the Media**

This course examines the role of print, electronic and digital media in the relationship between social movements, the state and corporate interests.

***6Q03 / Advanced Topics in Communication I**

Students will learn about specific areas or aspects of research in communication studies, such as critical media discourse, culture and consumption, media and globalization, media organization, media and the social environment.

***6QQ3 / Advanced Topics in Communication II**

Students will learn about specific areas or aspects of research in communication studies, such as critical media discourse, culture and consumption, media and globalization, media organization, media and the social environment.

Students may also take up to one 3-unit graduate course in another program, as approved by the department.

COMPUTATIONAL ENGINEERING AND SCIENCE

The School of Computational Engineering and Science (hereafter the School) is an equal partnership between the Faculties of Engineering and Science, with outreach to the School of Business and the Faculty of Health Sciences. The School of Computational Engineering and Science will produce highly qualified graduates who can develop and apply computational methodology to all areas of engineering and science. Graduates of the School will be employed by engineering design, information technology, financial, biotechnical industries, government and academic institutions. Educational programs will be at the Master's (M.Eng. and M.Sc. with coursework and project, as well as M.A.Sc. and M.Sc. with thesis), and Ph.D. level. These will be of an interdisciplinary nature including core courses at the Master's level and module-based topic courses at all levels.

Enquiries: 905 525-9140, Ext 23486

Email: computational@mcmaster.ca

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Staff / Fall 2009

DISTINGUISHED UNIVERSITY PROFESSOR

Simon S. Hakin, B.Sc., Ph.D., D.Sc. (Birmingham), F.I.E.E.E., F.R.S.C.

PROFESSORS

Alex B. Bain, B.Sc. (Toronto), M.Sc. (British Columbia), Ph.D. (Cambridge) / Chemistry
 Suzanna Becker, B.A., M.Sc. (Queen's), Ph.D. (Toronto) / Psychology, Neuroscience & Behaviour
 Patrick J. Bennett, B.Sc. (Tufts), Ph.D. (California, Berkeley) / Psychology, Neuroscience & Behaviour / Canada Research Chair in Vision Science
 David W. Capson, B.Sc. Eng. (New Brunswick), M. Eng., Ph.D. (McMaster), P. Eng. / Electrical & Computer Engineering
 Samir E. Chidiac, B.Eng., M.Eng., Ph.D. (McMaster), P.Eng. / Civil Engineering
 Walter Craig, Ph.D. (Courant, N.Y.U.) / Mathematics & Statistics / Senior Canada Research Chair in Mathematical Analysis and its Application
 Hugh Couchman, B.A., M.A., Ph.D. (Cambridge) / Physics & Astronomy / Scientific Director SHARCNET
 Timothy Davidson, B.Eng. (Western Australia), Ph.D. (Oxford) / Electrical & Computer Engineering / Canada Research Chair in Communication Systems
 David Earn, B.Sc., M.Sc. (Toronto), Ph.D. (Cambridge) / Mathematics & Statistics
 Franya Franek, M.Sc., RNDr (Charles, Prague), Ph.D. (Toronto) / Computing & Software
 G. Brian Golding, B.Sc. (Dalhousie), Ph.D. (Alberta) / Biology / Canada Research Chair in Bioinformatics
 Bradd Hart, Ph.D. (McGill) / Mathematics & Statistics
 Paul Higgs, B.A., Ph.D. (Cambridge) / Physics & Astronomy / Canada Research Chair in Biophysics
 Thomas, R. Hurd, Professor, D.Phil. (Oxford) / Mathematics & Statistics
 Pavlos S. Kanaroglou, Professor B.Sc. (Athens), M.A., M.Sc., Ph.D. (McMaster) / School of Geography and Earth Sciences / Canada Research Chair in Spatial Analysis
 Nicholas Kevlahan, Ph.D. (Cambridge) / Mathematics & Statistics
 Thia Kirubarajan, B.A., M.A. (Cambridge, UK) M.S., Ph.D. (Connecticut, USA) / Electrical & Computer Engineering / Canada Research Chair in Information Fusion
 Marilyn F. Lightstone, B.A.Sc. (Queen's), M.A.Sc., Ph.D. (Waterloo), P.Eng. / Mechanical Engineering
 John C. Luxat, B.Sc. (Eng.) (Cape Town), M.Sc. (Cape Town), Ph.D. (Windsor), P. Eng. / Engineering Physics / NSERC/UNENE Industrial Research Chair in Nuclear Safety Analysis

Vladimir Mahalec, Dipl. Ing. (Zagreb), Ph.D. (Houston), P. Eng. / Chemical Engineering
 Thomas, E. Marlin B.S. (State University of New York at Buffalo), M.S. (University of Dayton), Ph.D. (University of Massachusetts) / Chemical Engineering / Director MACC
 Kathryn M. Murphy Ph.D. (McMaster) / Psychology, Neuroscience & Behaviour
 Natalia Nikolova, Dipl. Eng. (TU - Varna, Bulgaria), Ph.D. (University of Electro Communications, Tokyo) / Electrical & Computer Engineering
 Nicholas Provasas, M.Sc., Ph.D. (McGill) / Materials Science & Engineering
 Sanzheng Qiao, B.S., M.S. (Shanghai Teacher's College) M.S., Ph.D. (Cornell) / Computing & Software
 Allison B. Sekuler, B.A. (Pomona College), Ph.D. (Psychology, UC Berkley) / Psychology, Neuroscience & Behaviour / Canada Research Chair in Cognitive Neuroscience
 An-Chang Shi, B.Sc. (Fudan), M.Sc., Ph.D. (Illinois) / Physics and Astronomy
 Eric Sorensen, B.Sc., M.Sc., (Aarhus), Ph.D. (California, Santa Cruz) / Physics and Astronomy
 George Steiner, M. Sc. (Budapest), Ph.D. (Waterloo) / DeGroote School of Business
 Dieter F.E. Stolle, B.Eng., M.Eng., Ph.D. (McMaster), P. Eng., / Civil Engineering
 Chris Swartz, B.Sc. (Eng) (Cape Town Ph.D). Wisconsin MAChE / Chemical Engineering
 Ioannis K. Tsanis, Dipl. Eng. (Thessaloniki), M.A.Sc., Ph.D. (Toronto), P. Eng. / Civil Engineering
 Xialon Wu, B.Sc. (Wuhan University, China) Ph.D. (University of Calgary, Canada) / Electrical & Computer Engineering / NSERC-DALSA Industrial Research Chair in Digital Camera
 Boris Zhorov., M.S c., Ph.D., D.Sc. (St. Petersburg, Russia) / Biochemistry & Biomedical Sciences

ASSOCIATE PROFESSORS

Christopher Anand, B.Math (Waterloo), M.Sc., Ph.D. (McGill) / Computing & Software
 Paul W. Ayers, B.Sc. (Lipscomb), Ph.D. (North Carolina, Chapel Hill) / Chemistry / Canada Research Chair in Theoretical Chemistry and Chemical Biology
 Mohamed Bakr, B.Sc., P.Eng. M.Sc. (Cairo University, Egypt), Ph.D. (McMaster) / Electrical & Computer Engineering
 Ian Bruce, B. Eng., M. Eng., Ph.D. (McMaster), P. Eng. / Electrical and Computer Engineering / Barber-Gennum Chair in Information Technology
 Antoine Deza, M.Eng. (Ecole Nationale des Ponts et Chaussées, Paris), Ph.D. (Paris), Ph.D. (Tokyo Institute of Technology) / Computing & Software / Canada Research Chair
 Randall S. Dumont, B.Sc. (University of Western Ontario), Ph.D. (University of Toronto) / Chemistry
 Matheus Grasselli, Ph.D. (King's College London) / Mathematics & Statistics / SHARCNET Chair
 Peijun Guo, B.Sc., M.A.Sc. (SWJTU), Ph.D. (Calgary) / Civil Engineering
 Elkafi Hassini, B.Sc. (Bilkent), M.A.Sc., Ph.D. (Waterloo) / M.D. deGroote School of Business
 George Karakostas, Dipl. Eng. (Patras), M.S.A., Ph.D. (Princeton) / Computing and Software
 Jan Modersitzki, Dipl. Math., Dr. rer.Nat. (Hamburg), Habil. (Luebeck) / Computing and Software
 Ned Nedialkov B.Sc. (Sophia University, Bulgaria), M.Sc., Ph.D. (Toronto) / Computing & Software
 Dmitry Pelinovsky, Ph.D. (Monash University, Australia) / Mathematics & Statistics
 Bartosz Protas, M.Sc. (Warsaw Univ. Technology), Ph.D. (Warsaw Univ. Technology and Université de Paris VI [Pierre et Marie Curie]) / Mathematics & Statistics / SHARCNET Chair
 Shahram Shirani, B.S. (Isfahan), M.Sc. (Amirkabir), Ph.D. (British Columbia) / Electrical and Computer Engineering
 Spencer Smith, B.Eng. C.S., M.Eng., Ph.D. (McMaster). P.Eng. / Computing & Software

Allan Spence, B.Math. M.A.Sc. (Waterloo), Ph.D. (British Columbia) / Mechanical Engineering
 James Wadsley, B.Sc. (Monash), Ph.D. (Toronto) / Physics and Astronomy / SHARCNET Research Chair

ASSISTANT PROFESSORS

Jonathan Dushoff, B.A. (Pennsylvania), Ph.D. (Princeton) / Biology
 Aleksandar Jeremic, Dipl.Ing. (Belgrade), M.S., Ph.D. (Illinois at Chicago) / Electrical & Computer Engineering
 David Jones, B.Sc. (University of Western Ontario), Ph.D. (Stanford University) / Electrical & Computer Engineering
 Gerald, R. Moran, MSc., Ph.D. (Guelph) / Medical Physics and Applied Radiation Sciences
 Michael Noseworthy, B.Sc., M.Sc., Ph.D. (Guelph) / Electrical and Computer Engineering
 Jonathon Stone B.Sc., M.Sc., Ph.D. / Biology / SHARCNET Chair
 Stephen Tullis, B.Sc., M.Sc., (Queen's), Ph.D. (Cambridge), P.Eng. / Mechanical Engineering

ADJUNCT MEMBERS

Douglas Moseley, B. Math (Waterloo), M.Sc., Ph.D. (Western)
 Michael Sharpe, B.Sc., Ph.D. (Western)
 Tamás Terlaky, Ph.D. (Loránd Eötvös, Budapest)

PROFESSOR EMERITUS

J.W. Bandler, B.Sc.(Eng.), Ph.D., D.Sc.(Eng.) (London), D.I.C. (Imperial College), F.I.E.E.E., F.I.E.E., F.E.I.C., F.R.S.C., C.Eng., P.Eng. / Electrical & Computer Engineering

Master's Degrees

The Master's programs emphasize industry relevant academic research and development. The degree may be earned either with a thesis option (M.A.Sc. when the supervisor is from the Faculty of Engineering and M.Sc. when the supervisor is from the Faculty of Science) or by a course-project option (M.Eng. when the supervisor is from the Faculty of Engineering, and M.Sc. when the supervisor is from the Faculty of Science) to be decided jointly by the candidate, the supervisor and approved by the director of the School of Computational Engineering and Science. A strong bachelor's degree with an average of at least B+ (equivalent to a McMaster GPA of 8.5) in engineering, mathematics or physical sciences, that included a substantial computational component, is generally required to enter the Master's programs with thesis option. For the Master's programs with the course-project option an average of at least a B is required. Students who do not have an adequate background in Mathematical Computing will be required to take CES *600 – Mathematical Foundations for Computing.

M.A.Sc. or M.Sc. with Thesis

A candidate for a Master's degree with thesis is required to successfully complete a minimum of four half courses and successfully defend a thesis. Two of the four half courses have to be chosen from the three core courses offered by the School. The remaining two half courses are normally chosen from the list of the courses approved by the School. One of the courses may be at the 600-level where appropriate. Additional courses beyond the minimum four may be required by the Director, in consultation with the supervisor. The thesis topic is to be chosen in consultation with the supervisor. The School arranges a series of seminars; candidates are required to attend and participate, and may be required to present their research results as part of this series. Normally, an M.A.Sc. or M.Sc. program is completed within 20 months of full time study. It is expected that many students will choose this route towards a Ph.D. degree.

M.Eng. or M.Sc. with Project

A candidate for a Master's degree with project is required to successfully complete a minimum of six half courses plus a research project. The project is to be decided jointly by the candidate and the supervisor, and approved by the Director. Of the six half courses, three must be the core courses, at least two modules (=one half course) must be chosen from the Parallel Programming modules, and at least two modules (=one half course) must be chosen from the Computational Techniques modules. The remaining half course may be chosen from those listed by the School, in consultation with the project supervisor. Up to two of the half courses may be at the 600-level. The School arranges a series of seminars; candidates are required to attend and participate, and may be required to present their research results as part of this series. Normally, this option will require 12 months residence. This option is not a preferred qualification for entrance to a Ph.D. program.

M. Eng. or M.Sc. by Coursework

A candidate for a Master's degree by coursework is required to successfully complete a minimum of eight half courses. Of these, three must be the core courses, at least two modules (=one half course) must be chosen from the Parallel Programming modules, and at least two modules (=one half course) must be chosen from the Computational Techniques modules. The remaining courses may be chosen from any of those listed by the School, in consultation with the Director. Up to two of the half courses may be at the 600-level. The School arranges a series of seminars; candidates are required to attend and participate. Normally, this option will require 12 months resident. This option is not a preferred qualification for entrance to a Ph.D. program.

Ph.D. Degree

The general regulations for the Degree Doctor of Philosophy appear earlier in the Calendar. Students with a Master's degree equivalent to the Master's degree with thesis option at the School of Computational Engineering and Science are required to take four half courses, at least three of which must be at the 700 level. Students entering into the Ph.D. program directly from a Bachelor's degree, or transferring into the Ph.D. program without completing the Master's degree are required to take a total of eight courses of which at least six must be at the 700 level. Students having previously earned a Master's degree at a relevant program, and transferring from the Master's degree programs with thesis option to the Ph.D. program are required to take a total of six courses of which at least four must be at the 700 level.

During their course of study, doctoral candidates will have to pass a Comprehensive Examination of the School of Computational Engineering and Science. The purpose of this examination is to ensure that the candidate possesses sufficient knowledge and maturity in computational engineering and science. The Comprehensive Examination will be in two parts.

For Part I the student has to prepare a report in advance on a subfield and the examination will be an oral, defense style examination which is designed to test the student's breadth of knowledge, her/his understanding of computational sciences and computational engineering, and to test the student's ability for critical thinking, and her/his ability to synthesize and integrate ideas from within and peripheral to the candidate's research area.

Part II will take the form of an oral examination designed to examine the student's understanding of, and approach to, her/his proposed dissertation research topic. The candidate will normally take Part I within 10 months of admission to the doctoral program and Part II no later than 24 months following admission. Both parts of the examination may be repeated once. Reporting of examination results will be done in accordance with the Regulations of the School Graduate Studies.

A Supervisory Committee determines when a candidate is ready to write her/his thesis and then ensures that the quality of the student's oral presentation is satisfactory.

The School of Computational Engineering and Science arranges a series of seminars; graduate students are required to attend, participate, and present their research results in these seminars at least twice before they graduate.

Courses

Courses marked with an asterisk (*) are half courses. Courses marked with a pound (#) sign are quarter courses (modules).

*600 / Mathematical Foundations for Computing

An introduction to the mathematical tools of scientific computing. This course is required for students whose mathematical background is not adequate to proceed with the core courses. Topics will include: Algebra: bases, vector spaces, sets of linear equations, matrices, linear transformations; Calculus: limits, derivatives, integration, vector calculus; Differential equations: separable equations, integrating factors, first order linear equations; Series: Taylor series, Fourier series and transforms, Laplace transforms; Probability and Statistics: discrete random variables, continuous random variables, and probability density functions.

Core Courses:

*700 / Foundations of Scientific Computing / N. Nedialkov

An introduction to scientific computing, modeling, and numerical methods covering such topics as Taylor series and truncation errors, numerical differentiation and integration, constrained optimization, and solving sets of: linear equations; linear algebraic equations; ordinary differential equations; and partial differential equations.

*701 / Foundations of Modern Scientific Programming / Staff

An introduction to modern scientific programming providing a background to such topics as binary systems, Unix and Windows based operating systems, parallel and distributed computing, and popular programming languages.

*702 / Advanced Computational Methods and Models / N. Nedialkov (Same as Computing and Software *755)

Advanced topics in scientific computing, including iterative sparse methods and direct sparse methods for linear systems, QR-type algorithms for computing Eigen values, perturbation analysis, methods for large-scale ODE systems, choice of preconditioners, Newton-Krylov methods for solving nonlinear systems, introduction to multigrid methods, automatic differentiation, and sensitivity analysis.

Parallel Programming Modules

#704 / Parallel Programming / Staff

General ideas and principle of parallel programming. Investigates fundamental concepts of data vs. work division, domain decomposition, scaling, efficiency, communication to computation cost ratios. Introduction to parallel programming techniques including, shared memory and distributed systems (message passing). First approaches to parallelizing a new or existing application will be discussed.

#706 / Shared Memory Approaches to Parallel Applications / Staff

Shared memory is an approach to parallel programming that relies on expensive hardware to make program data available to all processors. This makes parallel programming easier and has led to OpenMP as a standard compiler extension to enable semi-automated parallelism. The module will examine OpenMP in depth and also the lower level threads approach on which it is based. Examples applications in C and Fortran will be parallelized using OpenMP.

#713 / The Message Passing Interface for Parallel Applications / Staff

Message passing is required to share program data between processors on distributed memory parallel computing platforms. The Message Passing Interface is the standard behind MPI message passing libraries available on parallel computing platforms. The rationale and overall structure of MPI will be discussed, including implementation, bottlenecks, variations between platforms and common mistakes. Example applications in C and FORTRAN will be parallelized with MPI.

#727 / Parallel and High Performance Computing Systems / Staff

Hardware: cache, memory subsystems, network architectures and design, latency vs. bandwidth. Classifications: SISD, SIMD, MIMD. History: Moore's Law, Top 500, Vector, RISC, Beowulf clusters. Parallel languages (HPC, UPC, Titanium, OpenMP, CHARM++) and messaging libraries (PVM, MPI, MPI2, vendor lib's). Design of software frameworks for parallel computing; evolution of programming strategies in relation to hardware; grid computing. Elements of parallel software development.

Computational Techniques Modules

#703 / Computational Linear Algebra / Staff

In addition to solution techniques for large linear systems, this module will also review the computational techniques of eigenvalue and singular value problems, various decompositions (LU, Cholesky), and linear least squares problems. Sparse matrix techniques and various parallelization strategies will be considered.

#707 / Visualization and 3D Rendering / Staff

This course will provide an introduction to the use of graphics to visualize research data (grids, meshes, particles) in two and three dimensions. It will cover algorithms (surface drawing, transparency), real time visualization, post processing (including large data sets) and generating animations and movies. It will introduce OpenGL as a low-level mechanism to access hardware graphic acceleration as well as other popular toolkits such as vtk and provide experience with visualization tools built on these foundations.

#708 / Symbolic Computing and Automatic Differentiation / Staff

This module presents an overview of techniques for symbolic computation applied to solving linear equations, analytic and automatic differentiation and integration of functions, and analytic solution of differential equations. Hybrid, symbolic-numeric methods will be considered as well.

#709 / Optimization of Numerically Intensive Codes / Staff

This module will teach participants how to optimize numerically intensive code. Optimizing codes require knowledge of how modern compilers operate, how CPUs and memory subsystems work. This module will demonstrate how to write a code that allows the compiler to make best use of specific architectures and how to make use of vendor-optimized code libraries for linear algebra, transforms and other common operations. The module will also examine using profilers and debuggers for optimization of serial and parallel applications.

#739 / Introduction to Iterative Methods in Computational Science / Staff

This module reviews the theoretical foundations and various implementation issues concerning the use of iterative methods. The focus will be on solution techniques for sparse linear systems, such as arising in numerical solution of PDEs, systems of nonlinear equations and numerical solution of integral equations.

Computational Physical Sciences Courses and Modules**#712 / Introduction to Particle Methods / B. Protas**

The uses of particles for numerical simulations of physical systems. Particles can correspond to real objects (molecules, stars) or represent parcels of fluid or material. When solving Hamiltonian systems, particles can be considered to be a Monte Carlo type realization of characteristics making up the phase space. Numerical methods for these systems will be examined, including smoothed particles, symplectic time integrators, discreteness effects and parallelization strategies. Applications include hydrodynamics, gravitational and molecular dynamics, and protein folding and computational materials.

#717 / Foundations of Computational Finite Element Methods / B. Protas

This module provides an introduction to the general theory of the finite element method; formulation of finite elements; construction and optimization of meshes for finite elements and the treatment of boundaries. Issues for programming finite element codes including parallelization are in the focus as well.

***6E04 /** Computational Modeling of Microstructure Formation
(Same as *Materials Science and Engineering *6E04*)

***6G03 /** Computational Physics

(Same as *Physics & Astronomy *6G03*)

***6Q03 /** Numerical Methods for Differential Equations
(Same as *Mathematics *6Q03*)

#705 / Computational Chemistry: An Introduction
(Same as *Chemistry #705*)

#715 / Incompressible Computational Fluid Dynamics
(Same as *Physics & Astronomy #715*)

#716 / Mathematical Introduction to Fluid Mechanics
(Same as *Physics & Astronomy #716*)

#718 / Combustion Theory and Modeling / S. Tullis

#719 / Numerical Solution of Scalar Transport / M. Lightstone

#721 / Compressible Computational Fluid Dynamics
(Same as *Physics & Astronomy #719*) / J. Wadsley

***724 /** Solid and Surface Modeling Techniques
(Same as *Mechanical Engineering *724*)

#748 / Principles of Pulse and Two-Dimensional NMR
(Same as *Chemistry #748*)

***752 /** Optimization of Chemical Processes
(Same as *Chemical Engineering *752*)

***753 /** Modern Antennas in Wireless Telecommunications
(Same as *Electrical and Computer Engineering *753*)

***756 /** Computational Fluid Dynamics
(Same as *Mechanical Engineering *756*)

#770 / Molecular Electronic Structure Theory
(Same as *Chemistry #770*)

#771 / Concepts in Quantum Chemistry
(Same as *Chemistry #771*)

#773 / Numerical Methods and Computational Chemistry
(Same as *Chemistry #703*)

#774 / Statistical Mechanics (Same as *Chemistry #774*)

***783 /** Finite Element Method (Same as *Civil Engineering *703*)

Computational Optimization Design and Control Courses and Modules

***6T13 /** Fundamentals of Image Processing / J. Modersitzki
(Same as *Computing and Software *6T13*)

***710 /** Engineering Optimization
(Same as *Electrical and Computer Engineering *710*)

#722 / Algorithms for Constrained Optimization / T. Terlaky

#723 / Algorithms for Unconstrained Optimization / T. Terlaky

#725 / Surrogate Modeling and Space Mapping / J. Bandler

#726 / Sensitivities, Tolerances and Yield-Driven Design
/ J. Bandler

#728 / Numerical Time Domain Electromagnetic Technique
/ M. Bakr

#729 / Finite Element Techniques for Electromagnetics / M. Bakr
***731 /** Linear Systems

(Same as *Electrical and Computer Engineering *730*)

#732 / A Basic Introduction to Data Mining / J. Peng

#733 / Advanced Topics in Knowledge Discovery / J. Peng

#736 / Computational Geometry in the Plane / A. Deza

#737 / Computational Geometry in Dimension 3 and Higher
/ A. Deza

***740 /** Numerical Methods for Ordinary Differential Equations and
Differential-Algebraic Equations / N. Nedialkov
(Same as *Computing and Software *740*)

***741 /** Development of Scientific Computing Software / S. Smith
(Same as *Computing and Software *741*)

***742 /** Special Topics in Communication Systems and Networks
(Same as *ECE *738*)

***750 /** Model-Based Image Reconstruction / C. Anand
(Same as *Computing and Software *750*)

***759 /** Medical Image Registration / J. Modersitzki
(Same as *Computing and Software *759*)

***768 /** Special Topics in Signal Processing
(Same as *Electrical and Computer Engineering *768*)

***782 /** Data Structures and Algorithms
(Same as *Computing and Software *702*)

***791 /** Algorithms for Parameter and State Estimation
/ T. Kirubarajan
(Same as *Electrical and Computer Engineering *771*)

Computational Biosciences

***6Y03 /** Genomes and Evolution / P. Higgs
(Same as *Biochemistry *6Y03*)

#711 / Advanced Statistics and Computational Methods I
(Same as *Psychology #711*)

***720 /** Bioinformatics (same as *Biology *720*)

***734 /** Neural Network Models of Cognition and Perception
(Same as *Psychology *734*)

***738 /** Computational Biochemistry / B. Zhorov
(Same as *Biochemistry *730*)

***757 /** Special Topics in Biophysics / P. Higgs
(Same as *Physics and Astronomy *756*)

***796 /** Models of the Neuron
(Same as *Biomedical Engineering *796*) *Electrical and
Computer Engineering *796*)

Other Courses

***799 /** Special Topics in Computational Engineering
and Science

Facilities and Research

The members of the School have active research programs in a variety of aspects and applications of computational engineering and science. The list of available research topics includes industrially strategic areas such as process control, algorithm design, financial mathematics, materials properties and manufacturing, simulation of polymer processing, casting, semiconductor design, photonics, structural analysis and nanotechnology, bioinformatics and brain modeling and neurosciences. McMaster University also offers a unique environment in Canada, boasting some of the world's leading computational resources, and an organizational culture that facilitates multidisciplinary endeavours. The departments of Computing and Software, and Material Science and Engineering, are affiliated with both the Faculties of Engineering and Science. Also, active cooperation channels exist via the Brockhouse Institute for Materials Research and the McMaster Nuclear Reactor with high quality researchers involved from both faculties. McMaster University is also a major partner in the recently formed Shared Hierarchical Academic

Research Computing Network (SHARCnet), currently among the leading high-performance computing centers in the world. A significant fraction of funding for this research at McMaster University comes from industrial support. To the potential graduates, research in any of the Computational and Engineering Science research fields will provide not only in-depth training in topics that require advanced computational skills but will also expose students to cutting edge, industrially relevant multidisciplinary training. This combination will provide access to the industrial job market of the future.

COMPUTING AND SOFTWARE

The Department of Computing and Software offers programs leading to Master's and Ph.D. degrees in both Computer Science and Software Engineering; and Master's degrees in Mechatronics, and Software Engineering and Virtual Systems Design.

Enquiries: 905 525-9140 Ext. 27863

E-mail: gradcas@mcmaster.ca

Website: <http://www.cas.mcmaster.ca/cas/graduate/admissions.html>

Staff / Fall 2009

PROFESSORS

Ivan Bruha, Dipl. Ing. (Czech. Tech. Univ., Prague), RNDr. (Charles, Prague), Ph.D. (Czech. Tech. Univ., Prague)
 William M. Farmer, B.A. (Notre Dame), M.A., M.S., Ph.D. (Wisconsin-Madison). P. Eng.
 Frantisek Franek, M.Sc., RNDr. (Charles, Prague), Ph.D. (Toronto)
 Ryszard Janicki, M.Sc. (Warsaw), Ph.D., D.Hab. (Polish Academy of Sciences)
 Thomas Maibaum, B.Sc. (Toronto), Ph.D. (London) / Canada Research Chair, P. Eng.
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 Jeffery I. Zucker, B.Sc. (Witwatersrand), Ph.D. (Stanford)

ASSOCIATE PROFESSORS

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 Jan Modersitzki, Dipl. Math., Ph.D. (Hamburg), Hab (Lubeck)
 Ned Nedialkov, B.Sc. (Sofia University, Bulgaria), M.S.c., Ph.D. (Toronto)
 W.F. Skipper Pohlman, B.S. (Niagara), B.Sc. (Brock), M.Sc., Ph.D. (McMaster), P.Eng.
 Emil Sekerinski, Dipl.Inf., Dr.rer.nat. (Karlsruhe)
 Spencer Smith, B.Eng.C.S., M.Eng., Ph.D. (McMaster). P. Eng.
 Michael Soltys, B.Sc., M.Sc., Ph.D. (Toronto)
 Martin von Mohrenschildt, Dipl. Math., Dr.sc. Math. (ETH-Zürich), P. Eng.
 Alan Wassyng, B.Sc. (Hons.), M.Sc., Ph.D. (Witwatersrand), P. Eng.

ASSISTANT PROFESSOR

Kamran Sartipi, M.Sc. (Tehran), M.Math, Ph.D. (Waterloo)

ASSOCIATE MEMBERS

Norman P. Archer (Commerce), B.Sc. (Alberta), M.S. (New York), Ph.D. (McMaster)
 Saeed Habibi (Mechanical Engineering), B.Sc. (Dundee), Ph.D. (Cambridge), P.Eng.

Markad Kamath (Medicine), M.S., Ph.D. (Indian Institute of Technology), Ph.D. (McMaster)
 Geoffrey Rockwell (Multimedia), B.A. (Haverford), M.A., Ph.D. (Toronto)
 Stephen Veldhuis (Mechanical Engineering), B.Eng. and Mgmt. (McMaster), M.Eng. (Carnegie Mellon), Ph.D. (McMaster), P.Eng.

PROFESSORS EMERITI

Peter E. Lauer, B.A. (Alabama), M.A. (Emory), Ph.D. (Queen's, Belfast)
 David L. Parnas, B.S., M.S., Ph.D. (Carnegie), Dr.h.c. (ETH Zürich), Dr.h.c. (Louvain), F.R.S.C., F.A.C.M.
 Patrick J. Ryan, B.Sc. (Toronto), Ph.D. (Brown)
 William F. Smyth, B.A. (Toronto), M.Sc. (Ottawa), Ph.D. (Curtin), C.Eng., F.B.C.S., F.I.C.A.
 Paul A. Taylor, B.Sc., Ph.D. (Univ. Of Wales), P.Eng.

Admission requirements are given under the General Regulations of the Graduate School at the beginning of the Calendar.

Master's Degree in Computer Science

M. Eng. Degree

The program consists of a minimum of three consecutive terms in which the candidate is required to successfully complete six graduate half courses (or equivalent), including at least two of COM SFWR *701, *702, *703, *705, *706, *707, *708, and at least two other 700-level courses, as well as a project. The project should either be a software development project, or a project demonstrating analytical or interpretive skills. The outcome should be documented in a project report.

Students in the B.A.Sc. Computer Science program at McMaster University may apply for an Advanced Credit Option after their third year of study. The Advanced Credit Option is open to graduates who have maintained a minimum average of B in each year of the B.A.Sc. program in Computer Science at McMaster University and have taken two 600-level courses during their fourth undergraduate year for advanced graduate credit.

M.Sc. Degree

Applicants who have an honours degree in another discipline with the required average and whose undergraduate program has included a substantial Computer Science content will be required to take one or more courses simultaneously with their graduate courses to make up any deficiencies.

A M.Sc. degree can be obtained by successful completion of the following requirements:

- A minimum of four one-term courses (half courses) with at least a B- standing, chosen in consultation with the candidate's thesis supervisor and the Computer Science Graduate Student Advisor.
- A thesis which demonstrates the ability to do original research.
- An oral examination to defend the thesis.

It is expected that these requirements will normally be met within 20 months of full-time study. All programs of study are subject to the approval of the Department Chair.

Master's Degrees in Software Engineering

A candidate for a Master's Degree in Software Engineering may proceed by one of two routes: thesis-oriented (M.A.Sc.) or course-oriented (M.Eng.).

M.A.Sc. Degree

Students must successfully complete four graduate courses and successfully defend a thesis. Students may be required to take more courses as judged by the graduate committee. All programs of study are subject to the approval of the Department Chair.

M. Eng. Degree

Each student's background will be assessed and his/her program of study designed to ensure appropriate depth and breadth in Software Engineering.

Students must successfully complete the equivalent of six graduate courses. These include three core courses in Software Engineering, with the remaining courses to be chosen from annual lists published by the department. Students must also produce a major study report containing independent work that demonstrates a knowledge of how to do Software Engineering at an advanced level.

M. Eng. Degree in Mechatronics Engineering

The program consists of a minimum of three consecutive terms in which the candidate is required to successfully complete six graduate half courses (or equivalent), which consist of COM SFWR *704, SFRW ENG *6GA3, MECH ENG *6K03 and at least three other 700-level courses from a list approved by the department, as well as a project. The project consists of designing a real Mechatronics System including software, hardware components, specification, documentation and testing reports. The outcome should be documented in a project report.

Students in the Mechatronics Engineering program at McMaster University may apply for an Advanced Credit Option after their third year of study. The Advanced Credit Option is open to graduates who have maintained a minimum average of B in each year of the B. Eng. program in Mechatronics Engineering at McMaster University and were allowed to take two 600-level courses, SFWR ENG *6GA3 and MECH ENG *6K03 during their fourth undergraduate year for advanced graduate credit.

M. Eng. Degree in Software Engineering and Virtual Systems Design

Each student's background will be assessed and his/her program of study designed to ensure appropriate depth and breadth in Software Engineering and Virtual Systems Design.

Students must successfully complete the equivalent of six half graduate courses. These include at least three core courses in Software Engineering with the remaining courses to be chosen from annual lists published by the department, of which at most two are 600-level courses approved by the department. Students must also submit and defend a report on an approved project, which must demonstrate ability to carry out independent study and reach a satisfactory conclusion in an area of Software Engineering and Virtual Systems Design.

Students in the Software Engineering (Game Design) program at McMaster University may apply for an Advanced Credit Option after their third year of undergraduate study. The Advanced Credit Option is open to graduates who have maintained a minimum average of B in each year of the B. Eng. program in Software Engineering (Game Design) at McMaster University and allows them to take two specified 600-level courses during their fourth undergraduate year.

Ph.D. Degree in Computer Science

Outstanding students with a Master's degree in a field other than Computer Science will be counselled about the breadth and depth of the comprehensive examination before proceeding with the application. Each student's background will be assessed and his/her program of study designed to ensure appropriate depth and breadth in Computer Science.

Students holding a Bachelor's degree should enrol at the Master's level. Excellent students may be transferred to the Ph.D. program prior to completing their Master's thesis.

Ph.D. Degree in Software Engineering

Outstanding students with a Master's degree in a field other than Software Engineering will be counselled about the breadth and depth of the comprehensive examination before proceeding with the application. Each student's background will be assessed and his/her program of study designed to ensure appropriate depth and breadth in Software Engineering.

Students holding a Bachelor's degree should enrol at the Master's level. Excellent students may be transferred to the Ph.D. program prior to completing their Master's thesis.

Requirements for the Ph.D. Degrees in Computer Science and Software Engineering

Students must successfully complete the following requirements:

- (a) Equivalent of 4 one-term (half course) graduate courses in Computer Science, Software Engineering, or relevant areas of Engineering or Mathematics. At most two courses can be from outside the department, all must be at the 700-level. More than two courses outside the department requires approval of the department. Students may be required to take more courses as judged by the supervisory committee.
- (b) Pass a two-part Comprehensive Examination. Part I tests breadth of knowledge and Part II is a defense of a thesis proposal.
- (c) Prepare and successfully defend a thesis.

Courses

All graduate courses offered by the Department are one term courses (half courses) and are marked with an asterisk (*). Not all courses are given each year. The 600-level courses are offered in conjunction with senior undergraduate students, but are also available for graduate credit; graduate students will be required to do additional work as detailed in the course outline which may take the form of a seminar, written report on further studies of the topic, a more extensive project, extra assignments or term projects. Students should contact the Department or the course instructor concerning the appropriateness of their background for any course in which they are interested.

COMPUTING AND SOFTWARE COURSES

*6CD3 / Distributed Computer Systems / Staff

Distributed systems; real-time, agent-oriented, heterogeneous, multi-computer, multi-processor, coupling schemes: loose, tight; networking, ATM, frame relay, clustering, software protocols; communication strategies, client/server approaches.
Antirequisite: COMP SCI 4CD3

*6D03 / The Human Computer Interface / Staff

A study of the principles of good interface design. Information overload problems and accommodating user mental models. Human input and technology insertion methods. Information and data visualization techniques. Modes and the mode awareness problem. Human factors and health issues, ergonomics. Interface design tools and Performance Support Systems. Antirequisite: SFWR ENG 4D03

*6E03 / Performance Analysis of Computer Systems / Staff

Use of queuing models and simulation to predict computer system performance and find bottlenecks in a system. Types of models, distributions. Markov models. Modelling storage and network behaviour, lock, critical sections, concurrency. Introduction to analytical system reliability.

Antirequisites: COMP SCI 4E03, SFWR ENG 4E03

***6GA3 / Real-Time Systems and Computer Game Applications / Staff**

Hard and soft real-time systems. Safety classification. Fail-safe design, hazard analysis. Discrete event systems. Modes. Requirements and design specifications. Tasks and scheduling. Clock synchronization. Data acquisition. Applications in real-time networking, quality of service and multimedia.
Antirequisite: SFWR ENG 4GA3

***6GC3 / Sensory Perception, Cognition and Human/Computer Interfaces for Game Design / Staff**

Human sensory perception, learning and cognition. Game aesthetics. Precise control and feedback mechanisms. Use of music and sounds. Critical analysis of existing interfaces. Alternate input devices.
Antirequisite: SFWR ENG 4GC3

***6M03 / Databases / Staff**

Physical organization of data, file structures, need for database management systems, entity-relationship design, the relational data model, concurrent access, mechanisms for data recovery. Assorted applications. Antirequisite: SFWR ENG 4M03

***6O03 / Operations Research / Staff**

Linear programming, integer programming, decision trees, network flow problems, graph algorithms, route planning, applications to engineering problems.
Antirequisite: COMP SCI 4O03, SFWR ENG 4O03

***6TB3 / Syntax-Based Tools and Compilers / Staff**

Lexical analysis, syntax analysis, type checking; syntax-directed translation, attribute grammars; compiler structure; implications of computer architecture; mapping of programming language concepts; code generation and optimization. Antirequisite: COMP SCI 4TB3

***6TC3 / Recursive Function Theory and Computability / Staff**

Recursive and primitive recursive functions, decidability and undecidability with applications to formal language theory, logic and algebra. Antirequisite: COMP SCI 4TC3

***6TE3 / Continuous Optimization Algorithms / Staff**

Fundamental algorithms and general duality concepts of continuous optimization. Special attention will be paid to the applicability of the algorithms, their information requirements and computational costs. Practical engineering problems will illustrate the power of continuous optimization techniques.
Antirequisites: COMP SCI 4TE3, SFWR 4TE3

***6TI3 / Fundamentals of Image Processing / Staff
(Same as Computational Engineering & Science *6TI3)**

Discrete-time signals and systems, digital filter design, photons to pixels, linear filtering, edge detection non-linear filtering, multi-scale transforms, motion estimation. Antirequisite: COMP SCI 4TI3

***6WW3 / Web Systems and Web Computing / Staff**

World wide web as networks: protocols, clients/servers and social issues; programming systems: mark ups, scripts, style; platform technologies; WWW services: standard systems, browser-based, security issues, examples. Antirequisite: COMP SCI 4WW3

The following 700-level courses are offered for graduate credit.

***701 / Logic and Discrete Mathematics in Software Engineering / Staff**

Mathematical objects and logical concepts used in Software Engineering. Higher-order logic. Partial functions and undefined terms. Practical application of the axiomatic method. Recursive definition and inductive proof. Survey of common mathematical structures and axiomatic theories used in Software Engineering. Effective use of mechanized mathematics systems.

***702 / Data Structures and Algorithms / Staff
(Same as Computational Engineering & Science *782)**

The course will cover some basic material encountered at the relevant undergraduate courses on data structures and algorithms plus more advanced material on topics such as network flows, linear

programming, computational geometry and NP-completeness. There will be emphasis on techniques such as greedy and dynamic programming.

***703 / Software Design / Staff**

Formal specification methods. Requirements specifications. Fail-safe systems. Verification of safety critical applications. Systematic testing. Specification and design of concurrent, multi-process and distributed systems.

***704 / Embedded, Real-Time Software Systems / Staff**

Continuous and discrete event dynamical systems. Stability, controllability and observability. State space control. Scheduling for soft and hard real-time software systems. Design of software real time control systems and codesign issues.

***705 / Computability and Complexity / Staff**

Computability: Finite automata, Turing machines, and recursive functions. The Halting problem and the Church-Turing thesis. Complexity: Classes defined in terms of time, space, and circuits. The reachability method. The P vs. NP problem, Cook's theorem, and NP-completeness. The Time and Space Hierarchy theorems. Randomized and parallel computations.

***706 / Programming Languages / Staff**

Design, definition and implementation of programming languages. Programming language paradigms; syntax, attribute grammars, typing; axiomatic, operational and denotational semantics; correctness proofs; implementation techniques, virtual machines; design and implementation of Domain-Specific Languages.

***707 / Formal Specification Techniques / Staff**

Pre/Postconditions, refinement, state-based approaches, event based approaches, algebraic specifications, Petri nets, temporal logic, properties of programs, and specification, verification, and validation.

***708 / Scientific Computation / Staff**

Floating-point arithmetic, solutions of systems of linear equations by direct and iterative methods, sparse matrix algorithms, solving systems of nonlinear equations, integration, differentiation, eigenvalue problems, methods for initial value problems in ordinary differential equations, and automatic differentiation.

***721 / Combinatorics and Computing / F. Franek**

Topics in applied combinatorics and graph theory of importance to both theoretical computer science and practical computing including combinatorial computing. Main topics: graph theory and algorithms, combinatorial optimization and algorithms, design theory and coding theory. Solving problems in finite combinatorics using computers.

***722 / Computing Patterns in Strings / W.F. Smyth**

This course deals with algorithms for finding "patterns" in strings, patterns of three main kinds: specific, generic, and intrinsic. The importance of approximate patterns and algorithms which identify them is made clear. Applications to DNA sequence analysis and other scientific areas are emphasized.

***723 / Distributed Real-Time Systems / W.F.S. Poehlman**

A study of hard and soft systems: specifications, event processing, data concurrency, distribution completeness, corrections, integrity fallback, fault tolerance and applications; timing analysis: synchronization, deadlock, modeling.

***724 / Concurrency Theory / R. Janicki**

Models based on interleaving and partial order paradigms including the Calculus of Communicating Systems (CCS), Communicating Sequential Processes (CSP), Actors, Petri Nets, Pomsets and COSY. Basic properties of concurrent systems such as deadlock, liveness, safety, fairness, etc. Temporal Logic techniques. The growing role of concurrent systems in many diverse scientific and engineering activities will also be discussed.

***725 / Formal Methods of Real-Time Systems / M. Lawford**

Introduction to formal methods including equivalence verification, model-checking and theorem proving. Emphasis on verification of safety-critical real-time control systems using automated theorem provers and simple programming techniques.

***727 / Design of Numerical Software / S. Qiao**

Principles of finite precision computation, subtleties of floating point arithmetic, design of stable and accurate numerical algorithms, techniques of testing numerical software, portability and performance.

***728 / Computability on Abstract Data Types / J. Zucker**

A study of the extension and generalizations of classical computability theory (or recursion theory) to abstract data types.

***729 / Problem Solving with Knowledge-Based Systems / W.F.S. Poehlman**

A practical study of knowledge-based technology as applied to appropriate problems including knowledge engineering; structure of expert, neural and fuzzy systems; application areas include simulation, fault analysis, rapid prototyping, adaptive scheduling, control and strategic planning.

***730 / Machine Learning and Related AI Topics / I. Bruha**

A broad study of major approaches and methodologies related to machine learning from the viewpoint of artificial intelligence. Symbolic algorithms of learning. Statistical algorithms of learning. Well-known existing learning systems. Data mining and knowledge discovery.

***731 / Symbolic and Logic Programming / I. Bruha**

Methodology of advanced symbolic programming: data structures and non-standard control techniques. Methodology of logic programming: Prolog programming for AI, strategies of the resolution principle, reverse resolution, elements of theory revision.

***732 / Logical Foundations of Computer Science / J. Zucker**

A solid logical and mathematical foundation for reasoning about software and software descriptions is provided. Topics include: introductory concepts in set theory (sets, relations, functions, etc.); various logics (first order, higher order, equational, conditional equational); many-sorted algebras; initial algebra semantics for equational and conditional equational theories.

***734 / Formalized Mathematics / W.M. Farmer**

Computer-supported, formalized mathematical reasoning for practical applications. Specification and verification in higher-order logic. Interactive theorem proving systems. Techniques for developing axiomatic theories.

***736 / Analysis of Stochastic Networks / D. Down**

Techniques for the analysis of large networks that can be modeled in a statistical manner. Single queues, product form networks and mean value analysis. Fluid and diffusion approximations. Simulation techniques, including variance reduction. Hybrid simulation. Current research directions in Stochastic networks.

***738 / Relation Algebra and Kleene Algebra and their Applications / R. Khedri**

Advanced course in relation algebra and an introduction to Kleene Algebra. Homogeneous relations, orderings and equivalence relations, heterogeneous relations, basic results of Kleene algebra. Discussion of some computer science and software engineering problems within the framework of these algebras.

***740 / Numerical Methods for Ordinary Differential Equations and Differential-Algebraic Equations / N. Nedialkov (Same as Computational Engineering & Science *740)**

Numerical methods for ODEs and DAEs; Runge-Kutta, multistep methods; convergence, accuracy, consistency; error estimation and propagation, stepsize and order control; stability, non-stiff and stiff methods; software for ODEs and DAEs.

***741 / Development of Scientific Computing Software / S. Smith (Same as Computational Engineering & Science *741)**

This course presents the basic principles of software development for reliable scientific and engineering software. Using example applications, a systematic process is given for the development and documentation of requirements, high-level design, module design, implementation, testing and inspection.

***742 / Methods of Symbolic Computation / M.V. Mohrenschildt**

This course gives an introduction to symbolic computation methods and their application to (electrical, computer and mechanical) engineering problems. Topics include: linear and nonlinear equations and their solutions; algebraic equations; term-rewriting and their application to formal software specifications; Groebner-basis and their application to geometric problems; differential equations; visualization of dynamic processes.

***743 / Functional Programming / W. Kahl**

The powerful abstraction capabilities and clean semantics of functional programming languages improve programmer efficiency and facilitate correct program derivation and transformation. This course will present practical aspects of software development in modern functional programming languages and theoretical foundations, like term rewriting systems, lambda-calculi, and type systems.

***744 / Advanced Topics in Design of Algorithms / G. Karakostas**

Advanced design techniques for algorithms, including (but not limited to): approximation algorithms, randomized algorithms, on-line computation and competitive analysis, quantum computing. Each term the course will concentrate mainly on one of these topics for a deeper understanding of the particularities and the defining problems/issues of the field as well as its applications to other fields and to practice. Presentation of up to date results and tackling of open research problems will be the main requirement for the students taking this course.

***745 / Supervisory Control of Discrete-Event Systems / R. Leduc**

This course is an introduction to the control of discrete-event systems (DES), asynchronous systems discrete in space and time (e.g. manufacturing systems, communication systems, etc.). The course will provide a solid foundation for research in this area, focusing on architectural issues such as modular, decentralized, and hierarchical control. The course will also discuss timed DES, as well as current topics of interest.

***746 / Advanced Topics in Combinatorial Optimization / A. Deza**

This course provides an introduction to useful frameworks for discrete optimization problems. We introduce the basic concepts of polyhedra, lattices and integer cones and illustrate these notions by some examples coming from combinatorial optimization. An algorithm for finding the Hermite normal form of a lattice and the main methods for facet or vertex enumeration are presented.

***747 / Software Architecture Modeling and Reverse Engineering / K. Sartipi**

This course exposes the graduate students to the models, techniques, and tools for designing, developing, maintaining, and evolving medium and large software systems. The topics include: software architecture fundamentals; representations; views; components; patterns; model-driven architecture; and software architecture recovery and evaluation techniques. The course includes group projects to cover the design and recovery aspects of a software system.

***748 / Analysis and Synthesis of Sound / M. V. Mohrenschildt**

Sound as signals (Fourier Analysis, basic harmony theory), Sound analysis (filters, FFT), Synthesis (band limited signals), over-sampling, real-time signal processing, user interfaces (real time interaction with algorithms), vocoders, physical modelling (fast DSP algorithms to solve PDE's).

***749 / Advanced Topics in Computational Geometry / A. Deza**

This course provides an introduction to useful frameworks for computational geometry problems in dimension 2, 3 and higher. We introduce the basic concepts of triangulations, Voronoi diagrams, polyhedra, lattices and integer cones, arrangement of hyperplanes and linear programming and illustrate these notions by some examples coming from combinatorial optimization.

***750 / Model-Based Image Reconstruction / C. Anand
(Same as Computational Engineering & Science *750)**

An overview of three themes in advanced image processing: functional analysis (e.g., Fourier, Wavelet and SVD methods), PDEs (e.g., anisotropic diffusion), optimization of statistical models (e.g. Total Variation regularization). And, a detailed look at specific methods and techniques for applying these methods in new areas: medical imaging, visual process control. Including all phases of application development from mathematical modelling, through complexity analysis.

***752 / Symbolic Analysis / J. Carette**

This course explores the topic of exact, or closed-form, analysis by computer. This requires merging topics from Computer Algebra, classical analysis and constructive mathematics. Topics covered will involve computations of limits, series, integrals of functions, as well as closed-form solution of algebraic and differential equations. Very close attention will be paid to underlying semantics issues.

***753 / Specifying, Implementing and Verifying Timing Behaviours for Hard Real-Time Systems / A. Wassyyng**

Hard-real-time systems are those in which timing requirements are just as important as any other requirement. The course will present a number of timing specification models and methods, such as timed automata, as well as new methods that cope with tolerances on the time durations. Techniques for implementing timing behaviours and verification of those behaviours, both mathematical and testing-based, will be included.

***754 / Programming Methodology / E. Sekerinski**

Verification and Refinement Methods for Sequential and Concurrent Programs, Specification Techniques, Reliability, Object-Oriented (Modeling, Design, Patterns, Concurrency), Program Design and Program Documentation, Tools and Compilers.

***755 / Advanced Computational Methods and Models / Staff
(Same as Computational Engineering & Science *702)**

Advanced topics in scientific computing, including iterative sparse methods and direct sparse methods for linear systems, QR-type algorithms for computing eigenvalues, perturbation analysis, methods for large-scale ODE systems, choice of preconditioners, Newton-krylov methods for solving nonlinear systems, introduction to multigrid methods, automatic differentiation, and sensitivity analysis.

***756 / Advanced Topics in Formal Methods and Software Architecture / T. Maibaum**

The course presents advanced techniques for formal specification of requirements, designs and implementations of software based systems, focusing on software architecture as the organising principle for software development. Course content will include some topics amongst: comparative properties of formalisms for specification; meta-properties of specification formalisms, including interpolation properties, modularity and their relationships; component based approaches and the role of category theory in component composition; formalisation of encapsulation, cohesion and coupling; externalisation of interaction definition; formal toolkit for software architecture.

***757 / Modern Software Technology for eHealth / K. Sartipi**

This course exposes the graduate students in Software Engineering and Computer Science programs to the challenges in the field of Electronic Health (eHealth). The course introduces a collection of modern architectures and technologies that are recommended by standardization organizations to build the infrastructure that meets the emerging demands in the growing network of healthcare systems. The topics include: challenges in ultra large systems; standard healthcare data formats; clinical decision support systems; data and knowledge interoperability; autonomic computing; integration of existing healthcare systems; and service oriented architectures.

***758 / Advanced Compiler Design and Optimization / F. Franek**

Advanced compiler design methodologies with emphasis on control and data flow analyses, code optimization and related issues.

***759 / Medical Image Registration / J. Modersitzki**

Image processing, registration, warping, fusion, elastic matching, landmark registration, parametric models, non-parametric models, numerical scheme for image processing, optimization, large scale problems.

***760 / Logic for Practical Use / W. M. Farmer**

Attributes of a practical logic. Techniques for improving the practicality of traditional logics. Design, implementation, and use of practice-oriented logics.

***761 / Generative Programming / J. Carette**

This course will explore the rationale for, and the various aspects of generative programming. Special attention will be paid to Domain Specific Languages, and typed Meta programming. The relation with product families and model-driven software engineering will be emphasized. Key techniques in generative programming will be studied.

***780 / Independent Study in Computing and Software**

Normally a self-study course. Prerequisite: Permission of the Chair of the Department.

***781 / Advanced Topics in Computing and Software / Staff**

Topics of interest to Computer Science and/or Software Engineering. See annual departmental listings for current year topic. A student may receive credit for this course more than once if the specific topic differs.

The following 700-level courses are relevant to Computer Science and Software Engineering. Not all courses will be offered every year. Interested students should contact the department concerned regarding the course description and offering of a particular course:

BUSINESS ADMINISTRATION COURSES

K721 / eBusiness System Analysis / Y. Yuan

K778 / eHealth: Innovations and Issues / N. Archer

ELECTRICAL AND COMPUTER ENGINEERING COURSES

***711 /** Computer-Aided Design / J.W. Bandler

***712 /** Matrix Computations in Signal Processing / J.P. Reilly

***723 /** Information Theory and Coding / K.M. Wong, S. Hranilovic

***726 /** Local Area Networks in Manufacturing Environment / B. Szabados

***764 /** Computational Vision / D.W. Capson

***766 /** Pattern Recognition / M. Kamath

MATHEMATICS COURSES

***711 /** Mathematical Logic

+*712 / Topics in Foundations

+*745 / Topics in Numerical Analysis

***782 /** Probability Theory

STATISTICS COURSES

***752 /** Design of Experiments

Laboratory and Computer Facilities

Extensive, modern computing resources, including two high performance parallel computing clusters, are provided to facilitate graduate students' academic work and research activities. There are also specialized graduate laboratory facilities maintained by researchers working in the areas of real-time, embedded systems and optimization.

Additional research facilities are furnished by individual faculty members according to the needs of their projects/research, providing an enhanced alternative to the departmental resources. Facilities are available to graduate students on a 24-hour basis, with support staff available during normal working hours.

CULTURAL STUDIES AND CRITICAL THEORY

The Department of English and Cultural Studies offers a program in Cultural Studies and Critical Theory leading to an M.A. degree.

Enquiries: 905 525-9140 Ext. 24732

Fax: 905 777-8316

E-mail: somoant@mcmaster.ca, dcoleman@mcmaster.ca (Fall Term), fastfs@mcmaster.ca (Winter Term)

Website: http://www.humanities.mcmaster.ca/~cstudies/MA_CSCT

Staff / Fall 2009

PROFESSORS

David Clark, B.A., M.A., Ph.D. (Western)

Daniel Coleman, B.Ed., M.A. (Regina), Ph.D. (Alberta) / Canada Research Chair

Susan Fast, B.M. (Western Washington), M.A., Ph.D. (Iowa)

Henry Giroux, B.S. (Maine), M.A. (Appalachian State), Ph.D. (Carnegie-Mellon) / Global Television Network Chair in Communications

Donald Goellnicht, B.A. (Queen's), M.A., Ph.D. (McMaster)

Mary O'Connor, B.A. (McGill), M.A., Ph.D. (Toronto) / Chair of English and Cultural Studies

Imre Szemán, B.A. (Queen's), M.A. (Western), Ph.D. (Duke)

Peter Walmsley, B.A., M.A. (Toronto), Ph.D. (Cambridge)

Lorraine York, B.A., M.A., Ph.D. (McMaster)

ASSOCIATE PROFESSORS

Sarah Brophy, B.A. (Wilfrid Laurier), M.A., Ph.D. (McMaster)

Catherine Graham, B.A., M.A., Ph.D. (McGill)

Janice Hladki, B.A. (York), M.A., Ph.D. (Toronto)

Dana Hollander, B.A. (Oberlin College), M.A., Ph.D. (Johns Hopkins)

Grace Kehler, B.A. (Regina), M.A., Ph.D. (Western)

Andrew Mactavish, B.A. (Mount St. Vincent), M.A. (Dalhousie), Ph.D. (Alberta)

Gabriel Moyal, B.A. (McGill), M.A., Ph.D. (Toronto)

Susie O'Brien, B.A. (Queen's), M.A. (Queensland), Ph.D. (Queen's)

Liss Platt, B.F.A. (Connecticut), M.F.A. (California)

Petra Rethmann, B.A. (Vienna), M.A. (Munich), Ph.D. (McGill)

Susan Searls Giroux, B.A., M.A.T. (Miami), Ph.D. (Pennsylvania State)

ASSISTANT PROFESSORS

Chandrima Chakraborty, B.A. (Calcutta), M.A., M. Phil. (Jawaharlal Neru), Ph.D. (York)

Peter Nyers, B.A., M.A. (Victoria), Ph.D. (York)

Helene Strauss, B.A., M.A. (Free State), Ph.D. (Western)

M.A. Degree

Candidates for the M.A. in Cultural Studies and Critical Theory will complete 2 compulsory core half courses (CSCT *700 and *701) and 4 elective half courses (or their equivalent) over the fall and winter terms, with grades of at least B- in each, write a satisfactory major research project of 10,000 to 12,500 words (40 to 50 pages) over the course of the summer, and successfully present the project at a symposium.

The M.A. degree normally requires one full year to complete. The minimum admission requirement is a four-year undergraduate degree in a relevant discipline (or disciplines), and with an average of B+ in at least six full or twelve half courses beyond the introductory level. In recent years, successful candidates typically have had averages of at least 80% in their upper-level courses in their area(s) of specialization.

Courses

Required Course for All Graduate Students

All graduate students, including part-time students, must complete the course *SGS #101- Academic Research Integrity and Ethics* within the first twelve months after their admission to graduate studies at McMaster. The purpose of this course is to ensure that the standards and expectations of academic integrity and research ethics are communicated early and are understood by incoming students. A graduate student may not obtain a graduate degree at McMaster without having passed this course. In the event that a student fails this course, they must retake it at the earliest opportunity. The course description for *SGS #101* may be found in Section 11.

Courses marked with an asterisk (*) are half courses.

Core Courses

*700 / Issues in Cultural Studies and Critical Theory I: Power/ Knowledge/Critique

This course focuses on the historical provenances, conceptual genealogies, and cultural locations of critique as a critical practice through a careful engagement with a selection of relevant contemporary texts in cultural studies and critical theory, and some of their historical pretexts. The specific content of the class will vary from year to year depending on the instructor involved.

*701 / Issues in Cultural Studies and Critical Theory II: Sites and Spaces of Critique

This course invites students to examine critically specific institutional and historical sites in which the practice of critique has been developed and continues to be carried out today. Particular attention may be paid to an interrogation of the university, but other cultural sites and conceptual spaces may also be considered.

Elective Courses

*702 / Film Theorizes Social and Cultural Differences / J. Hladki

This course examines how gender, race, sexuality, and disability are theorized through film and other audio-visual technologies. How do films mobilize "difference"; and how, as socially constructed subjects, do we encounter/mediate/negotiate the production of cultural identities in film and other modes of production?

*703 / Cultural Production and Cultural Studies / J. Hladki

This course will examine the ongoing significance of perspectives in feminist, queer, disability, and critical race studies for practices of cultural production. Forms of cultural production covered will include popular film, artists' filmmaking, video art, and performance art.

*704 / Music and Subjectivity in a Global Context / S. Fast

This course examines how ideas concerning place, nationality, ethnicity, and race—intersecting with gender and class—have been negotiated through musical sound, lyrics, and the visual imagery of live musical performance, in a global context. Topics such as orientalism, hybridity, the global music industry, and "world music" will be covered.

*706 / Fictionality, Historiography, and the Afterlife of the Event / P. Rethmann

In this course we will examine the afterlives of vital cultural and political moments and events in 20th century political culture. With a few exceptions, we will focus on the period of the mid-1950s to the mid-1990s in an attempt to access the fictional and historical afterlife of the important moments and events, including social and political utopianism, internationalism, "third-worldism," Vietnam, and 1968 afterlives (Germany, Italy, France, United States).

***707 / Acts of Global Citizenship / P. Nyers
(Same as Globalization *703)**

This course examines recent debates about a fundamental concept in globalization studies: global citizenship.

***708 / Marxist Cultural Criticism / I. Szeman
(Same as English *708)**

An introduction to Marxist cultural criticism through a careful consideration of such figures as Marx, Gramsci, Benjamin, Althusser, Williams, Jameson and Zizek.

***709 / Contemporary Women's Collaborative Writing
/ L. York (Same as English *704)**

This course examines collaborative writing by women, particularly the overt co-authorship or co-signature of women's texts. A substantial part of the course will be devoted to theoretical discussions of authorship and collaborative writing, since one of the main aims of the course will be to assess the implications of this mode of writing for existing theories of authorship. Other relevant questions will include: Are women's collaborative texts necessarily subversive, or do they harbour various ideological potentials and power relations? How can difference operate in a textual venture that has traditionally been described in terms of cooperation and mutuality?

***710 / Globalization and Culture / I. Szeman
(Same as Globalization *709 and English *709)**

Over the past decade, almost everyone engaged in literary and cultural studies has had to assess the implications of globalization for their various disciplinary practices. In particular, globalization has meant that a wide range of academic practices have had to confront the artificiality of the 'nation' as the apparently natural space in which cultural objects are produced, given meaning, and interpreted. This course offers a comprehensive introduction to and exploration of debates over the role and function of culture in the era of globalization.

***711 / Celebrity/Culture / L. York (Same as English *711)**

This course engages the pervasive phenomenon of celebrity and poses questions about its operations in the field of culture. It will focus on influential theories of stardom and ideology, power, and cultural value that see celebrity operating variously within culture, and audiences, in turn, acting and signifying upon celebrity. Students will be encouraged to develop a framework for using a specific study of a celebrity or celebrity phenomenon to assess theoretical texts. This course will consider the workings of celebrity in academia.

***712 / Childhood in Cultural Theory and Popular Culture
/ S. Brophy (Same as English *712)**

Childhood is a contested site of symbolic, moral, and material investment in contemporary culture. Focusing on three topics—gender and sexuality, delinquency, and consumption—and with reference to a variety of media, we will consider how cultural theory questions the governing myths of childhood and attempts to theorize children as cultural agents.

***715 / Modern and Postmodern Slavery / S. Searls Giroux
(Same as English *715)**

Although most people consider slavery to be a historical aberration confined to the distant past, the practice of enslaving people by violence and by holding them against their will continues to the present. This course offers a critical and historical investigation of the economic and political conditions of slavery, as well as the broader socio-cultural contexts that enable and legitimate its ongoing existence.

***717 / Global Sex / S. Searls Giroux (Same as English *717)**

This course explores the culture of neoliberalism in terms of its specifically gendered dynamics. It will engage three related moments that map the transformation of human relations, moving out from the most intimate of human bonds to the broadly political: (1) the shifting nature of human connectedness—of intimacy, family, community, national unity; (2) the commodification of sexual relations recast as sexual revolution for some, sexual slavery for others; and (3) the emergence of rigidly fundamentalist and patriarchal discourses globally.

***719 / Public Intellectuals and Their Work: Intellectual
Practices in Culture and Power / H. Giroux
(Same as English *719)**

This course will examine the role of a select group of academics who have become known in the dominant media in the United States as engaged public intellectuals. It will focus on the political rationale for their work, the institutional conditions that make such work possible, and how the work functions as a particular form of intellectual practice and mode of cultural politics. The work of a number of public intellectuals will be examined, including that of Cornel West, Arundhati Roy, Pierre Bourdieu, Edward Said, and Michael Dyson.

***722 / Activist Bodies in the Public Sphere / C. Graham**

This course will explore theoretical approaches to understanding activist uses of the body to influence public opinion, with a concentration on notions of the public sphere, social body and performance as political action.

***723 / Surveillance and Digital Society / L. Platt**

This course explores the issue of surveillance through both theoretical writings and media art practices.

***727 / The New Constellation of Race: Sovereignty,
Citizenship, Social Death / S. Searls Giroux
(Same as English *727 and Globalization *727)**

This course seeks to map the new trajectories of race theory in a post-civil rights, post-apartheid, post 9/11 world.

***729 / Cultural Studies and the Politics of Cultural Pedagogy
/ H. Giroux (Same as English *729)**

This course will examine the intersection of cultural studies and critical education in both the early and later work of a prominent number of cultural studies theorists and educational theorists. The course will examine the primacy of pedagogy in the early work of prominent cultural studies theorists such as Raymond Williams, Stuart Hall, and Paul Willis and how such work not only provided a way to make the political more pedagogical but also gestured towards connecting work in higher education with a broader set of social issues and public commitments.

***731 / Anxiety Disorders: The Cultural Politics of Crisis
/ S. O'Brien (Same as English *731)**

This course will investigate how literature, cultural studies and critical theory have grappled with the imaginary limits of late capitalist culture.

***738 / Intra-African Mobilities: Contemporary African Cultural
Production / H. Strauss (Same as English *738 and
Globalization *738)**

This course examines contemporary African cultural texts that explore the intra-African circulation of ideas and people from the time of the Trans-Atlantic slave trade to the present. We will identify some of the specific contributions that African narratives of mobility and migration make to discourses of internationalism, diaspora and globalization.

***739 / The Archive and Everyday Life / M. O'Connor
(Same as English *739)**

An exploration of the intersecting fields of archive theory and everyday life theory and an examination of the practice of archival work in selected artists, writers and scholars.

***742 / Mapping South Asian Masculinities / C. Chakraborty
(Same as English *742)**

This course focuses on masculinities in moments of conflict and crisis in South Asia to explore how masculinities are embedded in and enable the operation of large scale political-historical projects/processes such as colonial rule, nation-formation, construction of civil society and religious fundamentalism. Reading South Asian literary and cinematic texts, it will examine masculinities in articulated relation to other social categories: among them, caste, class, religion, ethnicity and sexuality.

***746 / Reading Sex and Sexuality in Post-Apartheid South Africa / H. Strauss (Same as English *746)**

This course enters into conversation with an emergent post-apartheid South African literature on sex and sexuality. We will read a range of cultural and theoretical texts in an effort to examine, in the words of Foucault, "the regime of power-knowledge-pleasure that sustains the discourse on human sexuality" in contemporary South Africa.

***747 / Discourses of Empire 1700-1820 / P. Walmsley (Same as English *747 and Globalization *747)**

This course will consider how British and Colonial literatures articulated the process of forging a world empire. Our central project will be to map the shifting identities of self and other, and metropolis and colony, throughout the eighteenth century. We will read a wide range of texts—not only novels and poems representing imperial encounters, but also travel books and early slave narratives—and the course will provide ample opportunity for reference to McMaster's rich collection of books and periodicals from this period.

***749 / Getting and Spending: The Birth of Consumer Culture / P. Walmsley (Same as English *749)**

This course will consider how eighteenth-century British and Colonial literatures articulate the opportunities and the dangers of an emergent consumer culture, focusing on ideas of money, luxury, shopping and labour.

***750 / Gothic, Sensation and Victorian Discourses of the Body / G. Kehler (Same as English *750)**

This three-unit course will explore the diversity in sensational and gothic treatments of bodies, bodies both literal and metaphoric, individual and collective, normative and "diseased." In particular, Gothic and Sensation writing compulsively explores (figures of) physicality as a means to interrogate the legitimate or desired composition of family and nation.

***759 / Victorian Natures / G. Kehler (Same as English *759)**

This course relies equally on Victorian texts and current criticism to investigate British successes and failures in coming to terms with "nature," both theirs and others'.

***761 / Framing CanLit / D. Coleman (Same as English *761)**

This seminar focuses on the interpretive frameworks we bring to our interpretations of Canadian texts by asking students to select specific critical or theoretical perspectives and explain why they are crucial or important for reading texts that have become canonical to "CanLit."

***762 / Queer Historicisms and British Cultural Memory / S. Brophy (Same as English *762)**

A critical examination of British queer film and fiction since the 1980s. Diverse approaches to representing the historical will be explored in light of queer theory and diaspora/postcolonial theory.

***765 / Biopolitics: An Introduction / H. Giroux (Same as English *765)**

This course will analyze how the concept of biopolitics is developed in the work of some of its major theorists and what the relevance of this work might be for constructing a new understanding of a publicly engaged notion of theory and social change.

***766 / Feminist and Queer Theory / M. Gough (Same as English *766)**

This seminar sets out to imagine effective ways for feminism and queer theory to meet, ally, and perhaps intermingle. We will read "foundational" texts that unite the two fields; examine areas of distinction between the two discourses; discuss key topics, such as normativity and identity, about which both feminist and queer theorists have had important things to say; and ask how feminist and queer theorists separately and together might make effective interventions across the fields of race and postcolonial studies, gender theory, and theories of sexuality.

***767 / Regarding Animals: Theories of Non-Human Life / D. Clark (Same as English *767)**

This course explores the question of the otherness of non-human animals through a reading of twentieth- and twenty-first-century theory and philosophy.

***768 / Modernism, Orientalism and the Representation of Post-War Japan in Cinema / J. King (Same as English *768)**

This course will be devoted to representations of post-war Japan in both Japanese and American/European cinema. Japanese attempts to deal with the after shocks of war in modernist films will then be compared to western representations.

***769 / Science Fiction: Mindworlds and the Boundaries of the Human / A. Savage (Same as English *769)**

Speculative fiction explores the multiple ways in which boundaries are breached by imagination and science. This course examines dissolving or movable boundaries in a variety of fictions, sites, or technologies, including neuroscience, philosophy, virtual worlds, cybernetics, and intra-species relations.

***771 / Canadian Literary Celebrity / L. York (Same as English *771)**

This seminar investigates the workings of celebrity in the contemporary Canadian literary arena, focusing on the relationship between the marketplace and literary value.

***774 / Derrida's Wake: On The Futures of Deconstruction / D. Clark (Same as English *774)**

How does one say *adieu* to Jacques Derrida? Exploring the legacies of Derrida's life and work, this course is organized around five overlapping questions: mourning, responsibility, democracy, justice and animality. We will read materials from thinkers with whom his writings are in a critical dialogue, including Marx, Levinas, Kant, and Benjamin.

***776 / Racial Formation: Selected U.S. Projects / D. Goellnicht (Same as English *776)**

Drawing on recent theories of racial formation, this course examines a number of significant moments in American racial history with the aim of understanding some of the complex ways in which "race" has operated, and continues to operate, as a discursive system that has profound material effects on the lives of Americans.

777 / Topics in Philosophy and Jewish Thought / D. Hollander (Same as Religious Studies *777)**778 / Topics in Modern Jewish Thought / D. Hollander (Same as Religious Studies *778)*****779 / The Times We Live In / S. O'Brien (Same as English *779 and Globalization *779)**

This course looks at changing conceptions of time in the late 20th/early 21st century in the context of globalization. We will survey a range of literary texts, films and social movements (e.g. Slow Food) that explore ideas about temporality, with a focus on the ways in which culture resists and/or supports such trends as acceleration, synchronization and the erosion of boundaries between private and public time.

***784 / Decolonizing Bodies / C. Chakraborty (Same as English *784 and Globalization *784)**

An examination of the representations of the body in postcolonial literary and visual texts from Africa and South Asia.

***787 / Post-colonial Ecologies / S. O'Brien (Same as English *786 and Globalization *787)**

This course will consider issues central to ecocritical and post-colonial theories, with a specific focus on topics of language, political sovereignty and the relationship between "self" and "other" in contemporary post-colonial English literature.

***788 / Writing Diaspora: Literature, Community, and Displacement / D. Coleman**
(Same as English *788 and Globalization *788)

This course examines critical debates in contemporary cultural studies over the best way(s) to conceptualize the experiences of people who have left their places of birth or places of cultural origin in an era of "globalization." It examines the representation of these experiences in literary works (memoirs, short stories, poems, and novels) by M.G. Vassanji and Dionne Brand about people who move between cultural locations on the assumption that literary works condense and intensify the questions and problems that characterize such cross-cultural movements.

***789 / Studies in Asian North American Literature, Culture and Identity / D. Goellnicht (Same as English *789)**

This course examines selected topics (e.g. national versus transnational/diasporic subjectivities, gender formation) in Asian American and/or Asian Canadian literature and culture, with a focus on issues of identity. The specific topics will vary from year to year.

***791 / Rethinking Politics: Thinking Past War, Democracy, and Terror / H. Giroux (Same as English *791)**

This seminar addresses how the notion of politics is being redefined within a changing global public sphere. How politics is addressed is central to matters of agency, social justice, as well as notions of individual and collective struggle. The course attempts to understand how politics is being addressed as a site of struggle through various deployments around race, globalization, education, and resistance.

***793 / Oh Behave! Post-war Sexualities / S. Brophy**
(Same as English *793)

A critical study of sexualities in British film, fiction, and culture of the 1950s and 60s. We will consider how key figures such as the teenager, the working woman, the single mother, the migrant, the homosexual, the servant, the playboy, and the secret agent mediated a rapidly transforming post-war social landscape.

ECONOMICS / ECONOMIC POLICY

The Department of Economics offers programs leading to the degrees M.A. and Ph.D. in Economics and M.A. in Economic Policy.

Enquiries should be directed to the Chair of the Graduate Studies Committee, Department of Economics, 905 525-9140, Ext. 24731
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Website: <http://www.mcmaster.ca/economics/>

Staff / Fall 2009

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Candidates for the M.A. and Ph.D. degrees in Economics and the M.A. in Economic Policy will normally satisfy the general regulations of the School of Graduate Studies with respect to admission and residence. Candidates with Honours, Master's or Ph.D. degrees in Business or in mathematically oriented disciplines will be given special consideration and may be admitted as students in the graduate program.

M.A. Degree

Candidates proceeding to the degree M.A. in Economics will follow a program comprising:

a) REQUIRED COURSES

- *721 / Microeconomic Theory I
- *723 / Macroeconomic Theory I
- *761 / Econometrics I
- *762 / Econometrics II
- *765 / Mathematical Methods (non-credit)

One (but not more than one) of these required courses may be waived if equivalent work has already been completed by the student in undergraduate course work. A student's claim to have completed equivalent work will be tested by examination at the beginning of the academic year.

- b) Subject to the approval of the Department, an elective program comprising a sufficient number of courses, from those listed below, to bring the student's total load to 8 half course equivalents. The course load may include up to two half courses taken outside of the Department, in each case to be approved by the Department.

Candidates must obtain a grade of at least B- in all courses taken for credit in order to receive the degree.

Ph.D. Degree

The minimum standard for admission to the Ph.D. program is a Master's degree from a recognized university, with a B+ average. Admission is competitive: not all applicants who meet the minimum standard will be offered admission.

There are three phases of doctoral studies. The first is passing the comprehensive exams in microeconomic and macroeconomic theory. Students must complete the theory sequence (*721, *722, *723 and *724), the econometrics sequence (*761 and *762) and the mathematics review course (*765) before attempting these exams. A candidate who has taken courses equivalent to *721, *723 and/or *761 at another university can petition the Chair of the Graduate Studies Committee to have these course requirements reduced. Both of the theory exams must be completed within eighteen months of entering the doctoral program.

The second phase is passing the comprehensive exams in two areas of specialization. Certain courses must be completed before attempting these exams. The areas of specialization, and the course requirement for each of them, are:

- Health Economics: *788, *793 and *791.
- International Economics: *751 and *752.
- Labour Economics: *785, *781 and *782.
- Growth and Monetary Economics: *741 and *742.
- Population Economics: *785, *710 and *711.
- Public Economics: *735, *733 and *731.
- Econometrics: *761, *762 and *768.

These comprehensive exams must be completed within twenty-four months of entering the doctoral program.

The third phase is the thesis. A student may choose to take additional courses at this stage if the courses are germane to the student's proposed research. Up to four half courses may be taken outside of the department with the approval of the Graduate Chair. A student at this stage is required to complete the seminar courses *798 and *799. Doctoral students typically take a total of 12-14 graduate courses at this university.

M.A. Degree in Economic Policy

Candidates for the M.A. in Economic Policy must complete eight half-courses. The following five half-courses are required for all candidates:

- *727 / Microeconomic Theory for Public Policy
- *728 / Macroeconomic Theory for Public Policy
- *761 / Econometrics I
- *773 / Economic Policy Analysis I
- *774 / Economic Policy Analysis II

Economics *761 may be waived if equivalent work has already been completed by the student in undergraduate course work. A student's claim to have completed equivalent work will be tested by examination at the beginning of the academic year.

Candidates for the M.A. in Economic Policy will designate a field of specialization in Health Economics, Human Resource Economics or Public Economics.

Co-op Option in M.A. and Ph.D. Degrees

M.A. students who have successfully completed Economics *761 and Ph.D. students who have successfully completed the comprehensive examinations, may apply for the co-op option associated with these degree programs. Students will not be considered for acceptance into this option in advance of completion of these requirements. The number of students who will be accepted will be small and will depend on available placements.

To complete either the M.A. or Ph.D. co-op option successfully, the student must work a total of eight months in either one or two placements. Each placement must be approved in advance by the supervisor and the Department. A placement must include a significant research opportunity and be consistent with progress to a degree. At the completion of each placement, the student must write a report describing the research outcome and append a letter of evaluation by the employer. This report must be judged satisfactory by the supervisory committee. In the event the report is judged unsatisfactory, the student will return to his/her original program (either the M.A. or Ph.D.) and will not be eligible for the co-op designation on her/his transcript. The remaining requirements for the M.A. or the Ph.D. program must be completed. During the period of co-op placement, a student will be considered as a full-time student on a work term and will pay a co-op fee.

Courses

Courses marked with an asterisk (*) are half courses. Courses marked with a plus sign (+) are open only to Ph.D. students except by special permission of the Department.

The following 700-level courses are offered for graduate credit. A list of course offerings for the forthcoming academic year will be posted on the grad website: <http://www.mcmaster.ca/economics/grad>

*700 / Topics in Economics / Staff

*703 / Experimental Economics / S. Mestelman, A. Muller

An introduction to the design of laboratory environments in economics, to the conduct of laboratory sessions, and to the analysis of laboratory generated data. Applications to public economics, industrial organization, and the evaluation of economic theory are studied.

*710 / Population Economics I / B. Spencer

A survey of topics in population economics, including the economic consequences of population aging, the economic theory of fertility, and the interrelations between economic and demographic phenomena generally.

***711 / Population Economics II / F. Denton, B. Spencer**

An advanced course in population economics, open only to Ph.D. students choosing population economics as a field.

Prerequisite: *710

***721 / Microeconomic Theory I / J. Leach, S. Han**

This course covers basic graduate-level microeconomic theory, including constrained optimization, theory of the household and the firm, decision-making under uncertainty, and general equilibrium analysis.

***722 / Microeconomic Theory II / S. Han, M. Ivanov, P. McCabe**

Topics include the theory of public goods and externalities, non-cooperative game theory and the economics of information such as adverse selection, moral hazard, and mechanism design. Applications can include bargaining, monopoly and oligopoly pricing, insurance and employment contracts, and auctions.

***723 / Macroeconomic Theory I / A. Johri, M. Letendre**

This course is an introduction to advanced macroeconomic theory which is based on dynamic optimization and general equilibrium. Applications will vary from year to year and may include economic fluctuations, economic growth, asset pricing, and fiscal policy.

***724 / Macroeconomic Theory II / A. Johri, M. Letendre**

The course focuses on theories that help explain business cycle fluctuations and economic growth. Some additional topics will also be covered that change from year to year.

***727 / Microeconomic Theory for Public Policy / M. Veall**

This course covers graduate-level microeconomic theory, but with an emphasis on how the tools of microeconomics can be used to inform public policy. Topics include theory of the household and the firm, decisions under uncertainty and over time, and basic welfare economics.

***728 / Macroeconomic Theory for Public Policy / W. Scarth**

This course introduces students to the research methods of modern macroeconomics, with an emphasis on developing an understanding of the major controversies in the field, and on how these tools can be used to address central policy issues (such as recessions, exchange-rate stability and debt reduction). The three modules focus on short-run stabilization problems, structural unemployment and long-run growth in living standards. Analysis based on the theory of the second best is stressed in an attempt to identify policy options that can simultaneously improve both economic efficiency and equity.

***731 / Public Finance / K. Cuff**

Topics may include positive and normative theories of taxation, the provision of public goods, collective decision-making, the theory of local public goods, and issues in fiscal federalism including tax and expenditure competition and inter-governmental transfers.

Prerequisite: *733

***733 / Topics in Public Economics / K. Cuff, A. Payne**

Topics may include: capital taxation; economic theory of redistribution; empirical assessment of the effects of taxation and government expenditure; and the measurement of welfare, poverty and inequality.

***735 / Economics of Public Sector Policies / A. Payne**

This course will study a current topic or theme in Public Economics. State of the art research will be surveyed with an emphasis on the policy relevance of research. Possible themes include: politicians v. bureaucrats in the provision of public goods, the effects of government policy on the provision of education, the alleviation of racial segregation through government policy, the relationship between federal and local governments.

***736 / Environmental and Resource Economics / S. Mestelman, A. Muller**

The course covers selected issues in the management of natural resources and the environment. Possible topics include the theory of externalities and policy instruments for remedying the associated market failure, management of renewable and non-renewable common property resources, contingent valuation, ecological indicators and the measurement of natural resource and environmental variables in the national accounts.

***741 / Monetary Economics / A. Johri**

This course is devoted to the discussion of some key issues in monetary theory and policy. It does not assume prior knowledge of dynamic optimization techniques. Topics that use modern macroeconomic methods will be discussed at the end of the semester.

***742 / Topics in Money and Macroeconomics / A. Johri, M. Letendre**

The course covers stochastic dynamic general equilibrium models in different fields of macroeconomics. Topics may include business cycle theory, numerical methods, open-economy models (real and monetary), heterogeneous-agent models, asset pricing and growth theory. Prerequisite: *724

***751 / International Trade, Development and Investment / S. Demidova**

The neoclassical or real theory of international trade is presented in a general equilibrium format using geometrical and mathematical methods. A central application of these methods is to the trade problems of developing countries. Topics therefore may include North-South trade, export-led growth, commercial policy, elective protection, foreign investment, integration, savings, financial development and income distribution.

***752 / International Finance / Staff**

The emphasis is on exchange rates and balance of payments theories. Topics include Mundell-Fleming open economy models, the asset approach to the balance of payments, theories of devaluation, and monetary and fiscal policies and international policy co-ordination.

***761 / Econometrics I / L. Magee, M. Veall**

Topics include linear regression and generalized least squares.

***762 / Econometrics II / L. Magee, M. Veall**

Topics include time series and simultaneous equations.

***765 / Mathematical Methods / S. Han, J. Leach, M. Letendre**

This course provides a systematic review of mathematical and statistical methods commonly used in economic modelling.

***766 / Quantitative Methods and Systems in Economic Analysis / F. Denton**

Topics include methods of seasonal adjustment, alternative forecasting techniques, price indexes, demographic modeling and projection, interpreting econometric models, and input-output analysis.

***768 / Advanced Econometrics / J. Racine**

This course builds on the material in *761. Topics include: asymptotic theory applied to M-estimation; other estimation methods such as GMM, minimum chi-square, and nonparametric; applications of these methods. Prerequisite: *762

***769 / Applied Microeconometrics / P. Contoyannis**

The main topic of the course is the application of econometric techniques to the study of household behaviour. Topics may include expenditure systems, the relationship of consumption patterns, labour supply, and savings behaviour, aggregation, price indices and household production. There are extensive illustrations employing household microdata.

770 / Advanced Analysis of Survey Data / M. Boyle, B. Spencer, B. Newbold, (Same as Geog 770, Psychology 770, HRM 790)

This course uses large-scale surveys to refine student skills in conducting secondary analysis and writing for publication in peer-reviewed journals. Students will develop a two-page research proposal on a topic of their choice. The proposal will identify a research question to be addressed using one or more population-based studies. The educational methods will be varied, depending on group composition and include lectures, small group tutorials, student presentations and faculty mentorship. The objective is to produce a research report for submission to a peer-reviewed journal.

***773 / Economic Policy Analysis I / P. DeCicca, J. Hurley, A. Payne, W. Scarth**

This course is the first semester of the two-semester sequence that will provide a grounding in policy processes, policy issues, and important institutional structures, in relevant policy sectors in Canada, and provide an introduction to the basic research designs appropriate for establishing causal relationships through program/policy evaluation.

***774 / Economic Policy Analysis II / P. DeCicca, J. Hurley, A. Payne, W. Scarth**

This course is the second semester in the two-semester sequence in Economic Policy Analysis. It will survey more advanced issues in policy evaluation and culminate in a major policy project the student will complete in conjunction with an outside agency.

***781 / Labour Economics I / S. Jones, S. Yamaguchi**

A survey of basic labour economics. Topics include labour demand, labour supply, and the determination of equilibrium wages in competitive markets. Sources of wage differentials in competitive markets, such as human capital investment and compensating differentials, are examined, as are the effects on labour markets of government policies such as minimum wages, immigration restrictions, occupational health and safety regulations, and subsidies to education.

***782 / Labour Economics II / S. Jones, S. Yamaguchi**

This course surveys state-of-the-art research in labour economics. Recently covered topics include asymmetric information models of strikes; estimation of duration models; recent trends in wage structure, firm size, unionization, and self employment; the impact of international competition and technological change on labour markets; and modeling dynamic family labour supply decisions. Prerequisite: *781

***784 / Industrial Organization / Staff**

***785 / Economics of Human Resource Policies / Staff**

This course will study a current topic or theme in Human Resource Economics. State-of-the-art research will be surveyed, with an emphasis on the policy relevance of research. Possible themes include: the design of social insurance systems for unemployment, disability, or retirement; policies to foster human capital formation; methods for evaluating labour market interventions; the human resource policy implications of globalization, technological change, or aging populations.

***788 / Health Economics / J. Hurley, P. Contoyannis (Same as Health Research Methodology *788)**

This is a basic graduate survey course on the economics of health and health care. Topics include the organization, financing and utilization of health care services. Both theory and evidence relating to patterns of consumer and provider behaviour are examined, as are the functioning and regulation of "markets" for health services. Major public policy issues in the provision of health care in Canada are identified and the economic aspects of such issues are considered in detail.

***791 / Topics in Advanced Health Economics / P. Contoyannis, J. Hurley, G. Stoddart, E. Tompa, J. Tarride (Same as Health Research Methodology *791)**

This course focuses on contemporary issues relating to the economics of health and health care. It is intended to provide a more detailed examination of selected issues from Economics/HRM *788 as well as expose students to more advanced topics and aspects of recent research in health economics. Topics may include economic evaluation, the economics of occupational health and safety, evaluation of health-care related interventions, advances in the empirical analysis of income and health inequalities, and the evolution of health from childhood to adulthood.

***793 / Health Economic Policy / P. DeCicca, P. Grootendorst, G. Stoddart**

This course will study a specific topic or theme area of health economics. State-of-the-art research will be surveyed, with an emphasis on the policy relevance of research. Possible topics include the economics of health, health care financing, health care funding, the economics of the pharmaceutical sector, health and aging, and labour market experiences and health.

***795 / Analysis of Health Data / P. Contoyannis**

This course is designed to introduce students to methods for the analysis of health data, with a particular focus on the use of survey datasets used in health-related micro-econometric research. Investigating features of health data requires the recognition of and methodology to cope with several characteristics not regularly (and rarely simultaneously) encountered in other areas. During the course we will focus on the use of cross-sectional and longitudinal observational data to estimate causal parameters of interest and test hypotheses relevant to the econometric analysis of health data. At the end of the course students should be able to perform their own econometric analyses of health data, and interpret and evaluate related studies.

+*798 / Workshop in Economics I / Staff

+*799 / Workshop in Economics II / Staff

eHEALTH

eHealth (also known as Health Informatics) is defined as 'The knowledge, skills and tools which enable information to be collected, managed, used and shared to support the delivery of healthcare and to promote health.' The objective of the program is to produce Masters level graduates with high quality training in the broad interdisciplinary area that spans eHealth, emphasizing industry-relevant academic research and development.

The program is based on a collaborative partnership among the Faculties of Health Sciences, Engineering and the DeGroot School of Business. It is administered by the DeGroot School of Business. Three Departments are major collaborators in the program: the Department of Clinical Epidemiology and Biostatistics (Faculty of Health Sciences), the Department of Computing and Software (Faculty of Engineering), and the Information Systems Area in the DeGroot School of Business. Additional faculty members with eHealth interests from other departments also participate in the program.

Enquiries: 905-525-9140 Ext. 23603
 Fax: 905-528-0556
 E-mail: ehealth@mcmaster.ca
 Website: <http://mscehealth.mcmaster.ca/>

Staff / Fall 2009**PROFESSORS**

R. Brian Haynes, B.Sc., M.D. (Alberta), M.Sc., Ph.D. (McMaster), F.R.C.P.(C), Clinical Epidemiology and Biostatistics / Medicine
 Anne Holbrook, B.Sc. Pharm. (Toronto), Pharm. D. (Philadelphia), M.D., M.Sc. (McMaster), F.R.C.P.(C) / Medical Sciences / Physiology / Pharmacology
 Donna Ciliska, B.Sc.N., M.Sc.N (Western), Ph.D. (Toronto) / Nursing
 Robert Issenman, M.D. / Pediatrics
 Franya Franek, M.Sc., RNDr. (Charles, Prague), Ph.D. (Toronto) / Computational Engineering and Science
 Ryszard Janicki, M.Sc. (Warsaw), Ph.D., D.Hab. (Polish Academy of Sciences) / Computing and Software
 Thomas Maibaum, B.Sc. (Toronto), Ph.D. (London) / Canada Research Chair / Computing and Software
 Ali Montazemi, H.N.D. (Teesside Polytechnic, U.K.), M.Sc. (Southampton), PhD. (Waterloo) / Information Systems
 Yufei Yuan, B.S. (Fudan), Ph.D. (Michigan) / Information Systems / Wayne C. Fox Chair in Business Innovation

ASSOCIATE PROFESSORS

Nick Bontis, B.A., Ph.D. (Western) / Strategic Market Leadership & Health Services Management / Director, Undergraduate Programs
 Kenneth R. Deal, B.S., M.B.A., Ph.D. (SUNY at Buffalo) / Strategic Market Leadership & Health Services Management
 Maureen Dobbins, B.Sc.N. (McMaster), Ph.D. (Toronto) / Nursing
 Lisa Dolovich, B.Sc. Pharm (Toronto), M.Sc. (McMaster), Pharm. D. (Toronto) / Physiology / Pharmacology / Clinical Epidemiology and Biostatistics
 Douglas G. Down, B.A.Sc., M.A.Sc. (Toronto), Ph.D. (Illinois, Urbana-Champaign) / Computing and Software
 Khaled S. Hassanein, B.Sc. (Kuwait), M.A. Sc. (Toronto), M.B.A. (Wilfred Laurier), Ph.D. (Waterloo), P.Eng. / Chair Information Systems / Director, McMaster eBusiness Research Centre
 Milena Head, B.Math (Waterloo), M.B.A., Ph.D. (McMaster) / Information Systems / Associate Dean, DeGroote School of Business
 David Koff, M.D. (Rene-Descartes) / Chair, Department of Radiology
 Ann McKibbin, B.Sc. (Guelph), M.L.S. (Western), Ph.D. (Pittsburg) / Clinical Epidemiology and Biostatistics
 W.F. Skipper Poehlman, B.S. (Niagara), B.Sc. (Brock), M.Sc., Ph.D. (McMaster), P.Eng. / Computing and Software
 Parminder Raina, B.Sc. (Saskatchewan), Ph.D. (Guelph) / Clinical Epidemiology and Biostatistics
 Rolf J. Sebaldt, B.Sc., M.D., C.M. (McGill), F.R.C.P.(C), F.A.C.P. / Clinical Epidemiology and Biostatistics / Medicine
 Lehana Thabane, B.Sc. (Lesotho), M.Sc. (Sheffield), Ph.D. (Western) / Clinical Epidemiology and Biostatistics
 Ruta Valaitis, B.A., B.Sc.N. (Windsor), M.H.Sc. (McMaster), Ph.D. (Toronto) / Nursing
 Alan Wassyng, B.Sc. (Hons), M.Sc., Ph.D. (Witwatersrand) / Computing and Software
 Donald Willison, B.Sc. (Toronto), M.Sc. (McMaster), Sc.D. (Harvard) / Clinical Epidemiology and Biostatistics

ASSISTANT PROFESSORS

Christopher Anand, B.Math (Waterloo), M.Sc., Ph.D. (McGill) / Computing and Software
 Pamela Baxter, B.A. (Wilfred Laurier), B.Sc.N., M.Sc., Ph.D. (McMaster) / Nursing
 Ilana Bayer, Ph.D. (Toronto) / Pathology and Molecular Medicine
 Catherine Connelly, B.Comm. (McMaster), M.Sc., Ph.D. (Queen's) / Human Resources & Management
 Sarah Garside, H.B. Arts and Sci., M.D. (McMaster), Ph.D. (McMaster), F.R.C.P.(C) / Psychiatry and Behavioural Neurosciences
 Elkafi Hassini, B.Sc., (Bilkent), M.A.Sc., Ph.D. (Waterloo) / Operations Management

Anthony Levinson, M.D., M.A. (Sussex), M.Sc. (McMaster), F.R.C.P.(C) / John R. Evans Chair Health Sciences / Educational Research and Instructional Development
 Christopher Longo, B.A. (York), M.Sc. (Western), Ph.D. (Toronto) / Strategic Market Leadership & Health Services Management
 David Musson, M.D. (Western), Ph.D. (Texas at Austin) / Anesthesia
 Kamran Sartipi, M.Sc. (Tehran), M.Math, Ph.D. (Waterloo) / Computing and Software
 Jean-Eric Tarride, B.A., M.A. (Toulouse), Ph.D. (Concordia) / Clinical Epidemiology and Biostatistics

ASSOCIATE MEMBERS

David H. Chan, B.Sc.E.Eng. (Louisiana) M.D. (Toronto), C.C.F.P., M.Sc. (McMaster) F.C.F.P., Associate Professor / Family Medicine
 Alex Drossos, B.E.Sc., B.Sc., M.B.A (McMaster), M.Ed (Toronto, in progress), M.D. (St. George's, in progress), Adjunct Professor (McMaster) / Health Services Management
 Karim Keshavjee, B.Sc. (McGill), M.Sc. (Toronto), M.D. (Toronto), M.B.A. (Toronto), C.C.F.P. / InfoClin
 Mark Morreale, B.Sc. (Toronto), M.Sc. (Queen's) / Clinical Epidemiology and Biostatistics
 Rocco Piro, B.Sc. (McMaster), / Director, IT, Faculty of Health Sciences
 Nancy Wilczynski, B.A., M.Sc., Ph.D. (McMaster) / Clinical Epidemiology and Biostatistics
 Andrew Worster, B.Sc., M.Sc. (New Brunswick), M.D. (Dalhousie), M.Sc. (McMaster), C.C.F.P. (EM), F.C.F.P. / Medicine / Clinical Epidemiology and Biostatistics

PROFESSORS EMERITI

Norman P. Archer, B.Sc. (Alberta), Ph.D. (McMaster), M.S. (New York) / Information Systems
 William F. Smyth, B.A. (Toronto), M.Sc. (Ottawa), Ph.D. (Curtin), C.Eng., F.B.C.S., F.I.C.A. / Computing and Software

Areas of Specialization

Students may specialize in one of the three fields in the program: health sciences, computer science, or business. All students are required to complete the three core courses, and a variety of elective courses in each field are available to cater to individual interests. Student specialization interest must be declared when applying for admission. Each student is assigned a supervisor from the student's field of interest upon registration, and a second member of the supervisory committee from one of the other two fields is appointed to ensure that the student maintains a broadly focused view of the eHealth field. All students must participate in and contribute to a seminar series designed to acquaint students with recent advances in the eHealth field.

Admission

Students entering the eHealth program may be admitted from a variety of suitable undergraduate degrees. They will belong to a community with a variety of backgrounds in related fields, with common interests in information technology to support health services delivery and research. The main requirements are a good background in computing and a strong interest in the use of computing support in healthcare applications. A background from the health sciences, life sciences, business, or computer science is an asset, but not a requirement. The Admissions Committee will in each case judge the candidate's suitability for the program. Students who are judged to be deficient in computer or mathematics skills may be given conditional admission until they can successfully complete specified background courses or modules. A minimum B+ average in the final year of a four year undergraduate degree program is required for admission. Applicants for the full-time options must also pass a face-to-face interview that evaluates their suitability for internship, a required component of the program.

Degree Options and Internship

A candidate for the M.Sc. eHealth degree may choose to take the program either full-time or part-time. The full-time program has two options: thesis or course-project. In the thesis option, students must complete the three required courses plus one elective course from the field of specialization (a total of four courses), and complete and defend a Master's thesis successfully. The thesis option is not open to part-time students. Completion of the M.Sc. thesis option is the preferred route to a Ph.D. program in a similar field (e.g., Health Research Methodology, Computer Science, or Business). In the course-project option (which may be taken full or part-time), students take the three required courses, two electives from the field of specialization, and two other electives from the other two fields (for a total of seven courses). All courses must be completed with at least a B- standing.

Students taking the thesis option are expected to complete their programs and submit their research theses within 20 months of registration. Full-time students taking the course-project option are expected to complete their programs within 20 months, including a project which will normally be a scholarly paper arising from a relevant study in eHealth. Full time students are limited to a maximum of three years from initial registration. Part-time students are expected to complete their programs within four years of registration, but are limited to a maximum of five years. They are also required to complete a project that is a scholarly paper relevant to eHealth, often for their current employer if the employer is in a health care industry.

In addition to coursework, all full-time students must complete an eight month paid internship with a company, healthcare institution, or government agency. All efforts are made to ensure that the placement is closely aligned with the student's research or project interests, and ultimately with the student's career goals.

Courses

Required Courses

All required and elective courses are half courses.

HRM *724 / Fundamentals of eHealth and the Canadian Health Care System / A. McKibbon

This tutorial-based course will cover a broad range of eHealth topics from the perspective of health care delivery. Topics include a definition of eHealth; health care data; hospital and primary care information systems (i.e., electronic health records [HER] systems), specialty components of an HER system; how health professionals use data; human/cognitive factors in development and implementation of eHealth applications, standards, vocabulary and nomenclatures and how used; aggregation of health information, especially for research purposes; patient information systems and consumer eHealth; research and evaluation of eHealth applications and research using eHealth applications; implementation issues and privacy, security, and confidentiality; and the future of eHealth. Prerequisite: Two-day orientation to the Canadian health Care Systems for students (non-health background).

BUS K736 / Management Issues in eHealth / N. Archer

This course covers a number of topics relevant to the management of electronic health systems. The topics will be presented in an integrated manner that will promote an understanding of health system governance, project management, accountability, risk analysis, management, ethical, privacy, legal and regulatory standards, and policies. It will demonstrate real issues by focusing on a team-based case study through much of the course that covers the life cycle process of managing a project to implement an eHealth system, beginning with needs analysis and ending with implementation, evaluation, and maintenance. Prerequisite or corequisite: K603 Information Systems Management (see MBA calendar) or equivalent.

CAS *757 / Modern Software Technology for eHealth / K. Sartipi

This course exposes the graduate students in Software Engineering and Computer Science programs to the challenges in the field of Electronic Health (eHealth). The course introduces a collection of modern architectures and technologies that are recommended by standardization organizations to build the infrastructure that meets the emerging demands in the growing network of healthcare systems. The topics include: challenges in ultra large systems; standard healthcare data formats; clinical decision support systems; data and knowledge interoperability; autonomic computing; integration of existing healthcare systems; and service oriented architectures.

Prerequisites: HRM 724 and BUS K736; Knowledge of information representation and communication of information among computer systems.

Elective Courses

For course details, see MBA Calendar (BUS courses); and the Graduate Calendar: Computing and Software; Health Research Methodology; Clinical Health Sciences; Medical Sciences (MED courses); and Nursing (NUR courses). Other courses may be approved through special permission.

SCHOOL OF BUSINESS

- C722 /** Management of Population Health / C. Longo
- K723 /** Databases & Data Warehouses / Y. Yuan
- K724 /** eBusiness Strategies / Hassanein
- K725 /** Business Process Reengineering / A. Montazemi
- K731 /** Project Management
- K737 /** Cases in eBusiness, Innovation, and Entrepreneurship
- K784 /** Privacy and Security / Y. Yuan
- O734 /** Supply Chain Management / K. Hassini
- P727 /** Strategic Knowledge Management / N. Bontis

COMPUTING AND SOFTWARE

- *6CD3 /** Distributed Computer Systems / Staff
- *6D03 /** The Human Computer Interface / Staff
- *6M03 /** Databases / F. Franek
- *6WW3 /** Web Systems and Web Computing / K. Sartipi
- *703 /** Software Design / Staff
- *704 /** Embedded Real Time Software Systems / Staff
- *730 /** Machine Learning Related AI Topics / I. Bruha
- *747 /** Software Architecture Modeling and Reverse Engineering / K. Sartipi
- *750 /** Model-Based Image Reconstruction / C. Anand

HEALTH RESEARCH METHODOLOGY

- *721 /** Fundamentals of Health Research and Evaluation Methods / A. McKibbon, M. Levine
- *727 /** Theory and Practice of Measurement / G. Norman, K. Eva
- *737 /** Economic Analysis for the Evaluation of Health Services / A. Gafni
- *740 /** Advanced Decision Analysis in Health Technology Assessment (HTA) / R. Goeree
- *748 /** Population and Public Health / P. Raina
- *762 /** Approaches to the Evaluation of Health Services / K. Brazil
- *787 /** Principles of Health Economics / S. Birch
- *788 /** Health Economics / J. Hurley

MEDICAL SCIENCES

- *760 /** Principles of Pre-clinical Drug Discovery / D. Crankshaw

NURSING

- *708 /** Information and Communication Technology Applications in Health: Theory and Practice / R. Valaitis

ELECTRICAL AND COMPUTER ENGINEERING**Staff / Fall 2009****DISTINGUISHED UNIVERSITY PROFESSOR**

S.S. Haykin, B.Sc., Ph.D., D.Sc. (Birmingham), F.I.E.E.E., F.R.S.C.

PROFESSORS

D.W. Capson, B.Sc.Eng. (New Brunswick), M.Eng., Ph.D. (McMaster), P.Eng. / Chair
 T. Davidson, B. Eng. (Hons.) (Western Australia), D.Phil. (Oxford), P. Eng. / CRC II
 J. Deen, B.Sc. (Guyana), M.S., Ph.D., (Case Western Reserve), F.I.E.E.E., F.I.N.A.E., F.E.I.C., F.C.A.E., F.E.C.S., F.A.A.A.S. / CRC Chair
 W.P. Huang, B.S. (Shandong), M.S. (University of Science and Technology of China), Ph.D. (M.I.T.)
 T. Kirubarajan, B.A., M.A. (Cambridge), M.S., Ph.D., (Connecticut) / CRC II / Associate Chair (Graduate Program)
 X. Li, B.S. (Shandong), M.S. (Wuhan Research Institute of Posts & Telecommunications), Ph.D. (Northern Jiaotong)
 N. Nikolova, Dipl. (Tech. University of Varna), Ph.D. (University of Electrocommunications, Tokyo), P.Eng. / Canada Research Chair
 J.P. Reilly, B.A.Sc. (Waterloo), M.Eng., Ph.D. (McMaster), P.Eng. / Associate Chair (Undergraduate Program)
 P.M. Smith, B.Eng.Mgt., M.Eng., Ph.D. (McMaster), P.Eng.
 T.H. Szymanski, B.A.Sc., M.A.Sc., Ph.D. (Toronto), P.Eng. / L.R. Wilson/BCE Chair in Data Communications
 T.D. Todd, B.A.Sc., M.A.Sc., Ph.D. (Waterloo), P.Eng. / NSERC/RIM/CITO Chair in Pico-Cellular Wireless Internet Access Networks
 K.M. Wong, B.Sc.(Eng.), Ph.D., D.Sc.(Eng.), D.I.C. (London), F.I.E.E.E., F.I.E.E., F.C.A.E., F.R.S.C., F.Inst.P., F.S.S., C.Eng., P.Eng. / NSERC-Mitel-CITO Chair in Digital Signal Processing
 X. Wu, B.Sc. (Wuhan University, China), Ph.D. (Calgary) / DALSA/NSERC Chair in Digital Cinema

ASSOCIATE PROFESSORS

M. Bakr, B.Sc., M.Sc. (Cairo), Ph.D. (McMaster), P.Eng.
 I. Bruce, B.Eng., Ph.D. (Melbourne), P. Eng.
 H. de Bruin, B. Eng, M. Eng., Ph.D. (McMaster), P.Eng.
 T. Field, B.A., D.Phil. (Oxford, U.K.)
 Y. Haddara, B.Eng., (Memorial), M.Sc., Ph.D. (Stanford), P.Eng.
 S. Hranilovic, B.A.Sc. (Waterloo), M.A.Sc., Ph.D. (Toronto), P.Eng.
 S. Kumar, B.S. (Mysore Univ., India), M.S., Ph.D. (Indian Institute of Science), Ph.D. (Osaka, Japan), P. Eng.
 N. Nicolici, Dipl. Ing. (Univ. of Timisoara), Ph.D. (Southampton, U.K.), P.Eng.
 S. Shirani, B.Sc.Eng. (Isfahan Univ. of Tech.), M.Sc. (Amirkabir Univ. of Tech.), Ph.D. (British Columbia), P.Eng.
 M.R. Sirouspour, B.Sc., M.Sc. (Sharif Univ., Iran), Ph.D. (U.B.C.), P.Eng.
 D. Zhao, B.S. (Northern Jiaotong, Beijing), Ph.D. (Waterloo), P.Eng.

ASSISTANT PROFESSORS

C.H. Chen, B.A.Sc. (National Central Univ., Taiwan), M.A.Sc. (Simon Fraser), Ph.D. (McMaster)
 J. Chen, B. Eng., M.Sc., Ph.D. (Cornell) / Barber Gennum Chair in Information Technology
 T.E. Doyle, B.Sc., B.E.Sc., M.E.Sc., Ph.D. (Western Ontario), P. Eng.
 S. Dumitrescu, B.Sc., Ph.D. (Bucharest)
 M. Howlader, B. Eng. (Bangladesh), M.Sc., Ph.D. (Kyushu, Japan)
 A. Jeremić, Dipl.Ing. (Belgrade), M.S., Ph.D. (Illinois at Chicago)
 M. Noseworthy, B.Sc., M.Sc., Ph.D. (Guelph)
 A. Patriciu, B.Sc., M.Sc. CompSci. (Univ. Craiova, Romania), M.Sc., MechEng., Ph.D. (John Hopkins)
 J.K. Zhang, B.Sc., M.S., Ph.D. (Xidian Univ., P.R. China)

ASSOCIATE MEMBERS

M. Anvari (Surgery)
 S. Becker (Psychology)
 W. Datars (Physics and Astronomy)
 T. Farncombe (Radiology)
 Q. Fang (Engineering Physics)
 J. Huizinga (Medicine)
 M. Kamath (Medicine)
 R. Kleiman (Engineering Physics)
 A. Knights (Engineering Physics)
 A. Spence (Mechanical Engineering)

ADJUNCT MEMBERS

E. Bosse, B.Sc.A., M.Sc. (Laval), Ph.D. (Carleton, Ottawa, Laval)
 L. Carney, S.B., M.S., Ph.D. (Wisconsin)
 Z. (Jack) Ding, B.Sc., M.A.Sc., Ph.D. (Northwestern Polytechnic University, P.R. China)
 R. Elliott, B.A., M.A. (Oxford), Ph.D. (Cambridge)
 A.B. Gershman, M.Eng.Sc., Ph.D. (Nizhny Novgorod), F.I.E.E.E.
 M. Haacke, B.Sc., M.Sc., Ph.D. (Toronto)
 Q. Jin, B.Eng., M.Eng. (Dalian, China), Ph.D. (McMaster)
 T. Lang, B.Eng., M.Eng. (McMaster)
 J. Lee, B.Sc. (Calgary), M.A.Sc. (Toronto), Ph.D. (Carleton)
 Z.Q. (Tom) Luo, B.Sc. (Peking), Ph.D. (M.I.T.), P.Eng., F.I.E.E.E.
 M. Margarit, M.Sc. (Bucharest), Ph.D. (Simon Fraser, B.C.)
 M. McDonald, B.Sc., M.Sc. (Queen's), Ph.D. (Western)
 B. Ong, B.Sc., Ph.D. (McGill)
 M. Pelletier, Ph.D., P. Eng.
 N. Sangary, B.Sc., M.Eng., Ph.D. (McMaster)
 D. Schuurman, B.A.Sc., M.A.Sc. (Waterloo), Ph.D. (McMaster)
 M. Sellathurai, B.Sc. (Peradeniya Univ.), Ph.D. (McMaster)
 S. Shahbazpanahi, B.S., M.Sc., Ph.D. (Shaif Univ. Tehran)
 P. Valin, B.A., B.Sc., M.Sc., Ph.D. (Harvard)

PROFESSORS EMERITI

R.T.H. Alden, B.A.Sc., M.A.Sc., Ph.D. (Toronto), F.I.E.E.E., P.Eng.
 J.W. Bandler, B.Sc.(Eng.), Ph.D., D.Sc.(Eng.) (London), D.I.C. (Imperial College), F.I.E.E.E., F.I.E.E., F.E.I.C., F.R.S.C., F.C.A.E., C.Eng., P.Eng.
 C.R. Carter, B.A.Sc., M.A.Sc. (British Columbia), Ph.D. (McMaster), P.Eng.
 S.H. Chisholm, B.A.Sc. (Toronto), Ph.D. (London), P.Eng.
 D.R. Conn, B.Sc., M.Sc., Ph.D. (Queen's), P.Eng.
 R.D. Findlay, B.A.Sc., M.A.Sc., Ph.D. (Toronto), P.Eng., F.I.E.E.E.
 A.S. Gladwin, D.Sc. (Glasgow), Ph.D. (London)
 R. Kitai, B.Sc., M.Sc., D.Sc. (Witwatersrand), F.I.E.E.E.
 J. Litva, B.Sc. (British Columbia), M.Sc., Ph.D. (Western), F.I.E.E.E.
 N.K. Sinha, B.Sc.Eng. (Banaras), Ph.D. (Manchester), F.I.E.E.E., F.I.E.E.E., P.Eng.
 B. Szabados, D.Ing. (Grenoble), M.Eng., Ph.D. (McMaster), P.Eng.

Master's Degree

A candidate for the Master's degree may proceed by one of three routes: the Research Program (M.A.Sc.), the course and project program (M. Eng.) or the M. Eng. in Electrical and Biomedical Engineering.

M.A.Sc. Degree

A candidate is required to complete successfully at least four graduate half courses (or equivalent), of which at least two must be from among the 700-level graduate courses offered by the Electrical and Computer Engineering Department, and to prepare a thesis embodying the results of the research taken on by the candidate. A full-time candidate is required to spend at least one calendar year in full-time study and research.

M. Eng. Degree

A candidate is required to complete successfully a program of seven graduate half courses (or equivalent), of which at least five must be 700-level and up to two 600-level courses approved by the department; these courses may be taken on a part-time basis. Two of these 600-level courses can be taken in the final undergraduate year at McMaster for graduate credit.

M. Eng. Degree in Electrical and Biomedical Engineering

This program is open to graduates who have maintained a minimum average of B in each year of the B.Eng. program in Electrical and Biomedical Engineering at McMaster University. The program consists of a minimum of three consecutive terms in which the candidate is required to complete successfully six graduate half courses (or equivalent), of which at least four must be 700 level and up to two 600 level courses approved by the department, followed by an independent study term. Two of these 600 level courses, Elec Eng 6BC4 and Elec Eng 6BE4 can be taken in the fourth undergraduate year for graduate credit. At the conclusion of the final term the candidate is required to submit and defend a report on an approved project which must demonstrate ability to carry out independent study and reach a satisfactory conclusion in an area of biomedical engineering.

Ph.D. Degree

The general requirements for the degree Doctor of Philosophy appear earlier in the Calendar. The minimum number of graduate courses required is four half courses (or equivalent) beyond the Master's degree, or eight half courses (or equivalent) beyond the Bachelor's degree. A candidate is also required to take the Ph.D. Comprehensive Examination which is designed to test the general knowledge of both undergraduate and graduate levels of Electrical Engineering. The Comprehensive Examination will normally be attempted no later than 24 months after a student has completed a Master's degree.

Within approximately one year of commencement a Ph.D. candidate must submit a report to the Supervisory Committee outlining the proposed line of research in sufficient detail so that the Committee can decide on its suitability.

General Requirements

Candidates for the degrees of M.A.Sc. and Ph.D. must present a seminar on a topic approved by the Department at least once during the course of their programs. Grading will be restricted to *Pass/Fail*. The thesis or report submitted by the candidate must be defended orally at the conclusion of the study. All M.A.Sc. and Ph.D. graduate students are required to register ECE 790- Graduate Seminars in Electrical and Computer Engineering. M. Eng. students registering for ECE *701, with the exception of those registered in the combined B. Eng./M. Eng. Biomedical Engineering program, must register for ECE 790 as well.

Courses

The following 600-level courses will be offered for graduate credit to ECE students in the M. Eng. program (to a maximum of two courses) or for extra graduate credits to ECE students in the M.A.Sc. and Ph.D. programs. However, these will not be available for graduate credit within the minimum course requirements of ECE students in the M.A.Sc. or Ph.D. programs. Courses marked with an asterisk (*) are half courses. All course prerequisites must be satisfied or students must have permission of the instructor. Credit for graduate courses from previous programs will be considered on a case by case basis by the Department's Graduate Affairs Committee on the recommendation of the student's supervisor.

***6BC4 / Modeling of Biological Systems / I.C. Bruce
(Same as Biomedical Engineering *6BC4)**

Introduction to mathematical and engineering methods for describing and predicting the behaviour of biological systems; including sensory receptors, neuromuscular and biomechanical systems; statistical models of biological function; kinetic models of biological thermodynamics.

***6BE4 / Medical Robotics / S. Sirouspour
(Same as Biomedical Engineering *6BE4)**

Fundamentals of robotics and telerobotics; feedback from the environment using sensors and machine vision; application of robotics to medicine and surgery.

***6DK4 / Computer Communication Networks / T.D. Todd**

Introduction to switching and communication networks; packet switching; shared media access and LANs; error control; network layer operation and the Internet; ISDN: wireless networks; performance and simulation.

***6DL4 / Real-Time and Distributed Computing Systems
/ B. Szabados**

Computing systems design for real-time applications in control and communications; data acquisition, file management, memory management and multi-tasking in a real-time environment; distributed computing systems; synchronization, fault tolerance.

***6DM4 / Computer Architecture / T. Szymanski**

Overview of CISC/RISC microprocessors and their evolution; performance metrics; instruction set design; microprogramming and hardwired control; processor and memory acceleration techniques; memory hierarchies; multiprocessor structures and their performance.

***6DS4 / Embedded Systems / D. Capson**

Embedded processor architectures and SOC organization; EDA tools for hardware/software co-design, co-verification and testability; Interfacing; Co-processors, soft processors and ASIP design; Real-time systems; Applications.

***6EK3 / Microelectronics / M.J. Deen**

CMOS and MOSFET integrated circuit design; fabrication and layout, simulation; digital and analog circuit blocks; computer aided design and analysis; testing and verification.

***6EL3 / Biomedical Electronic Instrumentation / H. deBruin**

Generation and nature of bioelectric potentials; electrodes and other transducers; principles of instrumentation; electrical safety; neuromuscular and cardiovascular instrumentation; ultrasonics and other medical imaging.

***6FJ4 / Introduction to Microwave Engineering / N. Nikolova**

Transmission lines, waveguides, microwave network analysis via S-parameters, impedance matching, resonators, power dividers, directional couplers, microwave filters, microwave sources, active components and circuits.

***6PJ3 / Rotating Machines / Staff**

Design considerations for electric machines; polyphase stator windings; harmonics; slotting; saturation; losses; reactance; saliency; equivalent circuits; synchronous, asynchronous and permanent magnet machines.

***6PK4 / Power Electronics / Staff**

Power circuits with switches; basic rectifier circuits; commutation; choppers; inverters; harmonic suppression techniques; generation and control of rotating fields; variable speed drives; system design.

***6PL4 / Energy Systems and Management / Staff**

Elements of generation, transmission, and distribution systems; system wide-energy flow and control; modeling and simulation; economics and management; fault prediction and management.

***6TK4 / Digital Communication Systems / K.M. Wong**

A/D conversion; digital modulation; frequency hopping; code-division multiplexing; matched filters; equalization; optimal receiver design; entropy; coding; data compression; capacity of band-limited Gaussian channel.

***6TL4 / Digital Signal Processing / TBA**

Classical filter theory; DFT and FFT; FIR and IIR digital filters; effects of finite precision; implementation of DSP-based systems; adaptive filtering; signal compression.

***6TM4 / Digital Communications II / J. K. Zhang**

This course continues the study of modern communication systems following ELEC ENG 6TK4. Topics include wireless communication systems, multiple antenna systems, channel models and error control coding.

***6TN3 / Image Processing / S. Shirani**

*(Same as Biomedical Engineering *6TN3)*

Digital image formation and representation; filtering, enhancement and restoration; edge detection; discrete image transforms; encoding and compression; segmentation; recognition and interpretation; 3D imagery; applications.

The following 700-level courses are available for graduate credit. However, not all courses listed will be offered each year. A list of those courses offered will be issued by the Department at the beginning of each academic year.

REQUIRED COURSE FOR M. ENG. WITH PROJECT***701 / M. Eng. Project / various ECE professors**

The goal of the project will be agreed upon by the instructor and the student at the beginning of the term. At the conclusion of the course, the candidate is required to submit a report on the approved project which must demonstrate the ability to carry out independent study and reach a satisfactory conclusion. The candidate is also required to register for the seminar course ECE 790 to present their project report.

COMPUTATION***710 / Engineering Optimization / T. Davidson, T. Kirubarajan
*(Same as Computational Engineering & Science *710)***

Concentrates on recognizing and solving convex optimization problems that arise in engineering. Convex sets, functions, and optimization problems. Basics of convex analysis. Least-squares, linear and quadratic programs, semi-definite programming, minimax, extremal volume, and other problems. Localization methods. Optimality conditions, duality theory, theorems of alternative, and applications. Interior-point methods. Applications to signal processing, control, circuit design, computational geometry, statistics, and mechanical engineering. The prerequisites are - a good knowledge of linear algebra and willingness to program in Matlab; exposure to numerical computing, optimization, and application fields helpful but not required; the engineering applications will be kept basic and simple.

***711 / Computer-Aided Design / J.W. Bandler**

Optimization techniques. Analysis of linear, nonlinear and electronic networks. Algorithms for small- and large-change sensitivity evaluation. Introduction to design centering, tolerancing, postproduction tuning and yield optimization. Least squares, least pth and minimax optimization. Device modeling and parameter extraction. Equivalent circuit and physics based models. Space mapping in engineering modeling and optimization. Hands-on use of friendly optimization. Practical, state-of-the-art CAD problems and methodology.

***712 / Matrix Computations in Signal Processing / J.P. Reilly**

Matrix decompositions: eigen-decomposition, QR decomposition, singular value decomposition; solution to systems of equations: Gaussian elimination, Toeplitz systems; least square methods: ordinary, generalized and total least squares, principal component analysis.

***715 / Simulation and Optimization / J.W. Bandler**

Simulation of linear and nonlinear circuits and systems. Hierarchical design formulations. Advanced optimization techniques. Sparsity. Parallel algorithms. Advanced transient analysis. Harmonic balance. Sensitivity analysis of linear and nonlinear circuits. Multidimensional modeling, including space mapping. Statistical design centering. Tolerance assignment. Pre- and postproduction tuning. Design and use of optimization systems.

***716 / Numerical Solution of Partial Differential Equations in Engineering / Staff**

Numerical methods for solution of partial differential equations arising out of field problems: classification of equations, finite difference techniques, weighted residuals and finite elements, special topics, with applications.

COMMUNICATION SYSTEMS AND NETWORKS***722 / Fundamentals of Wireless Communication / J. Chen**

The past decade has seen many advances in physical-layer wireless communication theory and their implementation in wireless systems. This course takes a unified view of the fundamentals of wireless communication and explains the web of concepts underpinning these advances at a level accessible to an audience with a basic background in probability and digital communication. Topics covered include MIMO (multiple input multiple output) communication, space-time coding, opportunistic communication, OFDM and CDMA. The concepts are illustrated using many examples from wireless systems such as GSM, IS-95 (CDMA), IS-856 (1xEV-DO), Flash OFDM and ArrayComm SDMA systems. particular emphasis is placed on the interplay between concepts and their implementation in systems.

***723 / Information Theory and Coding / S. Hranilovic,**

Entropy and mutual information. Discrete memoryless channels and discrete memoryless sources, capacity-cost functions and rate-distortion functions. The Gaussian channel and source. The source-channel coding theorem. Linear codes. BCH, Goppa, Reed-Solomon, and Golay codes. Convolutional codes. Variable-length source coding.

***724 / Space-Time Communication Theory / S. Haykin**

This course will provide a detailed treatment of communication theory with emphasis on the geometric representation of signals and its application to the carrier transmission of digital data, the synchronization problem, information theory and coding, wireless communications and the multi-user detection problem.

***725 / Telecommunications Networks - Modeling and Analysis / T. Szymanski**

This course provides a fundamental and in-depth knowledge of the analysis and modeling of telecommunication networks. The course will focus on mathematical analysis of fundamental systems and concepts, such as queuing systems (M/M/1, M/D/1, M/G/1), polling systems, multi access protocols (CSMA), shortest path routing, optimal routing and flow control. A good understanding of probability, digital systems and computing systems is required.

***726 / Local Area Networks in a Manufacturing Environment / B. Szabados**

Overview of user constraints for LAN in manufacturing environment. Overview of existing protocols leads into MAP and TOP standards emerging as the leading protocols. Study of MAP 2.1 and 3.0 with emphasis on physical layer and link layer structures, based on ISO 802.4 token passing bus protocol. Top 1.0 for office protocol using ISO 802.3 CSMA protocol. Extension to fibre optic technology and emerging standard for active bus. Emphasis on design and criteria for implementation of these LAN's, including state of the art hardware technology.

***727 / Wireless Communication Networks / T.D. Todd**

Introduction to the current state-of-the-art in wireless networking. Topics include infrastructure networking for wireless communications, smart antennas in wireless networks, wireless LANs and ATM, mobile IP, media access protocols for wireless networks and other resource allocation issues. Various networking aspects of wireless system operation such as location updating and roaming. Emphasis on system architecture, protocols and performance.

***728 / Multimedia Communications / S. Shirani**

The goal of this course is to introduce technologies involved in multimedia communications. Methods used to efficiently represent multimedia data (video, image, and audio), and deliver them over a variety of networks are discussed. State-of-the-art compression techniques will be introduced. Emphasis, however, will be given to compression standards, including H.26x, MPEG, and JPEG. The requirements and performance issues of multimedia networks (such as throughput, error resilience, delay, and jitter) and multimedia communications standards are introduced. Special factors in transmission of multimedia over ATM, wireless, and IP networks will be discussed. Moreover, authentication issues in multimedia communications (e.g. encryption, watermarking) are briefly introduced. Finally, multimedia databases, indexing and retrieval are presented. Current research areas in multimedia communications will be reviewed through students' seminars.

***729 / Resource Management and Performance Analysis in Wireless Communication Networks / D. Zhao**

This course focuses on resource management and performance analysis in transporting multimedia traffic in wireless communication networks. Topics include: traffic characteristics, connection admission control, packet scheduling, access control, and mobility and handoff management.

***730 / Linear Systems / T. Kirubarajan
(Same as Computational Engineering & Science *731)**

This course is intended as a first semester graduate course on linear systems theory, design and implementation with application to signal processing, communications, estimation and control. The objective is to present a comprehensive coverage of the basic tools needed by an electrical engineering graduate student specializing in the above areas.

***731 / Networks: QOS Routing, Switching, Scheduling / T. Szymanski**

Traffic Engineering" in telecommunication networks is rapidly evolving in response to the need to provide quality of service guarantees for data traffic in the internet. The course will focus on selected topics in the field, including the mathematical analysis of queueing systems, traffic models, large-scale switching system architectures, switch scheduling algorithms for QOS and network routing for QOS.

***732 / Non-linear Control Systems / S. Sirouspour**

Topics to be covered range from phase-plane analysis, Lyapunov and input-output stability, to feedback linearization and back stepping control.

***734 / Advanced Topics in Multimedia Coding and Communications / S. Dumitrescu**

This course will familiarize the students with recent results in several modern research topics in multimedia coding and communications. Four main topics are covered: joint source-channel coding/decoding; multiple description coding; distributed source coding; network coding. Presentation will include the theoretical foundations (asymptotic rate-distortion results) as well as practical aspects (coding and decoding strategies, optimal code design), applications, and open problems.

MICROELECTRONICS***740 / Semiconductor Device Theory and Modeling / M.J. Deen, Y. Haddara**

This course provides a fundamental in-depth knowledge of the theory of operation, modeling, parameter extraction, scaling issues, and higher order effects of active and passive semiconductor devices that are used in mainstream semiconductor technology. There will be a comprehensive review of the latest models for the devices that are valid out to very high frequencies and the use of physical device modeling/CAD tools. A review of the latest device technologies will be presented. The course will be a prerequisite to the other applied courses in microelectronics.

***741 / Analog Integrated Circuits / M.J. Deen**

This course provides a fundamental and in-depth knowledge of the analysis, modeling, and design of analog integrated circuits (ICs), mostly at radio frequencies (RF). It covers many aspects of the analysis and design of analog integrated circuits, mostly in CMOS technology. The topics include transistor models, reliability, small-signal analysis, amplifier design, biasing, noise analysis, low power design and examples of analog and RF ICs. It includes a review of the important circuit design techniques and device technologies. A good understanding of semiconductor device theory and modeling is required.

***742 / Digital Integrated Circuits / T. Szymanski**

Digital IC Design Flow, Deep Submicron Design Flow, VHDL hardware description language, synthesis of VHDL, CMOS logic, standard cell libraries, high speed clocking, verification, simulation, and testing, IC packaging, high speed I/O, ECL, LVDS, memory structures, Computer Aided Design algorithms.

***743 / Solid-State Switch Mode Power Converters / B. Szabados**

To provide understanding of the basic concepts involved in solid state switching technology. Students will be expected to evaluate the performances of solid state components used, design protection circuits as well as heat sinks. They will become familiar with electromagnetic interference problems and their mitigative solutions. In a mini-project, students will be able to apply their knowledge of switch mode power supply design and performance testing.

***744 / System-on-a-Chip (SOC) Design and Test: Part I - Methods / N. Nicolici**

This course provides in-depth knowledge of the design methodologies that meet the challenge of the global shift from chip-based products to those which implement complete systems on a single chip. The course focuses on the novel intellectual property (IP)-centered design methodologies. The topics include embedded processor cores and memories, low power design, system verification and fault-tolerant computing. Understanding of application specific integrated circuits and hardware description languages is recommended.

***745 / System-on-a-Chip (SOC) Design and Test: Part II - Algorithms / N. Nicolici**

This course offers fundamental algorithms that are part of the computer-aided design (CAD) tools which are essential to the future of SOC design. The topics include system, algorithmic, gate and physical level design automation algorithms, as well as computer-aided verification and test. Knowledge of system-on-a-chip design methods is required.

***746 / Analysis and Design of RF ICs for Communications / C.H. Chen**

This course provides a fundamental and in-depth knowledge of the analysis and design of radio-frequency (RF) integrated circuits (IC) in CMOS technology for wireless communications. The topics include the modeling of active and passive components for AC and noise analysis, design examples of amplifiers, filters, oscillators, PLL and frequency synthesizers. Circuit performance will be evaluated by both hand calculations and computer simulations. A good understanding of circuit analysis and CAD tools (e.g. HSPICE or SpectreRF) is required.

***747 / Polymer and Organic Semi-Conductors / Y. Haddara**

The course will explore electronic properties of polymer and organic semiconducting materials. In particular, we will study material structure, charge carriers, electronic transport, the effect of doping, device behavior, and fabrication issues.

MICROWAVES AND PHOTONICS***750 / Advanced Engineering Electromagnetics / W.P. Huang, X. Li, N. Nikolova**

This course provides solid understanding of electromagnetic phenomena related to microwave and millimetre-wave engineering, antenna engineering and wireless technology. It also gives comprehensive review of the last achievements in high-frequency computational electromagnetics, which form the core of contemporary electromagnetic CAA/CAD tools. Special attention is paid to analytical and numerical approaches and techniques for the analysis of electromagnetic wave propagation.

***751 / Microwave Circuits / P.M. Smith**

Review of microwave concepts. Waveguide components: couplers, isolators, phase shifters and filters. Microstrip circuits: transmission lines, couplers, filters and hybrid circuits. Monolithic Microwave Integrated Circuits. Microwave amplifier and oscillator design.

***752 / Electromechanical Devices for RF Applications / P.M. Smith**

An introduction to devices and circuits that employ mechanical motion and vibration to process RF signals. The course will focus on Microelectromechanical (MEM) and Surface Acoustic Wave (SAW) devices. By the end of the course, students will be experienced with the design and operation of devices of these types, and will be familiar with the underlying physics.

***753 / Modern Antennas in Wireless Telecommunications / N. Nikolova**

*(Same as Computational Engineering & Science *753)*

The course provides fundamental knowledge in the theory and practice of antennas used in modern wireless systems. It starts with an introduction into the theory of electromagnetic radiation. Fundamental antenna parameters are described in conjunction with the basic antenna measurement techniques. The course proceeds with classical antenna problems such as infinitesimal dipoles, wire and loop antennas; antenna arrays; reflector and horn antennas. Special attention is paid to printed antennas and their applications to wireless systems.

***754 / Modeling and Simulation of Photonic Devices and Circuits I (Passive Devices and Circuits) / W.P. Huang**

Photonic devices and circuits are key components used for lightwave generation, amplification, transmission and detection in communication systems and networks. Photonic devices and circuits that utilize primarily photons, in conjunction with electrons can offer the tremendous bandwidth which is the key to a variety of applications, especially broadband communication systems and networks. This course will focus on the modeling of passive device physics through numerical approaches, the simulation of device terminal performances through mixed analytical and numerical methods and the extraction of device behaviour models. This course will also cover circuit level simulation for a variety of monolithic or hybrid integrated photonic circuits constructed on those devices.

***755 / Modeling and Simulation of Photonic Devices and Circuits II (Active and Functional Devices) / X. Li**

Photonic devices and circuits are key components used for lightwave generation, amplifier, transmission and detection in communication systems and networks. Photonic devices and circuits that primarily utilize photons, in conjunction with electrons, can offer the tremendous bandwidth which is the key to a variety of applications, especially broadband communication systems and networks. This course will focus on the modeling of active and functional device physics through numerical approaches, the simulation of device terminal performances through mixed analytical and numerical methods and the extraction of device behaviour models.

***756 / Design of Lightwave Communication Systems and Networks / S. Kumar**

Lightwave communication has emerged as the undisputed transmission method of choice in almost all areas of telecommunication, mainly because it offers unrivaled transmission capacity at low cost. This course will mainly focus on the design and simulation of the physical layer of lightwave communication systems and networks based on the advanced discrete and integrated photonic devices and optical fibers.

***757 / Numerical Techniques in Electromagnetics / M. Bakr**

This course provides a solid understanding of the computational electromagnetic techniques used to model electromagnetic phenomena related to microwave and millimetre-wave engineering, antenna engineering and wireless technology. A systematic approach is adopted in which the complexity and dimension of the explained techniques are increased starting with simple 2D problems.

***778 / Introduction to Nanotechnology / C-H Chen, X. Li**

This course provides a fundamental knowledge in nanotechnology. It focuses on the new physical phenomena due to the reduction of device dimension and the new applications as a result of these new phenomena. The topics include nano-materials, nano-processing, nano-electronics, nano-photonics, nano-biotechnology, nano-MEMS and nano-integration. Students will learn what should be considered in the nano-world, what new applications we might be benefited from, and what precautions we need to pay attention when dealing with issues in the nano-world.

SIGNAL PROCESSING***760 / Stochastic Processes / T. Field**

Concepts of probability, logical relations, conditional probability and expectation, Bayes theorem, Bayesian statistics, central limit theorem; continuous random variables, correlation and higher order statistics; theory of distributions: moments, heavy tailed distributions, Cauchy distribution, characteristic functions, stability / infinite divisibility; Markov property, principles of stationarity, ergodicity; power spectral density and auto-correlation; population dynamics, birth-death-immigration processes, the Poisson process; diffusion processes, the Fokker-Planck equation; Brownian motion and the Wiener process; introduction to stochastic differential equations.

***761 / Advanced Digital Signal Processing / T. Davidson**

Statistical signal processing, nonparametric and parametric spectral estimation, direction finding in sensor arrays, adaptive beamforming, adaptive filtering and filter banks, applications to radar, sonar, communications, and biomedical engineering.

***762 / Detection and Estimation / K.M. Wong**

Hypothesis testing, decision criteria, detection of signals in noise; theory of parameter estimation, Bayes estimate, maximum likelihood estimate, Cramér-Rao bound, linear mean square estimation, Wiener filtering, Kalman filtering, applications to communication and radar systems.

***763 / Signal Space Theory / K.M. Wong**

Signal spaces, discrete signal representations, integral transform for signal representation, representation of linear operators, characterization of signal properties, time-frequency representations of signal.

***764 / Computational Vision / D.W. Capson
(Same as Biomedical Engineering *764)**

Formation and representation of pictorial data; Imaging geometry and sensor calibration; Filtering; Edge detection; Binary image processing; Measurement of shape, texture, shading and depth; Time-varying image analysis; Applications in automation, biometrics and document processing.

***765 / Multirate Filter Banks and Wavelets / T. Davidson**

Multi-rate signal processing, M^{th} band and mirror filters, M -band filter banks and perfect reconstruction of signals; filterbank families, design and performance; wavelet transforms, multi-resolution signal decomposition.

***766 / Pattern Recognition / M. Kamath
(Same as Biomedical Engineering *766)**

To study the basic concepts of pattern recognition, algorithms employed and their performance: patterns and transformations. Supervised and unsupervised classifiers. Bayes classifier and discriminant functions. Feature selection/extraction. Parameter estimation and learning. Clustering. Syntactic recognition. Neural networks in pattern classification.

***767 / Multitarget Tracking and Multisensor Information Fusion / T. Kirubarajan**

This course will introduce the advanced concepts and algorithms for multisensor-multitarget tracking under realistic conditions (with imperfect sensors and measurement uncertainties). In addition, this course will deal with multisource information fusion with applications to communications, signal processing and target tracking.

***770 / Bayesian Sequential State Estimation / S. Haykin**

Bayesian estimation theory and state-space formalism are reviewed. Algorithmic developments of particle filters (with each particle embodying the essence of a Kalman filter) are described. Issues such as the choice of proposed distribution, Kolmogorov complexity, and practical applications of particle filters are discussed.

***771 / Algorithms for Parameter and State Estimation / T. Kirubarajan (Same as Computational Engineering and Science *791)**

The objective is to present a comprehensive coverage of advanced estimation techniques with applications to communications, signal processing and control. In addition to theory, the course also covers practical issues like filter initialization, software implementation, and filter model mismatch. Advanced topics on nonlinear estimation and adaptive estimation will be discussed as well.

772 / Neural Networks and Learning Machines / S. Haykin

Statistical learning theory, including VC, regularization, and Bayesian theories. Algorithms for multilayer perceptrons, kernel-based learning machines, self-organizing maps, principal components analysis, and blind source separation. Sequential state estimation algorithms, including extended Kalman filter, unscented Kalman filter, and particle filters; applications to learning machines.

***773 / Adaptive Filter Theory / S. Haykin**

Wiener filter theory, least mean-square (LMS) algorithm and its variants: normalized LMS and affine projection algorithms. Kalman filter, recursive-least square (RLS) algorithm and its variants: square-root (RLS), QR-decomposition least-square lattice (LSL), and recursive (LSL) algorithms. Applications to linear prediction, channel equalization, and beamforming.

***774 / DSP System Design / D.W. Capson, N. Nicolici, S. Shirani**

This course addresses implementation aspects required to design custom and semi-custom systems for digital signal processing (DSP). Distinct fields, such as DSP, computer architecture, parallel processing and programmable very large scale integrated (VLSI) digital circuits are brought together. The emphasis is placed on efficient digital architectures for high speed, low area, and power efficient DSP systems.

***775 / Cognitive Dynamic Systems / S. Haykin**

Motivation through examples; Markov processes and simulations; stochastic dynamic programming; partially observable Markov and decision processes; game theory; reinforcement learning; Application I: cognitive radio; application II: cognitive radar; Application III: sensor networks.

POWER***781 / Design and Operation of Induction Motors / TBA**

Design of transformers. Relationship between transformers and induction machines. Review of circuit and mathematical models. Induction motors: construction details, form wound and die cast rotors; mush and form wound stators; concentrated, concentric and distributed windings. Practical considerations for wirings. Design and operation; electrical design aspects, induced voltages, currents, production of torque, circuit models. Thermal considerations: heating effects, radial and axial vents. Effective air gap, air-gap and saturation harmonics, development of hybrid circuit model, analysis and applications. Single phase operation of induction machines, design of single phase machines, circuit models and applications.

***782 / Dynamic Analysis of Power Systems / TBA**

Representation of turbine-generators, induction motor and composite loads, transmission systems, and control equipment for small-signal stability analysis. Matrix assembly and model reduction for large systems. Eigen-value analysis.

***783 / Electric Power Transmission and Distribution, Elements and Systems / TBA**

The transfer of electric power including the design of conductors, with electrical and mechanical considerations, and the determination of power line parameters. Operation of power lines under steady-state and transient conditions with special attention to current and voltage limitations including temperature effects, corona and protection.

***784 / Power Electronics / B. Szabados**

Rectifiers and inverters. Effects on supply transformer commutation. Harmonic generation by solid-state power converters. Minimization of harmonic generation. Design of control circuits for rectifiers and inverters. Applications of microprocessors to machine drives.

790 / Graduate Poster Seminars in Electrical and Computer Engineering (This is a zero-credit course)

Research poster seminar series presented by graduate students in electrical and computer engineering. All full time graduate students are required to register for this course as outlined in "General Requirements." Grading will be restricted to pass/fail (P/F).

BIOMEDICAL ENGINEERING***791 / Sensory and Neuromuscular Engineering / H. de Bruin
(Same as Biomedical Engineering *791)**

The course is designed to give the student a more detailed knowledge of engineering applications to sensory and neuromuscular physiology. Topics include models of the myelinated and unmyelinated nerves including applied stimulating electrical fields; electrical fields in tissue resulting from surface and subcutaneous applied stimuli; surface and subcutaneous electrical fields in tissue resulting from single or populations of active nerve or muscle fibers; models of neuromuscular control; acquisition and analysis of kinesiological electromyographic and electroneurographic signals to determine normal and pathological neuromuscular function; magnetic and electrical stimulation of neural structures; Functional Electrical Stimulation (FES) and Magnetic Stimulation (FMS) in rehabilitation; neuroprostheses and sensory system interfaces.

792 / Medical Visualization*(Same as Biomedical Engineering *792)**

A course covering the principles and techniques of visualizing anatomical structures from 2D and 3D medical data sets generated by various imaging modalities such as: X-ray, computed tomography (CT), magnetic resonance (MR), functional MR (fMR) and ultrasound. The application of computer visualization/virtual reality to clinical diagnosis, treatment planning and minimally invasive surgery will also be covered.

793 / Cardiopulmonary Engineering*(Same as Biomedical Engineering *793)**

A course to give the student a more detailed understanding of the cardiopulmonary system and the relevant diagnostic and therapeutic technology. Topics include fluid mechanics of the circulatory and pulmonary systems; linear and nonlinear models of pulmonary function and control; acquisition and analysis of the electrocardiogram including heart rate processing and applications; principles of ventilation and instrumentation design; methods of measuring and analysing cardiac output and pulmonary function; the design and application of pacemakers; cardiac assist devices, and other therapeutic technology.

***794 / Robotic and Telerobotic Control Systems / S. Sirouspour**

Topics to be covered range from the introductory rigid motions and coordinate transformations to advanced subjects such as design of controllers for teleoperation systems.

***795 / Quantitative Electrophysiology / I. Bruce, H. deBruin**

This course provides a solid quantitative understanding of the behaviour of excitable cells, the resulting extracellular fields, measurement of extracellular fields using techniques such as EMG and EEG and functional electrical stimulation of excitable cells for neural and muscular prostheses.

796 / Models of the Neuron / I. Bruce*(Same as Biomedical Engineering *796 and Computational Engineering & Science *796)**

This course provides a solid conceptual and quantitative background in the modeling of biological neurons and how they function as computational devices. Practical experience will be gained in modeling neurons from a number of perspectives, including equivalent electrical circuits, nonlinear dynamical systems, and random point-processes, and an introduction to the mathematics required to understand and implement these different engineering methodologies will be given.

***798 / Biomedical Signal Modeling and Processing / A. Jeremic**

A key to efficient biomedical signal processing is a fundamental understanding of physical models, simplified but adequate mathematical models and statistically efficient signal processing algorithms. This course exposes students to advanced signal processing techniques and illustrates their application to biomedical signal processing and diagnostic imaging.

SPECIAL TOPICS COURSES IN ELECTRICAL AND COMPUTER ENGINEERING

Current developments and specialized aspects of electrical and computer engineering.

718 / *719 / Special Topics in Computation**738 / Special Topics in Communication Systems and Networks (Same as Computational Engineering and Science *742)*****739 / Special Topics in Communication Systems and Networks*****748 / *749 / Special Topics in Microelectronics*****758 / *759 / Special Topics in Microwaves and Photonics*****768 / Special Topics in Signal Processing (Same as Computational Engineering and Science *768)*****769 / Special Topics in Signal Processing*****788 / *789 / Special Topics in Power*****799 / Special Topics in Biomedical Engineering**

In addition, 600- and 700-level graduate courses in other departments may well be suited to the needs of Electrical Engineering graduate students. Among them are: Computer Science *6GB3; Engineering Physics *6D03, *6E03, *6F03, *6K03, 6S04, *721, *722, *723, *724, *725, *782. Mathematics *745; Mechanical Engineering *724; and Statistics *6D03, *6U03, *741, *742, 743, *744, *754, *761.

Research in Electrical and Computer Engineering

The Department of Electrical and Computer Engineering has established an international reputation for its rigorous program of fundamental and applied research. The main areas of work are telecommunications, signal processing, microelectronics, photonics, computer engineering and power engineering. Many of the faculty are involved in specialized interdisciplinary groups within these and other fields with interaction among other departments in engineering, mathematics, science and business. Financial support for the faculty members of this department comes from a variety of sources including the Natural Sciences and Engineering Research Council (NSERC), federal and provincial centres of excellence programs such as Micronet, CITO and IRIS and from contractual research arising from the department's history of strong industrial interaction. The department has also been successful in attracting several NSERC Industrial Research Chairs and Canada Research Chairs. Most of its faculty members are registered professional Engineers in the province of Ontario and among them, several are IEEE Fellows.

In the area of signal processing, very significant research has been carried out in sensor array processing, statistical signal detection and estimation, adaptive systems, optimum designs, signal and image coding and compression, etc. Applications of such techniques include data communications, transmitter/receiver design, multi-antenna, radar, sonar, speech, image, graphics, video, and sensory-based servo systems; computer vision, multi-camera distributed imaging, and visual computing. There are extensive supportive facilities available including a microwave anechoic chamber.

Recently, the department was also the recipient of a major infrastructural grant from the Canadian Foundation for Innovation and the Ontario Innovation Trust to upgrade the research facilities in communication technology. This is a national recognition of the department as one of the research leaders in the area.

In the areas of microelectronics, microwaves and photonics, extensive experimental facilities exist in various laboratories for device, circuit and system design and testing. Current areas of research include ultra-high performance CMOS devices and circuits, photodetectors and optical receivers, antennas, computational electromagnetics, microwave circuits and systems, ultrasonic devices, photonic devices and circuits, light wave communication devices, systems and networks, lasers, system-on-a-chip, VLSI testing and design automation. Extensive research efforts are underway into computer-aided design and engineering, optimization techniques and modeling. Researchers in these fields work closely with industry.

In the area of computer and telecommunications networks, current research topics include low power wireless networks, ad-hoc networks, wireless access protocols, optical networks, quality of service, switching and scheduling, multi-media transmission and telemedicine. Researchers in this group collaborate closely with industry, and are establishing several test bed systems.

In computer engineering, the simulation optimization systems laboratory is well known for its contributions to CAD/CAE as well as performance- and yield-driven circuit design methods. Research activity in computational vision is linked closely with the Intelligent Machines and Manufacturing Research Centre (IMMRC), a multi-disciplinary group whose interests include sensory-based systems and robotics. Other research areas in computer engineering are design automation and test of embedded computing systems.

The power research laboratory was formed to facilitate experimental research and development in electric power engineering and related areas such as distribution systems and power devices.

Recently, the department has substantially increased its involvement in biomedical engineering and this is continuing to expand. At present the research in this area includes modeling of human hearing, sound processing for human audio systems, modeling of human brain and neuromuscular system, brain and muscle (EEG and EMG) signal processing, modeling of the human cardiopulmonary system, biomedical instrumentation and imaging. A combined approved B.Eng./M.Eng. biomedical engineering program has been implemented for students interested in developing their careers in this area.

Research Facilities

The research work of the department of Electrical and Computer Engineering is enhanced by excellent, modern computing resources comprising a wide variety of networked workstations and software. There are also many resources and laboratory facilities with specialized test equipment that have been developed and maintained by each research group.

Microelectronics Research Laboratory Facilities

The microelectronics laboratory is equipped with experimental and modeling facilities that are state-of-the-art. It has extensive experimental facilities for both device and circuit characterization and testing over a wide range of frequencies, temperatures and biasings. There is a complete microwave vector network analyzer system (up to 50 GHz); a 26.5 GHz noise parameter system; RF spectrum analyzer; low frequency signal analyzers; high frequency oscilloscopes; two on-wafer measurement systems with temperature varying capability; oven for high temperature measurements; electrometer; capacitance-voltage meters; several multimeters and power supplies. Several software packages for process, device and circuit designs, for device layout, system simulations and for microwave and electromagnetic device and circuit modeling are available on both PCs and UNIX workstations.

Further details may be obtained from the department website (<http://www.ece.mcmaster.ca>) which contains links to the home pages of individual faculty members as well as the various research groups.

ENGINEERING PHYSICS

The Department of Engineering Physics offers programs of study leading to the M.A.Sc., M.Eng. and Ph.D. degrees in Engineering Physics. Areas of specialization include Photonics and Nuclear Engineering.

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Staff / Fall 2009

PROFESSORS

Alexander A. Berezin, M.Sc., Ph.D. (Leningrad State)
 Adrian Buijs, Baccalaureate (European School, Karlsruhe, Germany), M. Eng, Ph.D. (Utrecht)
 Daniel T. Cassidy, B.Eng. (McMaster), M.Sc. (Queen's), Ph.D. (McMaster), P.Eng.
 Harold K. Haugen, B.Sc. (Acadia), M.Eng. (McMaster), Ph.D. (Aarhus) / Joint appointment with Physics and Astronomy
 David P. Jackson, M.A., M.A.Sc., Ph.D. (Toronto) / Part-time
 Paul E. Jessop, B.Sc. (Waterloo), M.A., Ph.D. (Harvard), P. Eng. / Chair
 Adrian H. Kitai, B.Eng. (McMaster), Ph.D. (Cornell), P.Eng. / Joint appointment with Materials Science and Engineering
 Rafael N. Kleiman, SB (M.I.T.), Ph.D. (Cornell)
 John C. Luxat, B.Sc., M.Sc. (Cape Town), Ph.D. (Windsor), P.Eng.
 Peter Mascher, M.Eng., Ph.D. (Tech. Univ. of Graz), P.Eng.
 John S. Preston, B.Eng. (McMaster), M.Sc., Ph.D. (Toronto), P.Eng.
 Chang Q. Xu, B.Sc., M.Sc. (University of Science and Technology of China), D.Eng. (Tokyo)

ASSOCIATE PROFESSORS

Andrew P. Knights, B.Sc., Ph.D. (East Anglia)
 Ray R. LaPierre, B.Sc. (Dalhousie), M.Eng., Ph.D. (McMaster), P. Eng.
 David R. Novog, B.Sc. Eng. (Manitoba), M.Eng., Ph.D. (McMaster)

ASSISTANT PROFESSOR

Qiyin Fang, B.S. (Nankai), M.S., Ph.D. (East Carolina)

ASSOCIATE MEMBERS

M.J. Deen (Electrical and Computer Engineering)
 Y. M. Haddara (Electrical and Computer Engineering)
 M.S. Hamed (Mechanical)
 J.E. Hayward (Radiology)
 F.M. Hoppe (Mathematics & Statistics)
 J.D. Huizinga (Medicine)
 M.F. Lightstone (Mechanical Engineering)
 R. O. Loutfy (Chemical Engineering)

ADJUNCT MEMBERS

Denis J. Corr, B.Sc., Ph.D. (Queen's, Belfast)
 Simon E. Day, B.Sc. (Saint Mary's), M. Eng., Ph.D. (McMaster)
 Nikola K. Popov, B.Eng. (Skopje), M.Sc. (Belgrade), Ph.D. (Zagreb) / (A.E.C.L.)
 Victor G. Snell, B.Sc. (Manitoba), M.Sc., Ph.D. (Toronto) / (A.E.C.L.)
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 Benjamin Rouben, B.Sc. (McGill), Ph.D. (Massachusetts Institute of Technology)
 Zhiyi Zhang, B.Sc.E., M.Sc. (National University of Defence Technology), Ph.D. (Zhongshan)

PROFESSORS EMERITI

Edward A. Ballik, B.Sc., P.Eng. (Queen's), D.Phil. (Oxford), P.Eng.
 Jen-Shih Chang, B.Eng., M.Eng. (Musashi Inst. of Tech.), Ph.D. (York)
 John A. Davies, M.A., Ph.D. (Toronto), F.D.R.S., F.R.S.C.
 William J. Garland, M.Eng., Ph.D. (McMaster), P.Eng.
 Archie A. Harms, B.Sc. (British Columbia), M.Sc.Eng., Ph.D. (Washington), P.Eng.
 Terence J. Kennett, M.Sc., Ph.D. (McMaster)
 John S. Kirkaldy, B.Appl.Sci., M.App.Sci. (British Columbia), Ph.D. (McGill), F.R.S.C., F.A.S.M., P.Eng.
 L.D. Pengelly, B.A.Sc. (Toronto), M.Sc., Ph.D. (McGill), P.Eng.
 John G. Simmons, B.Sc. (London), M.Sc. (Temple), Ph.D., D.Sc. (London)
 David A. Thompson, B.Sc., Ph.D. (Reading)

Master's Degree

The Master's programs emphasize industrially relevant research and development. The degree may be earned either with a thesis option (M.A.Sc.) or an industrial internship (M.Eng.) to be decided jointly by the candidate, the supervisor, and the chair. In recent years the internship option has been used very infrequently by students in the photonics area. A strong baccalaureate degree with an average of at least B (equivalent to a McMaster GPA of 8.0) in engineering, mathematics, or the physical sciences is generally required for admission to the M.A.Sc. program. For the M.Eng. program, an average of at least B- is required.

M.A.Sc. Degree

A candidate for the M.A.Sc. degree is required to complete a minimum of three half courses (the equivalent of one full course must be at the 700-level) with an average of at least B and a thesis. The thesis topic is chosen in consultation with the supervisor. A minimum of 12 months residence will normally be required. It is expected that many students will choose this route towards a Ph.D. degree.

M.Eng. Degree (Industrial Internship)

A candidate for the M.Eng. degree (Industrial Internship) is required to complete a minimum of two full courses (the equivalent of one full course must be at the 700-level). The candidate must attain a grade of at least B- in each of the selected courses. An on-campus project is to be pursued under the supervision of a member of the Department. The subject area is to be chosen in consultation with the Department Chair and the supervising faculty member.

In addition to the required courses and the on-campus project described above, the candidate for the M.Eng. degree (Industrial Internship) is required to complete EP 733. This involves spending approximately four months in an industrial laboratory carrying out an industry-oriented project under the supervision of a suitably qualified staff scientist. The candidate is usually required to undertake some on-campus study in preparation for the industrial project. The Department of Engineering Physics makes arrangements for the industrial project in consultation with the candidate. Subject to the approval of the Department Chair, the requirement for an on-campus project may be replaced by the addition of the equivalent of one more full course.

UNENE M.Eng. Degree in Nuclear Engineering

The requirement for the M.Eng. in Nuclear Engineering is to complete ten UNENE courses or eight such courses and an industrial project. These may include three ADMI half courses.

Ph.D. Degree

The general Regulations for the Degree Doctor of Philosophy appear earlier in the Calendar. Students with a Master's degree are required to take three half courses, at least two of which must be at the 700-level. Students entering into the Ph.D. program directly from a Baccalaureate degree, or transferring into the Ph.D. program without being required to complete the Master's degree are required to take a total of six half courses, of which at least four must be at the 700-level.

Students enrolling for a Ph.D. degree will be required to submit a written proposal for their research program no later than one year after entry into the program. The proposal will be reviewed by the Supervisory Committee.

During their course of study, doctoral candidates will be required to pass a Departmental Comprehensive Examination. The purpose of this examination is to ensure that the candidate possesses sufficient knowledge and maturity of approach. The Comprehensive Examination will be in two parts. Part I will be an oral examination to test the student's undergraduate level of knowledge and understanding of mathematics, physics, and the engineering sciences.

Part II will take the form of an oral examination designed to examine the student's understanding of, and approach to, her/his proposed dissertation research. The candidate will normally take Part I within 8 months of admission to the doctoral program, and Part II no later than 24 months following admission. Both parts of the Examination may, at the discretion of the Department, be repeated once. Reporting of examination results will be done in accordance with the Regulations of the School of Graduate Studies.

Courses

Courses marked with an asterisk (*) are half courses. The following courses are offered for graduate credit and are available to senior undergraduate students. Not all of the courses, however, will be offered each year.

*6D03 / Nuclear Reactor Analysis / Staff

Introduction to nuclear energy; nuclear physics and chain reactions; reactor statics and kinetics; multigroup analysis, core thermalhydraulics; reactor design.

*6F03 / Advanced Solid State Devices / A.H. Kitai

Electronic properties of field effect devices; electronic and optical properties of advanced devices and integrated circuits. Student projects will allow supplemental coverage of devices of particular interest to the class.

*6I03 / Introduction to Biophotonics / Q. Fang (Same as Medical Physics *6I03)

This is a survey course on basic principles of light interaction with biological systems and specific biomedical applications of photonics. In the first quarter of the course, basic principles in optics and biology will be briefly covered while emphasis will be on more advanced topics such as lasers and photo detectors, light-tissue interaction, and photobiology. The remaining part of the course will be focused on specific biomedical applications using photonics technology.

*6K03 / Optical Communication Systems / H.K. Haugen

Propagation of light in an optical fibre. Semiconductor lasers and detectors for optical communications. Analogue and digital coding. Signal to noise considerations. System design.

*6L04 / Industrial Monitoring and Detection Techniques

Single and two-phase flow diagnostics and monitoring techniques for industrial and power plant operations; radiation monitoring; pollutant monitoring and analysis; nuclear instrumentation for industrial processes.

*6NE3 / Advanced Nuclear Engineering / J.C. Luxat

Fission power generation and distribution in a nuclear reactor core. Design and performance of natural uranium, enriched uranium and mixed oxide nuclear fuels. Energy conversion, heat transfer and heat transport in a nuclear reactor core. Thermal margins and safety limits of nuclear fuel and reactor components. Irradiation, corrosion and aging of reactor structural materials. Structural integrity of nuclear components including properties of nuclear materials, stress in piping systems, material creep and fatigue behavior.

*6P03 / Nuclear Power Plant Systems and Operation / Staff

Systems and overall unit operations relevant to nuclear power plants; includes all major reactor and process systems; nuclear power plant simulator; self-study using interactive CD-ROM.

6S03 / Introduction to Lasers and Electro-Optics / C.Q. Xu

Electro-magnetic radiation; optical modulation and detection; non-linear optics; coherence; optical resonators; laser gain media; laser systems; mode locking.

***6X03 / Introduction to Photovoltaics / R. LaPierre**

This course reviews photovoltaic devices including solar cell operation, characterization, manufacturing, economics, and current and next generation technologies.

The following 700-level courses are offered for graduate credit only.

***704 / Selected Topics in Engineering Physics / Staff**

Current developments and specialized aspects of engineering physics. This course may be taken for repetitive credit.

***710 / Nuclear Reactor Dynamics and Control / J.C. Luxat**

Reactor kinetics: point kinetics model; modal model for space-time kinetics; reactivity feedback mechanisms; reactor transfer functions; the inhour equation; reactor stability; Xenon stability; bulk and spatial power control; load following; control systems for CANDU and LWR reactors.

***713 / Nuclear Safety Analysis and Reactor Accidents / J.C. Luxat**

Degraded fuel heat transfer; fuel failure mechanisms; fission product release and transport from nuclear fuel; leak-before-break and piping fracture mechanics; pipe ruptures; challenges to containment system integrity; severe accident progression and mitigation; off-site release of fission products; applications to CANDU and LWR reactors.

***714 / Nuclear Reactor Safety Design / Staff**

Safety design and analysis of nuclear reactors based on deterministic and probabilistic assessments. Topics include: concepts of risk; probability tools and techniques; safety criteria; design basis accidents; risk assessment; safety analysis; safety system design; and general policy and principles.

***715 / Advanced Nuclear Reactor Thermalhydraulics / Staff**

Advanced topics of current interest in the area of fission and fusion nuclear reactor primary heat transport system, system safety and the transitional operations.

***716 / Nuclear Reactor Heat Transport System Design / Staff**

This course covers the fundamentals of nuclear reactor heat transport system design for key reactor types, with emphasis on the CANDU and Light Water Reactor (PWR and BWR) designs. Theoretical topics and their application include reactor thermodynamics, single-phase and two-phase flow, heat and mass transfer, critical heat, flux, pressure drop prediction, flow stability, design of reactor core, reactor vessel, steam generators and primary heat transport pumps. The course also covers experimental techniques, facilities and results. Course assignments are analytical problems related to these topics.

***717 / Pollution Control Plasma Technology / A.A. Berezin, Staff**

Combustion flue gas treatment by energetic electron processes (electron beam/plasma); toxic waste treatments by ionizing radiation: waste water treatment by electron beams and pulse electric discharges; neutron activation analyses; ICP plasma analyses; thermal plasma waste treatments.

***718 / Reactor Heat Transport System Simulation and Analysis / Staff**

The course covers two-fluid phase modeling of thermal-hydraulic phenomena in the reactor heat transport system including modeling and simulation of postulated accidents, simulation methodology and tools, and development and qualification of selected thermal-hydraulics computer codes, including two-fluid modeling, nodalization schemes and numerical methods, computer code development, CATHENA computer code theory and numerical algorithm. This is a simulation-based course; it includes CATHENA training. Assignments include analytical problems, CATHENA code simulation and analysis, and preparing a CATHENA model and report.

***719 / MEMS Devices: Design, Fabrication, and Applications / R.N. Kleiman**

An introductory course that will provide the fundamentals from many disciplines relevant to the understanding and application of MicroElectroMechanical Systems (MEMS) technology. Design topics will include mechanical and biofluidic principles with an emphasis on analytical techniques. Equivalent circuits for MEMS devices, noise analysis, and nonlinear phenomena will be discussed. Fabrication methods will cover bulk and surface micromachining techniques that rely heavily on VLSI processing. Process integration with existing device platforms and materials properties related to MEMS design and fabrication will be discussed. Numerous applications of MEMS technology to problems in science, engineering, and medicine will be presented and analysed.

***720 / Advanced Modeling of Semiconductor Device Fabrication / A. Knights**

This course will explore the physics and technology under-pinning the global semiconductor fabrication industry. The design of processes for nano-, micro- and opto-electronic devices will be covered with description of the fundamental models describing diffusion, ion implantation, polymer processing, thin film deposition and thin film growth. Students will be required to develop models from first principal, as well as design novel process strategies using the industrial compatible software 'Athena.' Emphasis on industrial practice will be made with description of six-sigma process development.

***721 / Lasers and Laser Physics / H.K. Haugen**

An introduction to steady-state theories of laser oscillators and amplifiers, spectroscopy of laser media, population inversion mechanism in gaseous and solid-state systems. Characterization of pulsing laser systems.

***723 / Semiconductor Diode Laser Physics / D.T. Cassidy**

An examination of the theory of operation, manufacture, and application of semiconductor diode lasers. Emphasis will be on InGaAsP diode lasers and the application of these devices in optical communication systems.

***726 / Optoelectronic Device Physics / P.E. Jessop**

Optoelectronic devices and the physics that governs their operation: the electro-optic, acousto-optic, and photoelastic effects; optics in semiconductors: free carrier effects, heterojunctions, quantum wells, electroabsorption; guided wave optics; optical modulators; photonic switching and optical interconnects; Fourier optics.

***728 / Luminescence and Point Defects in Solids / A.H. Kitai**

Fundamental theory of radiation will be introduced and described in quantum terms. The theory will be applied to practical Solid State emitters with emphasis on point defects and visible wavelength emission and the technologically important materials in light emitting diodes, powder phosphors and electroluminescent thin films will be discussed.

***729 / Thin Film Growth and Deposition / R. LaPierre**

Thin film growth and deposition including thermal evaporation, e-beam evaporation, sputtering, chemical vapour deposition and molecular beam epitaxy; thermodynamics and kinetics of film growth.

***730 / Thin Film Characterization / R. LaPierre**

Characterization techniques of organic and inorganic thin films, including x-ray and electron diffraction, electron microscopy, chemical analysis, ion beam analysis, and optical and electrical characterization methods.

733 / Industrial Project in Engineering Physics / Staff

A substantial project requiring the student to spend approximately four months in an industrial laboratory carrying out an approved project under the supervision of a suitably qualified staff scientist. The candidate is usually required to undertake some on-campus study in preparation for the industrial project. This course is available only to students in the M.Eng. (Industrial Internship) degree program in the department of Engineering Physics.

***734 / Nonlinear Optics / C-Q. Xu**

This course gives an introduction to the basic principles of nonlinear optics, which is useful in understanding the nonlinear optical effects involved in many modern photonic components and devices. It mainly includes a project and an oral examination.

***782 / Solid-State Electronics / P. Mascher**

Crystallography: binding and structure; free and nearly free electrons, energy bands; electronic aspects of semi-conductors: doping, carrier statistics; point defects; energy levels, atomic configuration, thermodynamics; experimental aspects of defect spectroscopy.

A selection of Nuclear Engineering related courses offered by other departments is given below.

ELECTRICAL AND COMPUTER ENGINEERING COURSES

***782 /** Dynamic Analysis of Power Systems

MATERIALS SCIENCE AND ENGINEERING COURSES

***6D03 /** Corrosion

MECHANICAL ENGINEERING COURSES

***706 /** Advanced Heat Transfer I

***707 /** Advanced Heat Transfer II

***708 /** Two-Phase Flow and Heat Transfer

***723 /** Flow Induced Vibrations

MEDICAL PHYSICS AND APPLIED RADIATION SCIENCES COURSES

***6R03 /** Radiation and Radioisotope Methodology

***771 /** Isotopes In-Vivo

***772 /** Medical Health Physics

***775 /** Advanced Radiation Physics

***776 /** Principles of Radiation Protection

Photonics and nano technology related courses offered by other departments include the following:

ELECTRICAL AND COMPUTER ENGINEERING COURSES

***740 /** Semiconductor Theory and Device Modeling

***741 /** Analog Integrated Circuits

***750 /** Advanced Engineering Electromagnetics

***754 /** Modeling and Simulation of Photonic Devices and Circuits I

***755 /** Modeling and Simulation of Photonic Devices and Circuits II

PHYSICS AND ASTRONOMY COURSES

***729 /** Condensed Matter Physics I

***730 /** Condensed Matter Physics II

***731 /** Condensed Matter Theory

+*734 / Special Topics in Condensed Matter Physics

***739 /** Advanced Quantum Mechanics I

***740 /** Advanced Quantum Mechanics II

Research in Engineering Physics

Research in the Department of Engineering Physics emphasizes new engineering disciplines that have emerged in recent years. In these high technology areas the link between engineering applications and basic science is particularly important. The research activities stress the fundamental physics that relates to the new technologies, as well as its application to practical engineering problems.

The department conducts research in three designated fields :

Photonics**Nano- and Micro-Device Engineering****Nuclear Engineering and Energy Systems**

Photonics research activities comprise a broad range of efforts in optoelectronic devices, materials processing, and laser physics and applications. Specific topics include, for example, semiconductor lasers, photo detectors, bio-sensor development, ultrafast phenomena and processes, display devices, planar light wave structures,

nonlinear photonic devices, and optical fiber technologies. Traditionally the department has been strongly focused on III-V semiconductors, but more recently have broadened the scope to research in silicon photonics. Overall the efforts in photonics interface closely with the work in nano- and micro- devices, and in addition link with new directions in energy systems.

Nano- and Micro-Device Engineering is based on a number of materials fabrication technologies, including molecular beam epitaxy (MBE), thin film deposition, plasma processing, and laser machining. The research is aimed at the development of devices for deployment in a number of industrial and medical sectors. The study of fundamental systems is often conducted in parallel with the engineering of targeted devices. Examples of research topics in this area include MEMS (Micro-Electro-Mechanical Systems), high temperature superconductors, microfluidics, defect spectroscopy, low dimensional quantum structures, and biological systems.

Nuclear Engineering and Energy Systems cover a wide range of areas related to long term sustainable energy including nuclear power and alternative energy sources. The specific research areas include nuclear reactor physics, plant thermohydraulics, critical heat flux, post-dryout heat transfer and rewetting mechanisms, reactor simulations and probabilistic methods, safety system performance, nuclear instrumentation, generation IV reactor designs, fusion technology, and photovoltaics. In addition to the facilities within Engineering Physics, there are opportunities for collaboration with other McMaster Engineering Departments in the areas of wind energy, fuel cells, and pollution control technologies. The NSERC/UNENE Chair and Associate Chair in Nuclear Safety Analysis are also located at McMaster University.

Research Facilities

The department benefits strongly from various McMaster institutes, schools, and facilities including the Centre for Emerging Device Technologies (CEDT), the Brockhouse Institute for Materials Research (BIMR), McMaster School of Biomedical Engineering, the McMaster Institute for Applied Radiation Sciences, and the McMaster Institute for Energy Studies. The technical capabilities available to our graduate students include, for example, "clean rooms" with industry standard capabilities, molecular beam epitaxy, chemical vapour deposition, nuclear radiation detectors, positron lifetime and Doppler-broadening systems, compact and high power lasers, and a wide host of analytical capabilities and data acquisition equipment. The McMaster Nuclear Reactor (5 MW) is located on campus and is the largest academic research reactor in Canada. This provides access to neutron and gamma beam ports, neutron irradiation and neutron activation analysis facilities, neutron radiography, and neutron flux mapping. In addition, there are also facilities for Critical Heat Flux and post-CHF heat transfer experiments, computation fluid dynamics modeling facilities, as well as a variety of numerical computing clusters. For full description of research facilities, please see individual web sites.

UNIVERSITY NETWORK OF EXCELLENCE IN NUCLEAR ENGINEERING (UNENE)

The University Network of Excellence in Nuclear Engineering (UNENE), created through the partnership of four leading Ontario universities, namely, McMaster University, Queen's University, University of Waterloo, and University of Western Ontario, presents a unique, innovative learning experience through a Master's Degree Program in Nuclear Engineering with emphasis on nuclear power reactor technology. UNENE is an alliance of universities, nuclear power utilities, research and regulatory agencies for the support and development of nuclear education, research and development capability in Canadian universities.

The UNENE program is designed to provide practicing engineers the enhanced knowledge, tools, technology as well as business and management skills, necessary to keep them at the forefront of their profession. The UNENE Master's Degree program has the enthusiastic endorsement of industrial partners OPG, AECL, Bruce Power, CNSC, CNS, NSS and COG.

McMaster University Faculty members within the Faculty of Engineering and the School of Business contribute to the extensive selection of UNENE course offerings.

UNENE requires an Honours or Four-Year degree in engineering, science or mathematics and a B- average or better. UNENE also considers any relevant work or research history. Meeting the minimum requirements does not guarantee acceptance.

Individuals who choose to apply for admission to McMaster University will, once their application is approved, be registered within the Department of Engineering Physics on a part-time basis. The Master's Degree awarded by McMaster will be a M.Eng. with a Nuclear Engineering designation.

Enquiries: 905 525-9140 ext. 24545

Fax: 905 527-8409

Email: unene@mcmaster.ca

Websites: <http://www.unene.ca>

<http://engphys.mcmaster.ca/graduate/unene.htm>

Courses

The format of the UNENE courses recognizes that the majority of students in UNENE hold full-time jobs in the nuclear industry. Live courses are typically presented in three to four alternate weekend sessions. The concept is to bring the courses to the students, so the location is chosen in an educational centre or appropriate facility near to where the majority of the students work. To cater for students working at sites remote from the GTA, courses can also be given using distance education tools, which in addition allows more flexibility in class scheduling. The course content and requirements are the same in both cases.

UN 0600 / Industrial Research Project, University of Western Ontario

If they so elect, candidates for the M.Eng. (Nuclear Engineering) Degree may spend approximately four months in an industrial laboratory carrying out an industry-oriented project under the supervision of a suitably qualified staff scientist. Usually there is also a university co-supervisor. The Department will attempt to arrange an industrial project in consultation with the candidate and through negotiation with the candidate's employer. A satisfactory project topic and appropriate arrangements are required for the project to be approved by the Department and it is possible that in some cases this may not be feasible. Upon completion, the candidate will submit a substantial report on the project and make a presentation on it at the university. The industrial research project can only be undertaken after at least half the required courses have been taken. The industrial research project counts as two half courses.

UN 0601 / Control, Instrumentation and Electrical Systems in CANDU based Nuclear Power Plants / J. Jiang

This course covers the basic control, instrumentation and electrical systems commonly found in CANDU based nuclear power plants. The course starts with an overall view of the dynamics associated with different parts of the plant, i.e. reactor, heat transport systems, moderator, steam generator, turbine, and electrical generator. Based on such knowledge, the control and regulation functions in the above systems are then defined. Different instrumentation and measurement techniques are examined, along with control strategies. The time and frequency domain performance characterizations of control loops are introduced with consideration of actuator and sensor limitations. Different controller design and tuning methods and instrumentation calibration procedures are discussed. Two modes of operation of CANDU plants will be analyzed, i.e. normal mode and alternate mode.

Advanced control technologies, such as distributed control systems, and Field bus communication protocols are introduced in view of their potential applications in the existing and newly constructed CANDU power plants. The electric systems in the CANDU plant will be examined. The modeling of the dynamics and control devices for the generator will be covered in detail. The dynamic interaction between the CANDU power plants and the rest of the electric power grid with other generating facilities and various types of load will be studied.

UN 0602 / Nuclear Fuel Waste Management / D. Shoemith

Presently, nuclear fuel waste management involves storage in water pools or dry storage containers at reactor sites. If the fuel is then defined as waste, permanent disposal at an appropriate deep geological site would be considered. This course will describe the physical and chemical properties of the fuel and these approaches to storage and disposal. Key features of the fuel include its chemical and physical structure and properties prior to, and after, in-reactor irradiation, the nature and distribution of radionuclides produced in-reactor, and the chemical and physical properties of the Zircaloy fuel cladding before and after in-reactor exposure. The principles behind pool and dry storage will be described including the design of storage containers and the chemical and corrosion processes that could influence their long-term integrity. The possible permanent disposal scenarios developed internationally will be discussed, with a primary emphasis on those potentially applicable in Canada. For this last topic, the design and fabrication of waste containers and the processes that could potentially lead to their failure, the properties of engineered barriers within the geological site, the essential geological features of the chosen site, and the computational modeling approaches used in site performance assessment calculations will be described.

UN 0603 / Project Management for Nuclear Engineers

Project Management is emerging as perhaps the key core competency in engineering in the 21st century industrial workplace. This course in Project Management will prepare nuclear engineers in the application of this discipline in their work. It is an intensive investigation into the major principles of Project Management slanted towards, but not exclusively about, the management of nuclear engineering projects. The course uses the Project Management Institute's PMBOK (Project Management Body of Knowledge) as a skeleton and expands that coverage with relevant examples from nuclear, software and general engineering. Special emphasis will be placed on Risk Management, particularly in the area of safety-critical projects. The graduate will be well-positioned both to apply the knowledge in their area of engineering and to sit the PMI's PMP examination. The course will be taught by a professional engineer holding the PMP certification, using many case studies from industry and engineering.

UN 0700 / Industrial Research Project, University of Waterloo

If they so elect, candidates for the M.Eng. (Nuclear Engineering) Degree may spend approximately four months in an industrial laboratory carrying out an industry-oriented project under the supervision of a suitably qualified staff scientist. Usually there is also a university co-supervisor. The Department will attempt to arrange an industrial project in consultation with the candidate and through negotiation with the candidate's employer. A satisfactory project topic and appropriate arrangements are required for the project to be approved by the Department and it is possible that in some cases this may not be feasible. Upon completion, the candidate will submit a substantial report on the project and make a presentation on it at the university. The industrial research project can only be undertaken after at least half the required courses have been taken. The industrial research project counts as two half courses.

UN 0701 / Engineering Risk and Reliability / M. Pandey

This course presents a broad treatment of the subject of engineering decision, risk, and reliability. Emphasis is on (1) the modeling of engineering problems and evaluation of systems performance under conditions of uncertainty; (2) risk-based approach to life-cycle management of engineering systems; (3) systematic development of design criteria, explicitly taking into account the significance of uncertainty; and (4) logical framework for risk assessment and risk-benefit tradeoffs in decision making. The necessary mathematical concepts are developed in the context of engineering problems. The main topics of discussion are: probability theory, statistical data analysis, component and system reliability concepts, time-dependent reliability analysis, computational methods, life-cycle optimization models and risk management in public policy.

UN 0702 / Power Plant Thermodynamics / R. Chaplin

Theoretical and practical analysis of the following with particular reference to CANDU plants. - Thermodynamic Cycles: Nuclear versus conventional steam cycles, regenerative feedwater heating, moisture separation and reheating, turbine expansion lines, heat balance diagrams, available energy, cycle efficiency and exergy analysis. - Nuclear Heat Removal: Heat conduction and convection in fuel rods and heat exchanger tubes, heat transfer in boilers and condensers, boiler influence on heat transport system, boiler swelling and shrinking, boiler level control, condenser performance. - Steam Turbine Operation: Turbine configuration, impulse and reaction blading, blade velocity diagrams, turbine seals and sealing systems, moisture in turbines, part load operation, back pressure effects, thermal effects and turbine governing.

UN 0800 / Industrial Research Project, McMaster University

If they so elect, candidates for the M.Eng. (Nuclear Engineering) Degree may spend approximately four months in an industrial laboratory carrying out an industry-oriented project under the supervision of a suitably qualified staff scientist. Usually there is also a university co-supervisor. The Department will attempt to arrange an industrial project in consultation with the candidate and through negotiation with the candidate's employer. A satisfactory project topic and appropriate arrangements are required for the project to be approved by the Department and it is possible that in some cases this may not be feasible. Upon completion, the candidate will submit a substantial report on the project and make a presentation on it at the university. The industrial research project can only be undertaken after at least half the required courses have been taken. The industrial research project counts as two half courses.

UN 0801 / Nuclear Power Plant Systems and Operations / G. Bereznoi

System and overall unit operations relevant to nuclear power plants; includes all major reactor and process systems; nuclear plant simulator; self-study using interactive CD-ROM. Two to three class one day meetings will be scheduled. "Equivalent to EP *6P03."

UN 0802 / Nuclear Reactor Analysis / E. Nichita

Introduction to nuclear energy; nuclear physics and chain reactions, reactor statics and kinetics; multi group analysis, core thermalhydraulics; reactor design. "Equivalent to EP *6D03."

UN 0803 / Nuclear Reactor Safety Design / V. Snell

Safety design and analysis of nuclear reactors based on deterministic and probabilistic assessments. Topics include: concepts of risk; probability tools and techniques; safety criteria; design basis accidents; risk assessment; safety analysis; safety system design; and general policy and principles. "Equivalent to EP *714."

UN 0804 / Nuclear Reactor Heat Transport System Design / N. Popov

This course covers the fundamentals of nuclear reactor heat transport system design for key reactor types, with emphasis on the CANDU and Light Water Reactor (PWR and BWR) designs. Theoretical tools and their application include reactor thermodynamics, single-phase and two-phase flow, heat and mass transfer, critical heat flux, pressure drop prediction, flow stability, design of reactor core, reactor vessel, steam generators and primary heat transport pumps. The course also covers experimental techniques, facilities and results. Course assignments are analytical problems related to these topics. Equivalent to Engineering Physics *716

UN 0805 / Radiation Health Risks and Benefits / Staff

This course is designed to introduce graduate students to recent advances in radiation biology that have direct impact on our understanding of the health risks associated with ionizing radiation. The course will focus on radiation absorption in living tissue and physical and biological processes that influence the consequences of the exposure. Students will learn about the biological effects from different radiation qualities, doses, and dose rates. The course will address cellular radiation damage and repair mechanisms and introduce students to modern techniques in molecular biology used in accident and emergency biological dosimetry. The material will relate to radiation applications in medicine and industry. No prior knowledge of biology at an advanced level is required.

UN 0900 / Industrial Research Project, Queen's University

If they so elect, candidates for the M.Eng. (Nuclear Engineering) Degree may spend approximately four months in an industrial laboratory carrying out an industry-oriented project under the supervision of a suitably qualified staff scientist. Usually there is also a university co-supervisor. The Department will attempt to arrange an industrial project in consultation with the candidate and through negotiation with the candidate's employer. A satisfactory project topic and appropriate arrangements are required for the project to be approved by the Department and it is possible that in some cases this may not be feasible. Upon completion, the candidate will submit a substantial report on the project and make a presentation on it at the university. The industrial research project can only be undertaken after at least half the required courses have been taken. The industrial research project counts as two half courses.

UN 0901 / Nuclear Materials / R. Holt

A nuclear reactor presents a unique environment in which materials must perform. In addition to the high temperatures and stresses to which materials are subjected in conventional applications, nuclear materials are subjected to various kinds of radiation which affect their performance, and often this dictates a requirement for a unique property (for example, a low cross section for thermal neutron absorption) that is not relevant in conventional applications. The effects of the radiation may be direct (e.g., the displacement of atoms from their normal positions by fast neutrons or fission fragments), or indirect (e.g., a more aggressive chemical environment caused by radiolytic decomposition). This course describes materials typically used in nuclear environments, the unique conditions to which they are subjected, the basic physical phenomena that affect their performance and the resulting design criteria for reactor components made from these materials.

UN 0902 / Fuel Management / Staff

Nuclear fuel cycles are studied from mining to ultimate disposal of the spent fuel, including the enrichment processes and the reprocessing techniques, from a point of view of the decision-making processes and the evaluation of the operational and economical consequences of these decisions. For the steps within the fuel cycles, the method of determining the associated costs, in particular those relevant to the disposal of nuclear waste, and the overall fuel cycle costs are

described. Burn-up calculations are performed for the swelling time of the fuel within the reactor core. The objectives and merits of in-core and out-of-core fuel management for CANDU Pressurized Heavy Water Reactors (PHWR) and Light Water Reactors (LWR) are analyzed in detail, for the refueling equilibrium as well as for the approach to refueling equilibrium. The course also covers fuel management for thorium-fuelled CANDU reactors and other advanced fuels such as MOX containing plutonium from discarded nuclear warheads, and DUPIC (Direct Use of PWR fuel in CANDU reactors). The fuel management problem is treated as an optimization problem, with objective functions or performance indexes identified, as well as decision variables and appropriate constraints (active and non-active). The course also includes a review of the major work done in this area along with the most important computer codes.

UN 1000 / Industrial Research Project, University of Toronto

If they so elect, candidates for the M. Eng. (Nuclear Engineering) Degree may spend approximately four months in an industrial laboratory carrying out an industry-oriented project under the supervision of a suitably qualified staff scientist. Usually there is also a university co-supervisor. The Department will attempt to arrange an industrial project in consultation with the candidate and through negotiation with the candidate's employer. A satisfactory project topic and appropriate arrangements are required for the project to be approved by the Department and it is possible that in some cases this may not be feasible. Upon completion, the candidate will submit a substantial report on the project and make a presentation on it at the university. The industrial research project can only be undertaken after at least half the required courses have been taken. The industrial research project counts as two half courses.

UN 1001 / Reactor Chemistry and Corrosion / D. Lister

Corrosion and its costs, corrosion measurement, general materials and environment affects. Types of corrosion: uniform, galvanic, crevice, pitting, intergranular, selective leaching, erosion-corrosion, stress-corrosion, hydrogen effects. Corrosion testing: materials selection. Electrochemical principles: thermodynamics, electrode kinetics, mixed potentials, practical applications. High temperature corrosion. Nuclear plant corrosion, fossil plant corrosion, other industrial environments.

ENGLISH

The Department of English and Cultural Studies offers programs leading to the M.A. and Ph.D. degrees in English. Completed applications should reach the Department not later than January 15th. Programs begin annually in September.

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Staff / Fall 2009

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Chauncey D. Wood, A.B. (Union College), M.A., Ph.D. (Princeton)

M.A. Degree

A candidate for the M.A. in English has two program options: (1) course work only, or (2) course work and a thesis. Candidates choosing the first option will complete four full graduate courses or their equivalent, three courses in the fall and winter terms and one course in the summer term, with grades of at least B- in each. Candidates choosing the second option will take two full graduate courses or their equivalent over the fall and winter terms, with grades of at least B- in each, write a satisfactory thesis of 25,000 words (100 pages), and successfully defend the thesis in an oral examination, which will normally take place in August or early September.

The M.A. degree normally requires one full year to complete. The minimum admission requirement is a four-year undergraduate degree with a major concentration in English, Cultural Studies or a related discipline, and with an average of B+ in at least 6 full (or their equivalent courses beyond the introductory level in English, Cultural Studies or the related discipline. In recent years, successful candidates have typically had averages in the A range in their upper-year English courses. Candidates who have not passed a full university course in a language other than English must pass a reading examination in such a language during the M.A. year.

Ph.D. Degree

The Ph.D. Degree Program normally entails four years of study. The admission requirement is an M.A. with marks of at least A- in two of three courses. In recent years, successful candidates typically achieved an average of A (at least 85%) in their upper-level undergraduate and M.A. coursework. In the first year of the program, Ph.D. candidates will successfully complete three full-year graduate courses or their equivalent.

The University regulations require that Ph.D. candidates take a Comprehensive Examination; in the English Department, this examination takes place in the second year of study. Ten areas of study have been defined by the Department of English and Cultural Studies:

1. Medieval Literature
2. Early Modern English Literature
3. Eighteenth-Century British Literature
4. Nineteenth-Century British Literature
5. Twentieth-Century British and Irish Literature
6. American Literature
7. Canadian Literature
8. Postcolonial Literature
9. Critical Theory
10. Cultural Studies

A Ph.D. candidate in English is required to take the Comprehensive Examination in the area, chosen from the above list, of her or his intended dissertation research. This will involve writing two papers, a Field Survey and a Topic Paper, and defending both in an Oral Examination. The Field Survey should show broad expertise in the wider field of knowledge the candidate's research will engage. The Topic Paper describes how the candidate's dissertation intervenes in that field and the particular contribution it will make. Both papers are to be researched and written concurrently by the candidate, are to be between 25 and 30 double-spaced pages in length, and are due no later than February 27 of the second year of study (i.e. at the beginning of the 5th term). The Oral Examination of both papers will follow within 10 days of submission. The candidate's mark in the Comprehensive Examination will be calculated on the average of the grades for the Field Survey, the Topic Paper, and the Oral Examination.

In addition, each Ph.D. candidate is required to complete a set of bibliographic workshops from the end of April to the end of May during the second year of the program. The workshops are designed as problem-based learning whereby students engage in research into bibliographical issues relevant to their dissertation field. Students must attend all of the workshops in order to receive a passing grade.

These workshops are meant to complement two other sets of professionalization programs in the Department: 1) pedagogical instruction conducted in the teaching workshops offered at the beginning of each year for all teaching assistants, in preparation for supervised tutorial work throughout the program; 2) the Professionalization Workshops given each year on writing grant proposals, writing thesis proposals, publishing articles and giving conference papers, CVs, job applications and interviews.

The Department also has a second-language requirement for the Ph.D. degree. Candidates who have not passed a full university course in a language other than English must complete such a course or pass a translation examination with the aid of a dictionary.

During the third and fourth year of the program, the candidate will write a scholarly thesis normally of between 200 and 250 pages (not including bibliography), and will defend it at an Oral Examination.

Courses

Required Course for All Graduate Students

All graduate students, including part-time students, must complete the course *SGS #101- Academic Research Integrity and Ethics* within the first twelve months after their admission to graduate studies at McMaster. The purpose of this course is to ensure that the standards and expectations of academic integrity and research ethics are communicated early and are understood by incoming students. A graduate student may not obtain a graduate degree at McMaster without having passed this course. In the event that a student fails this course, they must retake it at the earliest opportunity. The course description for *SGS #101* may be found in Section 11.

Ten full-year graduate courses or their equivalent are usually taught in a given year. Courses marked with an asterisk (*) are half courses. A more detailed description of those courses offered in the upcoming year can be obtained after April on the Department website.

STUDIES IN MEDIEVAL LITERATURE

710 / Old English / A. Savage

Areas covered include the emergence of Germanic languages; the structure of Old English (poetry and prose will be read in the original); theories of the existence and transmission of Old English "literature" before Anglo-Saxon literacy; the influence of oral on written language; the relationship between Latin and vernacular literature.

714 / The Romances / A. Savage

A study of representative English romances, 13th to 15th centuries, including indigenous as well as Arthurian and "Roman" matter. Generic forms are traced through the *chanson de geste*, Breton *lai*, chronicle, fabliau, and saint's legend, while themes analyzed include chivalry, hagiography, and courtly love.

718 / Women and the Book in the Middle Ages / C. Grisé

Medieval women were readers, patrons, translators, owners, and sometimes writers of books; their contributions to literary production and reception challenge our modern notions of literature and literary culture. This course will examine several aspects of medieval literary production and reception, considering the ways in which gender, literacy, class, sexuality, and life choices influenced women's relationships to the medieval book.

*740 / Medieval Discourses of the Self, 1000-1200

/ B. Kaczynski, A. Savage (*Same as History *740*)

An interdisciplinary seminar, designed for students interested in a range of theoretical approaches to the past. We will examine a series of problematic medieval texts as contested sites of medieval selfhood: the correspondence of Heloise and Abelard, the writings of Hildegard of Bingen, Andreas Capellanus' *The Art of Courtly Love*, and Geoffrey de Monmouth's *History of the Kings of Britain*.

STUDIES IN EARLY MODERN LITERATURE

721 / The Self and Other in Elizabethan Poetry / M. Silcox

An exploration of the formation and representation of selves in poetry of the late sixteenth century. Beginning with the relationship between writer and culture, we then discuss how signifying systems such as genre, language and style become the means by which issues of gender, politics and subjectivity develop. Genres such as sonnet sequence, epyllion, satire, pastoral, epideictic (focusing upon Elizabeth I), historical, complaint, and religious verse will be included.

***723 / Ways of Knowing: Representations of Magic in Shakespeare and his Contemporaries / H. Ostovich**

This study of English drama and history examines how Shakespeare and his fellow playwrights understood knowledge, whether through religion, folklore, politics, or science. How did people in early modern England represent and come to terms with “reality” and the apparently impossible? Can thinking — for good or for ill — produce tangible and material changes in day-to-day life? Does discourse produce levels of ‘reality’? How did theatre help to explain the unexplainable?

732 / Ben Jonson in Context: Gender, Transgression, and Social Identity in the Plays of Jonson and his Contemporaries / H. Ostovich

This course offers a chronological reading of Jonson's plays and masques, along with plays by his contemporaries, with a focus on gender, transgression, and social identity. The range of study includes influences on Jonsonian drama, stage history and theatrical performance, and satirical tactics and targets.

***733 / Gender, Transgression, and Social Identity in Early Modern Comedy / H. Ostovich**

Should society aim at greater toleration or more stringent controls? Jonson, Middleton, Chapman, and others suggest answers in explorations of marriage, gang-formation, social-climbing, capitalism, cross-dressing, consumerism, and fraud, including abuses of learning (witchcraft), law (manipulative contracts), and faith (puritanism). This course focuses on how comedy depicts ways of projecting, containing, and coping with social change.

***734 / Gendered Authorship in Early Modern England / M. Gough**

This course will explore whether and how gender may have made a difference in the production and consumption of early modern English literature and theatre, whether there really was a Renaissance for women — women writers in particular. Examining a variety of texts and genres (poems, popular plays, closet dramas, masques, pamphlets, and translations), this course will compare early modern English women's cultural production and consumption with its continental counterparts.

***735 / Figuring the Nation in Early Modern England / M. Gough**

Studying proto-nationalism in early modern England canonical and non-canonical literature, this course will address issues of manuscript vs. print circulation; the Elizabethan writing of “English literature” as a concept and body of canonical writings; the interplay between early modern English statecraft, imperialism, dynastic monarchy, and religious identity; the role of gender ideology and proto-racialization in the formation of a national English literature; and/or contribution of public and private theatre to early modern nation building.

***736 / Rhetoric and Subject in Early Modern Devotional Poetry / M. Silcox**

This course will explore relationships between language — particularly as it is schematized in rhetoric — and subjectivity in early modern devotional poetry. Drawing on various theoretical models of religious subjectivity, we will consider such topics as: vocabularies of the inner life; the influence of rhetorical notions of the poet; the construction, reconstruction and deconstruction of relationships with God and society; the gender of devotion to God; and the effects of sectarian and political allegiances on religious poetry.

***737 / Speaking Pictures: Emblems, Metaphor and Language in Early Modern Writing / M. Silcox**

Metaphor, crucial to what language is and how it operates, is the basis for an interpretive understanding of the world. Early modern emblems embody a metaphoric process that permeated the writing of the time and exemplify the culture's relation to the symbolic. Exploring metaphor in the works of paired emblematisers and poets, we will consider topics such as early modern concepts of language, knowledge, mimesis, the relationship between the concrete and the abstract, and the relationship between the individual mind and the world.

***752 / Making History and the History Play: Early Modern Repertory and the Queen's Men / H. Ostovich**

This course examines the repertory of the Queen's men, the theatre company patronized by Elizabeth I, 1583-1603, and their impact on Shakespeare and other playwrights of comedy, romance, and history plays.

***753 / Rethinking the Renaissance: The Faerie Queene / M. Gough**

Topics may include genre, allegory and allegoresis, gender and sexuality, empire, and colonialism. Spenser scholarship will also introduce us to the “new” Renaissance Studies.

***763 / Studying the Book Before 1800 / C. Gris **

This course provides a thorough grounding for students in early primary source research—history, theory, criticism, and practice. Students develop a survey of cultural production and reception through to 1800 as well as examine specific aspects of this tradition through readings, case studies, and student work. Students design an individual research project on a primary text (or group of texts) of their own choosing from the Middle Ages to the eighteenth century.

STUDIES IN EIGHTEENTH-CENTURY BRITISH LITERATURE***743 / The Eighteenth Century Novel**

This course traces the eighteenth century novel's cultural impact as an innovative and infinitely malleable genre that radically transformed the way texts about the human subject were written. We will explore diverse novelistic genres specific to the period: the epistolary novel, the travel narrative, the novel of sensibility, and the commodity narrative.

***747 / Discourses of Empire 1700-1820 / P. Walmsley (Same as CSCT *747 and Globalization *747)**

This course will consider how British and Colonial literatures articulated the process of forging a world empire. Our central project will be to map the shifting identities of self and other, and metropolis and colony, throughout the eighteenth century. We will read a wide range of texts—not only novels and poems representing imperial encounters, but also travel books and early slave narratives—and the course will provide ample opportunity for reference to McMaster's rich collection of books and periodicals from this period.

***748 / The Invention of Britain / P. Walmsley**

This course will consider how literature of the eighteenth century expressed a radically new nationalism in step with Britain's rise as a modern imperial nation-state. We will look at a wide range of texts — literary criticism, essays, utopias, novels, poems, travel books, political tracts, and economic treatises — and we will consider such issues as the renewed importance of pastoral, the sustained resistance of Scottish ethnicity, the articulation of an English literary heritage, and elevation of women within the national allegory of progress.

***749 / Getting and Spending: The Birth of Consumer Culture / P. Walmsley (Same as CSCT *749)**

This course will consider how eighteenth-century British and Colonial literatures articulate the opportunities and the dangers of an emergent consumer culture, focusing on ideas of money, luxury, shopping and labour.

STUDIES IN NINETEENTH-CENTURY BRITISH LITERATURE***705 / Comparative Studies in Nineteenth Century Literature I / J. Adamson**

This course will focus on literary works—fiction, poetry, and essays — by some of the most important writers of the first half of the nineteenth century. The approach will make an eclectic use of theory and methodology, but will be based, above all, on an understanding of the works in terms of their metaphoric and narrative structure, as well as their affective and ideo-affective significance. A list of helpful theoretical readings will be provided.

***750 / Gothic, Sensation and Victorian Discourses of the Body / G. Kehler (Same as CSCT *750)**

This three-unit course will explore the diversity in sensational and gothic treatments of bodies, bodies both literal and metaphoric, individual and collective, normative and "diseased." In particular, Gothic and Sensation writing compulsively explores (figures of) physicality as a means to interrogate the legitimate or desired composition of family and nation.

***759 / Victorian Natures / G. Kehler (Same as CSCT *759)**

This course relies equally on Victorian texts and current criticism to investigate British successes and failures in coming to terms with "nature," both theirs and others'.

STUDIES IN TWENTIETH-CENTURY BRITISH AND IRISH LITERATURE

***762 / Queer Historicisms and British Cultural Memory / S. Brophy (Same as CSCT *762)**

A critical examination of British queer film and fiction since the 1980s. Diverse approaches to representing the historical will be explored in light of queer theory and diaspora/postcolonial theory.

***793 / Oh Behave! Post-war Sexualities / S. Brophy (Same as CSCT *793)**

A critical study of sexualities in British film, fiction, and culture of the 1950s and 60s. We will consider how key figures such as the teenager, the working woman, the single mother, the migrant, the homosexual, the servant, the playboy, and the secret agent mediated a rapidly transforming post-war social landscape.

STUDIES IN AMERICAN LITERATURE

***772 / American Poetry / J. Donaldson**

This course offers a consideration of a limited selection of representative American poets from 1850 to the present. The focus in any particular term will be on one or another specific historical period, thematic or formal concern, within this range.

773 / American "Minority" Writing / D. Goellnicht

A study of selected prose fictions by twentieth century writers from two prominent "minority" groups: North Americans of African and Asian origin. How the cultural experiences and expressions of these two groups overlap and differ will be given close attention, along with issues of race, gender, class, multiculturalism, and canon formation.

775 / Gender, Modernism and Modernity: American Women Writers / M. O'Connor

This course will explore American women's writing primarily of the 1920s and 30s in order to reconsider women's roles in modernism. Major areas of investigation will include ideas of modernity and modernism, commodity culture, women's labour, race, and sexuality. The course will focus on novels, stories, poetry and life writing, but it will also use photography and art for comparative artistic languages.

***798 / Language and Metaphor / J. Donaldson**

A study of language modes and metaphor. The focus will be on the varying impact of metaphoric expression among descriptive, conceptual, rhetorical, and imaginative modes of language. Our treatment will touch on a variety of related areas of interdisciplinary study, including but not limited to cognitive theories of mind, biology, evolutionary theory, grammar and linguistics, genre theory, and the visual arts.

STUDIES IN CANADIAN LITERATURE

***760 / White Civility: The Literary Project of English Canada / D. Coleman**

This course studies early Canadian literary and social texts in order to understand how dominant categories such as whiteness and Britishness were created and naturalized as normative in Canadian culture.

***761 / Framing CanLit / D. Coleman (Same as CSCT *761)**

This seminar focuses on the interpretive frameworks we bring to our interpretations of Canadian texts by asking students to select specific critical or theoretical perspectives and explain why they are crucial or important for reading texts that have become canonical to "CanLit."

***771 / Canadian Literary Celebrity / L. York (Same as CSCT *771)**

This seminar investigates the workings of celebrity in the contemporary Canadian literary arena, focusing on the relationship between the marketplace and literary value.

780 / Writing Ethnicity and the Canadian Nation / D. Coleman

This seminar traces a genealogy of Canadian ethnic literary history, beginning with the construction of Anglo-Canadian normativity in fiction by writers of British descent around the turn of the century and then examining how "third solitude" writers have challenged and diversified concepts of the Canadian nation from the 1914-1918 War to the present.

***781 / Debating Canadian Multiculturalism: Literary Production and Cultural Politics / D. Coleman**

This course examines the volatile debates in cultural politics over the function and effects of Canada's official multicultural policy. Reading a wide range of contributors to these debates in relation to two anthologies organized around the rubric of multiculturalism -- Linda Hutcheon and Marion Richmond's *Other Solitudes: Canadian Multicultural Fictions* and Smaro Kamboureli's *Making a Difference: Canadian Multicultural Literature* -- we will attempt to assess the gains, losses, inclusions, and exclusions of national multiculturalism.

782 / Contemporary Canadian Poetry / L. York

This course engages various theoretical frameworks for the study of contemporary Canadian poetry. Issues of concern will include: canonicity, gender, ethnicity, sexual orientation, post-colonialism, and identity politics.

783 / Novels of the Margin / R. Hyman

This course considers the continuing dialectic in the twentieth century Canadian novel between types of "peripheries", geographical, political, sexual, ethnic, racial, and religious, and the various "centres" of power on which they are dependent.

STUDIES IN POST-COLONIAL LITERATURE

***738 / Intra-African Mobilities: Contemporary African Cultural Production / H. Strauss (Same as CSCT *738 and Globalization *738)**

This course examines contemporary African cultural texts that explore the intra-African circulation of ideas and people from the time of the Trans-Atlantic slave trade to the present. We will identify some of the specific contributions that African narratives of mobility and migration make to discourses of internationalism, diaspora and globalization.

***742 / Mapping South Asian Masculinities / C. Chakraborty (Same as CSCT *742)**

This course focuses on masculinities in moments of conflict and crisis in South Asia to explore how masculinities are embedded in and enable the operation of large scale political-historical projects/processes such as colonial rule, nation-formation, construction of civil society and religious fundamentalism. Reading South Asian literary and cinematic texts, it will examine masculinities in articulated relation to other social categories: among them, caste, class, religion, ethnicity and sexuality.

***746 / Reading Sex and Sexuality in Post-Apartheid South Africa / H. Strauss (Same as CSCT *746)**

This course enters into conversation with an emergent post-apartheid South African literature on sex and sexuality. We will read a range of cultural and theoretical texts in an effort to examine, in the words of Foucault, "the regime of power-knowledge-pleasure that sustains the discourse on human sexuality" in contemporary South Africa.

***784 / Decolonizing Bodies / C. Chakraborty
(Same as CSCT *784 and Globalization *784)**

An examination of the representations of the body in postcolonial literary and visual texts from Africa and South Asia.

***787 / Post-colonial Ecologies / S. O'Brien
(Same as CSCT *787 and Globalization *787)**

This course will consider issues central to ecocritical and post-colonial theories, with a specific focus on topics of language, political sovereignty and the relationship between "self" and "other" in contemporary post-colonial English literature.

***788 / Writing Diaspora: Literature, Community, and Displacement / D. Coleman
(Same as CSCT *788 and Globalization *788)**

This course examines critical debates in contemporary cultural studies over the best way(s) to conceptualize the experiences of people who have left their places of birth or places of cultural origin in an era of "globalization." It examines the representation of these experiences in literary works (memoirs, short stories, poems, and novels) by M.G. Vassanji and Dionne Brand about people who move between cultural locations on the assumption that literary works condense and intensify the questions and problems that characterize such cross-cultural movements.

***789 / Studies in Asian North American Literature, Culture, and Identity / D. Goellnicht (Same as CSCT *789)**

This course examines selected topics (e.g. national versus transnational/diasporic subjectivities, gender formation) in Asian American and/or Asian Canadian literature and culture, with a focus on issues of identity. The specific topics will vary from year to year.

STUDIES IN CRITICAL THEORY AND CULTURAL STUDIES

***700 / Emotion and Culture / J. Adamson**

An exploration of the affect theory elaborated in Silvan Tomkins's massive four-volume work *Imagery, Affect, Consciousness* and the ways in which it might be fruitfully applied to literary and cultural analysis. The first part of the course will examine Tomkins's hypothesis concerning the psychological nature of ideo-affective positions, while the second part of the course will involve an application of affect theory to George Eliot's *The Mill on the Floss*, after which students will extend this analysis to an author or work of their own choice.

***701 / Visionary Women / C. Grisé**

This course explores the writings of women who can be defined as visionaries based on their feminist, religious, scientific, philosophical, or social vision. Starting with medieval religious visionaries, we will then examine writings that promote social change or envision a world or society in a new way. We will cover writings from a variety of historical periods and genres first of all to assess what kinds of visions women have produced through history, and then to evaluate their ability to reconceive the world around them.

***704 / Contemporary Women's Collaborative Writing / L. York
(Same as CSCT *709)**

This course examines collaborative writing by women, particularly the overt co-authorship or co-signature of women's texts. A substantial part of the course will be devoted to theoretical discussions of authorship and collaborative writing, since one of the main aims of the course will be to assess the implications of this mode of writing for existing theories of authorship. Other relevant questions will include: Are women's collaborative texts necessarily subversive, or do they harbour various ideological potentials and power relations? How can difference operate in a textual venture that has traditionally been described in terms of cooperation and mutuality?

***708 / Marxist Cultural Criticism / I. Szemán
(Same as CSCT *708)**

An introduction to Marxist cultural criticism through a careful consideration of such figures as Marx, Gramsci, Benjamin, Althusser, Williams, Jameson and Zizek.

***709 / Globalization and Culture / I. Szeman
(Same as CSCT *710 and Globalization *709)**

Over the past decade, almost everyone engaged in literary and cultural studies has had to assess the implications of globalization for their various disciplinary practices. In particular, globalization has meant that a wide range of academic practices have had to confront the artificiality of the 'nation' as the apparently natural space in which cultural objects are produced, given meaning, and interpreted. This course offers a comprehensive introduction to and exploration of debates over the role and function of culture in the era of globalization.

***711 / Celebrity/Culture / L. York (Same as CSCT *711)**

This course engages the pervasive phenomenon of celebrity and poses questions about its operations in the field of culture. It will focus on influential theories of stardom and ideology, power, and cultural value that see celebrity operating variously within culture, and audiences, in turn, acting and signifying upon celebrity. Students will be encouraged to develop a framework for using a specific study of a celebrity or celebrity phenomenon to assess theoretical texts. This course will consider the workings of celebrity in academia.

***712 / Childhood in Cultural Theory and Popular Culture / S. Brophy (Same as CSCT *712)**

Childhood is a contested site of symbolic, moral, and material investment in contemporary culture. Focusing on three topics — gender and sexuality, delinquency, and consumption — and with reference to a variety of media, we will consider how cultural theory questions the governing myths of childhood and attempts to theorize children as cultural agents.

***715 / Modern and Post Modern Slavery / S. Searls Giroux
(Same as CSCT *715)**

Although most people consider slavery to be a historical aberration confined to the distant past, the practice of enslaving people by violence and by holding them against their will continues to the present. This course offers a critical and historical investigation of the economic and political conditions of slavery, as well as the broader socio-cultural contexts that enable and legitimate its ongoing existence.

***717 / Global Sex / S. Searls Giroux (Same as CSCT *717)**

This course explores the culture of neoliberalism in terms of its specifically gendered dynamics. It will engage three related moments that map the transformation of human relations, moving out from the most intimate of human bonds to the broadly political: (1) the shifting nature of human connectedness — of intimacy, family, community, national unity; (2) the commodification of sexual relations recast as sexual revolution for some, sexual slavery for others; and (3) the emergence of rigidly fundamentalist and patriarchal discourses globally.

***719 / Public Intellectuals and Their Work: Intellectual Practices in Culture and Power / H. Giroux (Same as CSCT *719)**

This course will examine the role of a select group of academics who have become known in the dominant media in the United States as engaged public intellectuals. It will focus on the political rationale for their work, the institutional conditions that make such work possible, and how the work functions as a particular form of intellectual practice and mode of cultural politics. The work of a number of public intellectuals will be examined, including that of Cornel West, Arundhati Roy, Pierre Bourdieu, Edward Said, and Michael Dyson.

***726 / Narrative Theory / J. Donaldson**

This course offers an investigation into narrative theory from early classical antecedents to the present time. On the one hand, we will focus on narrative form and narrative kinds (mythoi and genres) and on the other hand on the ontology of words in sequence, on the illusion of consecutive prose, and on the larger implications of temporal verbal relationships, as for instance in the theory of typology and the meta-literary conditions of echo and allusion.

***727 / The New Constellation of Race: Sovereignty, Citizenship, Social Death / S. Searls Giroux
(Same as CSCT *727 and Globalization *727)**

This course seeks to map the new trajectories of race theory in a post-civil rights, post-apartheid, post 9/11 world.

***729 / Cultural Studies and the Politics of Cultural Pedagogy / H. Giroux (Same as CSCT *729)**

This course will examine the intersection of cultural studies and critical education in both the early and later work of a prominent number of cultural studies theorists and educational theorists. The course will examine the primacy of pedagogy in the early work of prominent cultural studies theorists such as Raymond Williams, Stuart Hall, and Paul Willis and how such work not only provided a way to make the political more pedagogical but also gestured towards connecting work in higher education with a broader set of social issues and public commitments.

***731 / Anxiety Disorders: The Cultural Politics of Crisis / S. O'Brien (Same as CSCT *731)**

This course will investigate how literature, cultural studies and critical theory have grappled with the imaginary limits of late capitalist culture.

***739 / The Archive and Everyday Life / M. O'Connor
(Same as CSCT *739)**

An exploration of the intersecting fields of archive theory and everyday life theory and an examination of the practice of archival work in selected artists, writers and scholars.

***764 / A Problem Like Maria / C. Grisé**

Examines literary depictions of nuns from the Middle Ages to today, exploring larger cultural and theoretical questions of gender, the body, sexuality, race and national identity, and space.

***765 / Biopolitics: An Introduction / H. Giroux
(Same as CSCT *765)**

This course will analyze how the concept of biopolitics is developed in the work of some of its major theorists and what the relevance of this work might be for constructing a new understanding of a publicly engaged notion of theory and social change.

***766 / Feminist and Queer Theory / M. Gough
(Same as CSCT *766)**

This seminar sets out to imagine effective ways for feminism and queer theory to meet, ally, and perhaps intermingle. We will read "foundational" texts that unite the two fields; examine areas of distinction between the two discourses; discuss key topics, such as normativity and identity, about which both feminist and queer theorists have had important things to say; and ask how feminist and queer theorists separately and together make effective interventions across the fields of race and postcolonial studies, gender theory, and theories of sexuality.

***767 / Regarding Animals: Theories of Non-Human Life / D. Clark
(Same as CSCT *767)**

This course explores the question of the otherness of non-human animals through a reading of twentieth- and twenty-first century theory and philosophy.

***768 / Modernism, Orientalism and the Representation of Post-War Japan in Cinema / J. King
(Same as CSCT *768)**

This course will be devoted to representations of post-war Japan in both Japanese and American/European cinema. Japanese attempts to deal with the aftershocks of war in modernist films will then be compared to western representations.

***769 / Science Fiction: Mindworlds and the Boundaries of the Human / A. Savage (Same as CSCT *769)**

Speculative fiction explores the multiple ways in which boundaries are breached by imagination and science. This course examines dissolving or movable boundaries in a variety of fictions, sites, or technologies, including neuroscience, philosophy, virtual worlds, cybernetics, and intra-species relations.

***771 / Canadian Literary Celebrity / L. York (Same as CSCT *771)**

This seminar investigates the workings of celebrity in the contemporary Canadian literary arena, focusing on the relationship between the marketplace and literary value.

***774 / Derrida's Wake: On The Futures of Deconstruction / D. Clark (Same as CSCT *774)**

How does one say *adieu* to Jacques Derrida? Exploring the legacies of Derrida's life and work, this course is organized around five overlapping questions: mourning, responsibility, democracy, justice, and animality. We will read materials from thinkers with whom his writings are in a critical dialogue, including Marx, Levinas, Kant, and Benjamin.

***776 / Racial Formation: Selected U.S. Projects / D. Goellnicht
(Same as CSCT *776)**

Drawing on recent theories of racial formation, this course examines a number of significant moments in American racial history with the aim of understanding some of the complex ways in which "race" has operated, and continues to operate, as a discursive system that has profound material effects on the lives of Americans.

***777 / Karl Marx / I. Szemán**

A detailed examination of the work of Karl Marx, beginning with his earliest writings and ending with *Capital*, as well as contemporary work dealing with Marx's thought such as work by Negri, Derrida or Balibar.

***779 / The Times We Live In / S. O'Brien
(Same as CSCT *779 and Globalization *779)**

This course looks at changing conceptions of time in the late 20th/early 21st century in the context of globalization. We will survey a range of literary texts, films and social movements (e.g., Slow Food) that explore ideas about temporality, with a focus on the ways in which culture resists and/or supports such trends as acceleration, synchronization and the erosion of boundaries between private and public time.

***791 / Rethinking Politics: Thinking Past War, Democracy, and Terror / H. Giroux (Same as CSCT *791)**

This seminar addresses how the notion of politics is being redefined within a changing global public sphere. How politics is addressed is central to matters of agency, social justice, as well as notions of individual and collective struggle. The course attempts to understand how politics is being addressed as a site of struggle through various deployments around race, globalization, education, and resistance.

***792 / The Literary and Cultural Theory of Northrop Frye / J. Adamson**

This course will explore the work of Northrop Frye by comparing three of the major works he wrote in the course of his career: *Anatomy of Criticism* (1957), *The Secular Scripture* (1976), and *Words with Power* (1990). This material will be supplemented by excerpts from *The Great Code*, from various essay collections, and new material from *The Collected Works*. Along with a careful definition of the most important concepts of Frye's thought, the class will focus on some of the more notable philosophical sources assimilated in his work.

***795 / Living with HIV/AIDS: On the Discourses of the Pandemic / D. Clark**

The objective of this course will be rigorously and responsibly to reflect upon the work of writing and reading narratives in the midst of the AIDS pandemic, this, through a careful consideration of selections from the proliferating archive by which HIV and AIDS is conceptualized, witnessed, and experienced. In particular, we will examine a range of recent theoretical discussions and memoirs by activists, caregivers, and people living with AIDS, each of which differently grapples with what Eve Sedgwick has called "the terrible accident" of HIV.

FRENCH

The Department of French offers graduate work leading to the M.A. degree in French Language and Literature.

The French Department offers a new area of concentration, "Francophonie et diversité."

Enquiries should be addressed to the Administrative Secretary of the Department of French, 905 525-9140 Ext. 24470

E-mail: fredept@mcmaster.ca

Website: <http://www.humanities.mcmaster.ca/~french/frenhome.htm>

Staff / Fall 2009**PROFESSORS**

Marie-Madeleine Ahmed, L. ès L., M. ès L., D. de l'U. (Sorbonne) / Chair

Suzanne Crosta, B.A., M.A. (McMaster), Ph.D. (Toronto)

William F. Hanley, B.A. (Toronto), M. ès L. (Sorbonne), D.Phil. (Oxford)

ASSOCIATE PROFESSORS

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Gabriel Moyal, B.A. (McGill), M.A., Ph.D. (Toronto)

Anna St. Leger Lucas, B.A. (Nottingham), M.A., Ph.D. (British Columbia)

Alexandre Sévigny, B.A. (York), M.A., Ph.D. (Toronto)

John C. Stout, B.A. (British Columbia), Ph.D. (Princeton)

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Stéphanie Posthumus, B.A. (Calvin College), M.A. (Queen's), Ph.D. (Western Ontario)

Jane A.C. Rush, B.A. (Toronto), M.A., Ph.D. (U.C.L.A.)

Nicholas Serruys, B.A., M.A. (Western), Ph.D. (Toronto)

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Pierre M. Conlon, B.A., M.A. (Auckland), D. de l'U. (Paris),

D. Litt. (McMaster), F.R.S.C.

Madeleine Jeay, L. ès L. (Bordeaux), M.A., Ph.D. (Montréal)

Owen R. Morgan, B.A., M.A. (Nottingham)

César Rouben, L. ès L. (Sorbonne), B.A. (Sir George Williams), M.A., Ph.D. (McGill)

M.A. Degree

The following programs are available for the M.A. in French on a full- or part-time basis. Admission requirements conform to the general University regulations. Applicants whose specialization is in linguistics, French or Francophone Literatures, translation, intermedialities (relationship between literature, the arts and other disciplines) and related areas are encouraged to apply to the M.A. program. The M.A. degree normally requires a full year to complete.

A. M.A. WITH THESIS

The candidate is required:

1. to obtain a grade of at least B- in each of *four* half courses. Exceptionally, after consultation with the Department, one graduate course at the 700-level may be taken outside of the Department in a related subject.
2. to write, under the supervision of a member of the Department, a thesis that would normally amount to 80-120 double-spaced typewritten pages. The thesis should be on an approved subject, embodying the results of original research and showing independent critical judgement. The student must successfully defend this thesis at an oral examination normally conducted in French.

B. M.A. WITH PROJECT

The candidate is required:

1. to obtain a grade of at least B- in each of *six* half courses. Exceptionally, after consultation with the Department, one graduate course at the 700-level may be taken outside of the Department in a related subject.
2. and to write in French, under the supervision of a member of the Department, a project that would normally consist of an essay amounting to approximately 25 double-spaced typewritten pages. The project must be on an approved subject. The student must successfully defend this project at an oral examination conducted in French.

Additionally, all M.A. students must pass the workshop on **Instruments and Methods of Research in French Literary Studies**. This compulsory workshop introduces students to the methods of bibliography. A "Pass" or "Fail" will be recorded on students' transcripts for the workshop.

With the approval of the Graduate Program Committee a student may select a course of study under French *730 Reading Course.

Registration in Program

By January 15 of the academic year of initial registration, full-time graduate students must declare their choice of Program A or B. Students opting for Program A must have a thesis subject and thesis committee approved by January 31. Students opting for Program B must have their project subject or comprehensive subject areas as well as their examining committees approved by April 15.

Part-time graduate students must declare their choice of Program A (M.A. with Thesis) or B (M.A. with Project) on completion of four half courses and must, before registering in their final courses, have their thesis subject, project or comprehensive subject areas, and examining committee approved by the Department.

Courses

All of our graduate courses are half courses. The definitive list of courses offered during each academic year will be made available the previous Spring. Please consult the Department or its website. The following courses are offered for graduate credit only.

*701 / La poésie française contemporaine / J. Stout, A. St. Leger Lucas

Grâce au développement du modernisme et du postmodernisme en France, les poètes ont pu découvrir une grande diversité d'approches à l'expression de la subjectivité et à l'exploration du langage. Nous étudierons les stratégies textuelles que les poètes ont employées afin de changer l'espace de la page tout en repensant ce qui constitue la subjectivité lyrique.

*702 / Sociolinguistique et francophonie / Staff

Après une définition socio-historique du concept de francophonie, nous examinerons le statut, les usages et les fonctions du français dans diverses situations tirées de l'espace francophone mondial. Ceci nous permettra d'aborder certaines notions sociolinguistiques telles que la diglossie, la véhicularisation, l'aménagement des langues et les politiques linguistiques. Sous l'effet du contact interlinguistique, on constate l'émergence de nouvelles variétés de français qui remettent en question le concept de norme unique et centralisatrice. De ce fait, nous essaierons de voir quels préjugés ou attitudes peuvent être associés à ces variétés régionales ou minoritaires.

*706 / Le corps dans le texte français pré-révolutionnaire / J. Rush

Suite aux recherches de M. Bakhtine sur le carnavalesque, une nouvelle critique s'est penchée, entre autres, sur l'importance du corps. La période qui suit les nouvelles découvertes scientifiques sur la reproduction produit un nombre important de textes littéraires pré-révolutionnaires qui accentuent le corps et la sexualité. Ce cours se propose d'examiner des textes marqués du signe de l'hybridation, textes où le littéraire s'imbrique dans le médical et le biologique, le politique et le philosophique. Qu'il s'agisse des oeuvres d'un Diderot, d'un Venette ou d'un Montesquieu, ces textes hybrides présentent le corps comme lieu expérimental de séduction, d'exotisme et de libertinage, mais également comme centre d'investigation biologique, médicale et philosophique.

*709 / Pragmatique / M. Kliffer

La pragmatique porte sur le lien entre le code linguistique (grammaire et sens) et les utilisations du langage, familières comme littéraires. Le pragmaticien examine les intentions des locuteurs, les significations implicites, l'organisation du discours, le point de vue, ainsi que d'autres domaines se prêtant à la formulation de principes généraux plutôt qu'à des règles catégoriques. Nous étudierons surtout les apports de la théorie française de l'énonciation (Benveniste, Ducrot.). Quoiqu'elle ne constitue pas une composante linguistique bien définie comme la phonologie ou la syntaxe, la pragmatique est néanmoins indispensable à une théorie compréhensive du langage.

*711 / Voltaire et son siècle / W. Hanley

Au Siècle des Lumières, la littérature française pose les jalons de la notion de diversité philosophique, politique et sociale. Parmi les philosophes de cette époque qui ont embrassé le plus vigoureusement cette perspective figurait Voltaire. Dans ce cours, nous abordons les questions les plus fondamentales de cette nouvelle façon d'envisager le monde. En examinant les textes de cet écrivain, nous explorons la pensée du XVIII^e siècle et ses répercussions dans le monde occidental.

*712 / Lire le Moyen âge. Entre quête d'origine et découverte d'une altérité: XIIe et XIIIe siècles / Staff

La fascination que le Moyen âge exerce dans la culture populaire traduit autant la quête d'une origine mythique que la découverte d'une altérité. À partir d'une oeuvre étudiée en profondeur, on se propose de réfléchir à la problématique du statut de la littérature du Moyen âge autour du thème fondamental de la relation à l'autre (femme, animal, étranger) à travers une conception propre de l'amour et de l'érotisme, mais aussi la tentation de la misogynie et de la violence.

*713 / Lire le Moyen âge. Entre quête d'origine et découverte d'une altérité: XIVe et XVe siècles / Staff

La fascination que le Moyen âge exerce dans la culture populaire traduit autant la quête d'une origine mythique que la découverte d'une altérité. À partir d'une oeuvre étudiée en profondeur, on se propose de réfléchir à la problématique du statut de la littérature du Moyen âge autour du thème fondamental de la relation à l'autre (femme, animal, étranger) à travers une conception propre de l'amour et de l'érotisme, mais aussi la tentation de la misogynie et de la violence.

*714 / Stylistique et linguistique textuelle / A. Sevigny

Ce cours emprunte à des travaux récents de linguistique cognitive du point de vue de l'analyse des grandes unités de la langue en contexte. L'objectif premier est de fournir aux étudiants un cadre conceptuel souple leur permettant d'étudier la production du sens dans les formes aujourd'hui en vigueur en français et en anglais international. Les applications reposent sur l'analyse comparée de textes et la traduction.

*717 / Style et histoire dans les textes littéraires du XIXe siècle / G. Moyal

Ce cours portera sur l'étude de l'histoire comme forme de discours scientifique, axée néanmoins sur des structures et des effets de style proprement littéraires. À son inception en pleine période romantique l'histoire dépend pour sa forme et sa justification d'un autre genre, lui aussi en pleine évolution: le roman lequel, depuis longtemps, se charge de véhiculer et d'illustrer différentes philosophies et idéologies. Dans la période étudiée, l'idéologie joue un rôle central à la fois dans la France d'après la grande Révolution et l'Empire, et dans les colonies et protectorats qui s'accroissent à grand rythme. Les effets contradictoires de cette expansion coloniale au sein d'un mouvement qui se veut largement démocratique seront un des points d'étude de ce cours.

*719 / Écritures de l'Afrique et de la Caraïbe / S. Crosta, E. Nshimiyimana

Ce cours se propose d'examiner un certain nombre de textes d'écrivains de l'Afrique et/ou des Antilles dans leurs contextes historique, culturel et artistique, pour se concentrer par la suite sur l'étude de leurs projets et pratiques d'écriture. Ce cours vise à explorer les relations intersignificatives entre la nation, la culture et la narration, entre les théories contemporaines et la production culturelle des oeuvres littéraires. Ainsi aborderons-nous les discours culturels et littéraires ainsi que les voix plurielles des écrivains qui s'interrogent sur les canons, le genre et les conventions littéraires, sur les assises culturelles de la référence, de l'identité et de la communalité.

*720 / Poésie québécoise / Staff

Ce cours se concentrera sur l'émergence de la poésie québécoise au début de ce siècle dans les textes d'Émile Nelligan, profondément marqués par une esthétique symboliste- Il continuera avec des textes des années cinquante, marqués par la **grande noirceur** de Duplessis, avec ceux de Paul Chamberland et Raoul Duguay qui ont reflété les développements de la contre-culture au cours des années soixante, et finalement on étudiera des textes qui ont démarqué **l'écriture féminine** des années soixante-dix et quatre-vingt.

*721 / Le roman québécois contemporain / M. Ahmed

Au Québec, la question identitaire est profondément ancrée dans sa littérature, surtout dans le roman, et a connu de notables transformations au cours des années. Nous attacherons une importance particulière à la question identitaire, dont nous analyserons les divers aspects, les enjeux, les transformations et leur expression. Nous examinerons les liens dialogiques que la question identitaire entretient avec le contexte politique, social et culturel du Québec, mais aussi avec l'américanité, la francophonie et les questions mondiales. Nous verrons comment s'inscrivent les différents facteurs (et leur conceptualisation) qui ont construit l'identité au Québec, tels que l'histoire, l'espace, la sexualité, l'ethnicité, la langue, la culture ou le statut migratoire. Quelle a été la place du roman dans ce débat?

***723 / L'évolution du roman moderne / A. St. Leger Lucas, J. Stout**

Ce cours examinera l'évolution du roman moderne depuis Diderot jusqu'au Nouveau Roman, à la lumière des considérations suivantes: les jeux et stratégies narratifs, les rapports entre narrateur et narrataire, locuteur et allocutaire, l'ambiguïté, le rôle du lecteur.

***724 / Cultures Contemporaines en France et en Europe / Staff**

La France au début du XXI^{ème} siècle est un autre territoire. Les identités de ses habitants reflètent les changements qui la traversent depuis au moins un demi-siècle, tels que la formation d'une communauté européenne grandissante, la globalisation, le cyberspace, la prise de conscience écologique, sa place dans la francophonie, et les mouvements migratoires. De ces changements émergent de nouveaux modes de pensée, de nouvelles problématiques, des transformations langagières et culturelles qui se greffent sur un héritage qu'ils mettent en question et enrichissent à la fois.

***725 / Écriture des femmes / Staff**

Ce cours portera sur l'écriture des femmes françaises et francophones. Selon l'année où on l'offrira, il s'agira de l'étude de textes de femmes du Moyen Age, du dix-septième, dix-huitième, dix-neuvième ou vingtième siècles, ainsi que du Québec, d'Afrique ou des Antilles. Ces textes seront étudiés dans leur contexte social et historique. L'apport possible des théories féminines/féministes de l'écriture des femmes à l'étude de tel ou tel corpus précis sera discuté dans le cours également.

***726 / Le théâtre français et francophone / Staff**

Dans ce cours, nous analyserons des oeuvres du théâtre français ou francophone. Nous étudierons l'évolution du théâtre en tant que genre, ainsi que différentes théories du théâtre pertinentes aux oeuvres choisies.

***727 / L'être humain et l'animal dans la littérature du XX^e siècle / S. Posthumus**

Objet sans voix, relégué au fond du paysage romanesque, l'animal passe sous silence dans les études littéraires. Pourtant, il y est, ils y sont en grand nombre. En nous penchant sur les oeuvres de Colette, de Giono, et de Tournier, nous découvrirons un bestiaire d'animaux domestiques et sauvages dans la littérature du XX^e siècle qui trouve écho dans les écrits philosophiques de Deleuze, Guattari et Derrida. L'étude des oeuvres littéraires supposera une double réflexion, d'une part, sur le rapport entre l'être humain et l'animal, et d'autre part, sur le réel et l'imaginaire.

***730 / Lectures Dirigées / Staff**

Ce cours est conçu comme un cours d'études indépendantes dans un domaine d'études françaises ou francophones, en littérature ou en linguistique, qui ne fait pas l'objet d'un cours figurant déjà dans l'annuaire.

GEOGRAPHY AND EARTH & ENVIRONMENTAL SCIENCES

The School of Geography and Earth Sciences offers programs leading to the degrees M.A., M.Sc., and Ph.D. in Geography; and M.Sc. and Ph.D. in Earth and Environmental Sciences.

Enquiries: 905 525-9140 Ext. 23535
 Fax: 905 546-0463
 E-mail: geograd@mcmaster.ca
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Staff / Fall 2009**DISTINGUISHED UNIVERSITY PROFESSOR**

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M.A. or M.Sc. Degree in Geography

At the Master's level the following programs are available:

M.A. or M.Sc.

This is the normal route to the Master's degree. A candidate is required:

1. To obtain at least B- standing in one full graduate course (or equivalent). If only two half courses are taken both must be at the 700 level. Supervisors may however require courses beyond the minimum;
2. To present a thesis on an approved topic and to defend this thesis at an oral examination.

M.Sc. Degree in Earth & Environmental Sciences

A candidate is required:

1. To obtain at least B- standing in one full graduate course (or equivalent). If only two half courses are taken both must be at the 700 level. Supervisors may however require courses beyond the minimum;
2. To present a thesis on an approved topic and to defend this thesis at an oral examination.

M.Sc. candidates for degrees in Earth & Environmental Sciences whose previous degrees are not in related fields may be required to pass additional undergraduate courses normally to be taken in the first year of graduate study, as specified by the supervisor and approved by the Director of the School.

Ph.D. Degree in Geography and Earth & Environmental Sciences

A candidate for the Ph.D. must comply with the general regulations and program requirements of the School of Graduate Studies. Students must obtain at least B- standing in one full graduate course beyond any taken at the Master's level. If only two half courses are taken both must be at the 700 level. Prescribed courses or evidence of prior training may be required of students in particular fields of specialization.

The comprehensive examination tests the student's command of the field of specialization and ability to design and defend an original doctoral research project. The written and oral parts of the examination are normally to be completed by the end of the fifth academic term for students entering with a Master's degree.

Normally, Ph.D. studies are available only to full-time students. In special circumstances, students may be admitted on a part-time basis.

Ph.D. candidates whose previous degrees are not in Geography or Earth & Environmental Sciences may be required to pass additional undergraduate courses as specified by the student's supervisory committee.

Environmental Science

Environmental Science is concerned with the interactions between the physical and biological environment and human activity. Courses and research programs in Earth & Environmental Sciences provide excellent training for students interested in Environmental Science. Additional courses may be taken in other departments such as Biology, Chemistry, Civil Engineering and Physics and Astronomy.

Environmental Studies

The existing courses and research programs in both physical and human geography provide very good training at Master's and Ph.D. levels for students whose interests are in this important area. Students will also be encouraged as part of their program to take relevant courses in other departments (e.g. Anthropology, Biology, Civil Engineering, Chemical Engineering) where environmental interests are strongly represented.

Courses

(Note: Not all courses are offered every year.)

Courses marked with an asterisk (*) are half courses. Courses marked with a plus sign (+) differ in content from year to year and may be taken a second time for credit. The following courses are offered for graduate credit and are also available to senior undergraduate students.

Graduate students registered in 600-level courses will be required to complete additional work (e.g. additional paper, project, or more in-depth analysis of course material) as determined by the course instructor.

All incoming graduate students are required to take either Geog *723 or Earth Sc *708. Students will receive a pass/fail grade and these units will not count toward the required number of units for completion of the graduate program. Students may be exempted from this requirement if they can show evidence of completion of an equivalent course at another university with good academic standing (at least a B+) and obtain permission of the Director.

HUMAN GEOGRAPHY COURSES***6D03 / Analysis of Transportation Systems / H.A. Paez
(Same as Civil Engineering *6H03)**

An introduction to the use of models in transportation planning. Topics include data issues, the four-stage approach to modeling transportation systems, discrete choice models and contextual factors such as land use.

***6GI3 / Advanced Vector GIS / D. Scott**

Advanced treatment of geographic information systems (GIS) focusing on vector data models and techniques. Real-world problem solving emphasizes business and transportation applications. Global positioning system (GPS) data collection and processing are addressed along with basic programming using Visual Basic for Applications (VBA).

***6HH3 / Environment and Health / N. Yiannakoulis**

Models and methods for research and policy on environment and health.

***6HT3 / Urban Places and Urban Dreams / W. Peace**

The ideas of planning visionaries and designs of city planners will be explored as responses to forces shaping cities and regions.

***6HY3 / Urban Development and Policy Issues / Staff**

Current debates on urban development and policy issues. Emphasis on the political economy of urban change.

***6HZ3 / Urban Housing / R.S. Harris**

The geography of housing, including the effects of land development, construction, municipal planning and public policy on the urban landscape of housing and homelessness.

PHYSICAL GEOGRAPHY AND EARTH & ENVIRONMENTAL SCIENCES COURSES***6B03 / Watershed Ecohydrology / J.M. Waddington**

A course that emphasizes a watershed ecosystems approach to interactions of hydrological, ecological and biogeochemical processes in the study of the natural ecohydrological function and response to disturbance of stream, riparian and wetland ecosystems. A mandatory field trip will occur.

***6C03 / Advanced Physical Climatology / A.M. Arain**

This course develops energy and mass exchange processes in the near surface layer, the lower atmosphere and at the earth-atmosphere interface. Sensitivities of these processes to environmental change and feedback mechanisms are examined (seminars and individual presentations are emphasized).

***6E03 / Coastal Environments / E.G. Reinhardt**

Coastal systems and their response to sea level change with an emphasis on the Holocene. Course will include a mandatory local field trip to collect data followed by laboratory analysis.

***6K03 / Advanced Mineralogy / J. Rink**

Advanced topics in crystal chemistry and mineralogy, with emphasis on mineral spectrosopes.

***6O03 / Environmental Isotope Geochemistry / G.F. Slater**

Application of isotopic analysis to environmental systems, both natural and impacted. Topics include sampling and analytical techniques, principles of isotopic fractionation and applications of light and transition metal isotopes to hydrogeology, microbiology and geochemistry.

***6Q03 / Sedimentary Geochronology / G.F. Slater**

Geological age determination techniques for the near-surface sedimentary record focusing on the last five million years of each history. Geochemical perspectives on the fundamentals of radioactive decay and radiation effects in datable minerals.

***6S03 / Advanced Topics in Spatial Statistics / P.S. Kanaroglou**

This course explores concepts and methods in visualisation, exploration and modeling of point pattern, spatially continuous data and area data.

***6T03 / Plate Tectonics and Ore Deposits / A.P. Dickin**

Synthesis of plate tectonics, with application to crustal evolution and genesis of ore deposits.

***6W03 / Hydrologic Modeling / P. Coulibaly
(Same as Civil Engineering *6M03)**

Principles of numerical modelling and examination of selected hydrologic models including deterministic, conceptual and statistical models.

***6WW3 / Contaminant Hydrogeology / J.E. Smith**

Physical and chemical aspects of the fate and transport of contaminants in soils and groundwater, including multiphase flow.

***6Z03 / Exploration Geophysics / J.I. Boyce**

Principles of subsurface exploration using seismic, magnetic and borehole geophysical methods. Applications in geological research and oil and gas exploration.

The following 700-level courses are offered for graduate credit only:

HUMAN GEOGRAPHY COURSES***715 / Special Topics / Staff**

Individual reading course on an advanced level topic. A student may register only once in this course with the permission of The School of Geography and Earth Sciences.

***723 / Research and Communications in Human Geography / Staff**

Theoretical and methodological approaches to contemporary *human* geography.

***726 / Feminist Geography / V.A. Chouinard**

This course examines recent work in feminist geography, with emphasis on issues of theory, method, praxis, and critical assessment of research studies. An introduction to origins of and changing directions in this field is followed by an examination of research in: changing geographies of cities and regions; women and work; housing and household survival strategies; state intervention in women's lives; women, disability and disabling environments; women, space, sexuality and violence; place, politics and identity; methodological issues; and future research directions.

***727 / Disability and Space / R.D. Wilton, V.A. Chouinard**

Disability and space is a rapidly developing substantive sub-field in critical social geography. In this course, we examine geographic and other research concerned with disability, space and disabling environments. Different approaches to explanation and to social change are highlighted and assessed.

***728 / Urban Historical Geography / R.S. Harris**

Study of internal characteristics and external relations of places in nineteenth century eastern North America with particular reference to Southern Ontario.

***733 / Integrated Urban Models: Design, Structure and Applications / P.S. Kanaroglou**

A review of location and transportation models used in integrated urban models. The performance of known computer implementations of integrated urban models will be evaluated in this course.

***734 / Qualitative Approaches to Health Geography / S. Elliott, A. Williams, B. Newbold, R. Wilton**

A range of qualitative approaches (interviews, focus groups, participant observation) will be reviewed as key research methods employed in a health geography context.

***735 / Topics in Urban Geography / Staff**

Discussion of selected aspects of urban spatial structure and location theory.

***736 / Theories and Methods in Environment and Health / J.D. Eyles (Same as Health Research Methodology *735)**

Models and methods for research and policy on environment and human health relationships.

***737 / Activity Analysis: Advanced Travel Behaviour Analysis and Modeling / D.M. Scott**

Theory, data and methods underlying the activity-based approach to travel behaviour analysis and modeling. The application of activity analysis to future models of urban travel demand is also emphasized.

***738 / Discrete Choice and Policy Analysis / A. Páez**

Discrete choice methods are studied as the technical foundation for the analysis of public and private policy. A particular emphasis is placed on urban policy issues, including travel behavior, energy consumption, and locational decisions. The course covers the micro-economic foundations of discrete choice theory, model specification and estimation, including modern simulation techniques, and applications.

***739 / Spatial Population Analysis / K.B. Newbold**

Theories and models of migration; characteristics of contemporary migration; movement in space and models of spatial interaction.

***743 / International Housing / R.S. Harris**

Trends in housing and housing policy internationally since 1945. Economic, social and political aspects.

***746 / Advanced Statistical Methods in Geography / K.L. Liaw**

Applications of advanced multivariate statistical methods in geographic research, including analysis of contingency tables and regression, logistic and probit models.

PHYSICAL GEOGRAPHY AND EARTH & ENVIRONMENTAL COURSES***708 / Research and Communications in Geoscience / Staff**

Survey of research methods in Geoscience, communications techniques including the preparation of proposals, manuscripts and public presentations.

***709 / Radiogenic Isotopes in Earth and Planetary Sciences / A.P. Dickin**

Nucleosynthesis and radioactive decay. Mass spectrometry. Radiogenic isotopes as chronometers and tracers in crust and mantle evolution, and in the study of ore deposits. Radiogenic isotopes as environment tracers. Origin of the solar system.

***715 / Special Topics / Staff**

Individual reading course on an advanced level topic. A student may register only once in this course with the permission of The School of Geography and Earth Sciences.

***717 / Palaeoceanography and Palaeoclimatology**

The course will focus on the modern physical and chemical structure of the ocean and its role in affecting climate. Ancient oceanic basins, sediment composition and geochemistry (especially stable isotopes) will be discussed in detail to provide an understanding of ocean-climate relationships for reconstructing long-term and short-term climate change.

***749 / Advanced Environmental Organic Geochemistry / G.F. Slater**

The course will focus on an advanced treatment of the underlying fundamental concepts in environmental organic geochemistry. Primary focus will be on the basic chemical parameters and kinetic and thermodynamic principles that control the distribution and persistence of organic chemicals in the environment and therefore the risk that they pose to human and ecosystem health. The same principles control the transport, fate and biological processing of both organic contaminants and natural organic matter. Therefore this course will provide students with fundamental understanding applicable to both contaminated and natural systems. The primary basis for this discussion will be the seminal text *Environmental Organic Chemistry* by Schwarzenbach et al, with discussion of the application of these principles as reflected in the recent literature. This course is an inquiry-based course.

***750 / Advanced Groundwater Flow and Contaminant Transport / J.E. Smith
(Same as Civil Engineering *770)**

This course will cover the theory, equations, fundamental principles, and processes of the flow of fluids and transport of contaminants in soils and groundwater at an advanced level.

***751 / Environmental Micropaleontology / E.G. Reinhardt**

Microfossils and biogeochemistry as an environmental tool for studying modern and ancient coastal, shelf and lacustrine environments. The course will examine a range of microfossil groups (e.g. ostracodes, diatoms) concentrating on foraminifera and thecamoebians. Course will include a small research project that will involve microscope work.

***752 / Geomicrobiology / L.A. Warren**

This advanced level course will provide an overview of the emerging conceptual framework of microbial geochemistry and discuss the implications of microbial activity, as it relates to geochemical processes of interest in interpreting the earth's record, as well as contaminant behaviour. Current and emerging techniques available in this field will also be discussed.

***753 / Advanced Environmental Geochemistry / L.A. Warren, G.F. Slater**

The course will focus on an advanced treatment of the underlying fundamental concepts in environmental geochemistry of equilibria, kinetics and partitioning, as they apply to both modern and ancient inorganic and organic geochemical processes of interest. It will also highlight available and emerging techniques for investigating past and modern environmental geochemical processes.

***755 / Bio- and Hydro-Meteorology / A.M. Arain**

Bio- and Hydro-meteorology studies the effect of the atmosphere on carbon and water cycles. The aim is to teach the theory and practical aspects of the energy, water and carbon exchanges from vegetated surfaces, data analysis techniques and surface exchange modeling.

***756 / Advanced Methods in Sedimentology and Stratigraphic Analysis / Eyles, Boyce, Reinhardt, Morris
(not all instructors will participate every year)**

The course will focus on the methods used in understanding sedimentological and stratigraphic successions, whether they are modern, archaeological or deep-time records. It will be structured as a modular course, consisting of anything between 3-5 modules on various topics. Topics include sedimentary environments, isotope stratigraphy & geochronology, sequence stratigraphy, magnetic stratigraphy, seismic stratigraphy and biostratigraphy. Each topic will consist of lectures, core papers and research papers.

***760 / Exploration Seismology / J.I. Boyce**

This course will examine current methods and recent developments in the field of reflection seismology. A major emphasis will be placed on the principles and practical aspects acquiring and processing multi-channel seismic reflection data. Applications for oil and gas exploration and investigation of the shallow subsurface for environmental purposes will also be reviewed through case studies.

***761 / Advanced Glacial Sedimentology / C.H. Eyles**

Current issues in glacial sedimentology including examination of glacial processes, environments and sediments in terrestrial and marine settings, the glacial sedimentary record of the Great Lakes basins and relationships between glacial sediments and urban environmental issues.

***762 / Advanced Geophysical Mapping and Modeling / W.A. Morris**

Airborne geophysical and satellite imagery for geological mapping application to problems in oil, and mineral exploration and to environmental contaminant mapping.

***764 / Quaternary Dating Methods / W.J. Rink**

Introduction to a range of dating methods useful over the last 2 million years of earth history. Physical basis of the methods as well as aspects of their application are the main topics, but can also include aspects of the sedimentary context for certain methodologies. Dating methods include radiocarbon dating, argon-argon dating, electron spin resonance dating and luminescence dating.

***765 / Ecohydrology / J.M. Waddington**

An examination of ecology and hydrology interaction through the study of biogeochemical cycling. (Not an inquiry course.)

770 / Advanced Analysis of Survey Data / M. Boyle, B. Spencer, B. K. Newbold (Same as Economics 770, Psychology 770, HRM 790, Sociology 765)

This course uses large-scale surveys to refine student skills in conducting secondary analysis and writing for publication in peer-reviewed journals. Students will develop a two-page research proposal on a topic of their choice. The proposal will identify a research question to be addressed using one or more population-based studies. The educational methods will be varied, depending on group composition and include lectures, small group tutorials, student presentations and faculty mentorship. The objective is to produce a research report for submission to a peer-reviewed journal.

NOTE: In addition, certain courses in other departments, notably Biology, Civil Engineering, and Economics may be allowed for graduate credit.

Research in Geography and Earth & Environmental Sciences

The School of Geography and Earth Sciences offers research opportunities in the areas of Environment and Health, Social Geography, Spatial Analysis, Hydrological Sciences, Geochemistry and Near-Surface Environmental Processes.

ENVIRONMENT AND HEALTH

The McMaster Institute of Environment and Health is located within the School of Geography and Earth Sciences and is directed by one of our faculty members, Dr. Bruce K. Newbold. Areas of research interest include individual and community impacts, environment and health policy, environment and development, and spatial relationships.

SOCIAL GEOGRAPHY

Research opportunities in the specialist area of Social Geography include the social aspects of health and health care, feminist geography, disability and space, housing, political economy and urban historical geography.

SPATIAL ANALYSIS

The application of economic and behavioural theory via quantitative analysis to understand spatial patterns of outcomes in human activity has been a major focus of urban/economic geography at McMaster. Areas of research interest now include transportation, population, urban economics and land use, and health and its determinants.

HYDROLOGICAL SCIENCES

The area of physical geography concentrates on physical hydrology, hydro-climatology, boundary layer research, aquatic biogeochemistry, biogeography, soil and vegetation, ground water contamination and near-surface water environments.

GEOCHEMISTRY

Geochemical research at McMaster is focused on the areas of stable and radiogenic isotopes, physical processes, geochronology and interpretation of physio-chemical records in terrestrial materials. The geological time frame addressed is broad but emphasizes Quaternary and Holocene time.

NEAR-SURFACE ENVIRONMENTAL PROCESSES (NEP)

The NEP research group focuses on earth and atmospheric processes operating at or close to the Earth's surface and includes research in the fields of physical climatology and hydrology, surficial geoscience (sedimentology, marine processes, paleoenvironmental reconstruction, geophysics), and environmental quality (biogeochemical and contaminant transport, trace gas exchange).

Facilities for Research in Geography

The School of Geography and Earth Sciences is amongst the most advanced in Canada in terms of its experience in training candidates for advanced degrees.

The facilities include: analytic and experimental laboratories for climatology, and geomorphology; a geographic information system laboratory; and a comprehensive map collection.

Facilities for Research in Earth & Environmental Sciences

The School of Geography and Earth Sciences is well equipped with analytical facilities including mass spectrometers, X-ray fluorescence, atomic absorption spectrometers, and gamma ray spectrometer. Transmission and scanning electron microscopes with elemental analysis facilities are available and commonly used. School facilities for Electron Spin Resonance (ESR) and thermoluminescence (TL) age-dating techniques have been used in the study of archaeological sites, earthquake recurrence rates, coastal sediments and hominid evolution.

There are special laboratories for the study of aqueous geochemistry, experimental sedimentology, X-ray diffraction and fluorescence, rock/mineral analysis, radiochemistry, mass spectrometry and fossils.

The School operates a microcomputer laboratory comprising a suite of PC's with associated printers, plotters and flat-bed scanners. At the undergraduate level specific courses have been developed around the application of software packages to geological problems.

The School maintains a suite of geophysical equipment for the acquisition of magnetic, gravity and IP/Resistivity data. In addition, an industry standard computing system is used for the imaging of geophysical and remote sensing information and interpretive modeling of potential field data.

The choice of thesis topic is made in light of the interests of the student and the support available from research grants.

GLOBALIZATION

The Institute on Globalization and the Human Condition offers a program leading to a M.A. degree.

Enquiries: 905 525-9140 Ext. 27556
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Staff / Fall 2009

DISTINGUISHED UNIVERSITY PROFESSOR

John C. Weaver, B.A. (Queen's), M.A., Ph.D. (Duke) / History

PROFESSORS

Marie-Madeleine Ahmed, L. ès L., M. ès L., D. de l'U. (Sorbonne)
 / French and Women Studies
 Virginia Aksan, B.A. (Allegheny College), M.L.S. (Berkeley), M.A.,
 Ph.D. (Toronto) / History
 Daniel Coleman, B.Ed. (Regina), M.A. (Regina), Ph.D. (Alberta)
 / English & Cultural Studies
 Robert O'Brien, B.A. (Carleton), M.Sc. (Econ.) (London), Ph.D. (York)
 / Political Science
 Peter Walmsley, B.A., M.A. (Toronto), Ph.D. (Cambridge) / English &
 Cultural Studies

ASSOCIATE PROFESSORS

Ellen Badone, B.A., M.A. (Toronto), Ph.D. (California, Berkeley)
 / Anthropology and Religious Studies
 Juanita DeBarros, B.A. (Toronto), M.A., Ph.D. (York) / History
 Michael Egan, B.A., M.A. (Simon Fraser), Ph.D. (Washington State)
 / History
 Bonny Ibhawoh, B.A. (Bendel State), M.A. (Ibaden), Ph.D. (Dalhousie)
 / History
 Peter Nyers, B.A., M.A. (Victoria), Graduate Diploma, Refugee &
 Migration Studies, Ph.D. (York) / Political Science
 Susie O'Brien, B.A. (Queen's), M.A. (Queensland), Ph.D. (Queen's)
 / English & Cultural Studies
 Petra Rethmann, B.A. (Vienna), M.A. (Munich), Ph.D. (McGill)
 / Anthropology
 Susan Searls Giroux, B.A., M.A.T. (Miami), Ph.D. (Pennsylvania
 State) / English & Cultural Studies
 Stephen Streeter, B.A. (Bates), M.A. (Riverside), Ph.D. (Connecticut)
 / History
 Donald Wells, B.A. (Western), M.A. (British Columbia),
 Ph.D. (Toronto) / Labour Studies and Political Science

ASSISTANT PROFESSORS

Chandrima Chakraborty, B.A. (Calcutta), M.A., M.Phil. (Jawaharlal
 Neru), Ph.D. (York) / English & Cultural Studies
 Diane Enns, B.A. (Ottawa), M.A. (Carleton), Ph.D.
 (SUNY-Binghamton) / Philosophy / Director
 Helene Strauss, B.A., M.A. (Free State), Ph.D. (Western) / English &
 Cultural Studies
 Rachel Zhou, B.A. LLM (Wuhan, China), M.A. (Toronto) / Social Work

M.A. Degree

Admission to the M.A. degree program requires an average of B+ or better in an Honours program in a Humanities or Social Sciences undergraduate program. Students with degrees in undergraduate programs outside the Humanities and Social Sciences where there is a component of relevant courses will also be considered.

In the M.A. program, studies take the form of course work plus a Major Research Paper. Students take six half courses (or equivalent) at the graduate level, including a required core course plus at least two other Globalization courses. During the fall term, students will take the required introductory course plus two other half courses. They take an additional 3 half courses during the winter term. During the winter term, students will prepare a proposal for their Major Research Paper and identify a potential supervisor and second reader. Students complete the Major Research Paper in the Summer term.

Courses

All courses are half courses. Globalization *710 is required of all students.

*6C03 / Topics in Feminist Scholarship: Refugee Women in Canada / M. Ahmed

In this seminar, we shall look at the evolution of gender considerations in the refugee determination process, examine refugee generating situations such as inter state and internal conflicts, forced economic displacement, natural disasters, trafficking or gender based persecution, how they affect refugee women's lives in specific ways and in different locations and contexts (ie: from refugee camps to Canada), and how they respond (ie: trauma, but also resilience, resistance and initiatives). We shall reflect on the methodological and ethical questions we need to address when conducting research with refugee women, as educators and advocates.

*6J03 / Global Feminism / D. Enns

This course will focus on a transnational or global approach to feminist thought and practice. We will be concerned with the question of how to negotiate the local and the global in matters of social justice, human rights and equality for women, and explore the challenges this negotiation poses to prevalent Western conceptions of feminism. Readings will focus on a number of different regions and address issues such as the impact of globalization on women's lives, women's resistance to war, global militarization and fundamentalism, feminism and Islam, the global sex trade, and transnational women's organizations.

*701 / Topics in Globalization Studies I

This course will expand the discussion of why globalization should be the focus of interdisciplinary inquiry giving particular attention to an identified key issue area in the field. For each of these areas, readings will be drawn from the social sciences and the humanities.

*702 / Topics in Globalization Studies II

This course will expand the discussion of why globalization should be the focus of interdisciplinary inquiry giving particular attention to an identified key issue area in the field. For each of these areas, readings will be drawn from the social sciences and the humanities.

*703 / Acts of Global Citizenship / P. Nyers (Same as CSC*707)

This course examines recent debates about a fundamental concept in globalization studies: global citizenship.

*704 / Global Social Policy / Y.R. Zhou

This interdisciplinary course introduces students to key concepts and issues of global social policy and its connections with globalization processes. It examines trends in global social policy and the diverse experiences of different welfare regimes across the world. Locating social policy within the context of global inequalities, this course also seeks a deeper understanding of the issues of poverty, social exclusion, and deprivation from an international perspective. In discussing the challenges and possibilities regarding the future of welfare, the roles of various non-state sectors (e.g., transnational corporations, international organizations, and international NGOs) in pursuing social justice and human rights in the global context are also addressed.

705 / Global Public Policy / M. Dion*(Same as Political Science *705)**

An examination of policy-making at global institutions and the relationships with other scales of policy formation.

706 / Social Welfare and Social Work in the Context of Globalization and Restructuring*(Same as Social Work *706)**

This course focuses on the dynamics and consequences of the restructuring of social programs in Canada. Attention will be given to policy trends toward privatization and market models of service delivery, to changes in the practices of social welfare institutions and to changes in the meaning of citizenship and political participation.

707 / Religion and Globalization*(Same as Religious Studies *768 and Sociology *709)**

This course will provide a critical account of debates about globalization as they relate to questions of religious identity, practice, belief and modes of affiliation. Through a combination of theoretical discussion and case studies, the course will provide students with a framework for analysing how religious movements operate on the world stage, both historically and in the contemporary situation. Thematic emphasis, and selection of case studies, will shift from year to year, including (but not limited to) studies of secular nationalism, religious fundamentalism, religion and global media, transnational and diasporic religious public spheres, missionaries and empire, religion and migration, pilgrimage and travel, religion and global environmentalism, or religious themes in world politics.

709 / Globalization and Culture / Staff*(Same as CSCT *710 and English *709)**

Over the past decade, almost everyone engaged in literary and cultural studies has had to assess the implications of globalization for their various disciplinary practices. In particular, globalization has meant that a wide range of academic practices have had to confront the artificiality of the 'nation' as the apparently natural space in which cultural objects are produced, given meaning, and interpreted. This course offers a comprehensive introduction to and exploration of debates over the role and function of culture in the era of globalization.

***710 / Globalization: An Introduction / W. Coleman**

An introduction to major theories and debates in the field of globalization studies.

***711 / Cosmopolitics: Community, Identity and Agency Beyond the State / P. Nyers**

This course examines some of the lively contemporary debates surrounding the concept of cosmopolitanism.

***712 / International Trade and Economic Development**

This one-semester course studies the economic impacts of world trade on developing countries.

***713 / Islam, Diaspora, and Identities in Central Asia 1880 to the present / T. McDonald (Same as History *713)**

This course focuses on Soviet Central Asia but begins with background from the late Tsarist period and ends in the post-Soviet present. Central Asia is the focus for broader discussions on issues of colonialism, identity, gender, nationalism, the Soviet legacy, Islam, diaspora, and the challenges of post-Soviet transition.

***714 / The United States and Globalization since the Late Nineteenth Century / S. Streeter (Same as History *714)**

This course explores the history of globalization in the modern era emphasizing the role of the United States both internationally and domestically. We begin with the War of 1898, track the rise of the American empire through the so-called Golden Age of capitalism, and conclude with the neoliberal era following the end of the Cold War. The focus is on how and why the United States came to play such a powerful role in shaping globalization; and, it also covers the impact of globalization on the United States itself.

***715 / Globalization and China / Y.R. Zhou**

An examination of China's response to globalization and the social, economic, political and cultural transformations of Chinese society in this globalized era. This course introduces students to the significant transformations of Chinese society since 1978 and their connections with globalization processes.

***717 / Gender and Globalization**

This course examines the relationship between gender and globalization by exploring how processes of globalization interact with dynamics of gender differentiation and inequality in various social contexts around the world.

***718 / Global Actors Beyond the State: Methods and Cases**

This course examines the emergence and effects of global activism beyond that of state actors and associations of states. It introduces methods for analysing global social movements: frame and discourse analyses; historical approaches; case-based and comparative research; network analysis; and approaches that emphasize political processes and opportunity structures. We also examine various cases, including: human rights movements; campaigns against neo-liberal policies affecting the developing world; and international religious mobilizations. Students will work on research papers using research methods appropriate to a case study of their own design.

720 / Topics in Political Culture / P. Rethmann*(Same as Anthropology *720)**

An examination of the interrelationship between politics and culture. Thematic foci of the course will vary.

727 / The New Constellation of Race: Sovereignty, Citizenship, Social Death / S. Searls Giroux*(Same as CSCT *727 and English *727)**

This course seeks to map the new trajectories of race theory in a post-civil rights, post-apartheid, post-9/11 world.

730 / Work and Democracy in the Global Society*(Same as Work and Society *730)**

This course centers on the transition from a postwar "golden age" of state-regulated labour regimes to a more disorganized capitalism of "flexible" labour regimes. The main dynamics of this transition include a new era of transnational corporate rivalry and collaboration, massive technological change, and a complex new global division of labour. Students will analyze this transition at the level of the workplace, community, nation-state, sub-national industrial districts and the supranational level, including regional trading blocs. Students will assess the impact on labour of key global institutions such as the International Monetary Fund, General Agreement on Trade and Tariffs/World Trade Organization and the International Labour Organization. The course will focus on both "first" and "third world" labour regimes. Finally, the course will examine key labour responses to globalization, including the activities of transnational labour bodies, new alignments between labour and social movements, and emerging forms of transnational labour solidarity. *Enrolment is limited to a maximum of 3 students from the M.A. in Globalization Studies, or permission of the instructor.*

738 / Intra-African Mobilities: Contemporary African Cultural Production / H. Strauss*(Same as CSCT *738 and English *738)**

This course examines contemporary African cultural texts that explore the intra-African circulation of ideas and people from the time of the Trans-Atlantic slave trade to the present. We will identify some of the specific contributions that African narratives of mobility and migration make to discourses of internationalism, diaspora and globalization.

746 / Science, Technology, and Nature / M. Egan*(Same as History *746)**

This reading course explores the historical relationships between science, technology, and the physical environment. Emphasis will be put on how knowledge and machines mediate historical understandings of nature, and how nature influences the production of science and technology.

***747 / Discourses of Empire 1700-1820 / P. Walmsley**
(Same as CSCT *747 and English *747)

This course will consider how British and Colonial literatures articulated the process of forging a world empire. Our central project will be to map the shifting identities of self and other, and metropolis and colony, throughout the eighteenth century. We will read a wide range of texts -- not only novels and poems representing imperial encounters, but also travel books and early slave narratives -- and the course will provide ample opportunity for reference to McMaster's rich collection of books and periodicals from this period.

***751 / European/Muslim Encounters in the Pre-Modern World**
/ V. Aksan (Same as History *751)

This seminar will explore the historical origins and evolution of East/West (Europe/Islam) relations, concentrating on a number of themes. These may include 1) perceptions of religious difference (Christianity and Islam); 2) the narratives of warfare (crusades and jihads); 3) The Orient and the "Turk" in European thought 17th – 19th centuries; 4) The politics and culture of eastern and western empires; and 5) Muslim encounters with the West, medieval and modern.

***757 / The British Empire and Global Integration, 1815-1960**
/ J. Weaver (Same as History *757)

This course considers how assorted types of colonizers working within a loosely-managed empire cooped, dispersed, and displaced subject populations and cultures, attempted to restructure established civilizations, pursued economic and strategic opportunities, moved and managed people in conjunction with plans for "improvement", diffused a language and array of ideas about law, justice and government, and distributed flora and fauna around the world.

***761 / Race and Gender in the Atlantic World**
/ J. de Barros (Same as History *761)

This course looks at the intersection of race and gender in the Atlantic World, from the sixteenth to the early twentieth centuries, focusing in particular on the legacies of the transatlantic slave trade.

***764 / Global Power, Local Cultures: Comparative Colonialisms in Africa / B. Ibhawoh (Same as History *764)**

A comparative study of the processes by which imperial global power and local responses shaped the political, economic and cultural history of Africa in the late 19th and 20th centuries.

***774 / Global Political Economy / Staff**
(Same as Political Science *774)

***777 / Global Governance / R. O'Brien, T. Porter**
(Same as Political Science *777)

***779 / The Times We Live In / S. O'Brien**
(Same as CSCT *779 and English *779)

***782 / Diasporas, Transnationalism, and Religious Identities**
/ E. Badone (Same as Anthropology *782 and Religious Studies *782)

An examination of religion among immigrant and diaspora communities in the contemporary globalized world.

***784 / Decolonizing Bodies / C. Chakraborty**
(Same as CSCT *784 and English *784)

An examination of the representations of the body in postcolonial literary and visual texts from Africa and South Asia.

***787 / Post-colonial Ecologies / S. O'Brien**
(Same as English *787)

This course will consider issues central to ecocritical and post-colonial theories, with a specific focus on topics of language, political sovereignty and the relationship between "self" and "other" in contemporary post-colonial English literature.

***788 / Writing Diaspora: Literature, Community, and Displacement / D. Coleman**
(Same as CSCT *788 and English *788)

This course examines critical debates in contemporary cultural studies over the best way(s) to conceptualize the experiences of people who have left their places of birth or places of cultural origin in an era of "globalization." It examines the representation of these experiences in literary works (memoirs, short stories, poems, and novels) by M.G. Vassanji and Dionne Brand about people who move between cultural locations on the assumption that literary works condense and intensify the questions and problems that characterize such cross-cultural movements.

HEALTH AND AGING

The Department of Health, Aging and Society offers a program leading to a M.A. degree.

Enquiries: 905 525-9140 ext. 27227

Fax: 905-525-4198

Email: has-dept@mcmaster.ca

Website: <http://www.socsci.mcmaster.ca/has-dept/index.cfm>

Staff / Fall 2009

PROFESSORS

Gavin Andrews, B.A. (Wales), Ph.D. (Nottingham) / Chair
Margaret A. Denton, B.A., M.A., Ph.D. (McMaster) / Sociology
Stephen Lewis / Visiting Professor in Global Health

ASSOCIATE PROFESSORS

Ivy Bourgeault, B.Sc. (Alberta) M.Sc., Ph.D. (Toronto) / Sociology
Lori Campbell, B.A., M.A. (Western Ontario), Ph.D. (Guelph) / Sociology
Anju Joshi, B.A., M.A. (Dalhousie)
James Gillett, B.A. (Calgary), M.A., Ph.D. (McMaster) / Sociology
Michel Grignon, M.Sc. (ENSAE, Paris, France), Ph.D. (Ecole des Hautes Etudes en Sciences Sociales, Paris, France) / Economics
Fiona Miller, B.I.S. (Waterloo), M.A. (Victoria), Ph.D. (York)
Celia Rothenberg, B.A. (Wellesley), M.A. (Oxford), Ph.D. (Toronto) / Religious Studies
Chris Sinding, B.A. (Western), M.A. (McMaster), Ph.D. (Toronto) / Social Work

ASSISTANT PROFESSORS

Alina Gildiner, B.Sc., M.Sc., Ph.D. (Toronto) / Political Science
Martin Hering, B.A., M.A. (Philipps-Universität Marburg, Germany), Ph.D. (Johns Hopkins) / Political Science
Lydia Kapiriri, M.D. (Makerere), M.P.H. (Royal Tropical Inst.), M. Med. Ph. (Makerere), Ph.D. (Bergen) / Medicine

ASSOCIATE MEMBERS

Jane Aronson, B.Sc. (New University of Ulster), B.S.W., M.S.W. (McGill), Ph.D. (Toronto) / Social Work
Roy Cain, B.S.W., M.S.W., Ph.D. (McGill) / Social Work
David Clark, B.A., M.A., Ph.D. (Western Ontario) / English and Cultural Studies
Laurie C. Doering, B.Sc. (Queen's) M.Sc., Ph.D. (Saskatchewan) / Pathology and Molecular Medicine
James W. Gladstone, B.A. (McGill), M.S.W. (British Columbia), Ph.D. (Toronto) / Social Work
Jeremiah E. Hurley, B.A. (John Carroll), M.A., Ph.D. (Wisconsin-Madison) / Economics
Carrie McAiney, B.A., M.A., Ph.D. (Waterloo) / Psychiatry and Behavioural Neurosciences

Colin McMullan, B.A. (Brock), Ph.D. (McMaster) / Geography and Earth Sciences
 Christina Moffat, B.Sc. (Toronto), B.A., Ph.D. (McMaster) / Anthropology
 Jenny Ploeg, B.Sc.N., M.Sc.N. (Western Ontario), Ph.D. (Toronto), R.N. / Nursing
 Ellen B. Ryan, B.A., Ph.D. (McMaster) / Psychiatry
 Byron G. Spencer, B.A. (Queen's), Ph.D. (Rice) / Economics
 David Wright, B.A., M.A. (McGill), D.Phil. (Oxford) / History, Psychiatry
 Rachel Zhou, B.A. (Wuhan University), M.A., Ph.D. (Toronto) / Social Work

ADJUNCT MEMBERS

Sherry Dupuis / (Waterloo) B.Mus. (Queen's), M.A. (Waterloo), Ph.D. (Guelph)
 Catherine Ward-Griffin / (Western Ontario) B.Sc.N., M.Sc.N. (Western Ontario), Ph.D. (Toronto)

M.A. Degree

The M.A. offers students a critical social science perspective and an interdisciplinary approach to the study of health and aging. Admission to the M.A. degree program requires an average of B+ or better in an undergraduate Honours degree or equivalent.

Degree Requirements

Students will have two options for completing their M.A.

A. Course Work and Research Paper Option (one year)

Students will be required to complete six (6) half courses, including:

- (i) *701/ Social Science Perspectives on Health and Aging and *702/ Research Methods & Design in Studies of Health & Aging
- (ii) Any one of the following courses: *703/ Health & Aging in a Global and International Context; *704/ Systems Services and Policy; *705/ Socio-Cultural Aspects of Health and Aging.
- (iii) Three elective courses offered by Health Aging and Society or by another department or academic unit (provided that permission has been obtained from those departments or academic units). One of the three courses can be taken as an independent study with a faculty member (*706/ Independent Study). Only two of the three elective courses may be taken in a department or academic unit other than Health Aging and Society.
- (iv) A research paper (7500-8500 words, excluding endnotes and bibliography) supervised by a core or associate faculty member. The research paper will be read by the supervisor and another faculty member. (If the supervisor is an associate member, then the second reader must be a core faculty member selected by the supervisor in consultation with the student).

B. Course Work and Thesis Option (two years)

Students will be required to complete four (4) half courses, including:

- (i) *701/ Social Science Perspectives on Health and Aging and *702/ Research Methods & Design in Studies of Health & Aging.
- (ii) Any one of the following courses: *703/ Health & Aging in a Global and International Context; *704/ Systems Services and Policy; *705/ Socio-Cultural Aspects of Health and Aging.

- (iii) One elective course offered by Health Aging and Society or by another department or academic unit (provided that permission has been obtained from those departments or academic units). This elective course may be taken as an independent study with a faculty member (*706 / Independent Study).
- (iv) A thesis that involves original and independent research (20,000 – 25,000 words excluding endnotes and bibliography) supervised by a core faculty member or an associated member if approved by the graduate committee. The thesis will be orally examined by a committee including the supervisor and two other faculty selected by the thesis supervisor in consultation with the student.

Courses

All courses are half (3 unit) courses. Health Aging and Society *701 and *702 are required. The 600-level courses are offered for graduate credit. The 600-level courses are also available to undergraduate Honours students.

*6C03 / Representations of Health and Illness Across the Life Course

An exploration of representations of health and illness across the life course in the humanities. The focus may vary from year to year, but will examine how health and illness, as it occurs at various stages in the life course, have been represented in literature, art, drama, or music.

*701 / Social Science Perspectives on Health and Aging

This course is an introduction to current theoretical issues and methodology used in research on health and aging in the social sciences. A range of approaches to interdisciplinary research will be explored.

*702 / Research Methods & Design in Studies of Health & Aging

This course explores the interdisciplinary methods and design used in conducting social science research on health and aging.

*703 / Health & Aging in a Global and International Context

This course examines the institutions and the players that address health and aging related issues on a global and international level. Possible examples might include: disability and pension policies in the European Union and implications for aging workforces; World Bank lending policies and tie-ins to borrower's social programs; and WHO and WTO impacts on international health and safety; global initiatives for specific groups, diseases and conditions; developing world health – causes, problems; comparative analysis of institutions and policies.

*704 / Systems, Services and Policy

Canadian approaches to health and aging are changing at every level: policy by federal and provincial/territorial governments; the organization of systems, and the day-to-day technological and human aspects of service provision. This course examines these changes and related issues, such as equity, risk, privacy, and formal and informal systems of care.

*705 / Socio-Cultural Aspects of Health and Aging

This course explores key debates in the socio-cultural study of health and aging. Topics to be addressed could include: consumerism; embodiment; media representations of health and aging; activism and advocacy; beliefs about health, aging and healing; health and the arts; and technology and health and aging.

*706 / Independent Study

This course is for independent research or study supervised by a faculty member.

***707 / Globalization and Health**

This course examines the impacts of globalization processes on various aspects of health in different social, economic and cultural settings. Situating health in a context of global inequity and global interdependence, this course will also discuss the "new" possibilities for and challenges of responding to global health problems.

***708 / Health, Aging and the Media**

This course critically explores the media's role in portraying issues relating to health and aging. Topics that could be covered include: social science critiques of media institutions; forms of media activism and media advocacy; the implications of emergent media forms; and the policy implications of media portrayal of health and aging.

***709 / Special Topics in Aging**

This course explores theoretical approaches to the study of aging including conceptual issues and debates related to an aging population, the experience of growing old, and the lives of older people. Possible topics include: gender, health and well-being in later life, care work, aging and family, gender and growing old, and the cultural context of aging. Issues will be examined through one or more theoretical lens, such as life course, social constructionism, political economy, or a feminist approach.

***710 / Multidisciplinary Perspectives on Aging**

Through in-depth analysis of multidisciplinary issues, students select and integrate gerontological knowledge about the social, psychological, health, cultural and other aspects of aging.

***711 / The Health Care System and the Older Person**

This course provides interdisciplinary analysis of priority issues relating to the health care system and the older person. In a problem-based self-directed and small group learning format, topics studied are health policy, models of care, comparative ways of life and the industry/government interface.

***712 / Special Topics in Health**

This is a special topics course in health. Topics may be of a general nature, covering debates and new directions in the discipline as a whole, or more specific to sub-areas within this discipline.

HEALTH POLICY

The interdisciplinary, interdepartmental, interfaculty program in Health Policy at McMaster University offers a Ph.D. in Health Policy.

Enquiries: 905-525-9140 Ext. 22952
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 Website: <http://fhs.mcmaster.ca/hpphd/>

Staff / Fall 2009**DISTINGUISHED UNIVERSITY PROFESSOR**

John D. Eyles, B.A., M.Sc. (L.S.E.), Ph.D. (London)

PROFESSORS

Stephen Birch, B.A. (Sheffield), M.Sc. (Bath), D.Phil. (York)
 Cathy Charles, B.A., M.A. (Toronto), M.Phil., Ph.D. (Columbia)
 Susan J. Elliott, B.A. (Brock), M.A., Ph.D. (McMaster)
 Amiram Gafni, B.Sc., M.Sc., D.Sc. (Technion, Haifa)
 Mita Giacomini, B.S., M.P.H., M.A., Ph.D. (California)
 Jeremiah E. Hurley, B.A. (John Carroll), M.A., Ph.D. (Wisconsin-Madison)
 M. Susan Watt, B.A., M.S.W., Adv. Dip. S.W. (Toronto), D.S.W. (UCLA)

ASSOCIATE PROFESSORS

Julia Abelson, B.A. Sc. (Hons) (McMaster), M.Sc. (Harvard), Ph.D. (Bath)

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 John Lavis, M.D. (Queen's), M.Sc. (London School of Economics), Ph.D. (Harvard)
 Lisa Schwartz, B.A., M.A. (McGill), Ph.D. (Glasgow)
 Wayne Warry, B.A., M.A. (McMaster), Ph.D. (Australian National)
 Donald Willison, B.Sc. (Toronto), M.Sc. (McMaster), Sc.D. (Harvard)
 David Wright, B.A., M.A. (McGill), D.Phil. (Oxford)

ASSISTANT PROFESSORS

Phil DeCicca, B.S. (Cornell), M.P.A. (Syracuse), M.A., Ph.D. (Michigan)
 Aina Gildiner, B.A. (York), B.Sc., M.Sc., Ph.D. (Toronto)
 Glen Randall, B.A., M.A., M.B.A. (McMaster), Ph.D. (Toronto)
 Jean-Eric Tarride, B.A., M.A. (Toulouse), Ph.D. (Concordia)

Ph.D. Degree

The purpose of the Ph.D. in Health Policy is to train intellectual leaders in the field who will make seminal contributions to policy understanding and practice. The curriculum provides the student with theoretical and empirical tools for answering a range of questions about health policy, and the ability to develop new investigation approaches to move the field forward. An emphasis on theoretical and conceptual frameworks for policy analysis distinguishes this program from health degrees with a primary focus on empirical methodologies or on specific substantive problems.

The Ph.D. program integrates intellectual resources for education and research across McMaster University. Participating faculty members have appointments predominantly in departments within the Faculty of Social Sciences, the Faculty of Health Sciences, and the School of Business. Graduates with a Ph.D. in Health Policy will be well prepared for academic appointments in interdisciplinary departments or institutes. Their training will also prepare them for fruitful engagement with policy makers as providers of useful knowledge, insightful research, and innovative solutions to policy problems. Outside of academia, graduates would be qualified for leadership positions in government, policy consulting, non-governmental organizations throughout the health sector, and private industry.

The program offers three fields of specialization: *Health Economics*, *Political Studies*, and *Social Organization*.

Health Economics

The economics field addresses the economic analysis of health policies and health systems, as well as the economic analysis of responses to health policies. Topics may include, for example, health resource allocation, configuration of health human resources, economic evaluation of policy options, public and private financing of health care, societal investments in health production, etc. The dominant disciplinary perspective is that of microeconomics, but insight into economic behaviour may also be provided by perspectives such as business, psychology, and others.

Political Studies

The political studies field emphasizes the political aspects of health policy including the influences by political institutions, actors, values, and ideas operating within state and global jurisdictions. Topics of interest, for example, may include the role of historical institutional arrangements in shaping health governance reforms, the impact of global trade agreements on domestic home care and pharmaceutical policy, the role of the public, stakeholders, and prevailing values on policy agendas, etc. Political science is the dominant disciplinary perspective, with related areas including, for example, public policy analysis and administration, comparative public policy, law, political theory and philosophy.

Social Organization

The social organization field includes social science perspectives on the institutions, organizations, culture, and society that form the social fabric of health systems (both for health creation and health care). Topics of interest for example include the generation and use of information, professional roles and behaviour, impacts of technology, political economies of health production, etc. Disciplinary perspectives include sociology, anthropology, business administration or management, and political science.

Admission

Admission to the Ph.D. program requires previous graduate training in a relevant field (e.g., social sciences, health professions, policy, business, legal or administrative professions), with at least an A-grade average in past graduate coursework. A Master's degree is preferred. At least one graduate-level statistics half-course should be passed prior to admission. Students without this preparation in statistics may be admitted, but would be required to take a graduate statistics course in addition to normal program requirements. Successful applicants must also meet all School of Graduate Studies admissions requirements. Current admission procedures, forms, and deadlines are available on the Health Policy program website: <http://fhs.mcmaster.ca/hpphd/>

Degree Requirements

The Health Policy Ph.D. curriculum has three parts, which will normally be completed over a four-year period: (1) coursework (first and second years); (2) comprehensive examinations (first and second years); (3) the doctoral dissertation, which involves the approval and defense of the proposal for the doctoral research (third year), dissertation research (third and fourth years), and the completion, approval, and defense of the written dissertation (fourth year).

- (1) Students must complete between 15 and 36 units (5-12 half courses) of course work. Courses are chosen from the list of recommended courses for each curriculum area (listed below). Required coursework includes 3 terms of the Doctoral Seminar in Health Policy, 2-3 specialty field courses, 0-2 breadth field courses outside the student's specialty field, and 0-4 methodology courses, including both quantitative and qualitative or mixed methods.

Students without prior graduate training in a given area are required to take the maximum number of required courses for that area. Students who have completed some relevant training prior to admission may have relevant course requirements waived at the time of admission to the Health Policy Ph.D. program. A minimum of 5 half-courses (3 doctoral seminar courses, 2 specialty field courses) may not be waived and must be completed while the student is enrolled in the Health Policy Ph.D. program.

Doctoral seminar

3 terms of HLTH POL 711

Breadth field courses

0-2 half courses, one from each of two fields other than the student's specialty:

Health Economics: HRM *787, ECON/HRM *788; with program permission: HLTH POL *750, HLTH POL *798

Political Studies: HRM *738, HLTH AGE *704; with program permission: HLTH POL *750, HLTH POL *798

Social Organization: SOCIOLOG *719, HIST *759, HRM *729; with program permission: HLTH POL *750, HLTH POL *798

Specialty field courses

2-3 half courses in 1 of the following 3 fields:

Health Economics: Required for all Health Economics field students, unless waived: ECON/HRM *788, ECON *727; Additional choices: ECON/HRM *791, ECON *793, HRM *737, HLTH POL *750, HLTH POL *798

Political Studies: Required for all Political Studies field students, unless waived: HRM *738; Additional choices: POLSCI *783, POLSCI *785, POLSCI *702, POLSCI *740, HLTH POL *750, HLTH POL *798

Social Organization: Required for all Social Organization field students, unless waived: SOCIOLOG *719; Additional choices: SOCIOLOG *705, SOCIOLOG *718, SOCIOLOG *714, HRM *729, POLSCI *786, ANTHRO *709, ANTHRO *717, GLOBAL *701, GLOBAL *720/ANTHRO *720, HIST *759, HLTH POL *750, HLTH POL *798

Methodology courses

0-4 half courses, including both quantitative and qualitative or mixed methods:

Quantitative Methods: Required for Health Economics specialty field students, unless waived ECON *761; Additional choices for students in all specialty fields:

ECON *762, ECON *795, ECON *770, HRM *727, HRM *751, HRM *762, HRM *723, HRM *731, HRM *740, HRM *737, POLSCI *784, SOCIOLOG *740, SOCIOLOG *761, HLTH POL *750, HLTH POL *798

Qualitative Methods: HRM *745, HRM *758, SOCIOLOG *743, SOCIOLOG *742, SOCIOLOG *744, HRM *705, HLTH POL *750, HLTH POL *798

Mixed Methods: HRM *700, POLSCI *796, HRM *770, HRM *705, HLTH POL *750, HLTH POL *798

- (2) Comprehensive examinations are completed during the first and second years of full time study, as the relevant coursework requirements are completed. Students complete three required comprehensive examinations in the following areas:
- Two breadth fields outside the student's specialty area (social organization, political studies, and health economics);
 - One chosen specialty area (social organization, political studies, or health economics); and
 - Research methods (qualitative and quantitative empirical approaches).
- (3) All Health Policy Ph.D. students are required to research, write, and successfully defend a doctoral dissertation, which constitutes an original contribution to knowledge in the field of health policy. The dissertation is developed and completed under the guidance of the student's primary supervisor and a dissertation supervision committee consisting of at least two additional faculty members.
- Normally by the beginning of the third year of full time study, the doctoral dissertation *proposal* is formally presented and defended before a committee;
 - The doctoral dissertation research is normally completed during the third and fourth years of full time study, with the completion, approval, and defense of the written dissertation by the end of the fourth year.

Supervision

Each student will be assigned a provisional faculty supervisor upon admission to the program. A final faculty supervisor and a three member supervisory committee will be appointed within 6 months of the student's enrollment in the program. At least two (of three) supervisory committee members must be core faculty members of the Health Policy Ph.D. Program. The faculty supervisor and supervisory committee provide guidance and monitor the student's progress. The supervisory committee is expected to meet with the student at least annually to assess the student's progress and to file a written progress report with the Program.

Additional Regulations

Students and prospective applicants should consult the Graduate Calendar for a complete description of regulations concerning the Ph.D. degree and graduate studies at McMaster University.

Courses

Listed below are courses offered by the Health Policy Ph.D. Program. The descriptions of additional courses relevant to the curriculum are listed elsewhere in the Graduate Calendar, under the primary department or program offering the course.

711 / Doctoral Seminar in Health Policy / J. Lavis, J. Abelson

The Doctoral Seminar in Health Policy is dedicated to the advanced study of health policy problems, ideas, and analytic approaches. It provides an opportunity for doctoral students with diverse experiential, methodological, and theoretical training to focus on common interests and problems that characterize the field of health policy. The seminar will highlight the frontiers of knowledge in the field and foster interdisciplinary communication and integration.

*750 / Special Topics in Health Policy / Staff

This course explores a current health policy topic area in depth applying analytic frameworks from health economics, political studies, or social organization, as well as addressing the relationship of conceptual frameworks to empirical questions and methods in the area. Examples of possible topic areas include: decision making, comparative health systems, environmental health, regulation, privatization, health human resources, public participation, health policy ethics, technology assessment, knowledge translation, etc. Because course content varies from term to term, students should check with the instructor regarding its applicability to specific Health Policy Ph.D. program curriculum requirements.

*798 / Independent Study in Health Policy / Staff

The Independent Study is designed to allow students to develop a course tailored to their specialized learning objectives. Students work independently under the guidance of a faculty member to read, analyze, and apply relevant literature to inquiry in health policy concepts, substantive topics, or methods. Please note that the application of this course toward Health Policy program curriculum requirements is conditional on review of the independent study plan by the Health Policy Ph.D. program for relevance to a specialty field or methodology area outlined in the program curriculum.

HEALTH RESEARCH METHODOLOGY

The Graduate Program in Health Research Methodology provides exciting new opportunities for advanced training in research methodology. The program is offered at the M.Sc. and Ph.D. level. Students are encouraged to enroll in full-time study, although requests for part-time studies will be considered at both the M.Sc. and Ph.D. level.

Through coursework and involvement in research projects students are exposed to evaluative frameworks and research methods derived from clinical epidemiology, biostatistics, epidemiology, health economics, health services research, health policy analysis, psychology, sociology, geography, political science, history, bioethics and education.

Trainees are challenged to integrate theory and methods from these alternative disciplinary perspectives to create innovative research and evaluation methods that can contribute to an improved understanding of health and disease (in individuals and populations) and strengthened health services and systems.

Students may choose to specialize in one of the following fields: Clinical Epidemiology, Biostatistics (Ph.D. level), Health Services Research, Population and Public Health and Health Technology Assessment.

For those students wishing to pursue a graduate level diploma in Health Services and Policy Research in addition to their degree, please refer to the Graduate Diploma Programs section at the back of this Calendar.

Enquiries: 905 525-9140 Ext. 27718

Fax: 905 546-1129

E-mail: carri@mcmaster.ca

Website: <http://www.fhs.mcmaster.ca/grad/hrm>

Staff / Fall 2009

PROFESSORS

Kathryn J. Bennett, B.A., M.Sc. (McMaster), Ph.D. (Waterloo)

Stephen Birch, B.A. (Sheffield), M.Sc. (Bath), D.Phil. (York)

Ralph Bloch, M.Sc., Ph.D. (Zurich), M.D. (McMaster), F.R.C.P.(C)
/ Part-time

George Browman, M.D., C.M. (McGill), M.Sc. (McMaster) / Part-time

Cathy Charles, B.A., M.A. (Toronto), M.Phil., Ph.D. (Columbia)

Deborah Cook, M.D., M.Sc. (McMaster), F.R.C.P.(C)

Richard Cook, B.Sc. (McMaster), M. Math, Ph.D. (Waterloo) / Part-time

Alba DiCenso, Ph.D. (Waterloo)

Abdel El-Shaarawi, B.Sc. (Hons.), M.Sc. (Cairo), Ph.D. (Waterloo),
(Math & Stats) / Sessional Instructor

Amiram Gafni, B.Sc., M.Sc., D.Sc. (Technion, Haifa)

Mita Giacomini, B.S., M.P.H., M.A., Ph.D. (California)

Gordon H. Guyatt, B.Sc. (Toronto), M.D., M.Sc. (McMaster),
F.R.C.P.(C)

R. Brian Haynes, B.Sc., M.D. (Alberta), M.Sc., Ph.D. (McMaster),
F.R.C.P.(C)

Milos Jenicek, M.D., Ph.D. (Charles), F.R.C.P.C. / Part-time

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Mitchell A. Levine, M.D. (Calgary), M.Sc. (McMaster), F.R.C.P.(C)

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(McMaster)

Parminder Raina, B.Sc. (Saskatchewan), Ph.D. (Guelph)

Barbara K. Schmidt, M.D., Ph.D. (Georg-August, Germany)
/ Part-time

Holger J. Schünemann, M.D. (Hanover, Germany), M.Sc.,
Ph.D. (Buffalo)

Harry S. Shannon, B.A. (Oxford), M.Sc. (Birmingham), Ph.D.
(London)

Stephen D. Walter, B.Sc. (London), Ph.D. (Edinburgh)

Salim Yusuf, M.B.B.S. (Bangalore), Ph.D. (Oxford)

ASSOCIATE PROFESSORS

Julia Abelson, B.A. (Hons) (McMaster), M.Sc. (Harvard School
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Kevin Brazil, B.A., M.A. (Carleton), Ph.D. (Toronto)

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Kevin Eva, B.Sc., Ph.D. (McMaster)

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A. Theodore Haines, M.D. (Toronto), M.Sc. (McMaster), F.R.C.P.(C)

Steven Hanna, B.Sc. (Toronto), M.A., Ph.D. (Western)

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(McGill) / Part-time

James Julian, B.Sc. (McMaster), M.Math. (Waterloo)
 Jeffrey Jutai, B.Sc. (Toronto), M.A., Ph.D. (British Columbia)
 / Part-time
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 Donald Willison, B.Sc. (Toronto), M.Sc. (McMaster), Sc.D. (Harvard)

ASSISTANT PROFESSORS

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 (Toronto) / Part-time
 Gord Blackhouse, B. Comm., M.B.A., M.Sc. (McMaster) / Part-time
 Dianne Bryant, B.Sc. (McMaster), B.A. (Waterloo), M.Sc. (Western),
 Ph.D. (McMaster) / Part-time
 Marc de Somer, M.B.A. (Columbia), M.Sc. (Harvard School of Public
 Health), M.D. (Brussels) / Part-time
 P.J. Devereaux, B.Sc. (Dalhousie), M.D., Ph.D. (McMaster)
 Amit Garg, M.D., M.A. (Toronto), Ph.D. (McMaster), F.R.C.P.C.,
 F.A.C.P. / Part-time
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 (Western), Ph.D. (McMaster) / Part-time
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 (HIV / AIDS, Simon Fraser University) / Part-time
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 Ph.D. (Toronto) / Part-time
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 Ph.D. (Guelph) / Part-time
 Feng Xie, B.Sc. (Shanghai), M.Sc. (Fudan), Ph.D. (Singapore)

CLINICAL PROFESSOR

John Sellors, M.D., M.Sc. (McMaster), C.C.F.P., F.C.F.P.

ASSISTANT CLINICAL PROFESSOR

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 / Part-time

ASSOCIATE MEMBERS

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 Sonia Anand (Medicine)
 Ronald Barr (Pediatrics, Medicine, Pathology & Molecular Medicine)
 Mohit Bhandari (Surgery)

Michael Boyle (Psychiatry and Behavioural Neurosciences)
 Regina Browne (Nursing)
 John Cairney (Family Medicine)
 Angelo Canty (Mathematics & Statistics)
 Claudio Cina (Surgery)
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 Stuart Connolly (Medicine)
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 and Pediatrics)
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 Koon Teo (Medicine)
 Achilleas Thoma (Surgery)
 Suneel Upadhye (Medicine)
 Roman Viveros-Aguilera (Mathematics & Statistics)
 Timothy Whelan (Medicine)
 Andrew Worster (Medicine)
 John You (Medicine)

PROFESSORS EMERITI

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 F.R.C.P.C. (Medicine)
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 Basel), M.A. (Harvard), F.R.C.P. (Ottawa, London, Edinburgh)
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 (Syracuse)
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 David Verma (Family Medicine)
 Andrew Willan, B.A. (York), M.Sc. (Queen's), Ph.D. (Western)
 Christel A. Woodward, B.A. (SUNY), M.A., Ph.D. (Ohio State)

Fields of Specialization

In addition to our regular offerings, the HRM program provides students with the opportunity to *specialize* in one of five 'fields of specialization'. The five fields are: clinical epidemiology, biostatistics, health services research, public and population health and health technology assessment. All five fields are offered at the MSc and PhD level except for Biostatistics, which is offered at the PhD level only. The original HRM program, wherein students opt not to declare a field of specialization will continue to be available as "*HRM Classic*". Students in HRM classic pursue a general methods degree, or explore other areas such as medical education research, health informatics or health ethics, to name but a few.

Clinical Epidemiology: P.J. Devereaux, Field Leader

Clinical epidemiology employs sound research principles, tempered with practicality, to find the best answers to "real world" questions about clinical practice and health care. Individuals training in this field (who usually have a clinical background) acquire the skills required to undertake research that addresses fundamental questions about the effectiveness of clinical therapies, usefulness of screening and diagnostic tools, prognosis and disease causation. Issues related to research synthesis and knowledge translation may also be a focus. Individuals training in clinical epidemiology work alongside world leading clinical epidemiologists who are conducting their research in multiple sites around the world and changing the way medicine is practiced globally. The field of clinical epidemiology in the Health Research Methodology Program offers a unique opportunity to learn and work with the best clinical epidemiologists in the world, thus enabling graduates to make profound contributions to the practice of clinical medicine through research.

Biostatistics (Ph.D. level): Stephen Walter and Lehana Thabane, Field Co-Leaders

The HRM Biostatistics PhD field is specially designed for applicants with an MSc in Mathematics and/or Statistics who wish to pursue doctoral work in Biostatistics. The program aims to provide trainees with the skills they need to conduct independent research into biostatistical topics, provide leadership as biostatistical collaborators in clinical, health systems and population health investigations and effectively teach biostatistics from introductory through to advanced levels. Graduates will possess the following skills: ability to apply biostatistical concepts, techniques and data-analytic strategies across the full spectrum of research questions and study designs; ability to contribute to grant proposals in the areas of research design, data analysis and interpretation; ability to teach biostatistical concepts to research colleagues who are not biostatisticians; and ability to adapt existing statistical techniques or to develop new techniques to solve research design and analytical programs. Graduates may pursue career opportunities in academia, government or private industry.

In addition to coursework related to research design, all students participate in a course on Biostatistical Collaboration. The aim is to develop the skills needed for successful collaborative research in the role of biostatistical consultant. These include communication of biostatistical concepts and the provision of leadership with respect to research design, analysis and reporting.

Health Services Research: Marko Simunovic, Field Leader

Health services research focuses on questions about the most effective ways to organize, manage, finance, and deliver high quality clinical and health care, reduce medical errors and improve patient safety. The research domains utilized by health services researchers may include individuals, families, organizations, institutions, communities, and populations. Graduates acquire a broad range of skills in research synthesis, research design, data analysis and writing for publication that enable them to conduct rigorous research in numerous areas including: patterns of care/process of care, small area practice variation studies, appropriateness of care, knowledge translation, economic analysis of health care, service and system organization, patient experience, theoretical underpinnings of health services organization, management, and financing and delivery. The curriculum emphasizes mixed methods approaches that utilize skills in both quantitative and qualitative research.

Public and Population Health: Parminder Raina, Field Leader

Canada faces many public health challenges, including emerging and existing infectious diseases and alarming increases in many chronic diseases. Research to address the determinants of these health problems is of paramount importance to maintaining a healthy population. The field of population and public health provides students with the methodological expertise needed to conduct cutting edge research, including investigations into the biological, economic, and social factors that protect, precipitate or perpetuate disability and disease, and to improve public health. Graduates will acquire the following skills: ability to critically appraise and interpret research evidence, formulate research questions, justify research and analysis methods and understand ethical issues involved in research in this field; ability to conduct research into biological, social, cultural, and environmental determinants of health; ability to conduct basic or applied research in public health aimed at improving the health of individuals, communities and populations; and ability to apply population and public health methods across a range of disease conditions.

Health Technology Assessment: Ron Goeree, Field Leader

Health Technology Assessment (HTA) is defined as the evaluation of the clinical effectiveness, cost-effectiveness, and broader impact of drugs, medical technologies, and health systems, both on patient health and the health care system. HTA has gained increasing importance in health care decision making locally and around the world and over the last decade there have been numerous important methodological advances in the techniques of HTA. As a result there is a growing gap between the need for HTA and the availability of skilled researchers to conduct HTAs. The goal of the HTA field specialization is to train individuals who, upon graduation, will have the necessary skills to be actively involved in independent and collaborative research in the field of HTA. Graduates will possess the following skills: a strong foundation in the basic principles of HTA; advanced decision analysis; ability to apply research methods derived from health economics; understand and use basic and advanced biostatistics; and utilize health services research and health policy analysis concepts and methods.

Students will be expected to collaborate with one of the many research groups conducting HTA at McMaster University.

M.Sc. Degree

The general requirements for the M.Sc. Degree appear under the Regulations for the Master's degrees near the beginning of this Calendar.

McMaster's Postgraduate Medical Education Program allows Clinician Investigator Program trainees the opportunity to undertake a Master's or Ph.D. degree as a full-time student (please refer to the Handbook for CIP trainees and the Health Sciences Graduate Programs Policy re CIP Applicants; separate applications are required for both).

A. M.Sc. BY THESIS

Requirements for the thesis-based M.Sc. degree include: i) successful completion of at least **five** half courses at the graduate level of which: a) one course must be HRM 721, b) one course must be HRM 702 and c) the remaining required courses may be selected from among the courses offered by the HRM Program; ii) field-specific courses (if applicable); iii) successful completion of a research internship; and iv) submission and successful defence of a thesis. The required courses for the M.Sc. thesis are:

Field of Specialization	Common Courses	Field Specific Courses	Electives
HRM-Classic	*721 & *702	n/a	3
Clinical Epidemiology		*743, *730 or *751	1
Health Services Research		*762	2
Population & Public Health		*751	2
Health Technology Assessment		*787, *737	1

B. M.Sc. BY COURSE WORK

Requirements for the course-based MSc degree include: i) successful completion of at least **seven** half courses at the graduate level of which: a) one course must be HRM 721, b) one course must be HRM 702 and c) the remaining required courses may be selected from among the courses offered by the HRM Program; ii) field-specific courses; iii) successful completion of a research internship and iv) a scholarly paper on a methodological issue, written at the completion of course work.

The required courses for the M.Sc. by coursework are as follows:

Field of Specialization	Common Courses	Field Specific Courses	Electives
HRM-Classic	*721 & *702	*730 or *751, one of: *723, *727, *731, *733, *737, *743, *745	3
Clinical Epidemiology		*743, *730 or *751	3
Health Services Research		*762	4
Population & Public Health		*751	4
Health Technology Assessment		*787, *737, *743	2

A part-time student who receives permission for exemption from the formal research internship requirement must successfully complete an additional HRM graduate half course.

Students are expected to attend and participate in rounds and special events of the Department of Clinical Epidemiology & Biostatistics and HRM student rounds.

Students wishing to be transferred to the Ph.D. program prior to completion of the M.Sc. degree by Thesis option (see section 2.1.2 of the General Regulations of the School of Graduate Studies and the statement entitled "Policy and Procedure for Transfer from the M.Sc. to Ph.D. Health Research Methodology") must have a minimum of an A- average in the M.Sc. curriculum with no grade less than a B, and must submit a critical Transfer Report, embodying a statement of progress and achievement in their research work to date and a proposal for Ph.D. research. The Transfer Report must be submitted within 18 months from entry at the M.Sc. level as a full-time student and 36 months from entry as a part-time student. The student must have successfully completed those courses required for the HRM M.Sc. Degree by Thesis as well as the formal research internship requirement before the Transfer Meeting. Part-time M.Sc. students would normally be expected to become full-time students when successfully transferring to the Ph.D. Approval to transfer will be determined at a meeting of the Transfer Committee at which the student will present his/her work and ideas for Ph.D. study orally.

C. CO-OP OPTION

Full-time HRM thesis or course-based Master's students who have successfully completed at least four half courses may be considered for the co-op option. The number of students selected will be subject to available placements.

To complete the M.Sc. co-op option successfully, the student must work a total of eight months in either one or two work-study placements. Each placement must be approved by the HRM Coordinator. For M.Sc. by thesis students, a project undertaken during a work term may evolve into a thesis topic during the second work placement, subject to the appropriate approvals.

At the completion of each work-term placement, the student must write a report and append a letter of evaluation by the employer.

During the co-op placement, a student will be paid by the employer. A separate co-op fee must be paid prior to placement. A student completing the co-op option will be exempted from the research internship requirement. This option would normally require longer than 2 years to complete.

Ph.D. Degree

While the field of focus is Health Research Methodology, the faculty is a diverse interactive group of researchers specializing in the evaluative and decision sciences in biostatistics/clinical trials; epidemiology/population health/health services; health economics/health policy analysis; and health measurement. Common to these diverse disciplinary interests is a central focus on the development and testing of theory and methods related to health problems. Thus, the program seeks candidates who show high scholarly promise from both clinical and non-clinical backgrounds: clinicians, in virtually all health-related disciplines, and non-clinicians, usually from backgrounds in the social and behavioural sciences. A candidate for the Ph.D. degree must comply with the School of Graduate Studies Regulations for the Degree Doctor of Philosophy, including completion of the equivalent of 1.5 full 700-level courses, as the minimum course requirement.

Students who have not taken courses that represent an introduction to health research methods (HRM *730 or HRM *751 [or their equivalents]) and basic biostatistics (HRM *702 [or equivalent]), and theory and practice of measurement (HRM *727 [or its equivalent]) will be required to take these courses in addition to the regular course load.

The specific recommended courses would depend on the student's field of specialization, and their interest in exploring focused areas in depth. These courses could be taken from the following list:

- | | |
|----------------------------------|--|
| (a) Philosophy of Science | HRM *700 |
| (b) Biostatistics | HRM *723, HRM *731, HRM *714, HRM *739 |
| (c) Health Economics | HRM *737 and HRM *787 or HRM *788 and HRM *791 |
| (d) Health Policy | HRM *738 |
| (e) Measurement | HRM *727 |
| (f) Epidemiology | HRM *733 and HRM *743 |
| (g) Qualitative Methods | HRM *745 |
| (h) Special Topics | HRM *722 |
| (i) Independent Student | HRM *705 |
| (j) Population Health | HRM *748 |
| (k) Program Evaluation | HRM *762 |
| (l) Research Ethics | HRM *742 |
| (m) Health Technology Assessment | HRM *740 |

Field of Specialization	Common Courses	Field Specific Courses	Electives
HRM Classic		n/a	3
Clinical Epidemiology		742	2
Biostatistics		739	2
Health Services Research	n/a	751 or 748	2
Population & Public Health		748	2
Health Technology Assessment		740	2

Other course offerings may be considered; students will be encouraged to consider existing courses in the Faculties of Health Sciences, Business, Science, and Social Sciences.

Candidates must also:

1. Obtain a grade of at least B- in all courses.
2. Pass a Comprehensive Examination between twelve and twenty-four months following the start of doctoral studies at McMaster. The examination will test the student's ability to acquire, evaluate critically, handle and conceptualize major issues in the discipline or sub-discipline to which their field of research belongs. They must include at least two of the aforementioned areas but these cannot be related directly to the thesis topic.
3. Complete a dissertation or thesis on an approved topic based on research carried out within the program, and defend the thesis at a final oral examination. The thesis will demonstrate the student's ability to develop new methodology, or to advance one or several competing existing methodologies in a challenging new area of health care/health services research.

Students may be asked to meet additional requirements of the program, including participation in special seminars or colloquia.

Courses

Courses marked with an asterisk (*) are half courses; courses marked with a plus sign (+) may be taken more than once at the M.Sc. level or Ph.D. level but only one of the two courses can be counted towards the minimum course requirements of the program at each level. Students taking HRM +*722 cannot also receive credit for any subsequent regular course offering on the same topic. HRM courses are available to students registered in other programs, although all courses are not offered every year. Some courses have limited enrolment and prerequisites.

Approved courses from other graduate programs may be taken for credit when appropriate and with permission of the supervisor.

***700 / Philosophy of Science for Health Research / M. Giacomini**
This course introduces students to the theoretical and methodological foundations of health research, a field currently characterized by the paradigms of the biomedical, public health, and social sciences. Topics covered in the course include: the logic of scientific inference, theorizing and empiricism in scientific knowledge, ontological and epistemological foundations of common health research methodologies, theories of scientific progress, and the role of values, ideology, and technology in science.

***702 / Introduction to Biostatistics / H. Shannon**
Basic statistical concepts and techniques as they apply to analysis and presentation of data in biostatistical and epidemiology practice. The course covers: graphical presentation of data, elementary probability, descriptive statistics, probability distributions, and introduces hypothesis testing using parametric and non-parametric methods. Specific techniques covered include z-tests, t-tests, ANOVA, contingency tables, regression and correlation.

***703 / Introduction to Biostatistics: Laboratory Section / C. Goldsmith**
Basic statistical concepts and techniques as they apply to the presentation and analysis of data encountered in laboratory oriented research. Topics include: descriptive statistics; graphic display principles; elementary probability; univariate distributions: normal, *t*, chi-square, *F*; hypothesis testing, confidence intervals, sample sizes and assumptions for means and proportions generated from one, two or many samples; transformations; regression and correlation; analysis of variance; experimental design principles and analyses. This course is evaluated on a pass/fail basis. Antirequisites: HRM *701, HRM *702.

***705 / Independent Study in Clinical Epidemiology and Health Research Methods / Assistant Dean**

This course is designed to allow students to either tailor their learning to the specific topics in clinical or health care, health policy and research methodology relevant to their clinical or health care and research interests and do advanced work in this area. The topic studied may be synergistic with the student's thesis topic but must not represent a major overlap with it. Under the guidance of a faculty member, the student will critically examine the pertinent literature. Students will prepare a term paper and give a seminar on a selected topic.

***711 / Health Economics and Evaluation / C. Longo
(Same as Business C711)**

This course examines the application of economic principles to policy-relevant questions in the area of health and health care. Topics will include applied health economics, economic correlates to health, demand and supply of health care and insurance, health care system financing, economic evaluation in the pharmaceutical/medical devices industries, costing methodologies, cost-effectiveness and cost-benefit analyses, QALYs, decision analysis, modeling and means by which to improve value-for-money in the health sector.

***713 / Health Quality Improvement / C. Goldsmith**

This course will expose students to principles of quality improvement (QI). It allows them to gain experience in using QI tools, develop an appreciation of the role that people management and teams play in QI, become proficient in conducting QI studies in the Health Care arena and become familiar with the QI literature applied to Health Care. Students will become familiar with the principle software for statistical QI methods and learn the principles of reduction of variation, robustifying processes and resisting human error. This course is evaluated on a Pass/Fail basis.

***714 / Methods for the Analysis of Longitudinal Data /
P. Contoyannis**

This course considers the design and content of longitudinal health surveys and national and provincial health databases. It provides students with skills in exploratory analysis of longitudinal data, discusses the use of dynamic/transitional models, examines attrition and selection issues, and considers approach to the analysis of models for categorical and count data.

***721 / Fundamentals of Health Research and Evaluation
Methods / A. Lytwyn, Summer / M.A.H. Levine, Fall**

The major components of research activities are covered, including concept of health, formulation of research questions, literature reviews, study designs, selection of study populations, choice of measuring instruments, and study interpretation issues such as determination of causality and the effectiveness of clinical and community interventions.

***722 / Selected Topics in Clinical Epidemiology and
Population Health Research Methods / Assistant Dean**

This special topics course will present leading edge thinking regarding controversies in health, health care, and population health research.

***723 / Regression Analysis / S. Hanna**

This is a second level course in statistical methods, concentrating on regression models of various types. Topics covered include various main techniques of simple and multiple linear regression, and techniques such as use of dummy variables, covariance adjustment, residual analysis and assessment of model fit. A similar agenda is followed for logistic regression, appropriate for binary outcome variables. We also consider some advanced topics and related methods.

***724 / eHealth: Fundamentals of eHealth and the Canadian
Health Care System / A. McKibbin**

This tutorial-based course will cover a broad range of eHealth topics from the perspective of health care delivery. Topics include a definition of eHealth; health care data; hospital and primary care information systems (i.e., electronic health records [EHR] systems); specialty components of an EHR system; how health professionals

use data; human/cognitive factors in development and implementation of eHealth applications, standards, vocabulary and nomenclatures and how used; aggregation of health information, especially for research purposes; patient information systems and consumer eHealth; research and evaluation of eHealth applications and research using eHealth applications; implementation issues and privacy, security, and confidentiality; and the future of eHealth.

***725 / Knowledge Exchange and Translation / J. MacDermid
(Same as Rehabilitation Science *725 and Nursing *725)**

This modular course will present students with an introduction to basic principles, conceptual frameworks, research design, and interventions used in knowledge exchange and translation. Faculty with specific expertise in knowledge exchange and translation for different target audiences (patients/public, policy makers, clinicians) will facilitate modules that address theoretical and practical issues around using developed knowledge to improve health or health care systems. Students will present their research protocol or KET project in the final module.

***727 / Theory and Practice of Measurement / G. Norman,
K. Dore, J. Cairney**

Principles of subjective assessment in topic areas ranging from educational evaluation to patient-based measurement of health attitudes or health status. Discussion includes: principles and methods of constructing rating scales and approaches to assessing the measurement properties of such scales. Special emphasis on assessment of reliability and validity—various forms of reliability (test-re-test, interobserver, split-halves), distinction between reliability and agreement, and indirect methods to assess validity of an instrument in the absence of a “gold standard.” Advanced topics in generalizability theory will be introduced. Format is that of lecture, plus small group discussion.

***728 / Genetic Epidemiology and Statistics / S. Anand**

Genetic epidemiology overlaps with molecular epidemiology. It is the epidemiological evaluation of the role of inherited causes of disease in families and in populations; it aims to detect the inheritance pattern of a particular disease, localize the gene, and find a marker associated with disease susceptibility. Gene-gene and gene-environment interactions are also studied in genetic epidemiology of a disease. Genetic epidemiology is “a science which deals with the etiology, distribution, and control of disease in groups of relatives and with inherited causes of disease in populations.” (Morton NE, 1982)

***729 / The Canadian Health Care System in Comparative
Perspective / TBA**

This course provides an overview of the Canadian health care system by examining its origins, institutional structures (i.e., governance, financing and service delivery), key elements (e.g., allopathic, physician and hospital centre), and reform challenges. Our analysis of the Canadian system is comparative, drawing on relevant evidence about the US, UK and Australian health systems. The course has two parts. In the first half, we review the evolution and structure of the Canadian, US, UK and Australian health systems. The second half of the course reviews a series of key health reform challenges in Canada from a comparative perspective: reform in the financing of health care, reform in the delivery of primary care, reform in the delivery of home and aged care, and reform in the coverage of pharmaceuticals.

***730 / Introduction to Research Methods for Randomized
Controlled Trials / P. J. Devereaux**

This course will introduce students to the main elements of clinical trial design, execution and analysis. At the end of this course, students should have a firm grasp of clinical trial methodology at a level that would allow them to prepare successful grant applications.

***731 / Advanced Linear Models for Health Data / TBA**

The course focuses on some advanced statistical techniques for the analysis of health studies that have continuous outcomes. Although these techniques are useful for many kinds of research, students interested in observational, repeated-measures, and longitudinal studies will find them especially helpful. The goal of the course is to give students the tools to develop multivariate linear models of health outcomes. The curriculum is divided into 3 modules: (1) fundamental topics in linear regression; (2) multilevel models and growth curve analysis for clustered and longitudinal data; and (3) structural equation modeling with latent variables. We take a conceptual, rather than mathematical, approach using a combination of lectures with problem-based discussion. Assignments emphasize computer analysis and interpretation of real data.

***733 / Statistical and Methodologic Issues in Randomized Clinical Trials / S. Walter**

This course will consider important statistical issues relating to the design, analysis and interpretation of randomized clinical trials. Specific topics will include issues in sample size determination, repeated data evaluation, composite outcomes in trials, crossover trials, large simple trials, factorial designs, economic evaluation in clinical trials, cluster randomization, meta analysis, Bayesian analysis of trials, analysis of missing data, subgroup analysis, reporting of trials, data monitoring, and stopping rules.

***735 / Theories and Methods in Environment and Health / J. Eyles (Same as Geog *736)**

Models and methods for research and policy on environment and human health relationships.

***737 / Economic Analysis for the Evaluation of Health Services / A. Gafni**

This course is a practical "How To" course in techniques for economic evaluation of health care programmes. The methodology of cost-benefit analysis, cost-effectiveness analysis, cost-minimization analysis and health status index models is examined in detail and several applications of each are reviewed during the first half of the course. During the second half of the course, each student is expected to complete an economic evaluation of a specific health care programme or intervention.

***738 / Health Policy Analysis / J. Abelson**

This course introduces students to the interdisciplinary field of health policy analysis, providing the concepts and tools needed to be able to critically appraise and conduct policy analyses at a variety of policy levels (e.g., clinical, administrative/managerial or public policy). Students learn how to analyze the relative roles played by different actors in the health system and explore the independent and combined influence of three major determinants of health policy: ideas, interests and institutional structures. Each week a different analytic concept is presented, discussed and applied to a particular problem or case study.

***739 / Biostatistical Collaboration / L. Thabane**

This course provides an overview of the strategies needed for effective biostatistical collaboration with clinical investigators. Topics covered include: strategies of eliciting information required to assist with study design from clinical collaborators; ways to translate the research questions into statistical questions; strategies to facilitate provision of statistical support on design, sampling and analytic plans; approaches of communicating the sampling plan, experimental design, statistical analysis to collaborators; methods to facilitate provision of support on statistical programming; strategies to facilitate provision of help with write-up of methods and reporting of results of studies.

***740 / Advanced Decision Analysis in Health Technology Assessment (HTA) / R. Goeree**

This is an advanced course in methods for Health Technology Assessment (HTA). It is a combined theoretical and practical 'hands-on' course that teaches students the essential components of contemporary HTA. Students will be exposed to national and

international HTA agencies and government decision making bodies, and their HTA guidelines and requirements. The course covers areas of systematic literature reviews, economic evaluation, analyses of uncertainty, value of information analyses, Bayesian decision analyses, quality assurance in economic appraisal, budget impact analysis, and knowledge translation. There is a heavy emphasis in this course on 'hands-on' learning-by-doing with computer application of 'real world' practical examples to cement student learning.

***741 / Introduction to Health Technology Assessment / D. O'Reilly**

Health Technology Assessment (HTA) has the tremendous potential to transform the delivery of health care services, and improve health outcomes and quality of life. Decisions about whether to purchase and use new health technologies should be based on high-quality evidence of its impact on health outcomes, the health care system, and cost-effectiveness. Payers of health care face the challenge of aligning decision making with the best available evidence. Upon completion of this course, students will be equipped with the skills to evaluate the quality of an HTA, to critically appraise it to make a judgment about a study's methods, results and conclusions. Additionally, students will become adept in conducting HTAs and be mindful of the barriers to, and facilitators of, evidence-based decision making in the real world.

***742 / Research Ethics / L. Schwartz, D. Willison**

This course is designed to prepare students to think creatively and proactively about ethical and legal issues in the design, conduct, analysis, and dissemination of research. Topics are divided into two categories: 1. ethical treatment of research participants and; 2. research integrity. Sessions will involve case discussion and critical analysis of ethical issues and the relevant principles, guidelines and laws. Exercises will coach students through mock-submission to a Research Ethics Board and provide insight of how REBs function.

***743 / Systematic Review Methods / G. Guyatt**

This course about research synthesis focuses on comparisons between alternative interventions. Rigorous review methods will be highlighted, such as searching for potentially relevant articles, selecting primary articles using explicit, reproducible criteria, appraisal of study architecture, quantitative data synthesis and interpretation. Old and new concepts and controversies in review methods will be highlighted. The work of the Cochrane Collaboration and in particular the Cochrane handbook, forms the underpinning of much of the material.

***745 / Qualitative Research Methods / C. Charles, S. Boblin, P. Baxter (Same as Nursing *745)**

This course introduces learners to theoretical traditions and corresponding methods of qualitative research using health and health care research as examples. Specific topics covered include: key paradigms underlying qualitative research, types of research questions best answered by qualitative methods, the role of theory in qualitative research, sampling objectives and procedures, methods of data collection, methods of analysis and interpretation, and ethical issues and responsibilities of qualitative researchers. Criteria for evaluating qualitative research will be discussed and applied to specific research studies. Learners will gain "hands on" experience using qualitative methods through in-class and take-home exercises.

***748 / Population and Public Health / P. Raina**

This course provides an overview of core concepts and methods in population and public health. We will discuss the concept of population health and explore the methods used to define, measure, and investigate health outcome and health determinants at a population level. The applications of this approach to public health will be discussed.

***750 / Practical Bayesian Design and Analysis in Clinical Studies / E. Pullenayegum, L. Thabane**

The intention of the course is both to introduce students to Bayesian ideas and to equip them to design, analyse and interpret clinical studies from a Bayesian perspective. Instruction will consist of both seminars and computer labs using WinBUGS. WinBUGS is not "point-and-click" software, so students will need to write short sections of code. Examples will be provided, and an instructor will be present in the lab sessions to provide advice.

***751 / Observational and Analytical Research Methods / P. Krueger**

The course is designed to introduce students to the basic concepts and methods used in observational (non-experimental) studies to conduct needs assessments (e.g., prevalence of disease or order), to understand the determinants of health (e.g., association between independent/exposure variables and dependent/outcome variables in analytic research) and to assess the impact of interventions implemented to improve health or alter life quality (e.g., program evaluations). The topics will focus on three broad areas: (i) the formulation of research questions and use of theory to explicate the relationships among key variables; (ii) study design options, sampling, measurement and analysis, and (iii) the control of error.

***758 / Qualitative Research Methods for Analysing and Interpreting Data / S. Wilkins, L. Lohfeld (Same as Nursing *758 and Rehabilitation Science *758)**

This intermediate-level course builds on prior knowledge about qualitative research approaches and their philosophical basis. The emphasis in this course will be on how the approaches affect data analysis and interpretation, as well as presenting findings in written and oral formats. The course is based on active involvement of learners through student-directed discussions and hands-on experiences, guidance and facilitation by graduate faculty with expertise in qualitative research, and interdisciplinary collaboration with faculty and classmates.

***759 / Survival Analysis in Health Research / N. Akhtar-Danesh**

This course will cover the main statistical issues in analysis. Specific topics of the course are Kaplan-Meier curves, log-rank test, Cox Proportional Hazard Model, Stratified and Extended Cox Model, Parametric Survival Models, Recurrent Events, Competing Risks, and Model Evaluation. Depending on time and the students' progress and interests, new advancements in survival analysis will be discussed.

***762 / Approaches to the Evaluation of Health Services / K. Brazil**

This course will introduce students to the major concepts and methods involved in program evaluation and will examine different methodologist's approaches to evaluation of programs. A framework for thinking about evaluation theory will be developed that allows students to explore how different theorists attempt to tackle fundamental problems in the field. A wide range of quantitative and qualitative design options will be discussed. The course will provide students with knowledge of the current controversies and major challenges facing this field.

***770 / Mixed Methods Research Designs for Health Services and Policy Research / S. Jack (Same as Nursing *770)**

This course introduces students to the major concepts and issues involved in mixed methods approaches to tackle important questions in the field of health services and policy. LearnLink is used as the mode of instruction as well as two-classroom sessions at McMaster. A framework for thinking about mixed methods will be developed that provides guidance to decision-making about when and how to use mixed methods and models to study health services and policy problems. The course will provide students with knowledge of the current controversies and major challenges in the use of mixed methods and models of research. Students are expected to design a mixed method study as part of the course and critically evaluate the design options chosen by a classmate.

***771 / Fundamentals of Health Research and Evaluation Methods (Online) / M. Levine**

This online course covers the major components of research activities, including concepts of health, formulation of research questions, literature reviews, study designs, selection of study populations, choice of measuring instruments, and study interpretation issues such as determination of causality and the effectiveness of clinical and community interventions.

***772 / Introduction to Research Methods for Randomized Controlled Trials (Online) / P.J. Devereaux**

This online course utilizes interactive learning modules, required readings, discussion boards, tutorials and assignments to introduce students to the main elements of clinical trial design, execution and analysis. The course is structured around the steps of designing and writing a clinical trials protocol. Students are expected to apply the knowledge they gain on an ongoing basis to complete their proposal by the end of the course. After completing this course successful students should have a firm grasp of clinical trial methodology that allows them to prepare successful grant applications.

***773 / Systematic Review Methods (Online) / G. Guyatt, D. Cook**

This online course about research synthesis focuses on comparisons between alternative interventions. Interactive learning modules, required readings, discussion boards, tutorials, and assignments will be used to highlight rigorous review methods, such as searching for potentially relevant articles, selecting primarily articles using explicit, reproducible criteria, appraisal of study architecture, quantitative data synthesis and interpretation. Students enrolling in the course must first identify a suitable research question and identify a partner for their review. The course is structured around the steps of executing a systematic review and students are expected to apply the knowledge they gain on an ongoing basis to complete their review by the end of the course.

***787 / Principles of Health Economics / S. Birch**

Problem-oriented course with an introduction to economic concepts and evidence related to health and health care. Current health policy issues and controversies are analyzed using an economic framework and basic economic theory. Special emphasis on population health issues, the role of the health care system in affecting health, and the influence of various participants (health care providers, patients, government) on health care utilization and population health status. No prior economics background is necessary.

***788 / Health Economics / TBA (Same as Economics *788)**

This is a basic graduate survey course on the economics of health and health care. Topics include the organization, financing and utilization of health care services. Both theory and evidence relating to patterns of consumer and provider behaviour are examined, as are the functioning and regulation of "markets" for health services. Major public policy issues in the provision of health care in Canada are identified and the economic aspects of such issues are considered in detail.

***789 / Health Economics for Health Care Managers / Staff**

Part I (sessions 1-6) introduces basic concepts of economics and health economics by reviewing how markets for health care and health care insurance operate, and examines techniques for economic evaluation of health care programs, such as cost-effectiveness analysis and cost-benefit analysis, and discusses how these evaluative principles are used to assess "value for money" in health care. Part II (sessions 7-12) introduces concepts regarding the economics of prevention, screening, diagnosis, and the economics of the pharmaceutical industry.

790 / Advanced Analysis of Survey Data / M. Boyle, K. Georgiades (Same as Economics 770, Geog 770, Psychology 770)

This course uses large-scale surveys to refine student skills in conducting secondary analysis and writing for publication in peer-reviewed journals. Students will develop a two-page research proposal on a topic of their choice. The proposal will identify a research question to be addressed using one or more population-based studies. The educational methods will be varied, depending on group composition and include lectures, small group tutorials, student presentations and faculty mentorship. The objective is to produce a research report for submission to a peer-reviewed journal.

***791 / Topics in Advanced Health Economics / P. Contoyannis, J. Hurlley, E. Tompa, J. Tarride (Same as Economics *791)**

This course focuses on contemporary issues relating to the economics of health and health care. It is intended to provide a more detailed examination of selected issues from Economics/HRM *788 as well as expose students to more advanced topics and aspects of recent research in health economics. Topics may include economic evaluation, the economics of occupational health and safety, evaluation of health-care related interventions, advances in the empirical analysis of income and health inequalities, and the evolution of health from childhood to adulthood.

CLINICAL HEALTH SCIENCES COURSES

***601 / Spiritual Work Life: Applied to Health Care / J. O'Connor**

This course explores the concepts of spirituality of work life in a health care setting from theoretical, professional and personal perspectives. How does one integrate pastoral care into a comprehensive spiritual plan of an organization? Concepts of 'greater hunger', theological worlds and other tools are used to explore the spiritual needs of staff and care providers. Some contexts addressed regarding spirituality include: change; loss; transition rituals; crisis intervention; suicide; addictions; abuse; team dynamics; identity; work ethics; spiritual conversations; stress management; and systems theory. The content is applicable to non-health care work settings.

***700 / Spirituality and Health: The Nature of the Wounded Spirit: Implications for Clinical Management / B. Clarke, J. O'Connor**

This course will encompass the study of suffering from the perspectives of "self" and "personhood". The scope and the dimensions of suffering as an entity separate from pain will be studied with emphasis on the power of suffering throughout the life span both in wellness and illness. Students will learn about the features that distinguish the language of suffering from the language of pain and will critically analyze the relationship between the two phenomena and the impact of suffering on health care costs (human and fiscal costs).

***701 / The Wounded Spirit in the Secular World: Legal, Ethical and Cultural Perspectives / B. Clarke, J. O'Connor**

This course will explore suffering from the perspective of self and personhood in relationship with the law and current societal values. Issues for study may focus on personal freedoms and rights after traumatic injury or events, living with terminal illness, autonomy in medicine and suffering in marginalized groups such as children, the elderly and the mentally handicapped. Topics may include: the law and culture, ethical considerations, health professional and care giver concerns, as well as the compatibility of the law and medicine. Students may select other relevant topics in relation to the law, societal attitudes and suffering.

***702 / The Impact of Spiritual and Religious Traditions on Health: Challenges for Multicultural Health Care Delivery Systems / J. O'Connor, B. Clarke**

This course will trace the understanding of suffering from the traditions of world religions. The focus of the course will be to understand the political outcomes of such traditions and its impact on the individual and health. Emphasis will be on the power of religious teachings on spirituality and personal suffering and factors such as hope, courage, and peace will be explored. The management of the suffering patient and the power of religious and spiritual beliefs will be delineated.

***703 / The Wounded Spirit: Applied Contemporary Health Practice Issues / J. O'Connor, B. Clarke**

The purpose of this course will be to differentiate between pain and suffering in medical practice and to determine the economic impact of suffering in either one of the following sub-units: general practice, rehabilitation psychiatry or palliative care (private and public health care delivery system). Study will take an evidence-based approach to problem identification, and efficacy of treatment interventions.

***707 / Post Modern Family Therapy / T. O'Connor**

The course presents the concepts from post modern family therapy and examines their implications for working with families. The course includes solution focused and narrative therapy especially the works of Steven de Shazer, Michael White and Charles Gerkin and compares them to the concepts of modern family therapy. The post modern family therapy concepts are used in understanding and explaining the practice of therapy and ministry within various contexts. The course is interdisciplinary.

***719 / Foundations of Education in the Health Sciences / B. Brown, Staff (Formerly NUR *719)**

This course will explore the education literature through discussion and application to health sciences issues, including health professional education. Examination of early education literature and changes over time in the philosophy and practice of education will provide the framework of approaches to teaching and learning. Topics include: recurrent issues in health professional education; teacher and learner-centred educational approaches; psychomotor learning; cognitive psychology and learning; instructional and evaluational methods.

Other courses that may be of interest are the following:

HEALTH, AGING AND SOCIETY COURSES

***710 / Multidisciplinary Perspectives on Aging**

Through in-depth analysis of specific multidisciplinary issues, students will select and integrate gerontological knowledge about the social, psychological, health, cultural, and other aspects of aging.

***711 / The Health Care System and the Older Person**

An interdisciplinary analysis of priority issues relating to the health care system and the older person. In a problem based, self-directed, small group learning format, the topics of study will be: health policy, policy determination, models of care, comparative ways of life, new trends/contemporary issues, and the industry/government interface.

HISTORY

The Department of History offers programs leading to the M.A. and Ph.D. degrees. Part-time M.A. and Ph.D. studies are possible.

Enquiries should be directed to the Chair of Graduate Studies in History, 905 525-9140 Ext. 24416
 Fax: 905 777-0158
 Website: <http://www.humanities.mcmaster.ca/~history/>

Staff / Fall 2009

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 Stephen Heathorn, B.A. (Toronto), M.A. (McMaster), Ph.D. (Toronto) / Graduate Studies Chair
 Bernice M. Kaczynski, B.A. (Pittsburgh), M.Phil., Ph.D. (Yale)
 Henry V. Nelles, B.A., M.A., Ph.D. (Toronto) / L.R. Wilson Professor of Canadian History

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 Karen Balcom, B.A. (Carleton), M.A. (Dalhousie), Ph.D. (Rutgers)
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 Evan Haley, B.A. (Dartmouth), M.A., Ph.D. (Columbia) / Joint appointment in Classics
 Martin Horn, B.A. (Western), M.A. (McMaster), Ph.D. (Toronto)
 Bonny Ibhawoh, B.A. (Bendel State), M.A. (Ibaden), Ph.D. (Dalhousie)
 Stephen Streeter, B.S. (Bates), M.A. (Stonybrook), M.A. (Riverside), Ph.D. (Connecticut)
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 David Wright, B.A., M.A. (McGill), D.Phil. (Oxford) / Joint appointment in Health Sciences

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 Projit Mukharji, B.A. (Calcutta), M.A., M.Phil. (Jawaharlal Nehru), Ph.D. (London)
 Jaeyoon Song, B.A., M.A. (Korea), Ph.D. (Harvard)

ASSOCIATE MEMBERS

Andrew Bone (Bertrand Russell Project)
 Richard Harris (Geography)

PROFESSORS EMERITI

James D. Alsop, B.A. (Winnipeg), M.A. (Western), Ph.D. (Cambridge)
 Alan Cassels, M.A. (Oxford), Ph.D. (Michigan), F.R.H.S.
 Paul S. Fritz, B.A. (Queen's), M.A. (Wisconsin), Ph.D. (Cambridge)
 Daniel J. Geagan, B.A. (Boston College), Ph.D. (Johns Hopkins)
 Charles M. Johnston, B.A. (McMaster), M.A., Ph.D. (Pennsylvania)
 Harvey A. Levenstein, B.A. (Toronto), M.S., Ph.D. (Wisconsin)
 Richard A. Rempel, B.A. (Saskatchewan), M.A., D.Phil. (Oxford)
 David J. Russo, B.A. (Massachusetts), M.A., Ph.D. (Yale)
 Wayne Thorpe, B.A. (Phil.) (Washington), M.A. (Phil.) (Colorado), B.A. (Portland State), Ph.D. (British Columbia)
 John H. Trueman, M.A. (Toronto), Ph.D. (Cornell)

M.A. Degree

The History Department offers work leading to the M.A. degree in the fields represented by the courses listed below. Admission to the program requires, subject to the general regulations of the School of Graduate Studies, an Honours B.A. in history or in history and another subject, with at least a B+ standing. Potential applicants with a B.A. Honours degree in a closely related discipline should consult with the graduate advisor or the Chair of the Department.

Candidates for the M.A. degree normally complete degree requirements in one calendar year of continuous work. Candidates must obtain at least B- standing in all seminars. Only graduate seminars (courses numbered 700) may be counted for graduate credit. Failure on any course in the M.A. program will entail immediate withdrawal from the M.A. program.

A. REQUIREMENTS FOR M.A. BY COURSE WORK

Students will complete six half courses, plus the M.A. Project course (History *797). Detailed requirements are as follows:

- Five seminar courses from those offered by the Department in any given year. Master's candidates may choose one half course seminar from those offered by another Department, subject to approval of the History Department.
- History *741 (Historiography).
- A comprehension test in French or German or a language acceptable to the Department.
- M.A. Project Course (Master's Research Paper): History *797.

B. REQUIREMENTS FOR M.A. BY THESIS:

- Three half-course seminars from those offered by the Department in any given year. Master's candidates may choose one-half course seminar from those offered by another department, subject to approval of the History Department.
- History 741 (Historiography)
- A comprehension test in French or German or a language acceptable to the Department.
- A thesis of 25,000-30,000 words of text, under the supervision of a member of the department.

Acceptance in the M.A. by thesis stream is not automatic with admission to the M.A. program. Students will require approval in writing from their prospective supervisor, submission of a formal thesis proposal and approval by the Departmental Graduate Studies Committee.

Ph.D. Degree

The Department directs doctoral research in six fields: Canadian History; British History; Twentieth-Century European History; War and Society; Gender History; History of Health and Medicine.

In certain cases, applicants with a B.A. (Honours) or the equivalent may be admitted directly to Ph.D. studies if their previous academic record shows sufficient promise, including at least an A average. Within one calendar year, the progress of students admitted to Ph.D. studies directly from a bachelor's degree will be reviewed by their supervisory committee and the Graduate Studies Committee. The Graduate Studies Committee will then recommend to the School of Graduate Studies one of the following:

- proceed with Ph.D. studies
- not proceed with Ph.D. studies but re-register as a Master's candidate
- withdraw from the University

The Ph.D. coursework required for candidates admitted directly with a B.A. (Honours) or the equivalent will be 15 units, comprising successful completion of two Minor Fields; completion of the Major Field; and successful completion of History *741 (Historiography).

When admission to Ph.D. work has been granted a candidate will, in consultation with the Graduate Studies Chair of the Department, select two Minor Fields and one Major Field of concentration. Major and Minor Fields will cover the principal literature in the area.

Minor fields normally consist of two half course 700-level graduate reading seminars (offered in the first term) in each of which a major historiographical essay and a written course examination are required. The grade for the minor field will consist of the grades for the in-course requirements, the examination, and the historiographical essay, in combination as indicated by the minor field supervisor.

Part, or parts of the Major Field may not be duplicated in the two Minor fields by candidates offering British or Canadian history as their major field. Candidates in the Twentieth-Century European History program may take one of their Minor Fields in Twentieth-Century European history; at least one other Minor Field must be taken outside Twentieth-Century European history. Candidates in the history of War and Society, Gender History, and the History of Health and Medicine may take one minor field in an area related to the regional subject area of their thesis research; at least one minor field must be outside the major field theme and the regional scope of the thesis.

No doctoral candidate may take both the major and either of the minor fields from the same instructors.

Candidates who have satisfied their minor field requirement will begin their Major field preparation in January of their first year in the program. The Department offers the following Major Fields:

1. Canadian History, 1791-2000
2. British History, 1485-1832; or British History, 1688-2000
3. Twentieth-Century European History
4. War and Society
5. Gender History
6. History of Health and Medicine

Major field preparation begins in January and takes the form of a major field seminar. Doctoral candidates will meet in regular seminars with their major field supervisors and submit a major historiographic paper (25-30 pages) or the equivalent. Historiographic papers (or the equivalent) will be assessed by all course instructors. The comprehensive examination, comprised of written and oral components, will be held in the month preceding September 15 of the second year of the program. It will test the candidate's knowledge of the area of concentration and the candidate's ability to deal with broad historiographic questions.

Successful completion of 6 units of minor-field coursework and 6 units of major field coursework, and the Comprehensive Examination will fulfil the course requirements of the School of Graduate Studies for doctoral candidates. Satisfactory performance in doctoral minor field and major field courses will be a minimum grade of B-. A grade of F on any course in the Ph.D. program will entail automatic withdrawal from the program. The Comprehensive Examination in History will require a minimum grade of P for successful completion.

Failure on any course in the doctoral program will entail immediate withdrawal from the program.

Following successful completion of the Major Field, doctoral candidates will present the supervisory committee with their thesis proposal. This should be about 10 pages in length, and will indicate the scope and structure of the thesis, the theoretical and research perspectives involved, and the principal archival sources to be used (along with brief mention of major secondary sources). The thesis proposal must be approved by the supervisory committee by early October, so that the candidate has a completed proposal ready for the OGS application deadline (normally mid-October). Length of thesis: 300 pages (75,000 words), exclusive of footnotes and bibliography.

Language requirements for doctoral candidates: Competence in English and one other language is the minimum requirement of the Department of History. For candidates selecting as their major field Canadian or Modern British History, the other language will normally be French or German, although utility in the candidate's proposed field of research will be the governing consideration. Candidates in Twentieth Century European History must demonstrate competence in two of French, German, Italian, Russian. Competence in a modern non-English language is deemed to mean the ability to comprehend standard historical prose with the aid of a dictionary. Written tests are administered by the Department for both M.A. and Ph.D. candidates at intervals throughout the academic year. In particular cases the Supervisory Committee may recommend that a candidate demonstrate proficiency in an additional language or in special methodological skills in preparation for his or her research. Statistics, computer application and programming, applied mathematics, and advanced cartography are examples of such skills, which may be demonstrated by arrangement with the Supervisory Committee. All such recommendations must be approved by the Graduate Studies Committee. All language and additional requirements for the Ph.D. must be cleared by the time the Comprehensive Examination is completed.

Courses

All courses are half courses. Not all courses are offered every year. A list of those offered is made available annually in the spring for the following fall/winter and summer sessions. In addition, credit for courses not offered in a given year may be obtained in certain cases by independent study with the appropriate faculty member. Students may take no more than one course by independent study.

***705 / Political Culture in Europe, 1900-1956 / W. Thorpe**

This course addresses selected topics in European political culture in the first half of the 20th century. It focuses on the genesis of political culture; the nature of competing ideologies such as socialism, nationalism, and fascism; the role of ideology in political mobilization; and the relationship between political culture and its socio-economic context.

***707 / European International Relations, 1890-1956 / M. Horn**

Directed readings on the history of international relations in Europe from 1890 to 1956. Among the topics that will be covered are the origins of the First World War, the post-war peace settlements, the coming of the Second World War, and the origins of the Cold War.

***708 / Research in European International Relations, 1890-1956 / M. Horn**

A major research paper in the field of European international relations, 1890-1956.

***713 / Islam, Diaspora, and Identities in Central Asia 1880 to present / T. McDonald (Same as Globalization *713)**

This course focuses on Soviet Central Asia but begins with background from the late Tsarist period and ends in the post-Soviet present. Central Asia is the focus for broader discussions on issues of colonialism, identity, gender, nationalism, the Soviet legacy, Islam, diaspora, and the challenges of post-Soviet transition.

***714 / The United States and Globalization since the Late Nineteenth Century / S. Streeter (Same as Globalization *714)**

This course explores the history of globalization in the modern era emphasizing the role of the United States both internationally and domestically. We begin with the War of 1898, track the rise of the American empire through the so-called Golden Age of capitalism, and conclude with the neoliberal era following the end of the Cold War. The focus is on how and why the United States came to play such a powerful role in shaping globalization; and, it also covers the impact of globalization on the United States itself.

***716 / Social and Cultural History of Victorian Canada, 1840-1914 / M. Gauvreau**

This seminar course provides an intensive introduction to the major themes and historiographic currents in nineteenth-century Canadian history. It will focus on the emergence of a more activist state in the wake of the Rebellions of 1837, the transformation of rural society, changing patterns of Victorian religious life and experience, gender ideologies and practices in the Victorian family, the growing segmentation of society into classes, and movements of social reform.

***717 / Topics in Early Modern European History / M. Armstrong**

This course will examine a particular facet of European history but this topic will change from year to year. Students taking this course will be introduced to the most recent scholarship on that topic. Potential topics include the reformation, persecution, and European cultural interactions in the Mediterranean and the Atlantic world. Particular attention will be given to religion though students will also study early modern political and social structures, economic practices and intellectual life.

***718 / Interpretations of Early Modern Britain / J.D. Alsop**

The time period covered, at the broadest extent, is 1485-1815. Some themes will necessitate a shorter time-frame. The period and the precise theme will be specified in the course description well in advance of each year in which the course is offered. The themes constitute the major historiographical foci of scholarship: politics and governance, religion, social and cultural history, war and society. There is some overlap, but each theme is a sub-field with an extensive historiography. The works chosen will provide a representative and influential cross-section of historiographical developments, from circa 1880 to 2003.

***720 / Canadian Social History / R. Frager**

This course focuses on key aspects of Canadian social history, particularly in the period from the late 1800's to the 1960's, with emphasis on gender history, working class history, and the history of immigrant groups.

***721 / Modern British History / S. Heathorn**

An intensive investigation of the creation and reproduction of social, political and cultural identities and relationships in Britain between c. 1860 and c. 1970. The course considers the expression of imperial, national, class, gender, ethnic and sexual identities and their role in forging modern British politics and culture. In addition to weekly reading on these themes, students will have the opportunity to research in both secondary and primary sources.

***722 / Research in Modern British History / S. Heathorn**

Major research paper on a topic concerning 19th or 20th Century Britain.

***723 / Global Environmental History / M. Egan**

This course examines how the natural environment intersects with major themes in world history, including colonialism, industrialization, and war. It investigates the environmental context and consequences of these and other subjects, with the understanding that the environment is an agent and a presence in human history.

***725 / Environmental History: Canada in International Perspective / K. Cruikshank**

In this reading seminar, we focus on an emerging literature in environmental history in Canada, in the context of the development of the field elsewhere. In doing so, we will explore the complicated ways in which the peoples of Canada have interacted with the dynamic biological world, from micro-organisms to mountains. We will consider how the natural world in which Canadians lived, worked and played changed, how ideas about nature changed, and how different social groups sought to shape and manage the natural world, and with what results.

***726 / Religion, Culture and Society in Canada, 1780-1970 / M. Gauvreau**

This course seeks to view religion as neither a form of "limited identity" nor as a reactionary anti-modern ideology; it treats religious institutions, practices and ideas as perspectives or lenses, through which can be viewed the transformations in the society and culture of Canada. Religious institutions and values infused popular culture in both private and public domains, and significantly shaped, throughout the period extending from the American Revolution to the "cultural revolution" of the 1960s the identities and social practices through which Canadians have lived: nationality, gender, class, ethnicity, and liberal capitalism. Because for much of its history Canada was a colonial society, the point of reference is 'transatlantic,' to the experiences of European, British, and American societies.

***727 / Culture, Politics, and Society in Canada, 1939-1989 / M. Gauvreau**

This course examines the encounter of Canadians with political, social, and cultural modernity in the five decades between the onset of World War II and the failure of the Meech Lake Accord. It explores themes such as development in the wartime and postwar Canadian welfare states, the culture of the postwar family; the redefinition of youth identities in the 1950s and 1960s; the nature of postwar immigration; the origins and nature of Quebec's Quiet Revolution; transformations within the ideology of liberalism; federalism and constitutional change; and the contested nature of Canada's integration into a North American political and economic system.

***728/ American Foreign Relations / S. Streeter**

This seminar explores major topics in the history of the U.S. foreign relations since the late nineteenth century. Areas covered include the traditional ones, such as the War of 1898, U.S. hegemony in Latin America, U.S. intervention in the First and Second World Wars, the origins of the Cold War, the Korean and Vietnam Wars, and diplomacy in the Middle East. These subjects will be explored using conceptual approaches and analytical methods that include dependency theory, world systems, bureaucratic politics, as well as modernization theory, gender, race, cultural transfer, and critical theory.

***729 / Twentieth Century Germany / P. Swett**

This course focuses thematically on key historical debates concerning Germany in the Twentieth Century. Topics may include responses to modernity in the Kaiserreich and the crisis of modernity in the Weimar Republic. The 'German catastrophe' that was National Socialism will also be examined in detail as well as the struggle to come to terms with the Nazi past in the East and West.

***730 / Research in War and Society / Staff**

A research seminar for those wishing to continue the in-depth study of war and society.

***731 / Violence in the Early Modern World / V. Aksan**

An examination of the sources of violence in the early modern period, largely 1500-1800 with particular attention to a comparative analysis of eastern and western societies. Themes would certainly include state generated violence as in slavery, conscription, and the socio-impact of war, but also ideological, cultural and gendered sources of riots, rebellions and individual abuse.

***732 / Twentieth Century China / D. Barrett**

China from the end of the imperial system, through the Republic (1912-1949), the Maoist phase of the People's Republic of China (1949-1976), to the present Post-Mao era, with emphasis on political history and revolutionary ideology.

***733 / Self and Society in the Early Middle Ages / B. Kaczynski**

The seminar will explore some key aspects of the complex and problematic transition from late Antiquity to the early Middle Ages. Topics will include the movement from paganism to Christianity, the practice of asceticism, shifting notions of the body and its place in society, changing definitions of gender, the social constructions of sanctity and sinfulness. The class will consider current debates about these issues and will give particular attention to what one historian describes as the "strategies involved in the recovery of a distant age."

***734 / Sources and Methods in Ancient History / E. Haley**
(Same as *Classics* *734)

***735 / Ancient Historiography / Staff (Same as *Classics* *759)**

***737 / Research in Medieval History / B. Kaczynski**

The seminar follows either History 733, Self and Society in the Early Middle Ages, or History 740, Medieval Discourses of the Self, 1000-1200 (same as *English**740). It provides students in both seminars with an opportunity for research on a related subject.

***739 / Topics in Late Roman Republican and Early Imperial History / E. Haley (Same as *Classics* *739)**

***740 / Medieval Discourses of the Self, 1000-1200 / B. Kaczynski, A. Savage (Same as *English**740)**

An interdisciplinary seminar, designed for students interested in a range of theoretical approaches to the past. We will examine a series of problematic medieval texts as contested sites of medieval selfhood: the *Memoirs* of Guibert of Nogent, the correspondence of Héloïse and Abelard, the writings of Hildegard of Bingen, and Geoffrey of Monmouth's *History of the Kings of Britain*.

***741 / Historiography / Staff**

Designed to provide students with an intensive introduction to the major schools, approaches and sub-disciplines within the historical profession since the beginning of the century. Students will read a variety of excerpts from such historians as Bloch, Erikson, Braudel, Foucault and Vansina, in addition to older but seminal historians such as Ranke, Marx, Becher and Bury. Other issues considered include types of historical controversy; and the potential for clash between moral and intellectual responsibility where sensitive issues are involved.

742 / Early Modern England, France and Germany
/ M. Armstrong, B. Kaczynski

This intensive reading course introduces the graduate student to influential scholarship on Early Modern England, France and Germany between 1450 and 1700.

***743 / Gender and the Soviet Experiment / T. McDonald**

Gender and the Soviet Experiment looks at the promises of the Revolution of 1917 to women and men in terms of emancipation, sexuality, work, and identity. The course will consider the relationship between Marxism and feminism in the Soviet context, the impact of Stalinism on men and women, and the impact of the years under Khrushchev and Brezhnev on gender identities in the Soviet Union. The course would focus on major historical works and primary sources, including film, from the Revolution of 1917 to the end of the Soviet Union.

***744 / Research in Soviet History / T. McDonald**

This course is a focused research course on an area of Soviet history chosen by the student. Students will work closely with the instructor in designing a research project. The course is designed so that each student receives maximum feedback from the instructor and from other students at each stage of his or her research and writing.

***745 / Research in Nature, Knowledge and Machines / M. Egan**

This research-oriented course engages with themes at the intersection of the histories of science, technology, and the environment.

***746/ Science, Technology and Nature / M. Egan**
(Same as *Globalization* *746)

This readings course explores the historical relationships between science, technology, and the physical environment. Emphasis will be put on how knowledge and machines mediate historical understandings of nature, and how nature influences the production of science and technology.

***747 / Comparative Settlement Frontiers / J.C. Weaver**

This course looks at settlement policies, conflicts and accommodations with indigenous peoples, land allocation schemes, and introduced biota, and the environmental consequences of settlement. The new societies considered include the United States, Canada, Australia, New Zealand, and South Africa.

***748 / Research in Canadian History / Staff**

This course is designed to introduce students to the techniques and methods of primary research in Canadian history. Topics will vary from year to year, and the emphasis will be on encouraging students, under the supervision of the instructor, to research and write a 20-25 page (5000-6000 word) research paper.

***749 / Research in United States' History / Staff**

Students will formulate and execute a research project, producing a major, investigative paper on a topic in United States history based on extensive primary and secondary source research. The topic normally will be related to the theme of the United States reading seminar that the student completed in the first term. The course will stress the development of sound historical research and analysis practices, along with writing development and presentation skills.

***750 / Research in European History / M. Horn**

This seminar provides students with an opportunity for independent research on a topic in European history.

***751 / European/Muslim Encounters in the Pre-Modern World**
/ V. Aksan (Same as *Globalization* *751)

This seminar will explore the historical origins and evolution of East/West (Europe/Islam) relations, concentrating on a number of themes. These may include 1) perceptions of religious difference (Christianity and Islam); 2) the narratives of warfare (crusades and jihads); 3) The Orient and the "Turk" in European thought 17th – 19th centuries; 4) The politics and culture of eastern and western empires; and 5) Muslim encounters with the West, medieval and modern.

***752 / United States Women's and Gender History**
/ K. Balcom

Exploration of the best practices and current historiographical debates in the history of women and gender in the United States. The course will include historical work on the construction of masculinity and femininity, the relationship between gender roles, race relations and class identity, the growth of the American state, the evolution of American political theory and the changing status of women in American society, among other topics. The class will address the influence of postmodernism, feminist theory, and theories of narrative structure on the writing of history.

***753 / Revolutionary China, 1949-76: Maoist Utopianism, Stalinist Reality / D. Barrett**

Chinese communist state and society during the Maoist period of the People's Republic of China, with the tension between Maoist visionary aspirations and Stalinist political and economic realities as the guiding theme.

***754 / Social and Environmental History of Modern America**
/ K. Cruikshank

This seminar is an introduction to some of the most interesting recent literature on the social and environmental history of the United States in the nineteenth and twentieth centuries. Topics address our understanding of industrial and urban development, nature, environmentalism, class, race, ethnicity and gender.

***755 / History, Heritage and Memory: How the Past is Used in Modern Western Culture / S. Heathorn, H.V. Nelles**

This course will explore how the past is represented and used within western societies. The focus is on the divergence between academic views and uses of the past and the role of the market, politics and popular culture in shaping and creating understandings of the past.

***756 / The World Wars / M. Horn**

Directed readings on the history of the two World Wars of the twentieth century. Among the topics that may be covered are strategy and command, war aims, intelligence, domestic politics, economic mobilization, the soldier's experience, literature on the wars, and the home front.

***757 / The British Empire and Global Integration, 1815-1960 / J. Weaver (Same as Globalization *757)**

This course considers how assorted types of colonizers working within a loosely-managed empire co-opted, dispersed, and displaced subject populations and cultures, attempted to restructure established civilizations, pursued economic and strategic opportunities, moved and managed people in conjunction with plans for "improvement", diffused a language and array of ideas about law, justice and government, and distributed flora and fauna around the world.

***758 / Research on the British Empire and Anglo-American Settlement Frontiers, 1750-1900 / J. Weaver**

A seminar designed to advance skills in research and writing by requiring an original research paper and by practicing editorial and peer evaluation of these papers. Topics selected may be drawn from the history of any British colony or the United States from 1750 to 1900.

***759 / Public Health and Medicine in Nineteenth Century Canada and the United States / D. Wright**

This seminar explores topics in the history of public health and medicine in Canada and the United States. Topics will include: Historiography of Health and Medicine; Colonial Orthodox and Alternative Medical Practice, c. 1800; The Rise of the Hospital, 1800-1850; Health Care Professionalization, 1815-67; Urban Epidemics, 1832-1866; Public Health and the Decline of Mortality, 1850-1914; 'Scientific Medicine' and the Germ Theory of Disease, 1850-1872; Childbirth and Maternal Mortality, 1850-1900; Child Health and Welfare, 1880-1914; The Eugenics Movement, 1880-1914; the transformation of the hospital, 1880-1914.

***760 / History of Psychiatry, 1760-1960 / D. Wright**

This reading seminar explores topics in the history of psychiatry and mental health in Canada, United States, and Britain.

***761 / Race and Gender in the Atlantic World / J. De Barros (Same as Globalization *761)**

This course looks at the intersection of race and gender in the Atlantic World from the sixteenth to the early twentieth centuries, focusing in particular on the legacies of the transatlantic slave trade.

***762 / Research in Topics in Atlantic History / J. De Barros**

This course examines various topics in the history of the Atlantic World, from the sixteenth to the early twentieth centuries.

***763 / Research in the History of Modern Africa / B. Ibhawoh**

A study of historical research methodology and historiography relating to African History.

***764 / Global Power, Local Cultures: Comparative Colonialisms in Africa / B. Ibhawoh (Same as Globalization *764)**

A comparative study of the processes by which imperial global power and local responses shaped the political, economic and cultural history of Africa in the late 19th and 20th centuries.

***765 / Canadian Sport History / N. Bouchier**

This seminar explores sport in Canada, focusing on its importance in the lives of Canadians and its complex role in larger processes of cultural and economic production. It investigates the connection of sport to broader themes in Canadian history, such as social class, ethnic, civic, and gendered identity formation, the capitalist economy, popular culture, discourses about respectability, ideas of social capital, and nation building.

790 / Major Field Seminar in Twentieth-Century European History / Staff

This course is compulsory for all Ph.D. candidates in the 20th century European field. It covers themes in the social, cultural, economic, diplomatic, and political history of Europe during the 20th century. Its intent is two-fold: it is designed to prepare students to complete the major field comprehensive examination and, in consultation with the course instructor(s), to prepare a major historiographical paper.

791 / Major Field Seminar in British History, 1485-1832 / Staff

This course is compulsory for all Ph.D. candidates in the British field researching in the period 1485-1832. It covers themes in the social, cultural, economic, and political history of Britain from the 16th to the 18th centuries. Its intent is two-fold: it is designed to prepare students to complete the major field comprehensive examination and, in consultation with the course instructor(s), to prepare a major historiographical paper (or the equivalent).

792 / Major Field Seminar in British History, 1688-2000 / Staff

This course is compulsory for all Ph.D. candidates in the British field researching the modern period (1688-2000). It covers themes in the social, cultural, economic, and political history of Britain from the 18th to the 20th century. Its intent is two-fold: it is designed to prepare students to complete the major field comprehensive examination and, in consultation with the course instructor(s), to prepare a major historiographical paper (or the equivalent).

793 / Major Field Seminar in Canadian History, 1791 – 1980 / Staff

This course, compulsory for all Ph.D. candidates in the Canadian field, covers themes in the social, cultural, economic, and political history of 19th and 20th century Canada. Its intent is two-fold: it is designed to prepare students to complete the major field comprehensive examination and, in consultation with the course instructor(s), to prepare a major historiographical paper (or the equivalent).

794 / Major Field Seminar in Gender History / Staff

This course is compulsory for all Ph.D. candidates in the Gender field. It studies the nature, role and construction of gender and gendered representations in a variety of historical contexts. Its intent is two-fold: it is designed to prepare students to complete the major field comprehensive examinations and, in consultation with the course instructor and the student's thesis director, to prepare a major historiographical paper (or the equivalent).

795 / Major Field Seminar in the History of Health & Medicine / Staff

This course is compulsory for all Ph.D. candidates in the History of Health & Medicine. It explores the historical literature in a number of thematic areas such as history of environmental health, history of public health, history of mental health, history of sport/leisure/health and medicine, and the history of welfare and social policy. Its intent is two-fold: it is designed to prepare students to complete the major field comprehensive examination and, in consultation with the course instructor(s), to prepare a major historiographical paper (or the equivalent).

796 / Major Field Seminar in the History of War and Society / Staff

This course is compulsory for all Ph.D. candidates in the War & Society field. It studies the political, cultural and socio-economic impact of warfare on specific societies and wider regions. Its intent is two-fold: it is designed to prepare students to complete the major field comprehensive examination and, in consultation with the course instructor(s), to prepare a major historiographical paper (or the equivalent) as directed.

***797 / M.A. Project Course (Master's Research Paper) / Staff**

A research paper of approximately 30 pages of text (8,000 – 10,000 words), exclusive of footnotes and bibliography, under the supervision of a History faculty member. The paper is due the first week of August.

KINESIOLOGY

The M.Sc. and Ph.D. programs in Kinesiology are offered in the Department of Kinesiology.

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Staff / Fall 2009

PROFESSORS

Cameron J. Blimkie, B.A., B.P.E. (McMaster), M.A., Ph.D. (Western)
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/ Chair

Audrey Hicks, B.P.E., M.Sc., Ph.D. (McMaster)

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/ Director, Graduate Program

ASSOCIATE PROFESSORS

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Maureen J. MacDonald, B.Sc. (Acadia), M.Sc., Ph.D. (Waterloo)

James R. Potvin, B.H.K. (Windsor), M.Sc., Ph.D. (Waterloo)

ASSISTANT PROFESSOR

Gianni Parise, B.Kin., M.Sc., Ph.D. (McMaster) / joint appointment
with Medical Physics and Radiation Sciences

ASSOCIATE MEMBERS

V. Galea (Rehabilitation Science)

N. MacIntyre (Rehabilitation Science)

R. McKelvie (Medicine)

M. Pierrynowski (Rehabilitation Science)

M. Tarnopolsky (Medicine)

B. Timmons (Pediatrics)

L. Wishart (Rehabilitation Science)

ADJUNCT MEMBERS

L.R. Brawley, B.P.E. (Calgary), M.Sc. (Oregon), Ph.D. (Pennsylvania
State)

Andrea Buchholz, B.A.A. (Ryerson), M.Sc. (Guelph), Ph.D. (Toronto)

John Cairney, B.A. (Brock), M.A. (Queen's), Ph.D. (Western)

Bareket Falk, B.Ed. (McGill), M.Sc. (Tel Aviv), Ph.D. (McMaster)

Lora Giangregorio, B.Sc. (Waterloo), Ph.D. (McMaster)

Marina Mourtzakis, B.Sc., B. Kin. (McMaster), Ph.D. (Guelph)

Ranil Sonnadara, M.Sc. (Leeds), Ph.D. (McMaster)

Philip Wilson, B.Sc. (UNC-Greensboro), M.Sc. (North Dakota),
Ph.D. (Alberta)

PROFESSORS EMERITI

J. Duncan MacDougall, B.A., B.P.H.E. (Queen's), M.S. (Oregon),
Ph.D. (Wisconsin)

Digby Elliott, B.Sc., M.Sc., Ph.D. (Waterloo) Audrey Hicks, B.P.E.,
M.Sc., Ph.D. (McMaster)

F. Hayden, B.A. (Western), M.S., Ph.D. (Illinois)

Digby G. Sale, B.P.H.E. (Toronto), M.A. (Western), Ph.D. (McMaster)

Janet L. Starkes, B.A. (Western), M.Sc., Ph.D. (Waterloo)

M.Sc. Degree

The Department of Kinesiology offers a program leading to an M.Sc. degree. The program is primarily research oriented and offers opportunities for study in human performance physiology, exercise rehabilitation, exercise psychology, psychomotor behaviour, biomechanics, and motor control. One emphasis of the program is research related to the problems encountered by a variety of populations during physical activity and to the adaptation of human movement to meet the special requirements of these populations. There is close collaboration with faculty members in Health Sciences, Engineering, Physiotherapy, and Psychology.

A candidate for the M.Sc. degree must fulfill the general regulations of the School of Graduate Studies. An honours baccalaureate degree in kinesiology, physical education, or some related field of study in science, social sciences, or allied health profession program with at least B+ standing (equivalent to a McMaster GPA of 8.5) is generally required for consideration of admission.

Graduate Academic Requirements

M.Sc. Degree

A candidate for Master's studies is required to complete, with at least a B minus standing, the following:

- KIN *701, one unit of KIN *702
- two courses from the following selection:
 - ◆ *704, *705, *706, *707, *708, *709, *710, *711, *712, *715, *716, *717, *718, *719, *720, *721

In consultation with their advisor, and with the approval of the Department of Kinesiology, the candidate may substitute one of his/her two KIN electives with an elective offered outside the Department of Kinesiology. Additional electives in departments other than the Department of Kinesiology will be determined in consultation with the advisor. It may also be necessary for certain candidates to take additional courses should their advisor and/or thesis supervisory committee members deem it necessary. A thesis is required.

Ph.D. Degree

Candidates for doctoral studies:

- must have a Master's degree in Kinesiology or a related field of study with, at least, the minimum course experience of our M.Sc. graduates (i.e., 4 courses)
 - ◆ at entry to the program, or
 - ◆ by the completion of their first 9 months of doctoral study
- are required to complete successfully, 2 additional half courses, one being KIN *714
- additional courses may be recommended by the candidate's advisor and/or supervisory committee

All full time graduate students must receive pass credit by the end of their second year of studies in KIN *703 (Seminars).

Ph.D. Candidates must also complete:

i) Comprehensive Exams

Candidates for the Ph.D. degree are expected to complete their comprehensive examination within the first 18-24 months of the program. The examination will be on a topic that is independent of the student's thesis area. The specific topic of the comprehensive examination will be determined by the candidate and their supervisory committee. An examination committee consisting of 3 members, one of whom (other than the supervisor) may be on the student's supervisory committee will

submit questions relating to 3 sub-topics of the main topic area, the sub-topics collectively addressing basic and applied aspects of the main topic and one relating to a special population. The comprehensive examination will consist of a written and oral component. The written component will consist of 3 questions, one from each examiner, covering the basic, applied and special population aspects of the main topic. The examination will cover material from a selected set of readings provided to the student 8 weeks in advance of the exam date. The written examination will be completed within a single working day in a closed-book format. The student will advance to the oral examination stage within two weeks of the written exam date, if two of the written answers are deemed acceptable by the examination committee. Following the oral examination, examiners will provide a single grade of fail (F), pass (P) or pass with distinction (P+) for the student's combined written and oral answers to each question. The student will be deemed to have passed the comprehensive examination if he/she obtains a pass (P) on at least two of the examination questions. A pass with distinction will require P+ grades on each of the three examination questions. Students who fail (fewer than two acceptable answers) at either the written or oral stages of the examination process will be given a second opportunity according to the Policy and Regulations set out by the School of Graduate Studies.

ii) Thesis

It is expected that the Ph.D. candidate will be actively involved in research throughout the program. Therefore, the thesis may not be characterized in the traditional sense where a committee approves a research proposal, the student conducts the research and prepares the written work for oral defense. Rather, the thesis may involve a collection of completed research efforts, some of which may have been presented at conferences and/or published prior to the oral defense. The thesis proposal meeting will be in the form of an open presentation by the candidate that summarizes the current state of research in the field, the candidate's research to date in this area, and a defense of the proposed research. Decisions regarding the quantity of research to comprise the thesis and the format of the written document will be made by the candidate's supervisory committee.

Courses

All courses are half courses. Courses marked with a plus sign (+) may differ in content from term to term.

*701 / Inquiry and Research in Physical Activity / Faculty

Detailed review and appraisal of common research procedures; application of statistical techniques, evaluation procedures and experimental methods in current use in the investigation of human movement.

*702 / Individual Study in Selected Topics / Graduate Faculty

Selected topics in kinesiology assigned according to student research interests and needs.

*703 / Seminars / Staff

Seminars in current topics are presented over two terms (fall and winter). All graduate students registered in the course who attend at least 80% of the seminars will receive a pass credit (3 units).

*704 / Cardiovascular Regulation in Exercise / M. MacDonald

This course will examine central and peripheral cardiovascular interactions during exercise. Focuses of the course will be the control of muscle blood flow, the role of the vascular endothelium and cardiovascular control reflexes in exercise.

*705 / Motor Behaviour / T. Lee, J. Lyons

Selected topics in motor learning and control are investigated. Two or three different topics are usually studied in detail.

*706 / Cardiac Rehabilitation / N. McCartney

An extensive review of cardiac rehabilitation with major emphasis on the role of physical activity in primary and secondary preventive strategies. Topics covered will include: epidemiology and etiology of heart disease; pathophysiology; medical and surgical management; exercise testing techniques; exercise prescription; exercise leadership; program management; exercise rehabilitation in relation to morbidity and mortality; behavioral and psychological issues; current research topics of interest and controversy.

*707 / Cognitive Dysfunction and Perceptual-Motor Performance

An examination of developmental and acquired cognitive handicaps particularly as they relate to the learning and control of voluntary movement. An introduction to a neuropsychological approach to movement pathology.

*708 / Biomechanics / J. Dowling, J. Potvin

Examination of issues involved in quantification and interpretation of effects and control of forces that act on and are produced by the human body. Topics include: whole body motion data collection and signal processing, biomechanical information content of electromyograms, human movement efficiency, modeling and muscle mechanics.

*709 / Neuromuscular Function in Aging and Disease / A. Hicks

In-depth study of the neuromuscular system and the changes which occur during aging and in certain pathological conditions. The course will be divided into three sections. Part A: General overview of the human neuromuscular system; and laboratory techniques for assessment of neuromuscular function. Part B: The aging neuromuscular system; and the effects of physical activity (inactivity), and training. Part C: Neuro-muscular changes in various myopathies and neuropathies; and the role of exercise intervention.

*710 / Exercise and Skeletal Development: A Lifespan Perspective / C. Blimkie

This course will examine the influence and importance of physical activity and exercise for optimizing skeletal development and function (strength) at different stages of the life-cycle, in both genders and in health and selected disease conditions. The influence of exercise will also be considered in the context of other putative osteogenic modulators, including, nutritional, neuro-endocrine and genetic factors.

*711 / Motor Control / R. Balasubramaniam

This course is designed to give a comprehensive overview of human sensorimotor control research. The course will cover neurophysiological, computational and cognitive approaches to the study of problems in human motor control. The goal of this course is to prepare the student for conducting research in motor control neuroscience with a thorough overview of the literature, methodologies and debates in the field. Applications for motor learning and functional rehabilitation will also be discussed.

*712 / Skeletal Muscle Metabolism / M.J. Gibala

This course will examine in detail the regulation of carbohydrate, lipid and amino acid metabolism in human skeletal muscle. Emphasis will be placed on the manner by which metabolic pathways operate to meet the energy demands of the muscle cell during rest and exercise (dynamic and resistive), and adaptations which occur in response to physical training. The role of the liver, adipose tissue, endocrine and circulatory systems will be considered when relevant, as well as the investigative techniques employed in human research studies.

*713 / Directed Readings in Kinesiology / Graduate Faculty

This course is for Ph.D. candidates only and is designed as an advanced reading course in an area of kinesiology related to performance in healthy individuals. A course outline must be submitted to the Graduate Coordinator in the Department of Kinesiology.

***714 / Directed Readings in Kinesiology's Special Populations / Graduate Faculty**

This course is for Ph.D. candidates only and is designed as an advanced reading course in an area of kinesiology related to performance in individuals from special populations. A course outline must be submitted to the Graduate Coordinator in the Department of Kinesiology. Candidates will be required to prepare a research grant proposal as part of the evaluation in this course.

***715 / Foundations of Health and Exercise Psychology / K. Martin Ginis, S. Bray**

An introduction to theories, measures, and methodologies typically used in health and exercise psychology research. Students will learn to critically evaluate and apply key principles.

***716 / Skeletal Muscle Cell Biology and Clinical Myology / M. Tarnopolsky (Same as Medical Sciences *755)**

This course will review the basics of cell biology and metabolism with specific emphasis on skeletal muscle. The cellular organization and the energy yielding pathways of skeletal muscle will be studied with special emphasis on the relationship to skeletal muscle pathology. Emphasis on analytical techniques will be stressed in each lecture. Experimental therapeutics for neuromuscular disorders will be another major focus.

***717 / Exercise Psychology: Applications to Chronic Disease and Disability / K. Martin Ginis, S. Bray**

A seminar course that examines exercise psychology principals as they apply to preventing disease and disability, and promoting well-being in chronically ill populations. Topics include quality of life, disease self-management, and exercise promotion.
Prerequisite: KIN *715

***718 / Human Factors / J. Lyons**

This course will provide an in-depth examination of the theoretical issues and practical applications surrounding research in Human Factors and Cognitive Ergonomics. Particular emphasis will be placed on current research that deals with understanding the relevance of human-information processing and human-machine interface models for ergonomic design, developing functional skills for the ergonomic assessment of products and human-machine systems, and developing an understanding of the fundamental requirements of conducting an ergonomic analysis of a work environment.

***719 / Topics in Molecular and Cellular Exercise Physiology / G. Parise**

This course will explore current and emerging topics in exercise physiology from a molecular and cellular perspective. Relevant molecular processes such as pre-transcriptional regulation of gene expression, molecular regulation of muscle satellite cells and adult muscle stem cells, inter and intra-cellular signaling for muscle adaptation, and necrosis and apoptosis in muscle will be examined. Relevant molecular events associated with muscle aging will also be explored.

***720 / Social and Psychobiological Factors in Health and Exercise Psychology / S. Bray, K. M. Ginis**

Physical activity is linked to numerous physiological and psychological benefits, yet the populations of industrialized nations are becoming increasingly sedentary. This course will explore empirical findings and methods examining mental health issues linked to physical activity participation including affective disorders and cognitive functioning as well as underlying biological processes theorized to account for these effects. The role of interpersonal forces and their interaction with behavioural and psychophysiological pathways to health-related outcomes will also be examined. Prerequisite: KIN *715

***721 / Human Muscle Protein Metabolism / S. Phillips**

An in-depth analysis of how physical activity affects skeletal muscle protein metabolism in humans. Examination of genetic and protein metabolic changes that underpin phenotypic changes in skeletal muscle with physical activity and other conditions namely disease and dietary change.

MATERIALS SCIENCE AND ENGINEERING

Candidates may be accepted for graduate work leading to the M.Sc. degree in Materials Science, and to the M.A.Sc. degree in Materials Engineering on a regular or part-time basis, or for the Ph.D. degree in Materials Science, or Materials Engineering.

Enquiries: 905 525-9140 Ext. 24295

Website: <http://materials.mcmaster.ca>

Staff / Fall 2009**DISTINGUISHED UNIVERSITY PROFESSORS**

J.D. Embury, B.Sc. (Manchester), Ph.D. (Cambridge), P.Eng., F.R.S.C., Member NAE / Emeritus
G.R. Purdy, M.Sc. (Alberta), Ph.D. (McMaster), D.H.C. (Grenoble), F.C.I.M., F.A.S.M., F.T.M.S., F.R.S.C., P.Eng. / Emeritus
D.S. Wilkinson, M.A.Sc. (Toronto), Ph.D. (Cambridge), F.C.I.M., F.A.Cer.S., P.Eng.

PROFESSORS

G. Botton, B.Eng., Ph.D. (École Polytechnique de Montreal)
K.S. Coley, B.Sc. (Strathclyde), Ph.D., D.I.C. (Imperial College, London)
J. J. Hoyt, B.Sc. (Cornell), M.Sc., Ph.D. (Berkeley)
G.A. Irons, B.A.Sc. (Toronto), M.Sc., Ph.D. (McGill), F.C.I.M., P.Eng. / Dofasco Chair in Ferrous Metallurgy
A. Kitai, B.Eng. (McMaster), Ph.D. (Cornell), P.Eng. / Joint appointment with Engineering Physics
A. Petric, M.A.Sc. (Toronto), Ph.D. (École Polytechnique), P.Eng.
N. Provatas, M.Sc., Ph.D. (McGill)
G. Xu, M.Sc., Ph.D. (Pittsburgh), D.E.S. (Columbia)
I. Zhitomirsky, M.Sc. (Kalinin), Ph.D. (Moscow)
S. Zhu, B.Eng. (Zhejiang), Ph.D. (McMaster) / Joint appointment with Chemical Engineering, Canada Research Chair

ASSOCIATE PROFESSORS

J. Kish, B.Eng., Ph.D. (McMaster)
D.V. Malakhov, B.Sc. (Moscow), Ph.D. (Novosibirsk, Russia)
M. Niewczas, M.Sci., M.Sc., Ph.D. (Krakow)

ASSISTANT PROFESSOR

H. Zurob, B.Eng., Ph.D. (McMaster)

ASSOCIATE MEMBERS

J.E. Greedan (Chemistry)
M. Hamed (Mechanical Engineering)
A.P. Hitchcock (Chemistry)
M. Jain (Mechanical Engineering)
R. LaPierre (Engineering Physics)
J. McDermid (Mechanical Engineering)
K. Saravanamutta (Chemistry)
H. Schwarcz (Geography and Earth Sciences)
S. Shankar (Mechanical Engineering)

ADJUNCT MEMBERS

H. Aziz, B.Sc. (Cairo), M. Eng., Ph.D. (McMaster)
O. Bouaziz, M.Sc., Ph.D. (Grenoble)
Y. Brechet, M.Sci. (École Polytechnique, Paris), D.E.A., Ph.D. (Technical University of Grenoble)
C. Cooper, B. Met., Ph.D. (England)

Z. J. Jakubek, M.S. (Cracow, Poland), Ph.D. (MIT)
 M. Karttunen, M.Sc. (Tampere, Finland), Ph.D. (McGill)
 D.J. Lloyd, B.Sc., Ph.D. (Wales)
 B.S. Ong, B.Sc. (Nanyang), Ph.D. (McGill)
 Z.D. Popovic, Dipl.Eng., M.Sc. (U. Of Belgrade), Ph.D. (McMaster)
 S.V. Subramanian, B.Sc. (Banaras), M.Met., Ph.D. (Sheffield)
 N. Zhou, B.A.Sc., M.A.Sc. (Tsinghua), Ph.D. (Toronto)

PROFESSORS EMERITI

G.P. Johari, M.Sc., Ph.D. (Gorakhpur), D.H.C. (Lyon), F.R.S.C.
 J.S. Kirkaldy, M.A.Sc. (British Columbia), Ph.D. (McGill), D.Eng.
 (Waterloo), D.Sc. (Queen's), D.Sc. (McMaster), F.R.S.C., F.A.S.M.,
 P.Eng.
 W-K. Lu, B.S. (Cheng-Kung), Ph.D. (Minnesota), D.M.I.S.S., F.C.I.M.,
 H.M.J.I.S.I.

The general requirements of the School of Graduate Studies must be met by all candidates. Additional departmental requirements are described in the following paragraphs.

All of the graduate degree programs in this Department involve course work, comprehensive examinations and research leading to a thesis.

All graduate students must attend seminars arranged by the Department, including the external seminar program, as well as the student seminar series organized as part of *701 and *702.

M.A.Sc. or M.Sc. Degree

All candidates for the M.Sc. in Materials Science and the M.A.Sc. in Materials Engineering must complete satisfactorily no fewer than two full courses of which no more than a half course may be at the 600-level. All students must complete *701, Graduate Seminar (Master's), as part of these course requirements. All candidates must present a thesis which embodies the results of original research. It is anticipated that about seventy-five percent of the candidate's effort will be devoted to the research problem on which the thesis is based.

Students wishing to be transferred to the Ph.D. program prior to the completion of the Master's degree (see section 2.1.2 of the General Regulations of the Graduate School) must submit a Transfer Report, embodying a statement of progress and achievement in the research to date and a proposal for Ph.D. research. The Transfer Report must be submitted to the Department Chair not later than the completion of five terms after initial registration in the Master's program. Approval to transfer will be determined through an oral examination.

Ph.D. Degree

A candidate for the Ph.D. degree in Materials Science or Materials Engineering will be required to complete not fewer than four full courses beyond the bachelor's degree. This includes the course requirements listed for the M.A.Sc. or M.Sc. programs, plus two additional full courses at the 700-level. Students must complete the Graduate Seminar courses, *701 or equivalent and *702, as part of these course requirements.

Students entering the Ph.D. program with a Master's degree or promoted from the Master's program are required to complete not fewer than two full courses at the 700-level. These students must complete *702, Graduate Seminar (Ph.D.), as part of these course requirements.

Students are encouraged to select some of their courses from areas beyond the focus of their research, including courses offered by other departments. It is expected that the student may also be required to

take courses in addition to the prescribed courses for graduate credit. These may be at either the undergraduate or graduate level. Students who enrol directly into the Department's Ph.D. program will submit a written proposal for their research program after one year. Their supervisory committee, augmented by two other departmental members, will give a critical review and examine the student on material contained in or related to the proposal.

The Ph.D. Comprehensive Examination will be in two parts. Part I will cover, at the undergraduate level, topics central to materials science and engineering. Credit for this part will be given to a candidate who has successfully completed the comprehensive examination previously required of M.Sc. and M.A.Sc. students. Part II will test the candidate's knowledge at an advanced level. Candidates will be expected to show the greatest depth of knowledge in their field of research but will also be expected to demonstrate knowledge of fields related to their areas of specialization. Part II must be completed within two years of entry into a Ph.D. program at McMaster.

Candidates are expected to begin their thesis research soon after registering for Ph.D. studies. Candidates will be required to submit a thesis which embodies the results of original research and to defend the thesis in the Final Oral Examination.

There are opportunities to take courses from visiting and adjunct professors and for part of the research to be conducted at other universities that collaborate with various faculty in the department.

Courses

Most of the 700-level courses offered by the Department are quarter course modules. These are identified by a pound (#) sign and are offered in 6 week slots. Half courses are identified by an asterisk (*) and last one term (approximately 12 weeks). The course structure is designed so that most courses are available on a two-year basis, subject to student demand and faculty resources. Some courses are offered every year. Students should select a program of study in consultation with their faculty supervisor and be aware of the prerequisite requirements of some courses.

The following courses, which are available to senior undergraduate students, are also offered for graduate credit at the M.Sc. and M.Eng. level only. Graduate students taking these courses are regularly required to do extra course work beyond that required of undergraduates in the 400-level course.

*6AA3 / Computational Thermodynamics / D. Malakhov

Thermodynamic modelling. Principles of computational thermodynamics and its applications. Thermo-Calc. Fortran programming.

*6C03 / Modern Iron and Steelmaking / K.S. Coley, G.A. Irons

Theory and practice of ironmaking. Heat and material balances, ironmaking reactors, raw materials, direct reduction and new processes. Thermodynamics and kinetics of steelmaking. Hot metal treatment; static and dynamic process control; deoxidation; casting; specialty steelmaking; inclusion engineering.

*6D03 / Materials and the Environment

The oxidation of metals and alloys; electrochemical principles and methods applied to aqueous corrosion and its control.

*6E04 / Computational Modeling of Microstructure Formation / N. Provatas (Same as Computational Engineering & Science *6E04)

Introduction to explicit and implicit finite difference and finite element simulation techniques for PDE's used in materials science and engineering. Applications to microstructure formation, reaction-diffusion kinetics and interface dynamics. Introduction to parallel methods. Course evaluation will be based on a term project.

***6F03 / Synthesis and Applications of Nanomaterials / G. Botton**

Review of methods of synthesis of nanoscale materials approaches (bottom-up and top down), review of the fundamental properties of nanoscale materials (thermodynamic, mechanical, optical, electronic). Discussion and presentations on many of the applications of these materials in fields of mechanical properties, energy storage, electronic and magnetic, optical etc.

***6G03 / Characterization of Nanomaterials**

Interaction of electrons and photons with matter. Imaging methods with electron microscopy, scanning probe techniques, x-ray photoelectron spectroscopy and x-ray absorption analysis with high spatial resolution.

***6H03 / Thin Film Science and Engineering / I. Zhitomirsky**

Deposition and fabrication techniques, surfaces, growth mechanisms, epitaxy, defects, kinetic effects in thin films, materials science aspects, applications and properties of thin films.

***6I03 / Sustainable Manufacturing Processes / G.A. Irons (Same as SEP *6I03)**

Sustainable development, materials cycles, methods for measuring environmental impact, life cycle analysis, waste treatment and recycling technologies.

***6NN3 / Computational Modeling in Materials Engineering / N. Provatas**

Numerical methods are introduced and used to model selected problems in materials science involving mass transfer, molecular dynamics and electronic properties.

***6P03 / Properties of Polymeric Materials / G. Xu**

Structure of amorphous and crystalline polymeric materials; mechanical, electrical and optical properties and their modification through processing.

***6R03 / Ceramic Science / Staff**

Microstructural development and properties of traditional ceramics. Acidic, basic, neutral and nonoxidizing refractories; ferro-electric, piezo-electric and ferromagnetic ceramics; super-ionic and structural ceramics.

***6T03 / Properties and Processing of Composites**

This course is intended to provide students with the knowledge related to the structure and properties of a range of composite materials systems. Topics include micromechanics of composites, intrinsic properties of matrix materials and reinforcements; elements of the mechanics and thermodynamics of interfaces; fabrication of composites materials, modelling of physical properties of composites with the emphasis on mechanical properties, thermal properties and electrical conductivities using Eshelby method. Recent developments in composite materials systems will also be covered.

ENG *6J04 / Materials Selection in Design and Manufacturing / J. McDermid

Materials selection charts, materials selection with mechanical constraints, coupled materials selection and processing/fabrication routes, effect of microscopic and macroscopic shape of materials selection, design of hybrid materials, eco-selection.

The following courses are offered for graduate credit only:

***701 / Graduate Seminar (Master's)**

Each student is required to prepare and present a major seminar, based upon extensive research work and literature surveys, on any topic of current research interest in Materials Science and Engineering. A grade will be assessed based on overall performance in the course.

***702 / Graduate Seminar (Ph.D.)**

Each student is required to prepare and present major seminars, based upon extensive research work and literature surveys, in areas related to their current research. A grade will be assessed based on overall performance in the course.

THERMODYNAMICS AND KINETICS***711 / Advanced Thermodynamics / Staff**

Solution thermodynamics including gas, liquid and solid equilibria. A background in basic thermodynamics of solid state systems is required.

***712 / Phase Transformations / Staff**

Diffusion in binary and ternary systems. Selected topics in phase transformations including: nucleation and growth phenomena; diffusionless transformations; morphological development, control and instability; influence of defects on transformations.

***713 / Computational Thermodynamics / D.V. Malakhov**

Scientific heritage of J.W. Gibbs. Lattice stabilities. Reference states. Thermodynamic models of phases including sublattice model, quasi-chemical model, associated solutions, partially ionic liquids, etc. and their application to metallic systems, oxides, salts and aqueous solutions. Usage of structural information for choosing a proper phase model. Calculation of equilibrium in gaseous systems. Magnetic contribution to the Gibbs energy. Order-disorder transformations and their modeling. Thermodynamic principles hidden behind phase diagrams. Driving forces for the onset of precipitation. Isonucleation diagrams. Thermo-Calc and TQ interface. Simultaneous treatment of heterogeneous experimental information (CALPHAD method). Fortran 90/95 programming.

DEFECTS IN SOLIDS***720 / Point Defects and Materials Behaviour / Staff**

An analysis of the point defects equilibria including vacancies, interstitials and substitutional atoms. Experimental techniques for their determination, Krüger-Vink diagrams, ionic conductivity/defect concentration relations. Their role in the deformation of metals, radiation damage, embrittlement, cold-working and hardening; concepts and practice.

MATERIALS CHARACTERIZATION**#731 / Introduction to Electron Microscopy / G. Botton (Same as Biomedical Engineering #731)**

Electron sources, optics, development of scanning, transmission and scanning-transmission electron microscopes. Electron-solid interactions, production of secondary electrons, x-rays. Diffraction theory, energy loss processes.

#732 / Analytical Electron Microscopy / G. Botton (Same as Biomedical Engineering #732)

Comparison of analytical techniques, low voltage and environmental SEM. Convergent beam diffraction methods, microanalysis in the TEM with EDS and EELS. High resolution TEM, high angle dark-field methods, EELS near-edge structure analysis.

SURFACES AND INTERFACES**#740 / Interfacial Phenomenon in Materials Science / J. McDermid**

Introduction to interfaces including free surfaces, grain boundaries and coherent and incoherent precipitate interfaces. Introduction to surface analysis techniques such as scanning Auger microscopy, X-ray photoelectron spectroscopy and secondary ion mass spectroscopy. Interfacial chemistry including adsorption isotherms, wetting of solid interfaces by liquids and solid/vapour interfaces. Interfacial phenomenon including segregation, formation of secondary phases and interfacial reaction phases, role of interfaces in creep, corrosion phenomenon, interfacial cohesion and the role of crystallographic anisotropy. Course evaluation will be based on assignments and a term project.

#743 / Selected Topics in Oxidation and Corrosion / Staff

Review of current research on various timely topics of corrosion. This module will feature either topics on aqueous corrosion or high temperature oxidation and sulphidation.

#780 / Metallic and Non-metallic Coatings / J. McDermid

Electrochemical basis of metallic coating protection systems, governing phase equilibria in metallic coating systems, gas/metal reactions, reactive wetting at interfaces, microstructural development of metallic coating systems on ferrous substrates, non-metallic and composite coatings, engineering properties and practical applications of coating systems.

MECHANICAL BEHAVIOUR OF SOLIDS**#751 / Effect of Length Scale on Mechanical Behaviour / D.S. Wilkinson, M. Niewczas**

Effect of microstructure — from the nano- to the macroscopic level — on the strength, ductility and toughness of materials, in both single phase and multiphase materials; modeling approaches, including continuum approaches, dislocation mechanics and atomistic modeling.

#753 / Fracture Mechanisms in Solids / D.S. Wilkinson, J.D. Embury

Mechanisms leading to fracture in solid materials. Ductile fracture by the nucleation, growth, and coalescence of voids; damage accumulation concepts; brittle fracture in metals and ceramics; crack propagation; crazing in the polymers.

#754 / Fracture Mechanics / J.D. Embury, D.S. Wilkinson

Elastic and plastic behaviour of bodies containing defects including: linear elastic fracture mechanics; description of crack tip plasticity; use of LEFM in design; ductile-brittle transition; crack propagation under conditions of creep or fatigue. Offered from time to time, depending on interest and demand.

#755 / Deformation of Crystalline Solids / J.D. Embury, D.S. Wilkinson, M. Niewczas

A quantitative treatment of the mechanical behaviour of crystalline materials, with emphasis on elasticity and plasticity. Topics include: ideal strength, isotropic and anisotropic elasticity, dislocations, continuum models, work hardening, strengthening mechanisms, time dependents effects. This course is offered in alternate years.

#756 / Deformation and Fracture of Crystalline and Amorphous Polymers / G.P. Johari

A quantitative description of anelastic, viscoelastic and plastic deformations and of fracture of crystalline and amorphous polymers, with emphasis on the mechanisms of deformation. The topics include morphology, microstructural defects, crazing, shear band formation, biaxial yielding, fatigue and the nucleation and propagation processes in the fracture of polymers.

PHYSICAL PROPERTIES OF SOLIDS***760 / Electronic Materials / I. Zhitomirsky**

Basic magnetic properties of materials, magnetic structure, domains, critical behavior at the ordering temperature, soft and hard magnetic materials. Ferroelectric, piezoelectric, pyroelectric and optical properties of materials. Capacitor materials. Semiconductors. Materials for energy storage and generation. Materials selection and design. Nanocomposites.

#763 / Physical Behaviour of Amorphous Solids / G.P. Johari (formerly part of Mat Sci *702)

Thermodynamic and diffusion aspects; methods of preparation; structure, short-range order, modeling; relaxation processes; low-temperature properties; amorphous metals; fracture and fatigue.

#764 / Solid State Polymer Analysis / G. Xu

Analytical solid state methods are employed to determine the influence of polymer structure on physical and chemical properties.

#765 / Selected Topics in Polymer Science & Engineering / S. Zhu, G. Xu

Discussions on topics of current interest in polymer science and engineering, such as structural characterization, diffusion in bulk solution, network formation, colloid stabilization, and flocculation. (**Note:** This course may also be taken for half course credit as Chemical Engineering *770. Such students will be required to complete the mid-term exam and a project as well. Students taking this course for quarter course credit as Materials Science #765 will be required to complete the mid-term exam.)

MATERIALS PROCESSING**#771 / Principles of Heterogeneous Kinetics / K.S. Coley**

Basic principles of chemical kinetics; transport processes by interfacial chemical reactions; empirical rate expressions based on experimental data, and theoretical rate equations based on proposed mechanisms; rate limiting steps and process control.

#773 / Properties of Metallurgical Slags / K.S. Coley

This course will present a theoretical picture of slags and their properties and will demonstrate how these properties can be controlled to help optimise metallurgical processes. The following aspects of slag properties will be covered: Slag structure and its relationship with basicity; Basicity concepts from V-ratio to optical basicity; the relationship between structural chemistry and physical property of slags; Basicity and slag capacities. Industrial examples will be taken from Oxygen steelmaking, ladle metallurgy and continuous casting.

#774 / Injection Metallurgy / G.A. Irons

The transport phenomena associated with the injection of gas or gas and particles into liquid metals are examined. Specific topics include: pneumatic conveying, particle injection, flow regimes, mixing, plume modeling and refining reactions.

#775 / Physical and Mathematical Modeling in Materials Processing / G.A. Irons

Criteria for similarity; analysis of tracer mixing; mathematical models of combined fluid flow, heat transfer and mass transfer. Critical review of case studies in the literature.

SPECIAL TOPICS**#791 / Special Topics in Materials Science and Engineering / Staff**

From time to time, modules will be offered on subjects of interest to the Department faculty.

***792 / Special Topics in Materials Science and Engineering / Staff**

From time to time, courses will be offered on subjects of interest to the Department faculty.

In addition to these courses, there are many courses offered by other departments which may be considered. The selection of such courses should be done in consultation with the student's supervisor and will be authorized by the Chair of the Department. Students should consider courses offered by the Departments of Engineering Physics, Chemistry, Chemical Engineering, Mechanical Engineering, Physics and Astronomy, and Mathematics and Statistics.

Research in Materials Science and Engineering

The Department of Materials Science and Engineering provides opportunities for research in a broad range of fundamental and applied topics including materials processing and recycling, nano-technology and nanoscale materials science, electronic materials and structural materials. Detailed descriptions of research activities can be found in the web pages for each faculty member and are briefly listed below: microstructure and interfaces in nanoscale functional materials, electronic structure and spectroscopy of complex oxides and alloys, electron microscopy and electron energy loss spectroscopy techniques (G. Botton); kinetics and thermodynamics of high-temperature reactions in materials processing and service, physical chemistry of iron and steel making (K. Coley); analysis of nanoscale materials, electron microscopy, strengthening and fracture in solids (D. Embury); transport phenomena in process metallurgy, computational fluid mechanics, steel making (G. Irons); physical properties of non-crystalline solids at high and low temperatures (G. Johari); materials for solid-state devices (A. Kitai); kinetics and mechanisms of gas-solid, slag-metal, pelletization and carbonization reactions (W. Lu); high temperature physical and chemical reactions and properties of ceramics (P. Nicholson); thermodynamics, ceramics, phase diagrams, fuel cells, solid electrolytes, energy conversion (A. Petric); crystallographic and kinetic aspects of phase transformations (G. Purdy); computational thermodynamics, measurement, analysis and modeling of texture, thermo-mechanical treatment of aluminum alloys, experimental and numerical simulation of solidification processes (D. Malakhov); crystallographic and kinetic aspects of phase transformations and electron microscopy in materials, magnetic and electrical properties of materials and nanomaterials, molecular dynamic and finite element modeling of the molecular structure of metals (M. Niewczas); solidification microstructure formation in alloys using phase-field and other continuum methods combined with high performance computing, deformation in cellular solids using continuum and quasi-atomistic methods, paper microstructure and its effects on electrophotography (N. Provatas); casting, physical metallurgy of steels and cast iron (S. Subramanian); microanalysis and mechanical property measurements applied to studies of mechanisms of strengthening, creep and fracture in metals and ceramics (D. Wilkinson); organic electronics, polymer fuel cells, nanostructures (G. Xu); electrodeposition of ceramics, metals, polymers and composites, nanostructured materials, nanofibres, photonic crystals, quantum dots, ferroelectric and magnetic materials, biomaterials, fuel cells (I. Zhitomirsky); polymerization kinetics and polymer characterization, polymer reactive processing, water-soluble polymers, fibre networks (S. Zhu); microstructure evolution and its effect on mechanical properties of metals (H. Zurob).

The Department is involved with several institutes that provide opportunities of interaction with industry and interdisciplinary research, including the Brockhouse Institute for Materials Research, the Steel Research Centre, the Centre for Automotive Materials and the McMaster Institute for Materials Research.

Facilities for Research

In addition to the special types of equipment required in the above fields of study, the research facilities available to the Department include a main shop employing several full-time instrument-makers, a student shop, a plasma melting facility, consumable and non-consumable electrode arc-melting furnaces, X-ray diffraction facilities, a supply of liquid helium, X-ray fluorescence and neutron activation analysis equipment, optical emission spectrometer, dielectric and mechanical relaxation, a wet-chemical analysis laboratory, levitation melting apparatus, laboratory rolling mill, computer-controlled mechanical testing machines, creep test facilities for metals and ceramics, hot isostatic press, vacuum hot press, interference microscope, hot-stage microscope, electron microscopes (including an environmental SEM), high frequency ultrasonic non-destructive evaluation system for ceramic specimens, and ion accelerator, 50 kg vacuum and a 100 kg air induction melting and casting facility, physical property measurement system for measurements of magnetic and electrical properties of materials and a high resolution scanning transmission electron microscope. Additional information is located on the department website.

MATHEMATICS

The Department of Mathematics and Statistics offers programs leading to the M.Sc. and Ph.D. degrees in Mathematics. Part-time doctoral studies in Mathematics are permissible.

Enquiries: 905 525-9140, Ext. 24336

Fax: 905 522-0935

E-mail: graduate@math.mcmaster.ca

Website: <http://www.math.mcmaster.ca/graduate>

Staff / Fall 2009

PROFESSORS

S. Alama, B.S. (Columbia), M.S., Ph.D. (Courant, N.Y.U.)
 N. Balakrishnan, B.Sc., M.Sc. (Madras), Ph.D. (I.I.T., Kanpur)
 H.U. Boden, B.S. (New Hampshire), Ph.D. (Brandeis)
 L. Bronsard, B.A. (Montreal), M.S., Ph.D. (Courant, N.Y.U.)
 W. Craig, A.B. (Berkeley), M.S., Ph.D. (Courant, N.Y.U.) / Senior Canada Research Chair
 D. Earn, B.Sc., M.Sc. (Toronto), Ph.D. (Cambridge)
 S. Feng, B.Sc., M.Sc. (Beijing Normal), Ph.D. (Carleton)
 J-P. Gabardo, B.Sc. (Université de l'Etat à Mons), Ph.D. (Maryland)
 I. Hambleton, B.Sc., M.Sc. (Toronto), Ph.D. (Yale) / Britton Professor of Mathematics
 B. Hart, B.Math. (Waterloo), Ph.D. (McGill) / Chair
 D. Haskell, B.A. (Oxford), M.S., Ph.D. (Stanford) / Associate Chair and Undergraduate Advisor
 F.M. Hoppe, B.Sc. (Toronto), M.Sc. (Weizmann Institute of Science), M.A., Ph.D. (Princeton)
 T.R. Hurd, B.Sc. (Queen's), D.Phil. (Oxford)
 N. Kevlahan, B.Sc. (British Columbia), Ph.D. (Cambridge) / Associate Chair and Graduate Advisor
 M. Kolster, Dipl. (Hamburg), Dr.rer.nat. (Saarbrücken), Habil. (Münster)
 M. Lovric, B.S. (Zagreb), M.S., Ph.D. (Ohio State)
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 G.H. Moore, B.A. (Berkeley), M.A., M.Sc., Ph.D. (Toronto)
 A.J. Nicas, B.Sc. (McGill), M.A., Ph.D. (Princeton)
 E.T. Sawyer, B.Sc., Ph.D. (McGill) / McKay Professor of Mathematics
 M.A. Valeriote, B.Math. (Waterloo), Ph.D. (Berkeley)
 R. Viveros-Aguilera, B.A. (Veracruzana, Mexico), M.A. (National Polytechnic Inst., Mexico), Ph.D. (Waterloo) / Graduate Advisor, Statistics
 M.Y.-K. Wang, A.B. (Princeton), Ph.D. (Stanford)
 G.S.K. Wolkowicz, B.Sc., M.Sc. (McGill), Ph.D. (Alberta)

ASSOCIATE PROFESSORS

A. Canty, B.Sc. (College Cork, Ireland), M.Sc., Ph.D. (Toronto)
 A. Childs, B.Sc., M.Sc., Ph.D. (McMaster)
 M. Grasselli, B.Sc. (São Paulo), Ph.D. (King's College)
 Z.V. Kovarik, M.S. (Charles, Prague), Ph.D. (Toronto)
 D.E. Pelinovsky, M.S. (Nizhny Novgorod State, Russia), Ph.D. (Monash, Australia)
 P. Speissegger, Diploma (Switzerland), Ph.D. (Illinois) / Canada Research Chair

ASSISTANT PROFESSORS

M. Harada, A.B. (Harvard), Ph.D. (Berkeley)
 D. Lozinski, B. Math. (Waterloo), M.Sc., Ph.D. (Northwestern)
 T. Pirvu, B.Sc. (Craivo), M.Sc., Ph.D. (Carnegie Mellon)
 B. Protas, M.Sc. (Warsaw Univ. Technology), Ph.D. (Warsaw Univ. Technology and Université de Paris VI [Pierre et Marie Curie])
 R. Zhu, B.Sc., M.Sc. (USTC, China), Ph.D. (British Columbia)

ASSOCIATE MEMBERS

A. Deza (Computing & Software), M.Sc., (Ecole Nationale des Ponts et Chaussées), Ph.D. (Tokyo Institute of Technology)
 J. Dushoff (Biology), B.A. (Pennsylvania), Ph.D. (Princeton)
 S.D. Walter, B.Sc. (London), Ph.D. (Edinburgh) / Clinical Epidemiology & Biostatistics

ADJUNCT MEMBER

A.H. El-Shaarawi (National Water Research Institute), B.S., M.Sc. (Cairo), Ph.D. (Waterloo)

PROFESSORS EMERITI

B. Banaschewski, Dipl. Math., Dr.rer.nat. (Hamburg), F.R.S.C. / McKay Professor of Mathematics
 C.E. Billigheimer, B.A., B.Sc., M.A. (Melbourne), Ph.D. (Toronto)
 T.H. Choe, B.S., B.Sc., M.A. (Kyungpook), Ph.D. (Florida)
 J. Csima, Dipl. Math. (Eotvos, Budapest), Ph.D. (Toronto)
 T.M.K. Davison, B.Sc. (Sir George Williams), M.A., Ph.D. (Toronto)
 C.W. Dunnett, M.B.E., B.A. (McMaster), M.A. (Toronto), D.Sc. (Aberdeen)
 G. Field, B.Sc., Ph.D. (London)
 H.P. Heinig, B.Sc. (McMaster), M.A. (Western), Ph.D. (Toronto)
 T. Husain, B.A., M.A. (Aligarh), Ph.D. (Syracuse)
 N.D. Lane, B.A. (Queen's), M.A., Ph.D. (Toronto)
 S.G. Mohanty, B.A. (Utkal), M.A. (Punjab), Ph.D. (Alberta)
 B.J.W. Mueller, B.S. (Göttingen), M.S., Ph.D. (Mainz)
 C.R. Riehm, B.A. (Toronto), Ph.D. (Princeton)
 A. Rosa, M.S. (Kiev State), Ph.D. (Slovak Acad. Sciences)
 J.D. Stewart, B.Sc. (Toronto), M.S. (Stanford), Ph.D. (Toronto)
 M.L. Tiku, B.A. (Kashmir), M.A. (Punjab), M.Sc. (Patna), Ph.D., D.Sc. (Aberdeen)
 P. Yip, B.Sc. (Memorial), Ph.D. (McMaster)

Admission requirements can be found under the School of Graduate Studies general regulations for the M.Sc. and Ph.D. programs at the front of this Calendar.

M.Sc. Degree

Applicants will be considered for admission to the M.Sc. program if they have a B+ average in the final year of an honours Bachelor's degree in Mathematics, or in a related area. They may apply to follow one of four options. In all options, at most two one-term 600-level courses may be used to fulfill the course requirement.

A. Thesis option

A candidate for the M.Sc. with thesis must complete a minimum of six one-term graduate courses and submit a thesis written under the supervision of a faculty member and based on original research. The thesis is defended in an oral examination. The duration of this option is normally 20 months.

B. Project option

A candidate for the M.Sc. with project must complete a minimum of six one-term graduate courses and present a research project written under the supervision of a faculty member. The duration of this option is normally between 16 to 20 months.

C. Coursework option

A candidate for the M.Sc. with coursework must complete a minimum of eight one-term graduate courses. The duration of this option is normally 16 months.

D. Transfer Option

A candidate may transfer directly to the Ph.D. program without completing an M.Sc. by first registering for the thesis option and then submitting an application for transfer after 12 to 20 months. This option requires completion of six one-term graduate courses, one written comprehensive exam, submission of a research proposal, and a statement from the supervisor. Successful applicants may apply all accumulated credits to the Ph.D. degree, but are still required to complete four one-term courses beyond the M.Sc. once registered in the Ph.D. program. Unsuccessful applicants must choose one of the other options.

Unless specifically exempted, each candidate for the M.Sc. student is required to choose no fewer than four 700-level courses in Mathematics. The remaining courses must be chosen from those acceptable to the department and may include up to two one-term courses at the graduate level from a cognate subject. Students intending to do doctoral work are expected to complete two of the two-term course sequences from Algebra *701/*702, Analysis *721/*722, and Applied Math *741/*742.

Ph.D. Degree

The Department of Mathematics and Statistics offers a program of study and research towards the Ph.D. degree in Mathematics, including appropriate topics in Applied Mathematics, Financial Mathematics, Probability, and Statistics. Applicants will be considered for admission to the Ph.D. program if they have completed an M.Sc. in Mathematics (or in a related area) with a B+ average.

The minimum course requirement for the Ph.D. is four one-term courses beyond the Master's degree and acceptable to the department. All candidates are required to pass the comprehensive exam consisting of two exams testing breadth of knowledge (the first written and the second written or oral, at the department's discretion), and one additional oral exam testing depth of knowledge in the proposed field of study. Candidates must also present and defend, in an oral examination, a thesis written under the supervision of a faculty member containing original research.

All graduate students must attend the weekly Department Colloquium, and students in the Ph.D. program are expected to participate in the seminar relevant to their field of study.

Courses

Courses marked with an asterisk (*) are one-term courses. Courses marked with a plus sign (+) may differ in content from year to year and may be taken a second time for credit. Note that only a selection of these courses will be offered each year.

Courses in cognate subjects may also be taken for graduate credit in Mathematics. Students interested in Mathematical Statistics should consult the Statistics course listing elsewhere in this calendar. Students interested in Computational Mathematics should consult the Computational Engineering and Science course listing elsewhere in this calendar. Students interested in Computer Science should consult the Computing and Software course listing elsewhere in this calendar.

The following courses, which are available to senior undergraduate students as 400-level, are offered for graduate credit. Graduate students in 600-level courses will be required to do extra work in addition to that required of undergraduate students in the corresponding 400-level course (such as extra reading, problems, written or oral presentations) as prescribed by the instructor.

***6A03 / Real Analysis II (Same as Math *4A03)**

Metric spaces, compactness. Spaces of continuous functions, functions of several variables, Inverse and Implicit Function Theorems. Lebesgue integration.

***6AT3 / Topics in Analysis (Same as Math 4AT3*)**

Precise topics will vary; consult the department for current information. Possible topics include: functional analysis, measure theory, harmonic analysis, calculus of variations

***6B03 / Calculus on Manifolds (Same as Math *4B03)**

Review of multivariate calculus, basic properties of manifolds, differential forms, Stokes' theorem, de Rham cohomology, and applications.

***6BT3 / Topics in Geometry (Same as Math 4BT3*)**

Precise topics will vary; consult the department for current information. Possible topics include: differential geometry, Riemannian metrics, connections, curvature, geodesics, topological and analytic properties of Riemannian manifolds.

***6E03 / Galois Theory (Same as Math *4E03)**

Field extensions, splitting fields, normality and separability, Galois extensions, finite fields, solvability by radicals, cyclic extensions, cyclotomic extensions, algebraic closure, classical constructions, computations of Galois groups.

***6ET3 / Topics in Algebra (Same as Math 4ET3*)**

Precise topics will vary; consult the department for current information. Possible topics include: algebraic geometry, algebraic number theory.

***6G03 / Dynamical Systems (Same as Math *4G03)**

Topics to be selected from ordinary differential equations theory, bifurcation and stability theory.

***6K03 / Mathematics of Finance (Same as Math *4K03)**

Options and forwards, efficient market hypothesis, no arbitrage condition, binomial asset pricing model, portfolio strategies, stochastic processes, conditional expectation, martingales, optimal portfolio selection, exotic options, stochastic interest rate models.

***6L03 / Introduction to Mathematical Logic (Same as Math *4L03)**

First order logic, deduction systems, completeness and compactness theorems, model theory.

***6LT3 / Topics in Logic (Same as Math 4LT3*)**

Precise topics will vary; consult the department for current information. Possible topics include: axiomatic set theory, computability theory, model theory or proof theory.

***6Q03 / Numerical Methods for Differential Equations (Same as Math *4Q03)**

Approximation error; methods for ODEs, stiffness; iterative methods for BVP; weighted residuals; spectral methods; methods PDEs, accuracy, consistency, convergence; stability analysis.

***6TT3 / Topics in Topology (Same as Math 4TT3*)**

Precise topics will vary; consult the department for current information. Possible topics include: fundamental group and covering spaces, cell complexes and homology theory, theory of knots, links and braids.

***6V03 / Applied Analysis (Same as Math *4V03)**

Theory of Distributions, Fourier Transform, fundamental solutions and Green's functions for partial differential operators, uncertainty principle, Poisson summation formula, applications.

***6X03 / Complex Analysis II (Same as Math *4X03)**

Conformal maps, analytic continuation, harmonic functions, the Riemann mapping theorem, Riemann surfaces.

The following 700-level courses are offered for graduate credit. Among these, the core sequences in Algebra *701/*702, Analysis *721/*722, Applied Mathematics *741/*742, and Geometry/Topology *761/*762 will normally be offered every year. The remaining courses may be offered less frequently, depending on student demand.

***701 / Algebra I**

Group theory, field theory and Galois theory with applications.

***702 / Algebra II**

Rings and modules, representation theory of finite groups, homological algebra.

+*703 / Topics in Algebra

Selected topics from: commutative algebra, representation theory, homological algebra, K-theory.

***704 / Algebraic K-Theory**

Etale cohomology, Chern characters, motivic cohomology, connections to algebraic number theory and algebraic geometry.

***705 / Algebraic Number Theory**

Number fields, theory of ideals and valuations, local fields, Dirichlet unit theorem, finiteness of class number, ramification theory, quadratic and cyclotomic fields, ideles, introduction to class field theory.

***706 / Algebraic Geometry**

Affine varieties, regular functions, projective varieties, Riemann surfaces, complex surfaces, computational algebraic geometry, sheaves, schemes.

***711 / Mathematical Logic**

First-order logic: completeness, compactness, Löwenheim-Skolem Theorems; model theory, proof theory will be covered. Extensions of first order logic: infinity logics, generalized quantifiers.

+*712 / Topics in Foundations

Selected topics, such as model theory, both pure and applied, general algebraic systems, set theory, proof theory, and the theory of computability.

***721 / Analysis I**

This course covers measures, integration, L^p -spaces, convergence theorems, and Fubini's theorem, differentiation, Baire category theorem.

***722 / Analysis II**

Complex analysis, properties of holomorphic and harmonic functions, approximation and factorization theorems, conformal mapping, analytic continuation. Introduction to functional analysis.

***723 / Functional Analysis**

Hahn-Banach, uniform boundedness principle, convex compact sets and Krein-Milman Theorem. Selected topics from: theory of locally convex spaces, orthogonal bases in topological algebras, topological groups.

***724 / Fourier Analysis**

Introductory Fourier analysis on Euclidean spaces and selected topics from: harmonic and subharmonic functions, weighted norm inequalities, Paley-Littlewood theory, analysis on compact and locally compact groups.

***727 / Partial Differential Operators**

Properties of distributions, fundamental solutions, the Cauchy problem, elliptic operators, maximum principles, applications and further topics.

***741 / Methods of Applied Mathematics I**

Ordinary differential equations: well-posed initial value problems (i.e. existence, uniqueness, continuation and continuous dependence), general non-autonomous linear systems, special linear systems (autonomous, periodic), classical stability theory, bifurcation and asymptotic methods.

***742 / Methods of Applied Mathematics II**

Partial differential equations: elliptic, parabolic, and hyperbolic equations using distributional, integral equation, and variational methods, and nonlinear problems.

+*743 / Advanced Topics in Differential Equations

Further study in Ordinary and/or Partial Differential Equations. Theory and Application. Selected topics from: dynamical systems theory, optimal control, nonlinear equations, with applications to shock waves, incompressible fluid flow, free boundary problems and porous media.

***744 / Asymptotic Analysis**

Asymptotic expansions, regular and singular perturbation theory, multiple scale analysis, boundary layer theory, WKB theory, applications.

+*745 / Topics in Numerical Analysis

Selected topics from numerical linear algebra, approximation theory, optimization, numerical solution of differential equations: finite differences, finite elements, boundary elements, spectral methods.

***746 / Bifurcations and Stability Theory**

Local and global theory, averaging techniques, Hopf bifurcations, group-theoretic aspects, strange attractors and chaos, applications and related topics.

+*747 / Topics in Mathematical Biology

Development of mathematical models using differential equations, difference equations, stochastic processes and/or game theory. Analytical and numerical exploration of the models. Topics selected from ecology, epidemiology, immunology, physiology and/or other areas of biological and medical science.

+*748 / Topics in Mathematical Physics

Linear operators in Hilbert spaces, spectral representations. Mathematical foundations of classical mechanics, general relativity, quantum mechanics, and quantum field theory.

***761 / Geometric Topology**

Differentiable manifolds and their basic properties, fibre bundles, de Rham cohomology and applications.

***762 / Differential Geometry**

Connections of fibre bundles, curvature, topological and analytic properties of Riemannian manifolds.

***763 / Algebraic Topology**

Homology and cohomology, duality on manifolds, characteristic classes.

+*764 / Topics in Differential Geometry and Global Analysis

Selected topics, such as differential operators on manifolds, complex differential geometry, submanifolds, harmonic maps, gauge theory, moduli spaces.

+*765 / Advanced Topics in Geometric Topology

Selected topics, such as Morse theory, cobordism, surgery theory, algebraic K-theory, group actions on manifolds, geometric group theory.

***766 / Lie Groups**

Subgroups and subalgebras, maximal tori, structure theory, representations of compact Lie groups, semi-simple Lie groups and symmetric spaces, Lie algebra cohomology, Clifford algebras and spinors, Kac-Moody algebras.

***771 / Mathematics of Finance**

Binomial model of stocks, stochastic calculus, martingales and arbitrage, Black-Scholes equation and pricing derivative securities, fundamental theorems of asset pricing, models of equity and fixed income markets.

+*772 / Topics in Financial Mathematics

Selected topics in financial mathematics, such as stochastic models in finance, pricing and hedging financial derivatives, analysis of financial time series/model calibration, portfolio optimization, interest rate theory, credit risk, Monte-Carlo methods, finite difference methods.

***773 / Applied Computational Finance**

Overview of equity, fixed income and FX markets; summary of continuous time financial modeling; pricing of vanilla and exotic derivatives; lattice methods: binomial trees; Monte Carlo methods; numerical methods for parabolic PDEs; risk measurement.

***774 / The Mathematics of Credit Risk**

Default events and stopping times; bonds and rates; credit spreads and corporate bond prices; intensity based models; credit rating models, firm value models; default correlation; credit derivatives; calibration; basket credit products; collateralized debt obligations.

***775 / Portfolio Theory and Incomplete Markets**

Semimartingale market models; trading strategies; wealth processes and stochastic integration; risk aversion; utility theory of consumption and wealth; solution of Merton's problem; pricing and hedging in incomplete markets; markets with stochastic volatility; transaction costs; Levy markets; risk measures and capital requirements.

***776 / Financial Markets**

Overview of equity, fixed income and FX markets; pricing of vanilla and exotic derivatives; financial time series, GARCH models; discussion of volatility; market risk, VaR, CAPM models; introduction to credit risk; capital models.

***782 / Probability Theory**

Probability measures, conditional expectations, martingales, convergence of probability measures, stochastic processes.

***795 / Math Graduate Seminar**

This seminar meets weekly in Fall and Winter terms, and students are expected to attend the seminar regularly, as well as to prepare and present several seminar talks on topics, which they are to choose with the supervision of the instructor.

+*798 / Directed Reading

Topics chosen by the student and instructor.

+*799 / Directed Reading

Topics chosen by the student and instructor.

MECHANICAL ENGINEERING

The Department of Mechanical Engineering provides facilities for students intending to proceed to the M.A.Sc., M.Eng. and Ph.D. degrees.

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Staff / Fall 2009**PROFESSORS**

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 Ilene Busch-Vishniac, B.Sc. (Rochester), M.Sc., Ph.D. (M.I.T.)
 Chan Y. Ching, B.S. (Perideniya), Ph.D. (Syracuse), P.Eng.
 Mohamed Elbestawi, B.Sc. (Alexandria), M.Eng., Ph.D. (McMaster), P.Eng.
 Saeid Habibi, B.Sc. (Dundee), Ph.D. (Cambridge), P.Eng. / Chair
 Mukesh K. Jain, B.E. (IISc), M.A.Sc. (Windsor), D.Sc. (Washington), P.Eng.
 Marilyn F. Lightstone, B.Sc. (Queen's), M.A.Sc., Ph.D. (Waterloo), P.Eng.
 Samir Ziada, B.Sc. (Cairo), M.Eng. (McMaster), Ph.D. (Lehigh), P.Eng.

ASSOCIATE PROFESSORS

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 Mohamed S. Hamed, B.Sc., M.Sc. (Alexandria), Ph.D. (Western), P.Eng.

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 Joseph R. McDermid, B.Sc. (Queen's), M.Eng., Ph.D. (McGill), P.Eng.
 Timothy J. Nye, B.A.Sc., Ph.D. (Waterloo), M.Sc. (Ohio), P.Eng.
 Sumanth Shankar, B.Tech. (Banaras Hindu), Ph.D. (Worcester Polytechnic)
 Mateusz P. Sklad, M.Sc., Ph.D. (Warsaw)
 Allan D. Spence, B.Math., M.A.Sc. (Waterloo), Ph.D. (British Columbia), P.Eng.
 Stephen C. Veldhuis, B.Eng.Mgt., Ph.D. (McMaster), M.Eng. (Carnegie Mellon), P.Eng.
 Peidong Wu, B.Sc. (Zhejiang), M.Eng. (China Univ. of Mining), Ph.D. (Delft)

ASSISTANT PROFESSORS

Robert V. Fleisig, B.A.Sc. (Waterloo), M.Eng., Ph.D. (McMaster) P.Eng.
 Eugene, Ng, Dipl. Mech. Eng. (Singapore), B.Eng., Ph.D. (Birmingham)
 Ponnambalam (Ravi) Selvaganapathy, B.S. (Madurai Kamaraj), M.S., Ph.D. (Michigan), P.Eng.
 Stephen Tullis, B.Sc., M.Sc., (Queen's), Ph.D. (Cambridge), P.Eng.
 Gregory Wohl, B.Sc., M.Sc., Ph.D. (Calgary)

ASSOCIATE MEMBERS

Anthony Adili (Surgery)
 David W. Capson (Electrical and Computer Engineering)
 Justin DeBeer (Surgery)
 J. David Embury (Materials Science and Engineering)
 Andrew Hrymak (Chemical Engineering)
 Nicholas Kevlahan (Mathematics and Statistics)
 Mesud Yelbuz (Pediatrics)
 Philip Wood (Chemical Engineering)

ADJUNCT MEMBERS

Amad Abdul-Razzak, B.Sc. (Baghdad), M.Sc. (Strathclyde), Ph.D. (McMaster), P.Eng. / Atomic Energy of Canada Limited
 Doug K. Chang, B.A.Sc., M.A.Sc. (Korea), M.A.Sc., Ph.D. (Windsor), P. Eng. / Ford Motor Company
 Glenn Harvel, B.Eng., M.Eng., Ph.D. (McMaster), P. Eng. / UOIT
 Anthony Robinson, B.Eng., M.Eng., Ph.D. (McMaster) / University of Dublin, Ireland
 Vincent M. Sowa, B.Sc. (Illinois Inst. of Technology), M.A. (Purdue), Ph.D. (Waterloo) / Conestoga College
 Jimi Tjong, B.A.Sc., M.A.Sc., Ph.D. (Windsor) / Ford Motor Company
 Norman Zhou, B.A.Sc., M.A.Sc. (China), Ph.D. (Toronto), P.Eng. / University of Waterloo

PROFESSORS EMERITI

Mohammed A. Dokainish, B.Sc. (Cairo), M.A.Sc., Ph.D. (Toronto), P.Eng.
 Ross L. Judd, B.E.Sc. (Western), M.Eng. (McMaster), Ph.D. (Michigan), P.Eng.
 George F. Round, B.Sc., Ph.D., D.Sc. (Birmingham)
 Mamdouh Shoukri, B.Sc. (Cairo), M. Eng., Ph.D. (McMaster), P. Eng.
 David S. Weaver, M.A.Sc. (Toronto), Ph.D. (Waterloo), P.Eng.

M.A.Sc. Degree

The requirements for the M.A.Sc. degree in Mechanical Engineering can be satisfied through full- or part-time study. The minimum course requirement is four half courses, at least three of which should be at the 700-level. Students are required to present a thesis which embodies the results of independent work that the candidate has completed and which demonstrates competence in Mechanical Engineering. An oral defense of the thesis is required.

ADMI M.Eng. Degree in Design and Manufacturing

The requirement for the M.Eng. in Design and Manufacturing is to complete ten module graduate courses (5 graduate half courses).

Ph.D. Degree

Four half courses, at the 700-level, are the minimum required beyond the Master's degree. The supervisory committee will approve the selection of courses in consultation with the student.

Ph.D. candidates are required to pass a Comprehensive Examination designed to test their breadth of knowledge and ability to integrate ideas. A candidate must complete a thesis which embodies the results of original research and mature scholarship. The general University requirements for the thesis and oral defense will apply.

Courses

Courses marked with an asterisk (*) are half courses. The following 600-level courses are offered for both graduate credit and senior undergraduate credit.

*6BB3 / Biomechanics / G. Wohl

Application of mechanical engineering principals to biomechanics problems including cellular biomechanics, hemodynamics, the circulatory system, the respiratory system, muscles and movement and skeletal biomechanics.

*6CC3 / Experimental and Computational Biomechanics / Staff

This course will provide basic background in experimental and computational biomechanics including biomechanical testing concepts and application of finite element method in simulations of biomechanical structures/systems.

*6K03 / Introduction to Robotic Mechanics / G.M. Bone

This course considers spatial descriptions and transformations, manipulator kinematics, inverse kinematics, Jacobians, and dynamics.

*6L03 / Industrial Design / Staff

Introduction to the techniques of industrial design, case studies and introduction to illustration techniques.

*6Q03 / Mechanical Vibrations / M.P. Sklad

This course is designed to provide students with an introduction to the fundamental concepts of vibration engineering. Students will learn an appreciation for harmonic motion as well as the modeling of mechanical systems. This course will draw on the math skills established in previous courses with a special emphasis on understanding the physical phenomena involved as well as interpret and apply the results to real problems. A project will also be undertaken involving the simulation and validation of a model capturing critical aspects of a dynamic mechanical system.

*6T03 / Finite Element Applications / P. Wu

Theory of the finite element derivation, solution procedures. Applications to static and dynamic mechanical systems using a finite element package.

*6U03 / Advanced Thermodynamics / S. Tullis

Compressible flows: Fanno and Rayleigh flows, normal and oblique shocks. Turbo machines: axial and radial flow gas and steam turbines, flow compressors, and fans.

*6V03 / Thermo-Fluids Systems Design and Analysis / C.Y. Ching

Design, operation and application characteristics of equipment commonly used in thermal systems. Modeling performance characteristics of piping systems, pumps, compressors, fans, heat exchangers, boilers and cooling towers. System simulation and optimization. Selection criteria of thermal equipment. Design optimization and system performance evaluation.

***6Z03 / CAD/CAM/CAE / A. Spence**

Solid modeling theory, part creation, assemblies and rigid bodies, mechanism simulation, B-Splines, data exchange, CNC machining and inspection. Major project using computer laboratory facilities.

The following 700-level courses are offered for graduate credit only:

***702 / Advanced Dynamics of Machines I / M.A. Dokainish**

The study of structural damping; shock loading response spectra; random vibration; self-induced vibration; nonlinear systems; introduction to elastic wave theory; dynamic criteria of failure; and Hamilton's principle and Lagrange's equations.

***705 / Advanced Finite Element Analysis / P. Wu**

Solve nonlinear quasi-static and dynamic problems in solid mechanics with finite element method. Introduce the kinematics of large deformations and metal plasticity theories. Describe explicit and implicit implementations of constitutive models into finite element software. Cover a range of engineering applications, including assessment of damage and failure, prediction of deformation localization and necking.

***706 / Advanced Heat Transfer / R.L. Judd
(Same as Chemical Engineering *706)**

Steady and transient conduction stressing formulation and approximate solution techniques. Convection heat transfer including compressible and incompressible flow. Radiation heat transfer including gray body radiation and radiation from gases and vapours.

***707 / Analytical Solutions in Transport Phenomena / S. Shankar
(Same as Chemical Engineering *707)**

Analytical solution techniques for heat and mass transfer problems, analysis of boundary conditions, solutions to solidification problems, evaluation of inter and intrinsic diffusivities, analysis of various coordination systems and transformation of coordinates and moving heat source problems.

***708 / Two-Phase Flow and Heat Transfer / C.Y. Ching**

Development of conservation laws for two-phase flow systems, two-phase flow modeling, pressure drop and void fraction in piping systems, pool and convective boiling transfer, critical heat flux in pool and flow boiling, post-dryout heat transfer, critical two-phase flow and flow instabilities.

***709 / Introduction to Turbulent Flows / C.Y. Ching**

The course introduces the phenomenological features in turbulent flows and the methods used to analyze these flows. This will include developing the Reynolds average equations, investigating the vortex dynamics in these flows, applying the governing equations to different flows and other topics. The course will cover material related to both wall-bounded and free-shear flows.

***710 / Machine Tool Analysis / S.C. Veldhuis**

Definitions and test of accuracy. Metrology using laser interferometer. Thermal deformations. Automation, numerical control: command generation, digital positional servos. Dynamics of machine tool structures, stability against chatter. Selection, specification, utilization, maintenance.

***711 / Advanced Dynamics of Machines II / Staff**

Extension of Mech. Eng. *702 which includes a study of random vibration, self-induced vibration, and nonlinear systems.

***712 / Kinematics of Three-dimensional Mechanisms / Staff**

A study of some of the common space mechanisms and their analysis and synthesis, using symbolic representations of kinematic pairs.

***713 / Combustion Theory and Modeling / S. Tullis**

Introduction to combustion and reacting flows. Topics include reaction mechanisms and kinetics, laminar and turbulent flames with both premixed and non-premixed reactants. The course will emphasize the main theoretical difficulties involved in describing turbulent flows with chemical reactions and will be discussed with reference to practical applications. Numerical methods and models for the simulation of reacting flows.

***714 / Solidification Processing / S. Shankar**

Fundamentals of Solidification, Review of Solidification processes, near net shape solidification, molten metal handling and treatment, cast part quality.

***722 / Theory of Elasticity / D.S. Weaver**

Theoretical foundations of the mechanics of deformable solids with engineering applications. Topics will include: the introduction to rectangular cartesian tensors, development of equations of classical linear elasticity, applications to plane and torsion problems, exact and approximate analytical methods.

***723 / Flow Induced Vibrations / D.S. Weaver**

Classification of problems in flow-induced vibrations, physical modeling and mathematical modeling of problems involving fluid-structure interaction. Examples of applications to hydraulic gates and valves, cylindrical structures such as: smoke stacks, marine risers, nuclear reactor internals, bridge decks.

***724 / Solid and Surface Modeling Techniques / A. Spence
(Same as Computational Engineering & Science *724)**

Fundamental issues in both solid and surface modeling. B-Rep, CSG, octree representations. Computational geometry searching and sorting techniques, surface representations, B-Splines, NURBS. Curve and surface intersection methods.

***728 / Manufacturing Processes I / P. Koshy**

Fundamentals of metal cutting: cutting process, cutting forces and temperatures, tool wear, machinability of materials, machined surface quality and integrity, optimization of cutting conditions. Applications to single edge and multiple edge operations and grinding.

***729 / Manufacturing Systems / T. Nye**

This course studies the organization and control of manufacturing systems. Types of production systems, the role of inventory, capacity and production control planning, scheduling, push-, CONWIP- and JIT -systems. Use of analytic, heuristic and numerical analysis and design methods.

***734 / Theory of Plasticity / M.K. Jain**

Yield Criteria for ductile isotropic metals. Invariants of a second order tensor. Representative stress and strain. Flow Rule (plastic stress/strain relationships). Fundamental plasticity theory leading to the establishment of the extremum principles. Application of these principles to a rigid, incompressible, non-hardening, rate-insensitive solid in a state of plane strain (upper and lower bound theorems). Slip line field analysis (a more advanced upper bound method). Theory of finite strain. Introduction to some macroscopic theories of anisotropy. Introduction to crystallographic theory of metal deformation and determination of crystallographic yield loci.

736 / Special Topics in Mechanics / Staff**737 / Special Topics in Thermo-Fluid Sciences / Staff*****738 / Manufacturing Processes II / M.P. Sklad**

Yield behaviour, yield criterion and flow rules. Review of bulk and sheet metal forming operations. Approximate methods of solution to some of these processes.

***739 / Special Topics in Production / Staff**

***742 / Fundamentals of Acoustics / S. Ziada**

Complex exponential method to solve partial differential equations, acoustic wave equation and simple solutions, sound transmission, sound absorption in fluids, radiation and reception of sound waves, acoustics of pipes and cavities, resonators, ducts, acoustic filters, instability of shear flows and its coupling with sound waves.

***743 / Advanced Mechatronics / S. Habibi**

This is a graduate course in mechatronics with an emphasis on actuation systems and control. The course begins by considering the industrial process that is followed for the design of large integrated systems. It then considers the necessity for a multidisciplinary approach to design and discusses the rational for mechatronics. Electrical and hydraulic actuation systems are considered, modeled and simulated. Electronic circuits, microcontrollers, real-time digital control, filtering, estimation and system identification are considered in the context of the control of actuation systems. The course heavily relies on experiential learning and includes a project.

***744 / Advanced Mechanical Engineering Thermodynamics / Staff**

The course covers a reappraisal of basic thermodynamic concepts; advanced aspects of thermodynamic systems; an introduction to direct energy conversion, advanced collision theory, and irreversible thermodynamics.

***745 / Analytical Fracture and Damage Mechanics / M.K. Jain**

Modeling of linear elastic, elastic-plastic crack and damage problems, including mathematical foundations, experimental determination of fracture toughness and multi-axial damage in engineering materials, and application of fracture mechanics concepts to suitable engineering problems.

***748 / Experimental Mechanics / D.S. Weaver**

A hands-on experimental mechanics course emphasizing theory, critical evaluation, and engineering applications. Topics include: electrical resistance strain gauges, brittle coating methods and photoelasticity using transmission and reflective polariscopes.

***750 / Computer Integrated Manufacturing / Staff**

Computer integrated manufacturing. Flexible manufacture. Retrieval and generative process planning. Design for manufacturability, assembly and inspection. Simulation of manufacturing systems. Manual, automated and robotic assembly. Integrating sensors in manufacturing.

***751 / Advanced Mechanical Engineering Control Systems / G.M. Bone**

Design of digital control systems with emphasis on mechanical engineering applications, sampling characteristics, z transforms and z transfer functions. Root Locus in the z plane, frequency response, transient response. State space analysis, Eigen values, Eigen vectors, controllability, observability (SISO). State space design, pole assignment, state feedback, output feedback, modal control. Introduction to adaptive control, self-tuning regulations, model reference adaptive systems.

***752 / Advanced MEMS Fabrication and Microfluidics / R. Selvaganapathy**

Introduction, Microfabrication and micromachining, Surface and bulk micromachining, non-conventional machining, Microfluidics, Microchannels, Microvalves, Micromixers, Micropumps, Droplet actuation, Integrated Systems.

***753 / Advanced Fluid Mechanics / M. Hamed**

Review of vectors, tensors, tensor notation, hydrostatics and stressed in fluid, and Eulerian and Lagrangian coordinate systems. Develop conservation of mass, momentum, and energy equations and examine their properties. Analyze boundary layer flows, potential flows, and introduce transition to turbulence and turbulence flows.

756 / Computational Fluid Dynamics / M. Lightstone*(Same as Computational Engineering & Science *756)**

This course provides an introduction to finite-volume methods for solving fluid flow and heat transfer problems. Course content includes multi-grid solvers and pressure-velocity coupling techniques. The course emphasizes an understanding of the physics and the fundamentals of fluid flow and heat transfer. A working knowledge of FORTRAN is required.

***757 / Simulation of Manufacturing Systems / T.J. Nye**

Introduction to discrete event simulation as applied to the design and analysis of manufacturing systems. Modeling of manufacturing systems, simulation software, data collection and input analysis, random number generation, validation, output analysis for single and multiple systems, variance reduction techniques and experimental design. Students will apply these skills to a major project, where they will define the problem, develop and validate a conceptual and computer model, perform an analysis, and make managerial recommendations.

***758 / Graduate Seminars in Mechanical Engineering / R.L. Judd, Coordinator**

Seminar series presented by graduate students and guest speakers. All full time graduate students are required to register for this "zero credit" course in the fall and winter semesters. Course grades are either Pass or Fail (P/F). To pass the course the student must attend at least 60% of the seminars. Full time Master's students are required to present one seminar in the series before graduation, and Ph.D. students must present two seminars.

Facilities for Research

One entire wing of the John Hodgins Engineering building is devoted to Mechanical Engineering and contains a number of laboratories specifically allocated to research. Current equipment includes various vibration measurement instruments, experimental stress analysis equipment, high-speed camera, electrical instrumentation, metrology facilities, gas turbine, gas analysis instrumentation, heat transfer apparatus, variable slope water flume, wind tunnel, cascade tunnel, hot-wire anemometry, plasma generator, computer-aided design equipment, metal forming and cutting facilities, and noise measuring instrumentation.

ADVANCED DESIGN AND MANUFACTURING INSTITUTE (ADMI)

The Advanced Design and Manufacturing Institute, ADMI, created through the partnership of four leading Ontario universities, namely, University of Toronto, University of Waterloo, University of Western Ontario and McMaster University, presents a unique, innovative learning experience through a Master's Degree Program in Design and Manufacturing with emphasis on business and management. The program is designed to provide practicing engineers the enhanced knowledge, tools, technology as well as business and management skills, necessary to keep them at the forefront of their profession. The ADMI Master's Degree program has the enthusiastic endorsement of Materials and Manufacturing Ontario and Ontario Industry.

McMaster University Faculty members within the Faculty of Engineering and the School of Business contribute to the extensive selection of ADMI course offerings.

Individuals who choose to apply for admission to McMaster University will, once their application is approved, be registered within the Department of Mechanical Engineering on a part-time basis. The Master's Degree awarded by McMaster will be a M.Eng. with a *Design and Manufacturing* designation.

Enquiries: 905 525-9140 ext. 23097

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Email: mech@mcmaster.ca

Websites: <http://www.mech.mcmaster.ca>

<http://www.admicanada.com>

Courses

DM 0609 / Conceptual Design Studio

A large-scale object will be designed to satisfy commercial specifications. Perspectives on elements of initial sizing, integration of engineering science, safety, social context, valences, windows of opportunity, tacit assumptions, manufacturability, and cost analysis, will be developed. Because of its rich window of opportunity and straight-forward context, an advanced aircraft will be the large-scale design object. Accordingly, technical aspects of geometry selection, avionics, aerodynamics, propulsion integration, stability and control, loads, structures, and its manufacturing will be integrated "just-in-time" into the design experience.

DM 0610 / Intelligent Manufacturing

In this course, the participants will develop an understanding of how machine intelligence, knowledge-based systems (KBSs) and smart sensors can effectively improve the performance of machine tools, work cells, and overall manufacturing enterprises. The aim is to introduce and explore the fundamental issues and modern tools in designing intelligent manufacturing systems.

DM 0611 / Design for Manufacturability

In this course, the participants will develop an understanding of how the physical design of a product interacts with the components of the manufacturing system. The aim is to introduce, familiarize, explain and demonstrate, and use some of the most common tools and techniques developed in the field.

DM 0612 / Finite Element Analysis for Design Engineers

The course is intended for engineers who wish to use the Finite Element Analysis (FEA) as on their design tools, and for engineering managers in charge of FEA related projects.

DM 0663 / Financial and Managerial Accounting

The purpose of this course is to provide a sound understanding of accounting - the "language of business" - and to develop skills in the interpretation and use of accounting information. The course will provide a thorough understanding of how accounting information is used in organizations.

DM 0664 / Principles of Technical and Professional Communication

The focus of this course is mastery of the fundamental elements of all effective professional communication: assessing the communicative situation, understanding the needs and expectations of the audience, creating an effective and suitable message, and projecting confidence and competence through an appropriate communication style. The course combines theoretical understanding with practical application in four areas of communicative competence: reading, writing, listening, and speaking. Students will prepare and present a variety of messages and will be involved in the critical appraisal of the messages of others.

DM 0665 / Business-to-Business (B2B) Marketing

The objectives of the course are to provide an introduction to the basic theories and concepts in marketing, with an emphasis on businesses marketing to other businesses (B2B marketing); to develop an effective decision-making framework to address practical problems and issues in marketing; to illustrate the need to integrate marketing decision-making with the other functional areas within an organization; and to offer specific insights into selected marketing contexts, e.g. services, new/high technology, developing and managing relationships, and marketing in the global environment. Emphasis will be placed on e-business and how the Internet and the World Wide Web have greatly changed the role, efficiency and effectiveness of the marketing function, especially in the business-to-business marketplace.

DM 0681 / Technological Entrepreneurship & Innovation

Technological entrepreneurship involves much more than having a good business idea and writing a solid business plan. This course will introduce new venture creation as a process intimately connected to new product innovation and design. The successful introduction of a new product or service within an existing or new business requires several important steps: identification, evaluation, and selection of opportunities; planning and financing the new venture or project; and executing the new venture or project plan. A combination of lectures, assignments, and experienced guest speakers will be used to explore each of these steps in a practical manner that will be interesting and useful to any professional engineer, entrepreneur, or manager.

DM 0701 / Metal Forming & Computer Modeling of Sheet Metal Forming

Course starts with a brief introduction to the theory of plasticity, directly applicable to the mathematical and physical analysis of problems in metal forming. A discussion of tribology and material attributes follows. Metallurgical phenomena, accompanying hot and cold forming of metals, are discussed. Application to bulk metal forming (rolling, extrusion, drawing and forging) and sheet metal forming (deep drawing, stretch forming, hydroforming) are considered. This module also covers numerical simulation techniques used to accurately and efficiently simulate industrial sheet and tube forming processes.

DM 0720 / Design: Materials Selection

The purpose of this course is to make sound, intelligent selections of materials for safe and efficient structures or components. A unique feature of the course is that it contains the methodology of design and how materials selection should be simultaneously chosen at every stage of the design process - concurrent engineering. The materials selection should be effected through consideration not only of their properties, their processing, and their fabrication, but also their recyclability, and disposal after their use, involving the concept of life-cycle analysis.

DM 0722 / Mechatronics Engineering

Mechatronics is the integration of mechanical, electrical, computer and control engineering. This course deals with the analytical tools required to design, model, analyze and control mechatronic systems. Properties of linear and nonlinear systems, system identification methods, process modeling, sensor and actuators, computer interfacing, computer control of machines and processes (PLC and PC based). Laboratories will include PLC based automation applications and PC based advanced robotics.

DM 0723 / Sensors, Actuators and Interfacing

This course presents the theory and design implementation of several types of sensors and actuators. Sensors discussed include solid-state optical sensors, temperature sensors, velocity sensors, piezoelectric sensors and accelerometers, strain and force sensors, analogue and digital position sensors, pressure and flow sensors, and magnetometers and Hall sensors. Theory and modeling of several common actuators including different electric motors, hydraulic and pneumatic motors and cylinders, as well as piezoelectric and magnetostrictive actuators are presented.

DM 0766 / Strategic Management of Technology

This course focuses on the strategic management of technology and innovation established in firms. We take an evolutionary process perspective. The fundamental ideas underlying the perspective are: (1) that a firm's technology strategy emerges from its technological competencies and capabilities, (2) that the technology strategy is shaped by evolutionary external (environmental) and internal (organization) forces. The course draws on strategic management, economics and organization theory for analytical tools to address important challenges faced by senior and middle managers in technology based firms.

DM 0790 / Logistics and Supply Chain Management

This is a course intended for students with strong interests in developing skills and knowledge within a global operations and logistics framework. In particular, this course will offer the opportunity to discuss how the Internet has enhanced supply chain management.

DM 0791 / Management of Quality

The organizational function, Quality Management, has disappeared in many organizations today. However the activities of management of quality have been dispersed throughout and are of increasing importance because of the ever escalating demands for performance excellence and customer satisfaction. Major topics covered in the course include: strategic quality planning, organizational structure for quality, quality in design and processes, statistical quality control techniques, teamwork and reward systems, and quality standards such as ISO9000, TS 16949, TL 9000, the national quality awards such as Baldrige, Canada's Award for Excellence and the Deming Prize.

DM 0803 / Advanced Machining Systems / M. Elbestawi

This course will deal with the major component of *intelligent* machining. Predictive modeling of machining processes. Computer simulation of various processes such as milling, turning, and drilling. Prediction of process variables such as forces, torques, power and tool wear. Simulation of machining dynamics for chatter prediction. Sensors. Review of sensing techniques, and signal processing methodologies for monitoring cutting processes. Examples including tool breakage, tool wear and chatter monitoring. Process Controls. Various approaches for process control in machining applications, interface with position control, and state-of-the-art open architecture control.

DM 0820 / Geometric Dimensioning & Tolerancing/

A.D. Spence, R. Johnston, K. Doytchinov

Drafting Standards, Conventional vs. Geometric Dimensioning & Tolerancing, Form Controls, Datums, Orientation Controls, Position Tolerances, Concentricity and Symmetry Controls, Runout Controls, Profile Controls, Tolerance Stacks, Preferred Hole/Shaft Sizes, Go/No-Go Gauges, Inspection Fixture Design, Coordinate Measuring Machine Technology, touch trigger and analog probes, non-contact laser digitizer probes, FARO arms and laser trackers, software error compensation, Computer Aided Design software tools for inspection planning and analysis.

DM0824 / Optimization of Energy Efficiencies in Industrial Processes / M. Hamed

The course covers the fundamentals of industrial energy management and the technical procedures required for assessing energy saving opportunities (ESOs) in equipment and systems found in almost every industrial facility. These procedures can be applied on existing equipment or systems. It can also be used for sizing and selecting new equipment. The required background in heat transfer, fluid mechanics, and thermodynamics to support the analysis and the assessment of the various ESOs is also covered.

DM 0825 / Computer Aided Design - Part, Assembly, and Mechanism Modeling / A.D. Spence, R.V. Fleisig

Part Modeling, Assembly Modeling, Solid Modeling Theory, Kinematic and Dynamic Mechanism Modeling, Sculptured Surface Design, Reverse Engineering and Visualization. A major project will require students to create individual designs for each major topic using Computer Aided Design software.

DM 0871 / Manufacturing Management: Organizational Behaviour

The course addresses the topics of organization structure and organization design in relation to manufacturing strategy. Specific content in this module will include: the strategy-structure relationship; differentiation and integration; centralization and decentralization; function and product and matrix and network forms of organizations; strategic alliances; principles of organization design; characteristics of high performing work organizations; technology and organization design. A feature of the module will be a group project based on a team of students examining an ongoing organizational unit from the

point of view of four different frames of reference: human resources, structural, cultural/symbolic, political. The project will sensitize students to the multiple ways of analyzing and understanding organizations and to some of the realities associated with the actors and politics of manufacturing entities. The module will also examine some new trends in manufacturing such as outsourcing, consideration of the entire value chain and the use of contract or temporary employees.

DM 0880 / International Business / J. Tiessen

This course (1) analyzes the international business environment and (2) surveys managerial issues associated with international operations. Part one focuses on the institutions of globalization — the WTO, IMF, European Union etc. — and their implications for national economies. The second part examines how firms operate in this global environment. Specifically we will study how marketing, accounting, finance, operations, human resources and strategy are affected by geography and culture. Both sections will require research projects aimed at developing familiarity with international economic information and news sources — in print and on the internet.

DM 0886 / Tools for Technology Transfer / M. Mongeon

In a knowledge-based economy, successful organizations develop technologies and intellectual capital that may give rise to competitive advantage. The purpose of this course is to provide students with basic tools that will allow them to identify such technologies and intellectual capital in organizations, protect that capital by applying the necessary types of legal protection such as patents and copyright registrations and to then profit by transferring it to others or otherwise creating new entrepreneurial activities within the organization.

DM 0891 / Total Quality Management / J. Miltenburg

The many factors that effect quality in business, government and other organizations comprise the broad subject called Total Quality Management (TQM). The course seeks to familiarize students with all aspect of TQM programs. Major topics covered in the course include: strategic quality planning, organizational structure for quality, quality in design and processes, statistical quality control techniques, teamwork and reward systems, and quality standards such as ISO9000, the Baldrige Award and the Deming Prize.

DM 0917 / Ergonomic Design

This course provides an overview of ergonomic problems that are addressed in engineering design: including biomechanical, physical and physiological issues. Case studies will range from the design of vehicle cockpits to process control rooms, from industrial manual materials handling tasks to human direct robots, and from domestic tools to biomechanical devices. Specific topics include: anthropometry, work space design, environmental conditions (light, noise, humidity, temperature, motion), physiology, materials handling capacity, gender issues, tool design, product design and structured ergonomic design evaluation techniques.

DM 0919 / Dynamics and Vibration in Engineering Design

The course is intended to provide students with the ability to understand and incorporate dynamics and vibration into their designs as predictors throughout the stages of the design process and as analysis tools during prototype testing. Techniques of dynamic model development ranging from Newton-Euler Equations to Lagrange's Equations to modern Multi-Body Dynamics (MBD) techniques are presented and compared. The design utility of the derived models, from simple linear to complex non-linear and 3D, and what they bring to the design process is presented.

DM 0920 / Design: Materials Selection

The theme of this course is how to integrate materials selection into the design process at an early stage. The objectives are: i) to upgrade students' knowledge of mechanical design, engineering materials, failure mechanisms and materials selection methodologies and the use of sources of information on materials properties.

DM 0922 / Mechatronics Design

Mechatronics Engineering can be defined as the discipline that integrates mechanical, electrical, computer and systems engineering. Module 1 is hands-on oriented and focuses on the application of electronics and microprocessors to mechanical systems. Students are supplied with a microcontroller for individual take-home assignments. Group workshops with mobile robots are conducted during the day. Module 2 is more theoretically based and provides an overview of the subject of mechatronic systems design, starting with review of dynamic system modeling, measurement and sensor techniques, actuator technologies, and analog and digital control systems. MATLAB is used for simulation based exercises. In Module 2, demonstrations and laboratories will be conducted in the Robotics and Control Laboratories located at the University of Waterloo.

DM 0967 / Manufacturing Business Strategy

This course introduces students to the current theories used for business strategy in a manufacturing environment including product streams, theory of constraints, lean/agile manufacturing, supply chain management, and reliability/maintenance programs. The fundamentals, tools advantages and disadvantages for each strategy are examined. First hand interaction with various analytical tools will be a major feature of the course. Case studies featuring automotive related industries and their suppliers will be used to highlight the potential uses and value of the product stream approach. Participants will have the opportunity to use the analytical tools to conduct additional analyses and construct their own business strategy models.

DM 1012 / System Integration

Topics include introduction to system engineering; dynamic modeling of electronic and electromechanical systems; real-time systems design for system engineers; system requirements and specifications; signal and data processing; approaches to system modeling and rapid prototyping; multilevel diagnosis methodology; case studies. Each student will participate in a team that will develop a dynamic model of a multidisciplinary system of its choice and will demonstrate system integration at the design level.

DM 1013 / System Maintenance

The course will cover tools and methodologies necessary to achieve a program of maintenance excellence such that assets within an organization are cared for through sound and timely decision-making. The methodology of Reliability Centered Maintenance will be used to describe a process that can be used to establish maintenance plans. The main thrust of the course will be to focus on techniques, such as Weibull analysis and life cycle costing, that can be used to optimize a range of decisions associated with systems maintenance.

DM 1015 / System Simulation

System Simulation is a methodology for developing computer models of a company's overall or partial production system. These models can incorporate all the relevant complexities and random factors. They can provide a 3-D graphic representation of the system and a test bed for suggested improvements. The model is first run under the "as is" assumption, and then modified to incorporate potential improvements. The change in model behaviour, such as cost or throughput, provides management with the necessary decisive information. The System Simulation course will provide the basic concepts required for the development of such models. This includes coverage of specialized techniques for modeling the system random factors and analyzing the model results, and an introduction to the AutoMod programming language.

DM 1016 / Design Methodologies

Assessment of design methodologies and the practical implications of formalizing approaches to design. Functional requirements and design parameter analyses; design axioms of independence and minimization of information. Hierarchical design philosophy. Design for manufacturability within the tolerancing and information content. Contribution of industrial design approaches. Case study illustrations with particular reference to the tool, die and mold industries. Group projects.

DM 1018 / Product Design & Development

The course is intended to provide graduate engineering students with a broad sense of the issues and methodologies involved in Product Design. Emphasis is placed on creativity in the design and development of readily useable products and systems intended for manufacture in quantity for consumer and commercial markets. The course covers a broad range of product development issues aside from those that are strictly technical, including appeal, appropriate functional aspects, viability and durability.

DM 1021 / Forensic Engineering and Failure Analysis

The course provides participants with the fundamentals necessary to understand and appreciate investigation methods into engineering failures. Topics to be considered include definition of potential sources of failure in engineered materials; understanding of failures due to natural causes, fire, high and low speed impacts, design, manufacture and service conditions; procedures for investigation of structural, materials, environmental, service and design-related failures; introduction to principles of materials selection for prevention of mechanical failures; characterization techniques used to assess materials structure and chemistry; demonstration of fundamental principles through real case studies to understand liabilities and legal issues.

DM 1031 / Heat Transfer in Manufacturing Processes

The course will address the fundamentals of heat transfer and how to apply heat transfer analysis in design and manufacturing. It will include a review of heat transfer mechanisms including conduction, convection, solidification phase-change and radiation. Specific applications of heat transfer in casting, die casting, thermal spray coating and electronic cooling will be discussed. The use of computer based numerical methods to analyze heat transfer and fluid flow will be taught. Attendees will work in teams on design projects where they will have the opportunity to use computer codes in the design process. Case studies drawn from industrial applications of heat transfer will be used in the course.

DM 1072 / Organizational Change

This course will provide students with the ability to understand and appreciate the forces that are driving manufacturing organization to change at very rapid rates and to take both project champion and facilitative roles that will increase the probability that the organization's efforts to adapt to such external changes will be successful. The module will introduce students to the basic ideas behind some of the major initiatives that are used to change the basic functioning of manufacturing organizations, e.g., business process re-engineering, total quality management and six sigma, socio-technical systems, balanced scorecard, etc. Through case studies, students will follow the successful and unsuccessful practices of change agents and major change interventions. They will also be introduced to models of the change process that have had some success.

DM 1085 / Advanced Project Management

This course builds from the basic tools of project management to introduce participants to the reality of managing projects within the context of engineering organizations that can be complex, where multiple projects may be in place, where membership is drawn from a variety of specializations and individual differences abound and where team-based functioning is the norm. The course will address issues such as management of multiple projects, individual differences, project leadership, working in teams, and change management. Case studies of managed projects will be used in the course.

MEDICAL PHYSICS AND APPLIED RADIATION SCIENCES

The M.Sc. and Ph.D. programs in Radiation Sciences and the M.Sc. program in Health and Radiation Physics are administered by the Department of Medical Physics and Applied Radiation Sciences. Staff from several University departments and from health care institutions contribute to the programs.

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Staff / Fall 2009

PROFESSORS

David R. Chettle, B.Sc., M.Sc., Ph.D. (Birmingham)

Michael J. Farquharson, B.Sc. (Sussex), M.Sc. (Surrey), Ph.D. (University College London)

Fiona E. McNeill, B.Sc. (Edinburgh), Ph.D. (Birmingham) / Chair

Carmel E. Mothersill, B.Sc., Ph.D. (University College Dublin)

Michael S. Patterson, B.Sc. (Queen's), Ph.D. (Toronto) / Joint appointment with Radiology

Colin B. Seymour, DCT(RT) (Guy's Hospital), B.L. (King's Inn), M.Sc., Ph.D. (Trinity College Dublin)

ASSOCIATE PROFESSORS

Douglas R. Boreham, B.Sc. (Laurentian), Ph.D. (Ottawa)

Thomas J. Farrell, B.Sc., B.Ed. (Toronto), M.Sc. (Western), Ph.D. (McMaster) / Joint appointment with Radiology

Joseph E. Hayward, B.Eng., M.Eng., Ph.D. (McMaster) / Joint appointment with Radiology

John F. Valliant, B.Sc., Ph.D. (McMaster) / Joint appointment with Chemistry

Douglas R. Wyman, B.Sc. (Waterloo), Ph.D. (McMaster) / Joint appointment with Radiology

ASSISTANT PROFESSORS

Nicholas Bock, B.Sc. (Western), Ph.D. (Toronto)

Soo Hyun Byun, B.Sc., M.Sc., Ph.D. (Seoul National University)

Kevin Diamond, B.Sc. (Waterloo), Ph.D. (McMaster)

Orest Ostapiak, B.Sc., M.Sc., Ph.D. (Toronto)

Gianni Parise, B.Kin., M.Sc., Ph.D. (McMaster) / Joint appointment with Kinesiology

SESSIONAL LECTURER

David M. Tucker, B.Sc. (McMaster), C.H.P. (American Board of Health Physics)

ASSOCIATE MEMBERS

Richard Butler (Pathology)

Raman Chirakal (Radiology)

Ian S. Dayes (Radiology)

Troy Farncombe (Radiology)

Christopher L. Gordon (Radiology)

Kathryn M. Murphy (Psychology)

Michael D. Noseworthy (Radiology)

Andrew J. Rainbow (Biology)

N. Renee (Crowther) Labiris (Radiology)

William J. (Jack) Rink (School of Geography and Geology)

Larry E. Roberts (Psychology)

Colin Webber (Radiology)

ADJUNCT MEMBERS

J.L. (Iain) Campbell, B.Sc., Ph.D., D.Sc. (Glasgow), D. Tech. (honoris causa) (Lund)

Charles H. Cunningham, B.A.Sc., Ph.D. (Toronto)

Ronald G.V. Hancock, B.Sc., M.Sc. (Auckland), Ph.D. (McMaster)

Joanne M. O'Meara, B.Sc., Ph.D. (McMaster)

Ana Pejovic-Milic, B.Sc., M.Sc. (Belgrade), M.Sc., Ph.D. (McMaster)

Richard B. Richardson, B.Sc. (London), M.Sc. (Aberdeen), Ph.D. (Bristol)

Anthony J. Waker, B.Sc., Ph.D. [Poly S. Bank (CNA), London, U.K.]

PROFESSORS EMERITI

Terence J. Kennett, M.Sc., Ph.D. (McMaster)

William V. Prestwich, B.Sc., Ph.D. (McMaster)

M.Sc. Degree

A. HEALTH AND RADIATION PHYSICS

The M.Sc. in Health and Radiation Physics is relatively course intensive and is designed to provide the education, training and professional development required for a career in Health Physics.

Normal admission requirements are a B.Sc. honours degree, at least B+ standing (or equivalent) in Physics, Biophysics, Engineering Physics, or Chemistry, or some course of study approved by the Department of Medical Physics and Applied Radiation Sciences.

A candidate for the M.Sc. degree must:

1. Complete satisfactorily the courses: Medical Physics *772, Medical Physics *775, and Medical Physics *776. Students must complete satisfactorily one additional *700-level course from the following list: Medical Physics *770, Medical Physics *771 or Medical Physics *778. Students who have not satisfactorily completed Medical Physics *6R03 and Biology *6U03 must also complete these courses satisfactorily.
2. Pass a final comprehensive examination.
3. Complete and defend a research report based on a project approved by the Department.

A student with a strong background in Health and Radiation Physics may be permitted to replace one or more of the core courses with relevant courses approved by the Department. A student may not take more than one 600-level full graduate course to satisfy the minimum course requirements.

B. RADIATION SCIENCES (MEDICAL PHYSICS/ RADIATION BIOLOGY)

The M.Sc. in Radiation Sciences (Medical Physics) requires that a candidate complete satisfactorily the courses Medical Physics *775 and one other half course at the 700-level. Students who have not satisfactorily completed Medical Physics *6R03 and Biology *6U03 must also complete these courses satisfactorily. Candidates for this M.Sc. are also required to present and defend a thesis which shall embody the results of original research.

The M.Sc. in Radiation Sciences (Radiation Biology) requires that a candidate complete satisfactorily two half courses at the 700 level from Medical Physics *773, Medical Physics *779, and Medical Physics *780. Students who have not satisfactorily completed Medical Physics *6B03 and Biology *6U03 must also complete these courses satisfactorily. Candidates for this M.Sc. are also required to present and defend a thesis which shall embody the results of original research.

Ph.D. Degree

RADIATION SCIENCES (MEDICAL PHYSICS/ RADIATION BIOLOGY)

The minimum course requirement for the Ph.D. degree in Radiation Sciences in both fields of Medical Physics and Radiation Biology is the completion of at least one full course at the 700-level beyond the courses required for the M.Sc. degree. Candidates in the Medical Physics field who have not already completed Biology *6U03, Medical Physics *6R03 and Medical Physics *775 shall take these courses plus at least one other half course at the 700-level. Candidates in the Radiation Biology field who have not already completed Medical Physics *6B03 and Biology *6U03 shall take these courses plus two half courses at the 700 level.

Every candidate for the Ph.D. must pass a Comprehensive Examination concerned with Radiation Sciences, but outside their own immediate area of research.

A thesis must be presented embodying the results of original research, and this thesis will be defended in a final oral examination.

Courses

Courses marked with an asterisk (*) are half courses.

BIOLOGY COURSES

*6U03 / Radiation Biology / A.J. Rainbow

The effects of radiation on biological material at the molecular, cellular, tissue and whole organism level. Applications of radiation in medicine and toxicology.

MEDICAL PHYSICS COURSES

*6B03 / Radioactivity and Radiation Interactions / D.R. Chettle

Radioactivity and radiation phenomenology: interaction of radiations with matter, dosimetry, radiation in medicine, biological effects, radiation levels and regulations, radiation protection.

*6I03 / Introduction to Biophotonics / Q. Fang (Same as Engineering Physics *6I03)

This is a survey course on basic principles of light interaction with biological systems and specific biomedical applications of photonics. In the first quarter of the course, basic principles in optics and biology will be briefly covered while emphasis will be on more advanced topics such as lasers and photo detectors, light-tissue interaction, and photobiology. The remaining part of the course will be focused on specific biomedical applications using photonics technology.

*6R03 / Radiation and Radioisotope Methodology / S.H. Byun

Lectures and laboratory work in the techniques and theory of the measurement of radiation. Topics include radioactivity and radioactive decay, solid state dosimetry, principles of active detectors, counting statistics and data reduction, advanced multidetector systems.

*6T03 / Clinical Applications of Physics in Medicine / M. Patterson

Basic physical concepts underlying medical imaging, nuclear medicine, physiological measurement, radiation therapy and biomedical laser applications with an overview of their technical implementation.

*6XX3 / Human Biology for Physical Scientists / R. Butler

An overview of the structure and the function of the major organ systems of the body with some reference to radiation interactions.

*770 / The Physics of Applied Medical Imaging / G. Moran

The physical principles of two of the main imaging modalities in current clinical practice, Magnetic Resonance Imaging (MRI) and Ultra Sound (US) will be introduced from a medical physics perspective. It will be explained how in one case quantum mechanics and nuclear spins, and sound waves in the other, can be manipulated to generate clinically relevant images. Both modules of the course will entail a laboratory component where students will see the direct application of the physical principles through hands-on experience with MRI and US apparatus.

*771 / Isotopes In-Vivo / Staff

Discussion of how various practical aspects of the production and in-vivo use of radioactive isotopes impact upon radiation doses of people who work with radioisotopes and people to whom radioactivity is administered either by design or by accident. Discussion of the regulatory processes involved in the production and in-vivo use of radiochemicals.

*772 / Medical Health Physics / Staff

Health Physics aspects of ionizing and non-ionizing forms of radiation commonly used in medicine. Includes ultraviolet, visible, infrared, radio frequency/microwave, ultrasound, diagnostic x-rays, radiation therapy.

*773 / Basic Clinical Radiobiology / D. Boreham

This course is intended to introduce graduate students to the clinical applications of radiation biology in cancer therapy. The course will focus on the general aspects of DNA repair, cancer biology and clinical radiation therapy.

*775 / Advanced Radiation Physics / S.H. Byun

Mathematical analysis of the radiation field; interaction coefficients, survey of interactions, radiation transport, electromagnetic and hadronic cascades, exposure, dose, kerma, dose equivalent, micro-dosimetry, interface dosimetry, cavity theory, shielding theory.

*776 / Introduction to Operational Health Physics / D.M. Tucker

Dose limitation, stochastic and non-stochastic effects, collective dose equivalent, effective dose equivalent, internal exposures, committed dose equivalent, cost-benefit analysis, sources of radiation, environmental monitoring, waste management, instrumentation, facility designs, applied health physics. This course is equivalent to UNENE 805.

*777 / Special Topics in Medical Physics / Staff

Directed reading course on advanced topics in Medical Physics to be designated by the staff instructing the course. Normally at least two topics will be allocated. Examples of such topics are: radiation induced chromosome aberrations and biological dosimetry; therapeutic applications of nuclear medicine; the role of stochastic geometry in microdosimetry; photobiological mechanisms and cancer therapy; digital radiographic techniques; statistics for medical imaging; iterative reconstructions in tomographic imaging; atomic and nuclear techniques in body composition. Topics will be designated so that they lie outside a student's own research area. A student may register only once in this course and must have the permission of the Department.

*778 / Radiation Oncology Physics / T. Farrell, W. McMillan

Theoretical aspects of clinical radiation oncology physics including dosimetry, radiation delivery, treatment optimization and dose calculation algorithms are presented in a series of lectures. These are complemented with clinical observation in which the practical implementation of radiation oncology is investigated.

*779 / Radiation Health Risks and Benefits / D. Boreham

This course is designed to introduce graduate students to recent advances in radiation biology that have direct impact on our understanding of the health risks associated with ionizing radiation. The course will focus on mechanisms of radiation damage and repair and applications in medicine and industry.

*780 / Radiation Effects in Plants and Animals / C. Mothersill

This course will consider past and newly developing approaches to protection of non-human species from the effects of radiation in the environment. The emphasis will be on practical problems of assessing radiation effects in ecosystems and on the ethical and legal dilemmas created by new research in this area.

Research in Medical and Health Physics

Research groups and research facilities exist in the Department of Medical Physics and Applied Radiation Sciences, Hamilton Health Sciences, the Juravinski Cancer Centre, St. Joseph's Hospital, and in different departments within the University. There are strong research links with the McMaster Institute of Applied Radiation Sciences (McIARS).

Current research activity includes dosimetry of diagnostic and brachytherapy radioisotopes, β interface dosimetry, imaging dose distributions (Prestwich), neutron micro-dosimetry (Byun), nuclear and atomic techniques used for analysis of both trace toxic elements and major components of human body composition (Chettle, McNeill, O'Meara, Pejovic-Milic), development of novel radiopharmaceuticals

and medical use of radioisotopes in diagnosis and therapy (Valliant, Farncombe), novel methods of imaging bone architecture and joint structure non-invasively (Gordon, Webber), magnetic resonance imaging (Moran, Noseworthy), the role of DNA damage and DNA repair processes in carcinogenesis and in the response of tumour cells to radiotherapy and chemotherapy (Rainbow), the role of adaptive response, genomic instability and bystander effect in radiation risk assessment of human and non-human biota (Boreham, Mothersill, Seymour), laser and light propagation in tissue for photodynamic therapy and tissue characterization (Patterson, Farrell, Hayward), skeletal muscle function and the mechanisms of repair/regeneration (Parise), radiation metrology and geochronology using thermoluminescence and ESR (Rink), radiation accident dosimetry (Rink, Boreham) and neuropsychological imaging involving EEG and MEG (Roberts) and optical techniques (Murphy).

Facilities for Research

The swimming pool reactor (operated at 2MW) is available for projects involving medical radioisotope and radiopharmaceutical development, neutron activation, dosimetry and neutron radiography. The accelerator laboratory houses a KN Van de Graaff (usually operated at up to 2.5MV and currents up to 200 μ A) and a polarized x-ray fluorescence facility, which are used for the development of in-vivo elemental analyses. Two new accelerators are being installed; one will be a microbeam facility for radiobiology research.

Within Nuclear Medicine there is an 11MeV proton cyclotron, primarily used for production of positron emitting isotopes, together with positron tomographs. Equipment used for body composition studies includes dual energy x-ray absorption scanners, a whole body counter and a peripheral quantitative computed tomograph.

At the Hamilton Regional Cancer Centre there is a suite of laser and other light sources and detectors used in conjunction with studies on photodynamic therapy and other applications involving light propagation in tissue.

In collaborating departments students have the opportunity to work on radiation metrology and geochronology involving electron spin resonance and thermoluminescence dosimetry and neuropsychological imaging involving functional MRI, EEG, and MEG (through off-site collaborations).

MEDICAL SCIENCES

The Graduate Program in Medical Sciences is designed to provide the opportunity for advanced education and research in the Biomedical and Health Sciences. Ph.D. level programs are available in: Metabolism and Nutrition (MN); Blood and Vasculature (BV); Cancer and Genetics (CG); Infection and Immunity (II); Neuroscience and Behavioural Sciences (NBS); and Physiology/Pharmacology (PP).

The goal of the program is to provide students with the opportunity to become competent investigators in health-related research problems. This is accomplished in an environment in which multiple disciplines are represented and in a setting appropriate for acquiring a broad appreciation of problems in health and disease. Students are expected to acquire in-depth understanding and expertise in a specific area.

Enquiries: 905 525-9140 Ext. 22983

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Website: <http://www.fhs.mcmaster.ca/grad>

Staff / Fall 2009

METABOLISM AND NUTRITION

PROFESSORS

Larry Arsenault, B.Sc., M.Sc. (Acadia), Ph.D. (Dalhousie)
Stephanie Atkinson, B.A. (Western), Ph.D. (Toronto)
Ronald D. Barr, M.B., Ch.B., M.D. (Glasgow), M.R.C.P. (U.K.),
M.R.C.Path. (Edinburgh)
Christoph Fusch, M.D. (Tübingen), Ph.D. (Berne)
Stephen Shaughnessy, B.Sc., M.Sc. (Brock), Ph.D. (McMaster)
Mark Tarnopolsky, M.D., Ph.D. (McMaster)
Colin E. Webber, B.Sc. (Birmingham), M.Phil., Ph.D. (Surrey)

ASSOCIATE PROFESSORS

Thomas Hawke, B.Sc., M.Sc., Ph.D. (Guelph)
Joan Krepinsky, B.Sc., M.Sc. (Toronto), M.D. (McMaster)
Joseph Macri, B.Sc., Ph.D. (Windsor)

ASSISTANT PROFESSORS

Katherine Morrison, B.Sc. (McMaster), M.D. (Calgary)
Sandeep Raha, B.Sc.H., M.Sc., Ph.D. (Toronto) / Coordinator
Shirya Rashid, B.Sc. (Saskatchewan), M.Sc., Ph.D. (Toronto)

ASSOCIATE MEMBERS

Radhey S. Gupta (Biochemistry)
Colin A. Nurse (Biology)
Stuart Phillips (Kinesiology)

PROFESSORS EMERITI

Richard G. Butler, B.Sc., M.Sc. (Toronto), Ph.D. (A.N.U. Canberra)
M.B.A. (McMaster)
Erwin L. Regoeczi, B.M. (Budapest), M.D. (Tübingen)
Gerard T. Simon, M.D. (Geneva), F.R.C.P.(C)
Eva S. Werstiuik, B.Sc., Ph.D. (London, U.K.)

BLOOD AND VASCULATURE

DISTINGUISHED UNIVERSITY PROFESSOR

John L. Brash (Chemical Engineering), B.Sc., Ph.D. (Glasgow)
/ Emeritus

PROFESSORS

Richard C. Austin, B.Sc. (Brock), M.Sc., Ph.D. (McMaster)
Catherine Hayward, B.Sc., M.D. (Western), F.R.C.P.(C), Ph.D.
(McMaster)
John G. Kelton, M.D. (Western), F.R.C.P.(C)
Fred A. Ofofu, B.Sc. (McMaster), Ph.D. (Toronto)
William P. Sheffield, B.Sc., Ph.D. (McGill)
Jeffrey I. Weitz, M.D. (Ottawa), F.R.C.P.(C), F.A.C.P.
Edward Young, B.Sc., M.Sc., Ph.D., D.Ci.Chem. (Toronto)

ASSOCIATE PROFESSORS

Anthony K.C. Chan, (Queen's), M.B.B.S. (Hong Kong), F.R.C.P.(C)
Peter Gross, B.Sc., M.Sc., M.D., C.I.M.R.P. (Toronto), L.M.C.C.,
A.B.I.M., U.S.M.L., F.R.C.P.C.
Peter Horsewood, B.Sc., Ph.D. (Loughborough, U.K.) / Part-time
Gonzalo Hortelano, B.Sc. (Basque), M.Sc. (Witwatersand),
Ph.D. (Wollongong)
Janusz Rak, M.D., Ph.D. (Wroclaw, Poland) / Part-time
Geoff Werstuck, B.Sc., Ph.D. (McMaster)

ASSISTANT PROFESSORS

Patricia Liaw, B.Sc. (McMaster), M.Sc. (Western), Ph.D. (McMaster)
/ Coordinator
Shirya Rashid, B.Sc. (Saskatchewan), M.Sc., Ph.D. (Toronto)

ASSOCIATE MEMBERS

Heather Sheardown (Chemical Engineering)
Bernardo Trigatti (Biochemistry)

PROFESSORS EMERITI

Morris A. Blajchman, B.Sc., M.D. (McGill)
 Michael Buchanan, B.A. (Toronto), M.Sc., Ph.D. (McMaster)
 Hallie M. Groves, B.Sc. (British Columbia), M.Sc., Ph.D. (McMaster)
 Mark W.C. Hattton, B.Sc., M.Sc., Ph.D. (London)
 Jack Hirsh, M.B., B.Sc., M.D. (Melbourne), M.R.C.P., F.R.C.P.(C),
 F.A.C.P., F.A.C.C.P.
 J. Michael Kay, M.B., Ch.B., M.R.C. Path., M.D., L.M.C.C., F.R.C.P.C.
 (London)
 George Sweeney, M.B., Ch.B., Ph.D. (Cape Town)

CANCER AND GENETICS**PROFESSORS**

Mickie Bhatia, B.Sc. (McMaster), Ph.D. (Guelph)
 Ronald Carter, B.Sc., M.Sc. (Toronto), D.V.M., Ph.D., F.C.C.M.G.
 (Guelph)
 John A. Hassell, B.Sc. (New York), Ph.D. (Connecticut)
 John Wayne, B.Sc. (Guelph), M.Sc. (McMaster), Ph.D. (Toronto)
 Judith West-Mays, H.B.Sc. (Wilfrid Laurier), M.Sc., Ph.D. (Waterloo)
 / Coordinator

ASSOCIATE PROFESSORS

Holger (Hal) W. Hirte, M.D., F.R.C.P.(C) (Toronto)
 Brian Leber, B.Sc., M.D., C.M., F.R.C.P. (McGill), F.R.C.P.(C)
 (McMaster)
 Murray Potter, B.Sc., B.Sc. Med., M.D. (Manitoba), F.R.C.P.,
 F.C.C.M.G.
 Peter F.M. Whyte, B.Sc., M.Sc. (British Columbia), Ph.D. (SUNY at
 Stony Brook)

ASSISTANT PROFESSORS

Helga Duivenvoorden, M.Sc. (A.U.W. Netherlands), Ph.D.
 (S.F.I.T. Switzerland)
 Michelle Ghert, B.A. (Stanford), M.D. (Vanderbilt)
 Damu Tang, B.Sc. (Harbin, China), M.Sc., Ph.D. (Calgary)
 Theodoras Tsakiridis, B.Sc. (A.U. Greece), M.Sc., (London, U.K.),
 Ph.D., M.D. (Toronto), F.R.C.P.C. (McMaster)

ASSOCIATE MEMBERS

Douglas Boreham (Medical Physics and Applied Radiation)
 Suleiman Igdoura (Biology)

PROFESSORS EMERITI

Silvia Bacchetti, Sc.D. (Rome)
 Patricia L. Chang, B.Sc. (Hong Kong), Ph.D. (Western)
 Frank L. Graham, B.Sc. (Manitoba), M.A., Ph.D. (Toronto)

INFECTIOUS AND IMMUNITY**DISTINGUISHED UNIVERSITY PROFESSORS**

John B. Bienenstock, M.B., B.S. (U.K.), M.R.C.P., F.R.C.P.(C),
 F.R.C.P. / Emeritus
 Stephen M. Collins, M.B., B.S. (London), L.M.C.C.(C), F.R.C.P.(C),
 E.C.F.M.G., V.Q.E.(U.S.A.), M.R.C.P.(U.K.)
 Jack Gaudie, B.Sc. (McMaster), Ph.D. (London)

PROFESSORS

Jonathan Bramson, B.Sc., Ph.D. (McGill)
 Gerard P. Cox, M.B., B.A.O., B.Ch. (Ireland), F.R.C.P.(C), F.R.C.P.(I)
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 Delsworth G. Harnish, B.Sc., M.Sc. (Queen's), Ph.D. (McMaster)
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 Mark Larché, M.Sc., Ph.D. (London, UK)
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 Mark R. McDermott, B.Sc., Ph.D. (McMaster) / Coordinator
 Carl D. Richards, B.Sc. (Western), M.Sc., Ph.D. (McMaster)
 Kenneth L. Rosenthal, B.Sc., M.Sc. (Illinois), Ph.D. (McMaster)
 Denis P. Snider, B.Sc., Ph.D. (Toronto)
 Brian J. Underdown, B.Sc., Ph.D. (McGill) / Part-time

ASSOCIATE PROFESSORS

Petra Arck, M.D., Ph.D. equivalent (Tübingen)
 Ronan Foley, B.Sc., M.D. (McMaster), F.R.C.P.(C)
 Alison Fox-Robichaud, B.Sc. (New Brunswick), M.Sc. (McMaster),
 M.D. (Ottawa)
 Martin Kolb, M.D., Ph.D. (Würzburg, Germany)
 Karen Mossman, B.Sc. (Guelph), Ph.D. (Alberta)
 Fiona Smaill, M.Sc. (McMaster), M.B., Ch.B. (Otago, New Zealand)
 F.R.C.P.(C), F.R.A.C.P.
 Martin Stampfli, Licentiate in Biochem, Ph.D. (Bern, Switzerland)
 / Assistant Dean
 Yonghong Wan, M.D., M.Sc. (Hubei Medical University)
 Zhou Xing, M.D. (North Sichuan, PRC), M.Sc. (Tongji, PRC), Ph.D.
 (McMaster)

ASSISTANT PROFESSORS

Ali A. Ashkar, D.V.M. (Tehran, Iran), Ph.D. (Guelph)
 Dawn Bowdish, B.Sc. (Guelph), Ph.D. (British Columbia)
 Charu Kaushic, B.Sc., M.Sc. (Delhi), Ph.D. (National Institute of
 Immunology, New Delhi)
 Brian Lichty, B.Sc. (Guelph), Ph.D. (Toronto)
 Peter Margetts, B.Sc. (Queen's), M.D., Ph.D. (McMaster) / MD/Ph.D.
 Program Director
 Kathy McCoy, B.Sc.H. (Victoria, NZ), Ph.D. (Otago, NZ)
 Roma Sehmi, B.Sc. (University College London, U.K.), Ph.D.
 (Royal Brompton, U.K.)
 Chengsheng Zhang, M.D. (Jiangxi, China), M.Sc. (Peking Union,
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ASSOCIATE MEMBER

Lori Burrows (Biochemistry)

PROFESSORS EMERITI

Max A. Chernesky, B.Sc. (Guelph), M.Sc. (Toronto), Ph.D. (British
 Columbia)
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 David J. Groves, B.Sc., M.Sc., Ph.D. (British Columbia)
 Dharam P. Singal, B.Sc., M.Sc. (Delhi), Ph.D. (Washington)

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Alexander Ball, B.Sc., Ph.D. (Dalhousie)
 Susan D. Denburg, B.A. (McGill), M.A. (Cornell), Ph.D. (Toronto)
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 India), M.Sc., Ph.D. (Toronto), F.R.C.P.C.

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 Boris Sakic, B.Sc., M.Sc., Ph.D. (Belgrade)

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 Hubert de Bruin (Electrical & Computer Engineering)
 J. Roger Jacobs (Biology)
 Daphne Maurer (Psychology)

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 Alan J. McComas, B.Sc., M.B., B.S. (Durham), F.R.C.P.(C)
 Michele Pisa, M.D. (Rome), M.Sc., Ph.D. (McGill)
 Ellen B. Ryan, B.A., M.A. (Brown), Ph.D. (Michigan)
 Meir Steiner, M.D. (Tel Aviv), Ph.D. (Michigan), F.R.C.P.(C)
 Sandra Witelson, B.Sc., M.Sc., Ph.D. (McGill)

PHYSIOLOGY/PHARMACOLOGY**PROFESSORS**

Jonathon D. Adachi, B.Sc., M.D. (McMaster), F.R.C.P.(C)
 Denis J. Crankshaw, B.Sc. (London), Ph.D. (Alberta)
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 Anne Holbrook, B.Sc. Pharm. (Toronto), Pharm. D. (Philadelphia),
 M.D., M.Sc. (McMaster), F.R.C.P.(C)
 Jan D. Huizinga, B.Sc., M.Sc., Ph.D. (Groningen) / Coordinator
 Luke J. Janssen, B.Sc., M.Sc., Ph.D. (McMaster)
 Kieran J. Killian, M.B., B.Ch., B.A.O., M.R.C.P. (Ireland), F.R.C.P.(C)
 Robert M.K.W. Lee, B.Sc. (Mandalay), M.Sc. (Rangoon), Ph.D.
 (Alberta)
 Robert S. McKelvie, B.Sc., M.Sc., M.D. (Western), Ph.D. (McMaster)
 F.R.C.P.(C)
 Ram K. Mishra, B.S., M.Sc. (India), M.S. (New Orleans), Ph.D.
 (St. John's)
 Carlos Morillo, B.Ac. (Colegio San Carlos, Colombia), M.D.
 (Pontificia Universidad Javeriana, Columbia)
 Paul M. O'Byrne, M.B., B.Ch., B.A.O. (Univ. Coll., Dublin) M.R.C.P.I.,
 F.R.C.P.(C), F.R.C.P.I.
 Alexandra Papaioannou, B.Sc.N., M.D., M.Sc. (McMaster)
 Mary H. Perdue, B.Sc. (Windsor), M.Sc. (Toronto), Ph.D. (Calgary)
 Ian W. Rodger, B.Sc. Ph.D. (Strathclyde) / Part-time
 Gurmit Singh, B.Sc., Ph.D. (Dalhousie)
 John Wallace, B.Sc., M.Sc. (Queen's), Ph.D. (Toronto), M.B.A.
 (Birmingham, U.K.), F.R.S.C.
 Salim Yusuf, M.B.B.S. (Bangalore), Ph.D. (Oxford), M.R.C.P.(U.K.)

ASSOCIATE CLINICAL PROFESSOR

Myrna Dolovich, B.E. (McGill)

ASSOCIATE PROFESSOR

Alison Holloway, B.Sc. (Toronto), Ph.D. (Guelph)

ASSISTANT PROFESSORS

Premysl Bercik, M.S. (Charles, Prague), Ph.D. equivalent
 (Lausanne, Switzerland)
 Gail Gauvreau, B.Sc., M.Sc. (Guelph), Ph.D. (McMaster)
 Mark Inman, M.Sc. (Waterloo), M.D., Ph.D. (McMaster)
 Renee Labiris, B.Sc., M.Sc. (McMaster), Ph.D. (Toronto)
 Louis W.C. Liu, B.Sc., M.Eng., Ph.D., M.D. (McMaster)
 Brian Timmons, H.B.K. (Lakehead), Ph.D. (McMaster)
 Elena Verdu, M.D. (Buenos Aires), M.D. thesis (Lausanne), Ph.D.
 (Czech Academic of Science)

ASSOCIATE MEMBER

Cameron J. Blimkie (Kinesiology)

PROFESSORS EMERITI

Edwin E. Daniel, B.A., M.A. (Johns Hopkins), Ph.D. (Utah)
 George Heigenhauser, B.A. (Western), M.S., Ph.D. (Michigan)
 Norman Jones, M.B., B.S., M.R.C.S., M.R.C.P., M.D., F.R.C.P.
 (London)
 David C.Y. Kwan, B.Sc. (Hong Kong), M.Sc. (Wilkes), Ph.D.
 (Pennsylvania)
 Jacob (Jack) M. Rosenfeld, B.Sc. (McGill), Ph.D. (Carleton)
 Edward V. YoungLai, B.Sc., Ph.D. (McGill)

M.Sc. Degree

The requirements for the M.Sc. degree appear under the Regulations for the Master's degree near the beginning of this Calendar. A candidate for the M.Sc. degree is required to spend at least one calendar year in full-time study at McMaster University.

McMaster's Postgraduate Medical Education Program allows Clinician Investigator Program trainees the opportunity to undertake a Master's or Ph.D. degree as a full-time student (please refer to the Handbook for CIP trainees and the HSGP Policy re CIP Applicants; separate applications are required for both).

The candidate must complete, with at least B- standing, not fewer than one full graduate course, which must include at least one 700-level half course in Medical Sciences but may include one 700-level half course normally in the Faculty of Science or Faculty of Engineering. When appropriate, a maximum of one Health Research Methodology or Nursing half course may be taken by M.Sc. students. The candidate is also required to present a thesis, which embodies the results of original research. In a final oral examination the candidate will be required to defend the thesis.

Students wishing to be transferred to the Ph.D. program prior to the completion of a master's degree (see Section 2.1.2 of the General Regulations of the Graduate School and the statement entitled "Policy and Procedure for Transfer from M.Sc. to Ph.D. - Medical Sciences") must have an overall course average of B+ or better in the M.Sc. curriculum and must submit a critical Transfer Report, embodying a statement of progress and achievement in the research work to date and a proposal for Ph.D. research. The Transfer Report must be submitted to the student's Transfer Committee within 21 months from entry at the M.Sc. level as a full-time student. Approval to transfer will be determined at a meeting of the Transfer Committee at which the student will present his/her work and ideas for Ph.D. study orally.

Ph.D. Degree

A candidate for the Ph.D. degree must comply with the School of Graduate Studies Regulations for the Degree Doctor of Philosophy, including the completion of one and one-half full graduate courses beyond the B.Sc. or one additional half course in Medical Sciences beyond those required for the Master's degree. The three half courses beyond the B.Sc. must include at least one full 700-level graduate course in Medical Sciences, but may include one 600-level half course in Medical Sciences or one 700-level half course normally in the Faculty of Science or Faculty of Engineering. When appropriate, a maximum of one Health Research Methodology or Nursing half course may be taken from the B.Sc. to the level of Ph.D.

Candidates must also:

1. Obtain at least B- standing in course work.
2. Pass a Comprehensive Examination before the end of the twenty-first month following the start of their doctoral studies at McMaster. The examination, which consists of a written and oral part, gives students an opportunity to demonstrate their ability to acquire information about major issues in biomedical sciences and to evaluate critically such information. The written component of the Comprehensive Examination is a Canadian Institutes of Health Research (CIHR)-style grant proposal. In the oral component of the Comprehensive Examination, the student is expected to provide reasoned arguments in support of his/her interpretation of the scientific area under study, to demonstrate his/her ability to use the information acquired to formulate a hypothesis, and develop an experimental plan that addresses the hypothesis, to rationalize weaknesses and strengths of the experimental approach. The student and supervisory committee will agree on a topic that is of interest and value to the student and merit independent study. Further information regarding the comprehensive examination is contained in the Medical Sciences Graduate Program Comprehensive Examination, Purpose and Procedure booklet, which is available in the Office of the Associate Dean of Graduate Studies (Health Sciences).

3. Present a thesis on an approved topic and defend the thesis at a final oral examination.

All graduate students in Medical Sciences are expected to present at least ONE research seminar during their M.Sc. and their Ph.D. studentships at McMaster.

MD/Ph.D. Program in Medical Sciences or Biochemistry and Biomedical Sciences

Students in the MD/Ph.D. program will complete both the MD curriculum requirements (eligible for MD residency programs), and the Ph.D. curriculum requirements in order to be eligible for particular academic placements across institutions. The program will seek to train individuals who will pursue research as a major priority and to prepare graduates for leadership roles in integrated research initiatives, particularly those involving interdisciplinary and translational health research endeavors. The program expects that McMaster MD/Ph.D. graduates will contribute significantly to the need for clinician scientists in a variety of roles including academic research teams, public sector positions in government or private sector positions in health-product related companies. The program will accept 1-3 students on a yearly basis, and reach 10-15 students in the program at steady state.

The MD/Ph.D. program is offered in an integrated format with specific blocks of time provided for activities either in full- or part-time studies in either program. There will be opportunity for flexibility in the arrangement of student curriculum, if requested and/or deemed appropriate, but that is at the discretion of the MD/Ph.D. Program Committee. The Program utilizes the established MD curriculum and the established graduate programs and fields in Medical Sciences and Biochemistry & Biomedical Sciences.

MD program fulfillment (in the MD/Ph.D. program): The new MD curriculum, electives and clerkship periods. Horizontal electives (optional in current MD program, not optional in the MD/Ph.D. program) must be completed during graduate research block (3 years). A minimum of 80 hours in horizontal electives must be completed satisfactorily.

Ph.D. program fulfillment (in the MD/Ph.D. program): Time will be allowed for attendance at regular research group meetings while in the MD curriculum. Attendance at MD/Ph.D. program group meetings (faculty and students) will be held a minimum of 3 times annually. In addition, students must complete the requirements noted below in the relevant graduate program.

MEDICAL SCIENCES

Candidates must successfully complete the equivalent of three 700-level graduate half courses (credit for satisfactory completion of MD horizontal electives are provided within the graduate program such that only three courses are required), comprehensive examination, and submission and defence of a research thesis (the research proposal should be completed as early as possible in the program).

BIOCHEMISTRY & BIOMEDICAL SCIENCES

Candidates must successfully complete the equivalent of 3 700-level graduate half courses (credit for satisfactory completion of MD horizontal electives are provided within the graduate program such that only 3 courses are required). Please refer to <http://www.fhs.mcmaster.ca/biochem/educ/grad/req.htm#cour> for information regarding the comprehensive examination and the submission and defence of a research thesis.

The Associate Dean of Graduate Studies (Health Sciences) or the Supervisory Committee may recommend a more extensive course of study.

Courses

Courses marked with an asterisk (*) are half courses. Courses marked with a plus sign (+) may differ in content from year to year. Not all courses will be offered every year. Before students can enroll and register their name in the Health Sciences Graduate Studies Office in MDCL-2235 for any course, they must have permission from the course instructor.

*6J03 / Biochemical Immunology / M. McDermott, J. Bramson, Z. Xing (Same as Biochemistry *6J03 and Molecular Biology *6J03)

This advanced course applies small group-based learning to immunological problems. Topics concern development of immunoassays, resistance to infection and immunity in health and disease.

*701 / Cell Biology I / R. Austin, Staff

Different structural and molecular aspects of both cellular and extra-cellular components will be discussed. Topics will include cell structure, calcium regulation, cytoskeleton, exocytosis, wound healing, matrix synthesis, cell adhesion, and integrins.

*702 / Cell Biology II / P. Whyte, Staff

Topics to be discussed will include nuclear structure, chromatin structure and function, chromosomal dynamics and DNA replication. In recent years, it has been determined that many nuclear processes are localized to different areas of the nucleus and that processes such as transcription and DNA replication may be dependent upon interactions with nuclear structures. The relationship between nuclear structure and nuclear process will be emphasized throughout the course.

*703 / Gene Therapy / G. Hortelano, Staff

An analysis of the technology of gene therapy. The principles of gene delivery through the use of viral and non-viral approaches, the particular characteristics of different target tissues and their suitability to be genetically modified, and the application of various gene therapy strategies in selected individual diseases of big impact to the health care system will be covered.

*704 / Cell Physiology / J.D. Huizinga

Cell physiology, with a focus on membrane transport, excitable membranes and cell to cell communication. The course will be problem based with other faculty members as discussants.

*705 / Neurochemistry / R.K. Mishra

A detailed analysis of the molecular mechanisms underlying the action of neurotransmitters and neuropeptides in the nervous system. Topics will include: synaptic transmission, biochemical pathways of neurotransmitters and neuropeptides, using selected examples. Basic concepts in the interactions of transmitters and peptides with their receptors, structural and pharmacological differences, receptor affinity vs. efficacy, and receptor-coupling to second messengers will be discussed. The role of neurotransmitter-peptide interactions and their relevance in selected diseases will also be addressed.

*706 / Topics in Cardiovascular Physiology / Staff

The course highlights advanced concepts in applied cardiovascular physiology ranging from the ultrastructural basis of cardiac muscle contraction to descriptions of cardiovascular control systems. Derangements of normal function will be discussed to explain normal function. However, normal control mechanisms will be analyzed in the resting state and in response to a variety of stresses including exercise.

*708 / Signal Transduction: Dynamic Mechanisms of Action of Growth Factors and Nuclear Receptors / R. Truant (Same as Biochemistry *709)

The topics covered will include: Ras and GTP binding protein families, MAP kinase cascades; T-cell and B-cell activation; nuclear receptors for steroid and thyroid hormones. The course will be based on recent review articles and important current papers.

***709 / Clinical Neuroanatomy / A. Ball, L. Doering**

This course deals with the basic organization of the central nervous system (CNS) with an emphasis on pathways and diseases affecting the CNS. A different topic is dealt with each week. Topics include: (a) blood supply, CSF, meninges; (b) CNS topography, CT scans; (c) spinal cord tracts and reflexes; (d) medulla, pons, mesencephalon; (e) cranial nerves, base of skull; (f) cerebellum; (g) forebrain, ventricles, thalamus, olfaction, audition, vision; (h) basal ganglia, hippocampus, hypothalamus; (i) cortex; (j) Autonomic Nervous System.

710 / Human Anatomy / Staff

The anatomy of the human will be studied regionally by dissection and supplemented with self-teaching modules in all areas of morphology. Relevant embryology, histology and applied anatomy will be introduced in order to understand certain structures more completely.

***711 / Psychoneuroimmunology / B. Sakic**

Psychoneuroimmunology (or science about mind-body interactions) examines bi-directional communication among the nervous, endocrine and immune systems. By critically reviewing contemporary topics, the students are expected to learn about the role of the "regulatory metasystem" in the maintenance of homeostasis. The etiology of common neuroimmunologic diseases and the immune theory of some classical mental disorders will also be topics of discussion. The learning method involves both didactic and problem-based approaches, accompanied by computerized and interactive video animations.

***712 / Reproductive Endocrinology / W.G. Foster**

Graduate students taking this course will be introduced to general principles of endocrinology with a special focus on reproductive endocrinology. Students will gain knowledge of the structure and function of the reproductive tract and all relevant endocrine glands. An understanding of classical and contemporary methods of investigating the function of the reproductive tract will be covered. In addition, students will gain experience in oral presentation of complex scientific materials and how to prepare a grant application. Emerging issues and techniques as they apply to research in reproductive endocrinology will be covered in this course.

***713 / Physiology and Pathophysiology of the Gastrointestinal Tract / J. Huizinga, W. Khan**

This course will teach aspects of the physiology and pathophysiology of the gastrointestinal tract. It will be taught by faculty in the Intestinal Disease Research Unit. Areas covered will include: epithelial function, intestinal motility, gut immunology, neuromodulation of gut function. All will be put in context of intestinal disease reflecting the bench to bedside approach of the clinical and basic researcher in the Intestinal Disease Research Unit. The course will include lectures, lab demonstrations, student presentations and discussion.

***714 / Industrial and Environmental Toxicology / W. Foster**

This course is designed to provide graduate students and others with basic and advanced knowledge to develop awareness and insight of the toxicologic aspects of life-science research, related professional activities, and environment and health issues. Topics that are emphasized include: (i) pathways to humans; (ii) human health effects; (iii) toxicologic mechanisms; and (iv) a consideration and application of accepted critical-appraisal guidelines and skills to assess the occurrence, in animal experiments or human experiences, of the following: acute toxicity, subchronic toxicity, reproductive and developmental toxicity, mutagenicity, carcinogenicity, respiratory and skin sensitization.

***715 / Advanced Immunobiology I / Z. Xing**

This 2-module course will examine important current research issues in immunology through the discussion of research papers around specific topics and problems in immunology with an emphasis on the critical analysis of immunological studies and the regulation of the immune response. Specifically, the students will examine the use and interpretation of immunological data and common themes in various types of cellular immune responses.

***716 / Advanced Immunobiology II / C. Richards, M. Stampfli
(formerly part of Medical Sciences *715)**

This 2-module course examines current research issues in immunology through discussion of research papers on specific topics and problems in immunology with emphasis on the immune response in disease including immune mediated disease and infection with different types of organisms. Issues of regional immunity and immune mediated pathology will be emphasized.

***717 / Vaccines and Vaccine Immunology / Y. Wan, Z. Xing, J. Bramson**

Vaccines and vaccine immunology have become an important sub-discipline of modern biomedical practice and research. It becomes increasingly important to both prevention and treatment of infectious diseases, cancer, autoimmune diseases and allergic diseases. This course is designed to provide graduate students with the basic concepts of current human vaccination programs, methods used to developing various forms of new vaccines, and vaccine immunology.

***718 / Molecular Cytogenetics and Techniques / J.C. Wang**

The goal of this course is to provide students with a detailed understanding of the principles and techniques of molecular cytogenetics and the application in research and clinical service. The topics include prenatal cytogenetics and pre-implantation cytogenetics, cytogenetics of infertility, paediatric cytogenetics, cancer cytogenetics, and chromosome instability syndromes. The course will take a seminar-based format with student participation.

***719 / Electrophysiology of Excitable and Non-Excitable Membranes / L. Janssen**

The goal of this course is to provide students with a detailed understanding of ionic mechanisms in excitable and non-excitable cells, in health and disease. After outlining general principles (currents; voltages; ions; membrane properties), we will examine various ion channels and pumps in detail, then consider ionic mechanisms in a variety of cell types in health and disease. Depending upon students' interests, the latter could include: electrical signalling in nerve and muscle; absorption/secretion in renal nephrons and the epithelium (respiratory or gastrointestinal); volume regulation, excitation-secretion coupling and the oxidative burst in inflammatory cells; sensory transduction in various cell types (retina, chromaffin cells, baroreceptors, chemoreceptors); bone sculpting by osteoclasts/osteoblasts; fertilization in oocytes. The course will take a seminar-based format with student participation.

***720 / Tobacco and Health: From Cells to Society / W. Foster**

This course will provide students with a comprehensive overview of tobacco and tobacco-related issues from a public health perspective. The course focuses on patterns, determinants and health effects of tobacco use, the causes, impacts and interventions regarding nicotine addiction, and the prevention of tobacco use. Topics will include epidemiology, nicotine addiction, genetic factors, health effects, treatment issues, prevention, and policy issues. Students will be exposed to experts in the field who bring hands-on experience in tobacco control in addition to academic expertise.

***721 / Pathophysiology of Lung Diseases - Asthma and COPD / R. Sehmi, G. Gauvreau**

This graduate course will be drawn on the contribution of several field experts within the Respiratory group at McMaster University, to cover topics on the immunology of airway inflammatory diseases, asthma and chronic obstructive lung disease. This course will include elements of inflammation/immunity, as well as basic lung cellular biology, developmental biology, pharmacology, ventilation-perfusion, epithelial function (ion transport and defense), drug metabolism, pathophysiology and disease in asthma and chronic obstructive lung disease. At the end of this course the students should have a good conceptual understanding of the cell biology of airway inflammatory diseases and the pathological features associated with asthma and chronic obstructive lung disease.

***725 / Current Topics in Mucosal Immunology / C. Kaushic, D. Snider**

This course will provide an in depth understanding of selected key areas of mucosal immunology. It is intended for students who have taken basic immunology courses already, and who have an interest in new evolving areas of research in immunology. Students study such topics as: the role of epithelial cells in mucosal immune responses; dendritic cells in mucosal tissues; mucosal microbial flora; innate responses in mucosa; the role of IgA at mucosal surfaces (among many topics). The course will emphasize understanding problems and controversies in the selected topics.

***729 / Molecular and Cellular Pathology / S. Shaughnessy**

This course provides an understanding of the molecular and cellular mechanisms of diseases. Topics include: cell injury and cell death; inflammation and tissue remodeling; diseases of the vasculature, lung, bone and gut; infectious diseases; immunologic disorders; genetic disorders; neoplasia/metastasis and forensic pathology.

***732 / Vascular Diseases, Haemostasis and Thrombosis I / P. Gross**

This two-module course presents current concepts and basic mechanisms involved in haemostasis and thrombosis. Module 1: blood coagulation and fibrinolysis. Module 2: platelet physiology and biochemistry.

***733 / Vascular Diseases, Haemostasis and Thrombosis II / P. Liaw**

(formerly part of Medical Sciences 732)

MS733 is a graduate course which is directed largely to the needs of students in the "Blood and Vasculature" area of the Medical Sciences Graduate Program, although other graduate students in Medical Sciences, Biomedical Engineering, or Biochemistry are welcome to attend. The subject areas covered in this course include evolution of the hemostatic system, the endothelium as an organ system, venous thrombosis, the microcirculation, animal models, intravital microscopy, vasculogenesis, angiogenesis, and atherosclerosis.

***740 / Advanced Concepts of Drug-Receptor Interaction / R. Mishra, L. Niles**

Detailed analysis of drug-receptor data. The course includes theory of ligand binding and analysis of graphical plots applicable to drug receptor studies. Selected topics include discussion of binding sites for the major neurotransmitters and hormone classes, the functional aspects of the binding in normal and disease state, and application of biotechnology to study cell surface receptors and signal transduction mechanisms.

***742 / Topics in Respiratory Physiology / M. Inman**

A seminar-based approach to understanding the principles of respiratory physiology. Initial focus will be on functional anatomy, ventilatory mechanics, alveolar gas exchange, gas transport, cell gas exchange and control of breathing in the normal individual. The focus will then switch to mechanisms by which these processes are disrupted in disease and how this might result in disability or handicap. Classes will involve faculty introductory, interactive sessions and student presentations on current topics.

***744 / Functional Neuroanatomy of Selected Psychiatric Disease / G. Hall, J. Foster, P. Bieling**

Three psychiatric diseases will be covered in detail: Schizophrenia, mood disorders, and obsessive compulsive disorder. The functional neuroanatomy underlying each disease will be examined using preclinical models, neuroimaging studies with a specific emphasis on one neuroimaging modality for each disease, and the clinical aspects of the illness will be integrated with the preclinical and imaging findings. Current research papers will be presented by students that integrate preclinical and clinical aspects of these illnesses

***746 / Exercise Physiology in Health and Disease / Staff**

Concepts related to the responses to exercise in both healthy individuals and those individuals with diseases which impair their exercise capacity. The course is divided into 4 topics: neuromuscular, metabolism, respiration and cardiovascular. A problem-based learning approach will be used.

***747 / Pediatric Exercise Medicine / B. Timmons**

This course will provide an opportunity to study physiological and medical aspects of exercise and physical activity in healthy children and in children with a disease. The purpose and relevance of exercise testing and exercise rehabilitation in pediatric diseases will be highlighted, and student-directed seminars will further explore the role of exercise in specific pediatric populations with a disease or disability.

***749 / Human Molecular Genetics / J. Waye**

Review of recent advances in human genetics by the use of recombinant DNA technology. Basic principles and novel insights in gene structure and function, molecular etiology, diagnosis, and treatment of genetic diseases will be discussed in detail. Consideration of their clinical and societal relevance.

***750 / Topics in Host Resistance / J. Bramson**

This half-course is designed to cover any special topic within molecular virology, immunology or host resistance. Students will decide as a group the subject that will be investigated. In the first part of the course, the students will investigate the chosen area. The students will then identify issues that need to be investigated with guidance from the course coordinator. In the second part of the course, the students will prepare CIHR-style grant applications focused on extending the questions raised in class. In the final part of the course, the students will evaluate the grants using a peer-review system similar to CIHR.

***751 / Topics in Tumourigenesis / B. Lichty**

An introduction to the major elements in the multi-step development of a malignant tumour. The student will be introduced to a range of concepts including oncogenes, tumour suppressor genes, epigenetic alterations, the multi-step nature of tumourigenesis, angiogenesis, metastasis and immune evasion. The course will utilize seminal scientific publications from the field to exemplify these various aspects of tumourigenesis.

***755 / Skeletal Muscle Cell Biology and Clinical Myology / M. Tarnopolsky (Same as Kinesiology *716)**

This course will review the basics of cell biology and metabolism with specific emphasis on skeletal muscle. The cellular organization and the energy yielding pathways of skeletal muscle will be studied with special emphasis on the relationship to skeletal muscle pathology. Emphasis on analytical techniques will be stressed in each lecture. Experimental therapeutics for neuromuscular disorders will be another major focus.

***756 / Human Nutrition and Metabolism / S. Atkinson, S. Phillips**

The course is a study of areas of nutritional biochemistry and human nutrition that integrate previous knowledge in biochemistry, physiology, genetics and endocrinology. Topics are discussed in relation to normal regulation of metabolism and nutritional aspects of specific human disease states. The approach to learning is through critical appraisal of the current research in specific areas of nutrition and metabolism with the objectives: to gain an appreciation of current areas of nutrition research; to understand appropriate models of investigation in the nutrition field; and to appreciate the limits to which research in animal and cell models can be extrapolated to human nutrition in both health and disease states.

***758 / Smooth Muscle Structure and Function I / R. Lee**

An in-depth analysis of the structure, biochemistry, physiology, and pharmacology of smooth muscle cells. This will be a lecture course with major student participation, which will consist of preparation and presentation of seminars and a major critical essay.

***763 / Medical Virology / J. Mahony, K. Mossman**

Selected advanced topics in the study of clinically relevant human viruses will be covered using specific examples from the medical literature. Students will take turns presenting papers for discussion. Topics will include the epidemiology, natural history, and pathology of viruses causing human disease with an emphasis on molecular mechanisms of infection, virus replication, how viruses manipulate the host cell's innate immune response to infection, and the use of viruses as vectors for gene therapy.

***765 / Advanced Functional Brain Imaging / M. Noseworthy**

Functional brain imaging using magnetic resonance techniques (MRI, and in vivo NMR) will be thoroughly discussed. Advantages and disadvantages, relative to other brain imaging modalities (CT, PET, SPECT, NIRS, US) will be discussed where appropriate. This course will provide students with an appropriate, yet complete, understanding of the underlying physics surrounding magnetic resonance and its relevance to neuroscience for the design of functional brain imaging experiments.

+799 / Independent Study in Medical Sciences / Area Coordinator and Staff

This half-course is designed to allow students to tailor their learning by selecting specific topics in Medical Sciences relevant to their thesis research and do advanced work in this area. A student will identify a topic and, in consultation with a faculty member with expertise in the area, a course outline will be developed that is tailor-made to meet the student's particular requirement. The student will then study under the guidance of a faculty member and examine the pertinent literature critically. This course may be taken only once during the student's graduate studies.

NEUROSCIENCE

The McMaster Neuroscience Graduate Program is a collaborative partnership among the Faculties of Science, Health Sciences, Engineering and Social Sciences. All four faculties are within a few minutes walking distance, facilitating interactions among graduate students, postdoctoral students, and faculty. Our goal is to attract the brightest graduate minds available each year to the field of neuroscience, by providing meaningful research opportunities in a collaborative, resource-rich environment. We offer programs in five research areas: Cellular & Molecular Neuroscience; Clinical & Health Neuroscience; Cognitive Neuroscience; Computational Neuroscience and Systems & Behavioural Neuroscience. Programs offered at the Master's level include research project, coursework and thesis requirements, leading to a Master of Science degree in Neuroscience. Ph.D. programs include research project, coursework, seminar, comprehensive and thesis requirements, leading to a Doctoral degree in Neuroscience.

Email: neuroinfo@mcmaster.ca

Website: <http://neuroscience.mcmaster.ca>

Staff / Fall 2009**DISTINGUISHED UNIVERSITY PROFESSORS**

John B. Bienenstock, M.B., B.S. (U.K.), M.R.C.P., F.R.C.P.(C), F.R.C.P., F.R.S.C./ Director, The Brain Body Institute, Pathology & Molecular Medicine
Simon Haykin, B.Sc., Ph.D., D.Sc. (Birmingham), F.R.S.C., F.I.E.E.E./ Electrical & Computer Engineering

PROFESSORS

Alexander K. Ball, B.Sc., Ph.D. (Dalhousie)/ Pathology & Molecular Medicine
Ramesh Balasubramaniam, Ph.D. (Connecticut) / Kinesiology
Suzanna Becker, B.A., M.Sc. (Queen's), Ph.D. (Toronto)/ Psychology, Neuroscience & Behaviour

Patrick Bennett, B.Sc. (Tufts), Ph.D. (California-Berkeley), Canada
Research Chair/ Psychology, Neuroscience & Behaviour
Ana R. Campos, B.Sc., M.Sc. (Rio de Janeiro), Ph.D. (Brandeis)/
Biology
Stephen Collins, M.B. B.S. (London), F.R.C.P. (U.K.), F.R.C.P.C.
/ Medicine
Denys deCatanzaro, B.A., M.A. (Carleton), Ph.D. (British Columbia)/
Psychology, Neuroscience & Behaviour
John Connolly, Ph.D. (London) / Linguistics & Languages
Margaret Fahnestock, B.Sc. (Stanford), Ph.D. (California-Berkeley)/
Associate Director, McMaster Neuroscience Graduate Program,
Psychiatry & Behavioural Neurosciences
James L. Henry, B.Sc. (Toronto), M.Sc., Ph.D. (Western)/
Psychiatry & Behavioural Neurosciences
Audrey Lyn Hicks, B.P.E., M.Sc., Ph.D. (McMaster)/ Kinesiology
J. Roger Jacobs, B.Sc. (Calgary), M.Sc., Ph.D. (Toronto)/ Biology
Timothy D. Lee, B.H.K., B.Sc. (Windsor), Ph.D. (Louisiana State) /
Kinesiology
Terri L. Lewis, B.A. (Toronto), Ph.D. (McMaster)/ Psychology,
Neuroscience & Behaviour
Daphne M. Maurer, B.A. (Swarthmore), M.A. (Pennsylvania), Ph.D.
(Minnesota)/ Psychology, Neuroscience & Behaviour
Michael F. Mazurek, B.A., M.D. (Toronto), F.R.C.P.(C)/
Psychiatry & Behavioural Neurosciences
Ram K. Mishra, B.Sc. (Udaipur, India), M.S. (Punjab Agricultural
University, India), M.S. (Louisiana State), Ph.D. (Memorial)/
Psychiatry & Behavioural Neurosciences
Kathryn M. Murphy, B.A. (Western), M.A. Ph.D. (Dalhousie)/ Director,
McMaster Neuroscience Graduate Program, Psychology,
Neuroscience & Behaviour
Lennard P. Niles B.A. (Western), M.Sc., Ph.D. (Toronto)/ Psychiatry
& Behavioural Neurosciences
Colin A. Nurse, B.E.Sc. (Western), Ph.D. (Harvard)/ Biology
Michel P. Rathbone, M.B., Ch.B. (Liverpool), Ph.D. (McMaster),
F.R.C.P.(C)/ Medicine - Neurology
C. David Rollo, B.Sc., M.Sc. (Guelph), Ph.D. (British Columbia)/
Biology
Allison B. Sekuler, B.A. (Pomona), Ph.D. (California-Berkeley),
Canada Research Chair/ Psychology, Neuroscience & Behaviour
Peter Szatmari, B.Sc, M.Sc., M.D. (McMaster)/ Psychiatry &
Behavioural Neurosciences
Henry Szechtman, B.Sc. (McGill), Ph.D. (Pittsburgh)/ Psychiatry &
Behavioural Neurosciences
Laurel J. Trainor, B.Mus., M.A., Ph.D. (Toronto)/ Psychology,
Neuroscience & Behaviour

ASSOCIATE PROFESSORS

Sigal Balshine, B.Sc., (Toronto), Ph.D. (Cambridge) Canada
Research Chair / Psychology, Neuroscience & Behaviour
James R. Bain, N.S. (Western), M.Sc (Toronto), M..D. (Western) /
Surgery
Ian Bruce, B.Eng., Ph.D. (Melbourne)/ Electrical & Computer
Engineering
Bruce K. Christensen, B.A. (British Columbia), M.A. (Wayne State),
Ph.D. (Vanderbilt) / Psychiatry & Behavioural Neurosciences
Laurie C. Doering, B.Sc (Queen's), M.Sc., Ph.D. (Saskatchewan)/
Pathology & Molecular Medicine
Reuven Dukas, B.A. (Jerusalem), Ph.D. (North Carolina State) /
Psychology, Neuroscience & Behaviour
Jane Foster, B.Sc. (Western), M.Sc. (Queen's), Ph.D. (Toronto)/
Psychiatry & Behavioural Neurosciences
Victoria Galea, B.Sc, M.Sc. (Waterloo), Ph.D. (McMaster)/
Kinesiology
Daniel Goldreich, B.Sc. (California-San Diego), Ph.D. (California-San
Francisco)/ Psychology, Neuroscience & Behaviour
Suleiman Igdoura, B.Sc. (Victoria), M.Sc. (Western), Ph.D. (McGill)/
Biology
Wolfgang Kunze, Ph.D. (McMaster) / Psychiatry & Behavioural
Neurosciences
James Lyons, B.A., M.Sc. (McMaster), Ph.D. (Simon Fraser)/
Kinesiology

Patricia I. Rosebush, B.Sc. N., M.Sc.N. (Toronto), M.D. (McMaster),
F.R.C.P.(C)/ Psychiatry & Behavioural Neurosciences
Mel Rutherford, B.A. (Yale), Ph.D. (California-Santa Barbara)
/ Canada Research Chair / Psychology, Neuroscience & Behaviour
Boris Sakic, B.Sc., M.Sc., Ph.D. (Belgrade, Yugoslavia) / Psychiatry
& Behavioural Neurosciences
Louis A. Schmidt, B.A. (Maryland), B.S. (Baltimore), Ph.D. (Maryland)
/ Psychology, Neuroscience & Behaviour
Elisabet Service, Ph.D. (London) / Linguistics & Languages
Alex Sevigny, Ph.D. (Toronto) / Communication Studies & Multimedia
Judith M. Shedden, B.Sc. (Alberta), M.Sc., Ph.D. (Pittsburgh)
/ Psychology, Neuroscience & Behaviour
David Shore, B.Sc. (McMaster), Ph.D. (British Columbia)
/ Psychology, Neuroscience & Behaviour
Hong-Jin Sun, B.Sc., M.Sc. (Peking), M.A. (Western), Ph.D.
(Queen's) / Psychology, Neuroscience & Behaviour
Ray Truant, B.Sc., Ph.D. (Toronto) / Biochemistry & Biomedical
Sciences
John Turnbull, B.Sc. (York), M.Sc. (Laval), M.D. (Western),
Ph.D. (Montreal), F.R.C.P.(C) / Medical Sciences
Judith A. West-Mays, B.Sc. (Wilfrid Laurier), M.Sc., Ph.D.
(Waterloo) / Pathology & Molecular Medicine

ASSISTANT PROFESSORS

Steven Brown, Ph.D. (Columbia) / Psychology, Neuroscience &
Behaviour
Paul Faure, B.Sc, M.Sc. (Calgary), Ph.D. (Cornell) / Psychology,
Neuroscience & Behaviour
David Feinberg, B.Sc. (Rutgers), Ph.D. (St. Andrews) / Psychology,
Neuroscience & Behaviour
Benicio Frey, M.D., M.Sc., Ph.D. (Universidade Federal do Rio
Grande do Sul) / Psychiatry & Behavioural Neurosciences
Joe Gabriele, Ph.D. (McMaster) / Psychiatry & Behavioural
Neuroscience
Deda C. Gillespie, B.Sc (Yale), Ph.D., (California- San Francisco) /
Psychology, Neuroscience & Behaviour
Geoffrey B.C. Hall, B.Sc., M.Sc. (Guelph), Ph.D. (McMaster) /
Psychiatry & Behavioural Neurosciences
Karin Humphreys, Ph.D. (Indiana) / Psychology, Neuroscience and
Behaviour
Shucui Jian, B.Sc. (Qingdao), M.Sc. (Shanghai), M.D. (Qingdao),
Ph.D. (Fed. Inst. Neurobiology, Germany) / Medicine -
Neurosurgery
Michael Kiang, A.B. (Harvard), M.D. (Toronto), Ph.D. (UC San Diego)
/ Psychiatry & Behavioural Neurosciences
Margaret C. McKinnon, B.A. (Windsor), M.A., Ph.D. (Toronto) /
Psychiatry & Behavioural Neurosciences
Michael Noseworthy, H.B.Sc., M.Sc. Ph.D. (Guelph) / Electrical &
Computer Engineering
Elyanne Ratcliffe, M.D. (McMaster) / Pediatrics
Sheila Singh, B.Sc. (McGill), M.D. (McMaster), Ph.D., F.R.S.C.
(Toronto) / Surgery
Valerie Taylor, M.D., Ph.D. (McMaster) / Psychiatry & Behavioural
Neurosciences
Scott Watter, Ph.D. (Indiana) / Psychology, Neuroscience &
Behaviour

PROFESSORS EMERITI

Larry E. Roberts, B.A., Ph.D. (Minnesota) / Psychology, Neuroscience
& Behaviour
Meir Steiner, M.D. (Tel Aviv University), Ph.D. (Michigan), F.R.C.P.C.,
C.P.S.O / Psychiatry & Behavioural Neurosciences and Obstetrics
& Gynecology
Sandra Witelson, B.Sc., M.Sc., Ph.D. (McGill) / Psychiatry &
Behavioural Neurosciences

M.Sc. Degree

All students will be required to take the 700 level Neuroscience course *The Nervous System* (full course). This course will cover the breadth of the field of Neuroscience in a series of modules, different instructors will contribute to teaching the modules and the course will be directed by a course coordinator. Students will also attend seminars as described below for the Ph.D. degree.

Students will complete a Master's research project. A written thesis and oral presentation describing the student's Master's research will be made to a committee of three faculty members appointed by the Director. The committee will examine the student on the Master's thesis and general knowledge of Neuroscience from the course taken in the first year.

Ph.D. Degree

A minimum of 1 one-term course beyond the Master's degree requirements (all students must take NEUROSCIENCE 700). The course must be from the list of Neuroscience courses and at the 700-level. The supervisory committee, in consultation with the student, may require additional course work. The list of Neuroscience courses covers the five areas represented in the graduate program: Clinical & Health Neuroscience, Cognitive Neuroscience, Computational Neuroscience, Cellular & Molecular Neuroscience, Systems & Behavioural Neuroscience; as well as Statistics and Quantitative Methods for research.

Students will complete an original research project and this will form the basis of the Ph.D. thesis that will be presented following the School of Graduate Studies regulations.

Seminar Requirement

Students will be expected to attend the seminars in the Neuroscience Program Seminar Series, including weekly journal club seminars presented by students and faculty, and regular colloquia presented by invited speakers. Master's and Ph.D. students will be required to present one seminar in the weekly series that describes their research.

Ph.D. Comprehensive Requirement

The Ph.D. comprehensive requirement must be completed within two years of entering the Ph.D. program and is designed to examine the student's ability to define a major question in Neuroscience research, to evaluate the research literature critically, to design experiments to address the research question, and to become familiar with a broad range of approaches across several of the five areas of Neuroscience research. The student, in consultation with their committee, will select an area of concentration that is relevant to, but distinct from, their thesis research. The comprehensive will take the form of a grant-style research report focused on the student's area of concentration and will address the four goals stated above. The student will submit the written proposal and be examined orally on the proposal as well as knowledge of the area of concentration. The committee will include the student's thesis supervisor (non-voting member), one member from the Supervisory committee, and two additional members from the Neuroscience faculty. The student's performance will be judged as Pass with Distinction, Pass, or Fail. Students who fail will have a second opportunity to take the comprehensive exam.

Progress Reports

Each year all students enrolled in the Neuroscience program will be required to submit a progress report to their supervisory committee detailing their achievements for the current year and objectives for the next year.

Supervisory Committee

Each student enrolled in the Neuroscience program will be required to have a supervisory committee that will help to direct the student's research. The committee will consist of the student's research Supervisor and 2-3 additional faculty members from the Neuroscience program. The committee will meet at least once a year to review the student's progress and objectives for the next year.

Thesis Evaluation Procedure

Theses will be evaluated following the School of Graduate Studies regulations.

Courses

Courses marked with an asterisk (*) are half courses and courses marked with a number sign (#) are quarter courses. Please note not all courses are offered every year.

#700 / The Nervous System (Core) / K. Murphy

This course is designed to give the student fundamental and in-depth knowledge of the field of Neuroscience. The course will focus on the five areas of Neuroscience research (Cellular/Molecular, Clinical/Health, Cognition, Computational, Systems/Behavioural) and will include a section on ethical and professional issues in neuroscience research.

#715 / Neuroscience Computational Methods / K. Murphy

Students will learn computational methods used in neuroscience research. These will include analytical methods for interpreting experimental data as well as methods for simulating predictions of computational models. Students will be introduced to both theoretical and practical aspects, including implementing algorithms in Matlab.

#721 / Lab Rotation in Neuroscience

The lab rotations give the student the opportunity to learn about the diversity of research problems in Neuroscience and the wide array of research methodologies used to address the research questions. Under the guidance of a faculty member the student will conduct a laboratory research experiment. This course may be taken twice with the permission of the Neuroscience program Director.

***722 / Independent Study in Neuroscience**

This course is designed to allow students to tailor their studies to the particular topics in Neuroscience relevant to their area of research interest and to do advanced work in the area. The student will work under the guidance of a faculty member to critically evaluate literature on the selected topic in neuroscience.

Additional courses that are relevant to Neuroscience are offered by the following departments/programs.

Biology Courses

*6T03 / Neurobiology

Electrical and Computer Engineering Courses

*6BC4 / Modeling of Biological Systems
 *772 / Neural Networks
 *791 / Sensory and Neuromuscular Engineering
 *792 / Medical Visualization
 *795 / Quantitative Electrophysiology
 *796 / Models of the Neuron

Kinesiology Courses

*705 / Motor Behaviour
 *707 / Cognitive Dysfunction
 *709 / Neuromuscular Function in Aging and Disease
 *711 / Motor Control

Medical Sciences Courses

*705 / Neurochemistry
 *708 / Signal Transduction
 *709 / Clinical Neuroanatomy
 *711 / Psychoneuroimmunology
 *719 / Electrophysiology of Excitable and Non-excitable Membranes
 *740 / Drug Receptor Interactions
 *744 / Functional Neuroanatomy of Psychiatric Disease
 *765 / Advanced Functional Brain Imaging

Psychology Courses

*710 / Statistics and Research Design
 *724 / Perception
 *726 / Behavioural Neuroscience
 *728 / Animal Behaviour
 *729 / Physiological Psychology
 *730 / Quantitative Methods
 *734 / Neural Networking of Cognition and Perception
 #711 / Advanced Statistics and Computational Methods I
 #712 / Advanced Statistics and Computational Methods II

Health Research Methodology Courses

*731 / Advanced Linear Models for Health Data

NURSING

The Graduate Program in Nursing provides the opportunity for advanced education and research in Nursing, M.Sc., and Ph.D. degree programs are offered on a full-time basis. The M.Sc. program allows selected students to obtain the extra requirements for the neonatal critical care specialist certificate. Those specializing as a Primary Health Care Nurse Practitioner may apply for advanced credit toward a M.Sc. Our programs provide students with the opportunity to become clinical health science investigators in Nursing, contributing to the development of the theoretical basis of practice and to the development and evaluation of health care interventions and programs.

Students in the M.Sc. and Ph.D. programs can declare their intentions to focus within one of the following five fields. They are:

1. Health Populations

Our research focuses on health outcomes, patterns of health determinants, policies and interventions. Examples of topics may include the impact of socio-economic status, the environment, culture, and gender on health and quality of life. Nursing studies examining the impact of globalization are also included.

2. Wellness and Healing Across the Lifespan

Our research focuses on the study of interventions, relationships and interactions that foster a sense of belonging, well-being, and coherence. This field includes the study of traditional or alternative nursing modalities in periods of illness and crisis, and the role of spirituality in health.

3. Health Services and Policy

Health services research is a multidisciplinary field of inquiry, both basic and applied, that examines access to, and the use, costs, quality, delivery, organization, financing, and outcomes of health care services to produce new knowledge about the structure, processes, and effects of health services for individuals and populations. New knowledge in relation to nursing services is our focus.

Related to Health Services is Health Policy Research which addresses the history, structure, theory and process of health policymaking to plan, implement, and evaluate policies. Topics may include the economic, ethical, and social implications of policy decisions, and may develop or assess strategies to effectively advocate for policy change. Effective policies are essential to quality nursing services.

4. Nursing Leadership and Practice

Research in Leadership focuses on studying the identification and development of the skills and knowledge needed for leadership roles in nursing. Complementary to nursing leadership (and management) is research in Practice which involves the study of relationships among advanced nursing practice, theory, and scholarly inquiry. Research may also focus on the development and evaluation of practice specialties with specific populations or settings (e.g., nurse practitioner) and knowledge exchange.

5. Nursing Education

Our research focuses on the investigation of teaching-learning modalities (e.g., self-directed learning, technology) for enhancing nursing education as a practice discipline, the development of the knowledge base related to learning to nurse, and the evaluation of educational programs and strategies. Examples of topics may include inter-professional learning, program evaluation, critical thinking, and reflective practice.

For those students wishing to pursue a graduate level advanced nursing practice program, graduate diplomas are offered in the following fields of specialization: Advanced Neonatal Nursing, Health Services and Policy Research, and Primary Health Care Nurse Practitioner, details of which are set out under the Graduate Diploma Programs section at the back of this Calendar.

The Ontario Public Hospitals Act requires that all persons working in a hospital setting meet certain criteria regarding surveillance for infectious diseases. In order for the requirement of the legislation to be met, once students have been enrolled in the Nursing Program they must complete Pre-Clinical Communicable Disease Screening.

More information will be sent to specific applicants prior to registration. Specific questions can be directed to the Health Sciences Graduate Programs Office.

Enquiries: 905 525-9140 Ext. 22983
 Fax: 905 546-1129
 E-mail: taym@mcmaster.ca
 Website: <http://www.fhs.mcmaster.ca/grad>

Staff / Fall 2009

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 Gina Browne, B.Sc.N. (Spaulding), M.S. (Boston), M.Ed., Ph.D. (Toronto)
 Donna Ciliska, B.Sc.N., M.Sc.N. (Western), Ph.D. (Toronto)
 Alba DiCenso, B.Sc.N., M.Sc. (McMaster), Ph.D. (Waterloo)
 Basanti Majumdar, B.Sc.N., M.Sc.N. (New Delhi), M.Ed. (New York), M.Sc. (T) (McMaster), Ph.D. (Michigan)
 Janet Pinelli, B.S. (Boston), M.Sc.N. (Toronto), D.N.S. (SUNY at Buffalo)

ASSOCIATE PROFESSORS

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 Jennifer Blythe, B.A. (Hull, U.K.), M.A., Ph.D. (McMaster), M.L.S. (Toronto)
 Barb Carpio, B.Sc.N. (Alberta), M.Sc.N. (Toronto), M.Sc.T. (McMaster)
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 Anita Fisher, B.A. (Windsor), M.H.Sc. (McMaster), Ph.D. (Cardiff)
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 E. Ann Mohide, B.Sc.N. (Toronto), M.H.Sc. (McMaster)
 Linda O'Mara, B.N., M.Sc. (McGill), Ph.D. (Toronto)
 Jenny Ploeg, B.Sc.N., M.Sc.N. (Western), Ph.D. (Toronto)
 Elizabeth Rideout, B.Sc.N. (New Brunswick), M.H.Sc. (McMaster), M.Sc., Ph.D. (Toronto) / Part-time
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 Denise Bryant-Lukosius, B.Sc.N., (McMaster), M.Sc.N. (D'Youville College), Ph.D. (McMaster)
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 Jeannette LeGris, B.N. (Manitoba), M.H.Sc. (McMaster)
 Lynn Martin, B.Sc.N. (McMaster), M.Sc. N. (Western), Ph.D. (Toronto)
 Colleen McKey, B.Sc.N. (Niagara), M.Sc. (D'Youville), Ph.D. (Capella)
 Charlotte Noesgaard, B.N. (McGill), M.Sc.N. (Western)
 Christine Patterson, N.P., B.Sc.N. (McMaster), M.Sc. (Waterloo)
 Gladys Peachey, B.N., M.Ed. (Memorial), M.H.Sc. (Toronto), Ph.D. (McMaster)
 Dyanne Semogas, B.N. (McGill), M.N. (Washington)
 Eric Staples, B.A. (Nursing) (Ryerson), M.Sc. (D'Youville), DNP (Case Western Reserve)
 Patricia Strachan, B.Sc.N. (McMaster), M.Sc. (Guelph), Ph.D. (McMaster)
 Olive Wahoush, M.Sc. (Ulster), Ph.D. (Toronto)

CLINICAL PROFESSOR

Ruth Lee, B.Sc.N., M.Sc.N., Ph.D. (Toronto) / Part-time

ASSOCIATE CLINICAL PROFESSORS

Carolyn Byrne, R.N. (Hamilton Civic Hospitals), M.H.Sc. (McMaster), Ph.D. (Guelph) / Part-time
 Dauna Crooks, B.Sc.N. (Toronto), M.Sc.N. (Western), DNS (State University of New York) / Part-time
 Sharon Dore, B.Sc.N. (McMaster), M.Ed. (Brock), M.S.N., Ph.D. (Wayne State) / Part-time
 Cheryl Forchuk, B.A., B.Sc.N. (Windsor), M.Sc.N. (Toronto), Ph.D. (Wayne State) / Part-time
 Sandra Henderson, R.N., B.Sc.N., M.Sc. (Western), CHE(PT)
 Sue Matthews, B.H.Sc. (York), M.H.Sc., Ph.D. (Australia)

ASSISTANT CLINICAL PROFESSORS

Susan Blatz, B.Sc.N. (McMaster), M.Ed. (Brock), M.S.N., Ph.D. (Wayne State) / Part-time
 Kathy Cunningham, B.Sc.N., M.H.Sc. (McMaster)
 Brenda Flaherty, B.A. (McMaster), M.Sc. (Queen's)
 Angela Kalyn, B.Sc.N. (Pittsburg), M.H.Sc. (McMaster) / Part-time
 Pat Mandy, B.A. (McMaster), M.R.A. (Queen's) / Part-time
 Dawn Prentice, B.S.N. (Niagara, New York), M.S. (SUNY at Buffalo), Ph.D. (McMaster)
 Janet Rush, B.Sc.N., M.H.Sc. (McMaster), Ph.D. (Toronto) / Part-time
 Leila W.M. Ryan, R.N. (Victoria), M.A. (Toronto), B.A., M.A., Ph.D. (McMaster) / Part-time
 Lori Schindel Martin, B.Sc.N., Ph.D. (McMaster), M.Sc. (D'Youville College) / Part-time
 Amanda Symington, B.Sc., B.Sc.N. (Toronto), M.H.Sc. (McMaster) / Part-time

ASSOCIATE MEMBERS

Ilana Bayer (Pathology and Molecular Medicine)
 Mabel Hunsberger, B.Sc.N. (Indiana), M.Sc.N. (Pennsylvania),
 Ph.D. (Waterloo)
 Alejandro Jadad (Clinical Epidemiology and Biostatistics) / Part-time
 Kyong-Soon Lee (Pediatrics)
 Stephen Lloyd (Emergency Medicine)
 David Ludwin (Medicine)
 Carrie McAiney (Psychiatry & Neurosciences)
 John A. O'Connor (Family Medicine)
 Gabriel Ronen, M.D. (Basle, Switzerland), M.Sc. (McMaster)
 Thomas St. James O'Connor (Family Medicine)
 Michael Stephenson (Family Medicine)
 Allyn Walsh (Family Medicine)

PROFESSORS EMERITI

Ann Beckingham, B.Sc.N., M.A. (Columbia), Ph.D. (Fielding Institute)
 Joan Crook, B.S. (Niagara), M.A. (Dalhousie), M.Sc. (McMaster),
 Ph.D. (Toronto)
 Susan French, B.N. (McGill), M.S. (Boston), Ph.D. (Toronto)
 Jo-Ann Fox-Threlkeld, B.N. (New Brunswick), M.Sc., Ph.D. (Queen's)
 Jacqueline Roberts, B.Sc.N., M.Sc. (McMaster)
 Robin Weir, B.Sc.N. (Western), M.S. (Boston), M.Ed., Ph.D. (Toronto)

M.Sc. Degree**A. M.Sc. by Thesis**

The admission requirements are:

1. Baccalaureate degree (60 units taken at a university) with a minimum of a B+ average over the final 60 units from an undergraduate nursing program, or its equivalent, which will include 20 units of course work at the 400-level. Applicants who are graduates of a baccalaureate nursing degree program for registered nurses *and who have between 50 and 59 units of university study* will be considered on a case-by-case basis. (**NOTES:** Applicants who do not hold a professional degree may be required to do make-up course work prior to admission. These 60 units will not include advanced credit for college courses.)
2. Two academic and one clinical references.
3. Evidence of current registration or eligibility for registration with the College of Nurses of Ontario.
4. A letter outlining career plans, research interests, and suitability for this professional nursing program.
5. Identification of a faculty member who agrees to supervise the student. (**NOTE:** Assistance will be provided in obtaining a supervisor for students residing outside Canada.)

For information on the Advanced Neonatal Nursing Diploma Program please refer to the 'Diploma' Section of this Calendar.

A graduate level diploma in Health Services and Policy is also outlined under the Graduate Diploma Programs section.

The general requirements for the M.Sc. degree appear under the Regulations for Master's degrees near the beginning of this Calendar.

Candidates must:

1. Complete, with at least a B- standing, a minimum of five graduate half courses which must include NUR *701, NUR *745, HRM *721, NUR *709 or HRM *701/*702, and one additional half course selected by the student in conjunction with his/her supervisory committee which may be at the 600 level.
2. Complete a thesis on an approved health care issue and defend the thesis at a final oral examination.

Students wishing to be transferred to the Ph.D. program prior to the completion of a master's degree (see section 2.1.2 of the General Regulations of this Calendar and the statement entitled "Policy and Procedure for Transfer from M.Sc. to Ph.D. - Nursing") must have

completed the minimum course requirements for the M.Sc. curriculum (as detailed above in item 1), and strictly adhere to the Policy and Procedure for Transfer from M.Sc. to Ph.D. - Nursing document. The Transfer Report must be submitted to the Transfer Committee within 18 months from entry at the M.Sc. level as a full-time student. Approval to transfer will be determined at a meeting of the Transfer Committee.

B. M.Sc. by Course Work

A course-based M.Sc. degree option in Nursing is offered on a regular full-time basis with accommodation for those students who are employed on a full- or part-time basis. The admission requirements are the same as for the M.Sc. thesis option (see above). Each student will be required to complete a minimum of seven graduate half courses which must include the four required courses: NUR *701, NUR *711, NUR *745 and HRM *721. The remaining courses will be chosen by the student with the approval of his/her faculty advisor and usually center around a theme. With the permission of the course instructor and faculty advisor, a student's minimum course requirements may include up to two 600-level graduate half courses. In addition, each student must write a 15-page scholarly paper on a topic approved by the Nursing Curriculum Committee.

For those wishing to obtain a Primary Health Care Nurse Practitioner certificate and a course-based M.Sc. degree, admission requirements are the same as for other course-based M.Sc. students with the additional requirement of two years' full-time nursing practice within the past five years.

Students complete three core graduate courses, write the 15-page scholarly paper, and complete the seven courses offered through the NP Consortium (NUR 761-767). Since the seven PHCNP courses are offered every year, they can be completed in 12 months of full-time study. The program typically requires 3 years to complete. Once the PHCNP courses have been completed successfully, students are eligible to write their RN (Extended Class) exams. Each student will have a Faculty Advisor assigned by the Assistant Dean.

Note: Students wishing to pursue PHCNP certificate only (post Master's or post baccalaureate) should consult the undergraduate calendar or the undergraduate School of Nursing website for more information.

Ph.D. Degree

The admission requirements are:

1. Master's degree or demonstrated readiness to transfer from the M.Sc. to the Ph.D. degree within the McMaster program.
2. Completion of a research thesis or equivalent (e.g. the candidate has already conducted funded research).
3. Same as requirements 2 through 5 under the M.Sc. Degree.

A candidate for the Ph.D. degree must comply with the School of Graduate Studies Regulations for the Degree Doctor of Philosophy. Candidates must:

1. Obtain at least B- standing in a minimum of three half courses beyond those required for the M.Sc. degree, one of which must be NUR *700. NUR *701 must also be taken as one of the three required courses for the degree, if an equivalent course was not previously taken at the master's level.
2. In addition to the above minimum course requirements for the Ph.D., candidates must successfully complete an approved research methods half course, and one HRM statistics half course, if equivalent courses were not previously taken at the master's level.
3. Pass a Comprehensive Examination before the eighteenth month from their date of entry into the doctoral program.
4. Submit a thesis on an approved topic and defend the thesis at a final oral examination.

Students entering the Ph.D. program after transferring from the McMaster M.Sc. Program in Nursing must obtain at least B- standing in a minimum of three half courses beyond those required for the M.Sc. degree, one of which must be NUR *700. For students who have completed this course at the master's level, another course must be selected by the student and the supervisory committee. Items 3 and 4 of the above listed Ph.D. requirements must also be completed.

Courses

Courses marked with an asterisk (*) are half courses. Electives may be drawn from Health Sciences, including Health Research Methodology courses. NUR *702 and NUR *703 can be taken more than once at the M.Sc. level and more than once at the Ph.D. level but only one of these two courses can be counted towards the minimum course requirements of the program at each level. Students taking NUR *702 cannot also receive credit for any subsequent regular course offering on the same topic. Not all courses are offered each year. Appropriate courses may be selected from other departments in consultation with the supervisory committee.

*700 / Philosophical Basis of Nursing Research / C. Tompkins

This course will explore, in seminar format, paradigms for clinical nursing research by examining the philosophical basis for development of clinically relevant knowledge. Topics include: history of the separation of science and religion, natural from social sciences; basic tenets of scientific method; critiques of modern/positivistic thinking (social construction of knowledge); assumptions of qualitative and quantitative research paradigms; and generation of clinically relevant knowledge. Anti-requisite: HRM *700.

*701 / Theoretical Basis of Nursing Practice / M. Black, J. Ploeg

Students will carry out supervised field-based practice to provide them with the opportunity to develop autonomous roles in multiple clinical settings, allowing critical appraisal of existing theories and testing of concepts relevant to the proposed research thesis topics. Practice will be complemented by seminars focused on the related concepts and theories including biological, psychological, epidemiological, and environmental perspectives. Students will make presentations and written assignments using theoretical frameworks appropriate for the clinical problems.

*702 / Selected Topics in Nursing / M. Black

This selected topics course will present leading edge thinking in relation to specific areas or issues in nursing. The specific topics will be developed in response to needs identified by faculty or students.

*703 / Independent Study in Nursing / M. Black

The course is designed to allow the student to tailor their learning to specific topics in nursing or health care relevant to their nursing and research interests and to do advanced work in this area. The topic studied will not overlap with the student's thesis topic. Under the guidance of a faculty member, the student will examine critically the pertinent literature.

*706 / Research Issues in the Introduction and Evaluation of Advanced Practice Nursing Roles / D. Bryant-Lukosius

The search for more cost-effective strategies to deliver health care and the nursing profession's emphasis on the development of advanced practice nursing (APN) roles have afforded the opportunity to consider expanded roles for nurses in a variety of primary, secondary and tertiary health care settings. A major change in the delivery of health services should be based on scientific evidence where possible. This course will focus on the steps involved in introducing and evaluating new roles for APNs, related research methods, APN models, working with decision-making partners, and writing successful related research proposals. A separate distance education fee will apply.

*707 / Theoretical Foundations of Leadership and Management in Nursing / C. McKey

This course explores, in particular, leadership and management paradigms that inform the nurse and the profession. The pertinent literature related to leadership and management within nursing and the broader health care environment is critically analyzed and applied. Topics include, but are not limited to: a) exploration of leadership and management frameworks in nursing and health care; b) critique of leadership theories; and c) examination of leadership's impact on the role of the nurse, the profession, and the health care system. The foci of the course are the exploration, critical analysis, and application of theory and research findings related to leadership.

*708 / Information and Communication Technology Applications in Health: Theory and Practice / R. Valaitis

Students in this course will critically examine a wide variety of issues and concepts related to the theory, research, and applications of information and communication technologies in health. Key topics will include: the organization of health information; computer applications in health research; internet accessibility; evaluation of health information on the web; E-health/telehealth interventions; computerized health information; and online learning. Students will be expected to participate in a mix of face-to-face and online seminars.

*709 / Statistical Methods in Nursing Research / N. Akhtar-Danesh

This course focuses on the main statistical issues that might be useful in nursing research. Some specific topics of the course are descriptive statistics, probability distributions (binomial, Poisson, normal), comparison between two mean values, one-way and two-way Analysis of variance (ANOVA) and post-hoc tests, correlation and simple linear regression analysis of the frequency tables, and some non-parametric tests.

*711 / Advanced Practicum in Nursing / M. Black, Staff

This course is designed to allow the student to tailor learning to a selected practicum in clinical, education, research or administration, which meets specific educational needs. Students choose clinical activities in their selected practicum to develop expert skills complemented by critical appraisal of existing theories and testing of concepts. The clinical practicum should be completed in a setting other than that used for NUR *701. This course is required for students enrolled in the course-based M.Sc.

*712 / Evidence-Based Health Care / D. Ciliska, A DiCenso, M. Dobbins, J. Ploeg

Evidence-based health care (EBHC) is the integration of best research evidence with patient preferences, clinician skills and available resources when making health care decisions. It involves the definition of questions that allow clear answers, the efficient searching for the best information to answer the question, the critical appraisal of the evidence to determine its strength, the extraction of the clinical/management/education/policy message, and the dissemination and utilization in health care decision-making.

720 / Advanced Nursing Care of High Risk Infants and Families / J. Pinelli, Staff

This problem-based learning course allows students to apply advanced problem-solving skills using selected clinical problems relevant to neonatal critical care. Students will acquire advanced theoretical knowledge in the physiological, behavioural, medical, and nursing sciences required for solving neonatal-focused problems through the identification and analysis of literature reviews and research papers. Students will develop differential medical and nursing diagnoses and plans of care and critically analyze the health and illness management strategies and outcomes of each case.

721 / Advanced Neonatal Nursing Clinical Practice I
/ K. Cunningham, Staff

This course provides an opportunity for students to develop advanced skills and knowledge by progressive clinical experiences through exposure to patient and family situations in the neonatal intensive care unit. Students will develop and implement a plan of care for a selected patient(s) and families, utilizing a variety of skills and knowledge applications. Students will provide health and illness management of neonates who require intensive medical and nursing care.

***722 / Advanced Neonatal Nursing Clinical Practice II**
/ K. Cunningham, Staff

Students will have the opportunity to consolidate their advanced skills and knowledge in an intensive clinical experience and to demonstrate increasing responsibility and independence in the care of patients and families with complex needs and problems. This experience will provide students the opportunity to refine their diagnostic and therapeutic clinical skills. Seminar discussions will cover issues relevant to the student's new role, including systems entry and clinical issues: parental support, premature infant feeding, long-term follow-up of ill neonates, pain management.

724 / Theoretical Foundations of Leadership and Organizational Effectiveness / C. McKey

This course will explore organizational effectiveness and leadership paradigms and theories that inform the nurse and the profession. The pertinent literature related to issues impacting organizational effectiveness and leadership, in particular, recruitment, retention, professional practice environments, mentorship, and entrepreneurship in nursing and the broader health care environment will be critically analyzed and applied.

***725 / Knowledge Exchange and Translation / J. MacDermid**
(Same as HRM *725 and Rehabilitation Science *725)

This modular course will present students with an introduction to basic principles, conceptual frameworks, research design, and interventions used in knowledge exchange and translation. Faculty with specific expertise in knowledge exchange and translation for different target audiences (patients/public, policy makers, clinicians) will facilitate modules that address theoretical and practical issues around using developed knowledge to improve health or health care systems. Students will present their research protocol or KET project in the final module.

***728 / Issues in International and Intercultural Health /**
B. Majumdar, Staff

This course is intended for students who have had little or no professional work experience in international or northern Canadian settings and who desire an orientation to the priorities, issues and strategies for health and development. The course will provide students with a structured introduction to health issues in a rural Canadian and international context, and challenge them to build a conceptual framework that is useful for analysing these problems.

During this course students will be introduced to the literature of development, political economy, medical and social anthropology and international and intercultural theories for nursing practice in these settings.

***745 / Qualitative Research Methods / S. Boblin, C. Charles**
(Same as HRM *745)

This course introduces learners to theoretical traditions and corresponding methods of qualitative research using health and health care research as examples. Specific topics covered include: theoretical paradigms of qualitative research, types of research questions best answered by qualitative methods, sampling objectives and procedures, methods of data collection, methods of analysis and interpretation, and ethical issues and responsibilities of qualitative researchers. Criteria for evaluating qualitative research will be discussed and applied to specific research studies. Learners will gain "hands on" experience using qualitative methods through in-class and take-home exercises.

***758 / Qualitative Research Methods for Collecting, Analysing and Interpreting Data / L. Lohfeld, S. Wilkins**
(Same as HRM *758 and Rehabilitation Science *758)

This intermediate-level course builds on prior knowledge about qualitative research approaches and their philosophical bases. The emphasis in this course will be on how the approaches affect sampling and data collection, data management, analysis, interpretation, and write-up. Students will also examine the writing of qualitative research proposals, including consideration of ethical issues. The course is based on active involvement of learners through student-directed discussions and hands-on experiences, guidance and facilitation by graduate faculty with expertise in qualitative research, and interdisciplinary collaboration with faculty and classmates.

The following courses, *761-767, are required courses for the Primary Health Care Nurse Practitioner.

***761 / Pathophysiology for NPs / K. McHugh, M. van Soeren**

A system's approach is used to examine concepts in pathophysiology (patho) as a basis for advanced nursing practice. Case studies will provide a comprehensive overview of the etiology, pathogenesis, and clinical manifestations of disease in adults and children. Building on knowledge of normal anatomy and physiology across the lifespan, the student will learn to demonstrate an understanding of physiological principles such as clinical manifestations, alterations in physiological function in organs and systems, and the impact of stress on age-related, acute, episodic, and chronic conditions found in primary health care practice.

***762 / Advanced Health Assessment and Diagnosis I**
/ E. Staples, B. Myslik

This course introduces concepts and frameworks integral to advanced health assessment and diagnosis in nursing practice. It emphasizes comprehensive and focussed health assessment, including history taking, physical assessment and diagnostic reasoning as well as laboratory and diagnostic test selection and interpretation for the adult client. This lays the foundation for clinical decision making from data collection to diagnostic plan of care.

***763 / Advanced Health Assessment and Diagnosis II**
/ E. Staples

This course builds on the knowledge and skill acquired in AHAD I and applies the framework, concepts and methods of health assessment and clinical decision making studies in AHAD I to specific populations across the lifespan, to families and to the community. In addition, advanced practice skill pertaining to diagnostic test assessment is examined.

***764 / Therapeutics in Primary Health Care I**

This course introduces concepts integral to pharmacotherapy, advanced counselling, and complementary therapies predominantly related to common episodic conditions of clients across the lifespan. It emphasizes the therapeutic care plan approach which focuses on the following aspects: drug-related problems, goals of therapies, analysis of different therapeutic approaches, need for referral, monitoring parameters, acceptability to the client, and follow-up.

***765 / Therapeutics in Primary Health Care II**

This course builds on the knowledge acquired in both Therapeutics I and AHAD I and applies the frameworks and concepts of pharmacotherapy, advanced counselling, and complementary therapies predominantly to clients with chronic conditions and special populations.

***766 / Roles and Responsibilities / M. Lamb, M. Woodman**

In Roles and Responsibilities (R&R), the learner will be expected to engage in reflection of their previous and present nursing practice. Reflective practice promotes both personal and professional growth.

767 / Integrative Practicum / F. Donald

The Integrative Practicum (IP) course is the final course in the Primary Health Care Nurse Practitioner Program. AHAD Part I and Part II, R&R, Patho, and Therapeutics Part I and Part II are pre-requisites for IP. The IP course will provide the Primary Health Care Nurse Practitioner student an opportunity to consolidate advanced nursing knowledge, theory, and skills. The course is divided into two

integrated and concurrent parts: seminars, and clinical placements, both of which build upon critical thinking, self-directed learning and collaborative methods to assist the student to integrate theory and research based practice.

***770 / Mixed Methods Research Designs for Health Services and Policy Research / S. Jack, Staff (Same as HRM *770)**

This course introduces students to the major concepts and issues involved in mixed methods approaches to tackle important questions in the field of health services and policy. LearnLink is used as the mode of instruction. A framework for thinking about mixed methods will be developed that provides guidance to decision-making about when and how to use mixed methods and models to study health services and policy problems. The course will provide students with knowledge of the current controversies and major challenges in the use of mixed methods and models of research. Students are expected to design a mixed method study as part of the course and critically evaluate the design options chosen by a classmate.

CLINICAL HEALTH SCIENCES

***601 / Spiritual Work Life: Applied to Health Care / J. O'Connor**

This course explores the concepts of spirituality of work life in a health care setting from theoretical, professional and personal perspectives. How does one integrate pastoral care into a comprehensive spiritual plan of an organization? Concepts of 'greater hunger', theological worlds and other tools are used to explore the spiritual needs of staff and care providers. Some contexts addressed regarding spirituality include: change; loss; transition rituals; crisis intervention; suicide; addictions; abuse; team dynamics; identity; work ethics; spiritual conversations; stress management; and systems theory. The content is applicable to non-health care work settings.

***700 / Spirituality and Health: The Nature of the Wounded Spirit: Implications for Clinical Management / B. Clarke, J. O'Connor**

This course will encompass the study of suffering from the perspectives of "self" and "personhood". The scope and the dimensions of suffering as an entity separate from pain will be studied with emphasis on the power of suffering throughout the life span both in wellness and illness. Students will learn about the features that distinguish the language of suffering from the language of pain and will critically analyze the relationship between the two phenomena and the impact of suffering on health care costs (human and fiscal costs).

***701 / The Wounded Spirit in the Secular World: Legal, Ethical and Cultural Perspectives/ B. Clarke, J. O'Connor**

This course will explore suffering from the perspective of self and personhood in relationship with the law and current societal values. Issues for study may focus on personal freedoms and rights after traumatic injury or events, living with terminal illness, autonomy in medicine and suffering in marginalized groups such as children, the elderly and the mentally handicapped. Topics may include: the law and culture, ethical considerations, health professional and care giver concerns as well as the compatibility of the law and medicine. Students may select other relevant topics in relation to the law, societal attitudes and suffering.

***702 / The Impact of Spiritual and Religious Traditions on Health: Challenges for Multicultural Health Care Delivery Systems / J. O'Connor, B. Clarke**

This course will trace the understanding of suffering from the traditions of world religions. The focus of the course will be to understand the political outcomes of such traditions and its impact on the individual and health. Emphasis will be on the power of religious teachings on spirituality and personal suffering, and factors such as hope, courage and peace will be explored. The management of the suffering patient and the power of religious and spiritual beliefs will be delineated.

***703 / The Wounded Spirit: Applied Contemporary Health Practice Issues / J. O'Connor, B. Clarke**

The purpose of this course will be to differentiate between pain and suffering in medical practice and to determine the economic impact of suffering in either one of the following sub-units: general practice, rehabilitation psychiatry or palliative care (private and public health care delivery system). Study will take an evidence-based approach to problem identification, and efficacy of treatment interventions.

***707 / Post Modern Family Therapy / T. O'Connor**

The course presents the concepts from post modern family therapy and examines their implications for working with families. The course includes solution-focused and narrative therapy, especially the works of Steven de Shazer, Michael White and Charles Gerkin and compares them to the concepts of modern family therapy. The post-modern family therapy concepts are used in understanding and explaining the practice of therapy and ministry within various contexts. The course is interdisciplinary.

***719 / Foundations of Education in the Health Sciences / L. Martin, Staff (Formerly NUR *719)**

This course will explore the education literature through discussion and application to health sciences issues, including health professional education. Examination of early education literature and changes over time in the philosophy and practice of education will provide the framework of approaches to teaching and learning. Topics include: recurrent issues in health professional education; teacher and learner centred educational approaches; psychomotor learning; cognitive psychology and learning; instructional and evaluational methods.

OCCUPATIONAL THERAPY

The Faculty of Health Sciences Graduate Programs and the School of Rehabilitation Science offer a Master of Science in Occupational Therapy degree program. The goal of the Master of Science (OT) is to prepare occupational therapists who possess the requisite knowledge, skills and professional behaviours to practice in the emerging realities of the new health care system and the broader societal context of rapid and constant change, within our local, national and international communities. Students will achieve an understanding of the influence of family, society, culture and environment as they explore the concepts of occupation and health across the lifespan within the context of client-centred practice. The M.Sc. (OT) is a full time course-based Master's degree. Graduates with a strong research interest may be eligible to proceed to thesis-based graduate programs should they wish to do so in the future.

Enquiries: 905 525-9140 Ext. 27829, Admissions Coordinator

Fax: 905 524-0069

Email: otpt@mcmaster.ca

Website: <http://www.fhs.mcmaster.ca/rehab>

Staff / Fall 2009

PROFESSORS

Susan Baptiste, Dip. OT (England), M.H.Sc. (McMaster)

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Cheryl Missiuna, B.Sc.OT (Western), M.Sc (Calgary), Ph.D. (Toronto)

Michael Pierrynowski, B.Sc. M.Sc. (Waterloo), Ph.D. (Simon Fraser)

Debra Stewart, B.Sc. OT (Toronto), M.Sc. OT (McMaster) / Assistant Dean

Joyce Tryssenaar, B.Sc.OT (Western), M.Ed. (Brock), Ph.D.

(Western)/ Part-time

Seanne Wilkins, Dip. P&OT, B.Sc.OT, M.Sc., Ph.D. (Toronto)

ASSOCIATE CLINICAL PROFESSORS

Carol DeMatteo, Dip. P&OT (Toronto), M.Sc. (McMaster)
Nancy Pollock, B.Sc.OT (Queen's), M.Sc. (McGill)

ASSISTANT PROFESSORS

Rebecca Gewurtz, B.Sc. (Toronto), B.Sc.OT (Queen's), M.Sc. (Toronto)
Bonny Jung, B.Sc.OT (Toronto), M.Ed. (Brock)
Monica Maly, B.Sc., M.Sc., Ph.D. (Queen's)
John McCluskie, B.Sc. (Guelph), M.Sc. P.T., M.Sc. MedSci (McMaster)
Brenda Vrkljan, B.A. (Wilfrid Laurier), M.C.Sc. O.T.(Western), Ph.D. (Western)

ASSISTANT CLINICAL PROFESSORS

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Sandra Moll, B.Sc. OT, M.Sc. OT (Western)
Lorie Shimmell, Dip.OT (McMaster), B.H.Sc.OT, M.Sc. (McMaster)

PROFESSOR EMERITI

Penny Salvatori, Dip. P&OT (Toronto), M.H.Sc. (McMaster)
Mary Tremblay, Dip. P&OT (Toronto), M.H.Sc. (McMaster), Ph.D. (SUNY, Buffalo)

Program Requirements

The Master of Science in Occupational Therapy is a full time course-based professional Master's program which meets practice standards and professional accreditation. It prepares students with the knowledge skills and professional behaviours to practice as an entry-level occupational therapist. The program utilizes a problem-based self-directed learning philosophy. Students will complete course work, fieldwork and an independent evidence-based project during their two extended study years, from September to July (Year 1) and September to September (Year 2). Year 1 introduces students to the fundamentals of contemporary Canadian occupational therapy practice, professional frameworks and models of practice. Year 2 provides opportunities for developing more complex skills and preparing for the transition to practice in multiple settings, working with many client populations.

Admission Requirements

To be eligible for admission to the M.Sc. (OT) program, applicants must have completed a four-year baccalaureate degree or the equivalent number of courses (120 units/credits), and have achieved a minimum grade-point average of "B" or 75% or 3.0/4.0 or 8.0/12.0 in their final 60 units of credit. Post-graduate coursework is also considered in this GPC calculation.

Applicants may apply during the fourth year of their degree. In this case, the pre-admission GPA for eligibility purposes is calculated using the most recent 60 units of credit towards their degree. If an applicant in this category is subsequently offered admission to the program, the offer is "conditional" upon successful completion of their four-year degree by June 30 in that year and maintenance of a B average in their final 60 units of credit.

Application Procedure

Applicants are required to apply via the COMPASS.ORPAS online application service located at the Ontario Rehabilitation Sciences Programs Application Service (ORPAS), Guelph, Ontario website: <http://www.ouac.on.ca/orpas/>.

The M.Sc. (OT) International Students Brochure and Application package are available from the M.Sc. (OT/PT) Admissions Office, McMaster University.

The M.Sc. (OT) invites aboriginal applicants to submit applications via the COMPASS.ORPAS online application service located at the ORPAS website: <http://www.ouac.on.ca/orpas/>.

Top ranked applicants (based on GPA) will be invited for a personal interview, which entails a series of seven "mini interviews." Personal qualities and life experiences are assessed at these "mini" interviews. Interviewers are drawn from the faculty, the community, and current students.

Enquiries: 905 525-9140 Ext. 27829, Admissions Coordinator
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Website: <http://www.fhs.mcmaster.ca/rehab>

Courses**617 / Wellness, Health and Occupation: Inquiry and Integration**

This problem based learning and Inquiry course provides students with the opportunity to understand the concepts of wellness, health and occupation, and to become aware of issues which are influencing the direction in which health care is changing. By exploring global health concepts and issues specific to health professions, students will begin to build a sound basis and context which will help develop a professional understanding and awareness relative to occupational therapy. To facilitate evidence-based discussion of these concepts and issues, the process of critical appraisal will be employed throughout.

618 / Wellness, Health and Occupation: Professional Roles and Experiential Practicum

This Term 1 course will focus on developing foundational skills in communication, interviewing, identifying and analysing occupational performance issues, and critical thinking. The course will explore occupation in depth and begin application of the Occupational Performance Process Model, in preparation for occupational therapy practice.

627 / Person, Environment and Occupation: Inquiry and Integration

This Problem Based Learning and Inquiry course will provide students with opportunities to integrate new and existing knowledge of person, environment and occupation through the exploration of problem scenarios developed from real world situations and experiences. Areas of focus include: theoretical underpinnings of practice, ethics, spirituality, development and determinants of occupation.

628 / Person, Environment and Occupation: Professional Roles and Experiential Practicum

The course is designed to provide students with knowledge and skill in assessment and developing intervention strategies for individuals within the environments in which they are working, playing or living and for the occupations in which they engage in the context of their daily lives. The course stems from the Person Environment Occupation model as well as the Canadian Model of Occupational Performance.

637 / Disability, Development and Occupation: Inquiry and Integration

This course is designed to provide students with opportunities to develop an understanding of models for understanding disability, development and occupation through large group discussion and exploration of learning issues developed from problem scenarios. The course will focus on disability theory, models of occupation, and developmental theories.

638 / Disability, Development and Occupation: Professional Roles and Experiential Practicum

This Term 3 course builds on applying the occupational performance process model in a number of clinical scenarios. Course content will move into consideration and understanding of multi-system problems, and clinical problems which illustrate complexity and chronicity. Students will be expected to apply principles of evidence-based practice, critical thinking and clinical reasoning. Areas of focus include: working with children through play and in school settings, home and community practice, group interventions, psychosocial interventions, neurology, and using technology. The course also includes a practicum within a practice setting.

Year 2***717 / Youth and the Development of Self: Inquiry and Integration**

The purpose of this course is to provide students with an opportunity to gain a more in-depth understanding of childhood and adolescence. Students will investigate a variety of factors that may impact on individuals as they experience occupation during their development. Students will participate in large group sessions and problem-based tutorials where theory, family-centred care, legislation and ethics, complexities of practice, emerging occupational therapy roles and multifaceted systems will be explored.

***718 / Youth and the Development of Self: Professional Roles and Experiential Practicum**

This course is designed to provide opportunities for the student to learn advanced practice skills in occupational therapy for children and adolescents. Course content is based on the most prevalent health problems, the most commonly used and evidence-based assessments, interventions and service-delivery models in pediatric occupational therapy. Emphasis will be placed on applying the learning to case-scenarios and more in-depth exploration of roles, models of practice and settings.

***727 / Transition to Practice: Inquiry and Integration V**

This half course is the second part of a series of three half courses which are designed to work together across a full academic year, therefore, their content and design are similar. The emphasis in this term is upon adulthood and disability. The purpose of this half course is to provide the students with opportunities to pursue advanced knowledge and understanding of complex concepts underlying occupational therapy practice with adults and older adults within specialized areas of professional practice. Students will consider, through large group seminar sessions and in-depth exploration within small group problem-based tutorials, issues that pertain particularly to adults and older adults within the scope of occupational therapy practice. Large group seminar and small group tutorial formats are utilized.

***728 / Transition to Practice: Professional Roles and Experiential Practicum V**

This half course is the second part of a series of three half courses with the emphasis in this term upon adulthood and disability. This practically-based half course will provide students with the opportunity to develop advanced practice skills within laboratory and real world situations. The focus of the skills labs will provide access to a broad spectrum of applied practical knowledge, whereas the placements in practice settings will focus more specifically upon areas relative to each student's learning needs. The course coordinator will advise and approve all students' learning plans, which will build upon and enhance those learning plans identified within the Inquiry and Integration course (CHS *727).

***737 / Transition to Practice: Inquiry and Integration VI**

This half course is the third part of a series of three half courses which are designed to work together across a full academic year; therefore, their design is similar. Students will select six areas of study across the three half courses with the emphasis in this term upon the complexities of contemporary practice. The purpose of this half course is to provide the students with opportunities to pursue

advanced knowledge and understanding of complex concepts underlying occupational therapy practice with client populations within specific developmental groups and within specialized areas of professional practice. Students will consider, through large group seminar sessions and in-depth exploration within small group problem-based tutorials, issues that pertain particularly to children, adolescents, adults and older adults within the scope of occupational therapy practice. Large group seminar and small group tutorial formats are utilized.

***738 / Transition to Practice: Professional Roles and Experiential Practicum VI**

This half course is the third part of a series of three half courses with the emphasis in this term upon the complexities of contemporary practice. This practically-based half course will provide students with the opportunity to develop advanced practice skills within laboratory and real world situations. The focus of the skills labs will provide access to a broad spectrum of applied practical knowledge, whereas the placements in practice settings will focus more specifically upon areas relative to each student's learning needs. The course coordinator will advise and approve all students' learning plans, which will build upon and enhance those learning plans identified within the Inquiry and Integration course (CHS *737).

***747 / Transition to Practice: Evidence Based Practice IV**

The course is a half course that runs in Term 4 of the second year of the M.Sc. (OT) PROGRAM. It is organized based on small group learning with facilitators to support each group. The focus is on students refining their skills in searching, appraising, and applying research and other evidence related to practice dilemmas. Each student will present his/her analyses of the evidence on two practice dilemmas. Large group resource sessions will be offered to ensure students gain appraisal skills and knowledge needed to support their work in seminar groups.

748 / Transition to Practice: Evidence Based Practice V

This full course runs in Term 5 of the second year of the M.Sc. (OT) program. It builds on EBP IV *747 in Term 4 and will continue to focus on evaluating the evidence, interpreting the evidence, and more advanced, specific topics pertinent to Evidence Based Practice. It consists of large group resource sessions once per week. The sessions will involve guest experts and resource people who will focus discussion relating EBP to the practice of occupational therapy. Students will have the opportunity to engage in an interactive format and raise issues for discussion. It also includes a Program Evaluation Web Course, an interactive, self-directed web learning experience. Students will also begin their research project which includes a five-week research practicum.

***749 / Transition to Practice: Evidence Based Practice VI**

This half course runs in Term 6 of the second year of the M.Sc. (OT) program. It builds on 748 - Transition to Practice: Evidence Based Practice V, in Term 5. It focuses on synthesizing and disseminating research evidence in Occupational Therapy. It consists of individual research projects that were initiated earlier in the year in Term 5 and completed in Term 6.

Accreditation

The M.Sc. (OT) Program will be accredited by the Canadian Association of Occupational Therapists (CAOT).

Regulation of Practice

All occupational therapists in Canada must be registered with the appropriate provincial regulatory organization in order to practice in that province. Each regulatory body has a separate and distinct registration process; however, in all circumstances, a degree in occupational therapy and successful completion of the CAOT national certification examination are required. In Ontario, graduates from the M.Sc. (OT) Program will be granted a provisional practicing certificate of registration by the College of Occupational Therapists of Ontario (COTO) until they write and pass the Canadian Association of Occupational Therapists (CAOT) examination, at which point a general practicing certificate is granted.

PHILOSOPHY

The Department of Philosophy offers programs leading to the M.A. and Ph.D. degrees.

Part-time M.A. studies are permissible.

Enquiries should be directed to the Department Chair at
905 525-9140, Ext. 24312
Fax: 905 577-0385
E-mail: phlosdep@mcmaster.ca
Website: <http://www.humanities.mcmaster.ca/~philos/>

Staff / Fall 2009

PROFESSORS

Barry Allen, B.A. (Lethbridge), Ph.D. (Princeton)
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Nicholas J. Griffin, B.A. (Leicester), Ph.D. (Australian National)
David L. Hitchcock, B.A. (McMaster), Ph.D. (Claremont)
Wilfrid Waluchow, M.A. (Western), D. Phil. (Oxford) / Senator
William McMaster Chair in Constitutional Studies, Humanities

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Elisabeth Gedge, B.A., M.A. (Alberta), Ph.D. (Calgary),
M.Th. (Newman Theological College) / Chair
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Mark Johnstone, Ph.D. (Princeton)
Stefan Sciaraffa, Ph.D. (Arizona)

ADJUNCT MEMBER

Kenneth Blackwell, B.A. (Victoria), M.L.S. (Western), M.A. (McMaster),
Ph.D. (Guelph) / Honourary Russell Archivist

ASSOCIATE MEMBERS

Caroline Bayard (French)
Dana Hollander (Religious Studies)
Howard Jones (Classics)
Lisa Schwartz (Clinical Epidemiology & Biostatistics)

PROFESSORS EMERITI

G.B. Madison, B.A. (St. Joseph's College, Ind.), M.A. (Marquette),
Ph.D. (Paris)
Evan Simpson, A.B. (Amherst), Ph.D. (Duke)

M.A. Degree

Admission to the M.A. program in Philosophy requires, subject to the general regulations of the School of Graduate Studies, a B.A. with at least B+ standing in Honours Philosophy, or Honours Philosophy in combination with another subject. Other students may be admitted as candidates for the degree upon completion of prerequisite studies prescribed by the Department.

The requirements for the M.A. are: B- standing or better in course work, normally amounting to six one-term courses or the equivalent, and a satisfactory thesis and oral defense on a subject approved by the Department. The Department recommends that students with deficiencies in their undergraduate preparation in Philosophy should remedy these deficiencies through the courses they select. The thesis should demonstrate a capacity for independent study and critical judgement.

Ph.D. Degree

Admission to the Ph.D. program requires an M.A. in Philosophy or an equivalent degree. Selection is made by the Ph.D. Program Committee of the Department of Philosophy, and any student admitted comes under the general regulations of McMaster University.

The normal course load in the doctoral program is six half courses or the equivalent including the Ph.D. research seminar, which is a required course. Candidates are also expected to demonstrate familiarity with the central areas of philosophy.

Students in the program may be required to demonstrate competence in one or more skills which their supervisory committee decides, in consultation with the program officer, is needed for their dissertation (e.g., a language other than English, logic). Also required are successful completion of an Oral Qualifying Examination in which the dissertation proposal is presented; a satisfactory dissertation and oral defense.

A detailed description of the doctoral program is available at <http://www.humanities.mcmaster.ca/~philos/PHD.html>.

Courses

Courses marked with an asterisk (*) are half courses. Topics courses differ in content from year to year and, under different descriptions, may be taken a second time for credit. A topics course may not be taken for credit by a student who has already received credit for the same topic under a course listed in a previous calendar. Candidates should consult the Chair for the specific offerings in a given year. 600-level courses, which are also available to senior undergraduate students at the 400-level, may be offered for graduate credit. Graduate students will be required to complete extra work as detailed in the course outline in addition to that required of undergraduate students.

- *6A03 / Early Modern Philosophy
- *6B03 / Theory of Value
- *6C03 / Philosophy of Constitutional Law
- *6D03 / Twentieth Century Analytic Philosophy
- *6F03 / Recent European Philosophy
- *6I03 / Medieval Philosophy
- *6K03 / Ancient Philosophy

The following 700-level courses are offered for graduate credit:

- *706 / Basic Symbolic Logic
- *720 / Reading Course
- *721 / Reading Course
- *731 / Special Studies in Philosophy
- *743 / Graduate Seminar I
- *744 / Graduate Seminar II
- *750 / Selected Topics in Ancient Philosophy
- *751 / Selected Topics in Medieval Philosophy
- *752 / Selected Topics in Modern British Philosophy (1600-1900)
- *753 / Selected Topics in Early Modern European Philosophy (1600-1800)
- *754 / Selected Topics in Kant
- *755 / Selected Topics in 19th Century European Philosophy
- *756 / Selected Topics in 20th Century European Philosophy
- *757 / Selected Topics in 20th Century British Philosophy
- *758 / Selected Topics in American Philosophy
- *759 / Selected Topics in Applied Ethics
- *760 / Selected Topics in Logic & The Theory of Argumentation
- *761 / Selected Topics in Philosophy of Language
- *762 / Selected Topics in Metaphysics
- *763 / Selected Topics in Epistemology and Philosophy
- *764 / Selected Topics in Social & Political Philosophy

- *765 / Selected Topics in Ethical Theory
 *766 / Selected Topics in Philosophy of Religion
 *767 / Selected Topics in Aesthetics (*Same as Music *710*)
 *768 / Selected Topics in Existential Phenomenology & Hermeneutics
 *769 / Selected Topics in Philosophy of Law
 *770 / Selected Topics in Philosophy of Education
 *771 / Selected Topics in Philosophy of Science

Another course that may be of interest is the following:

HEALTH, AGING AND SOCIETY COURSE

- *710 / Multidisciplinary Perspectives on Aging

PHYSICS AND ASTRONOMY

The Department of Physics and Astronomy provides facilities for students intending to proceed to the M.Sc. and Ph.D. degrees.

Enquiries: 905 525-9140 Ext. 24558

Fax: 905 546-1252

E-mail: physics@mcmaster.ca

Website: <http://www.physics.mcmaster.ca>

Staff / Fall 2009

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 F.R.S.C. / Emeritus

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 Maikel C. Rheinstadter, B.Sc., M.Sc., Ph.D. (Saarland, Germany)

ASSOCIATE MEMBERS

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 Nikolas Provatias (Materials Science and Engineering)

ADJUNCT MEMBERS

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 Wytse van Dijk, B.Sc., Ph.D. (McMaster)

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 I. David Brown, B.Sc., Ph.D. (London)
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 John A. Cameron, B.A. (Toronto), Ph.D. (McMaster)
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 W. Ross Datars, M.Sc. (McMaster), Ph.D. (Wisconsin), F.R.S.C.
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 Robert G. Summers-Gill, M.A. (Saskatchewan), Ph.D. (California)
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 Thomas Timusk, B.A. (Toronto), Ph.D. (Cornell), F.R.S.C.
 James C. Waddington, B.Sc. (Queen's), Ph.D. (McMaster)
 Derek Walton, M.Sc. (Toronto), Ph.D. (Harvard)

M.Sc. Degree

Applicants will be considered for admission to the M.Sc. program if they have a B+ average in the final year of an B.Sc. honours degree in Physics and/or Astronomy, or in a related area. They may apply to follow one of three options. In all options, at most one half 600-level graduate course may be used to fulfill the minimum course requirements.

A. THESIS OPTION

A candidate for the M.Sc. with thesis must complete a minimum of two full graduate courses and present a thesis which embodies the results of original research. This option will normally require between 16 and 24 months for completion.

B. PROJECT OPTION

A candidate for the M.Sc. without thesis must complete a minimum of three full graduate courses and complete a research project. The project may be in an area of research of one of the Department members, or may be related to the teaching of Physics. This option will normally require 12 months for completion.

C. TRANSFER OPTION

Candidates who wish to proceed to the Ph.D. program without completing an M.Sc. may register first in the M.Sc. thesis option, and apply to transfer directly to the Ph.D. after 9 to 20 months. The transfer typically requires the completion of a minimum of two full graduate courses with an average of A-, and the submission of a transfer report for oral examination. Successful applicants may apply all the work accomplished during the M.Sc. to the Ph.D. Unsuccessful applicants must choose one of the other options for completing an M.Sc.

Ph.D. Degree

Applicants will be considered for admission to the Ph.D. program if they have completed a M.Sc. degree in Physics and/or Astronomy (or in a related area) with a B+ average, or are admitted through the M.Sc. transfer option described above.

The minimum course requirement for the Ph.D. is one full graduate course at the 700-level beyond the M.Sc., for a minimum total of 3 full graduate courses in the combined M.Sc. and Ph.D. degrees. The Department expects that most candidates will be required by their supervisory committee to complete more than the minimum number of courses. Two of the four following half courses must be completed in either the M.Sc. or Ph.D.: Physics and Astronomy *739, *740, *746, *750.

All candidates are required to pass an oral Comprehensive Exam and defend a thesis embodying original research. In addition, all graduate students must attend Department colloquia and are expected to attend and participate in seminars relevant to their field of research.

Interdisciplinary Fields and Programs

A. CHEMICAL PHYSICS

This interdisciplinary area of research is supported by the Department of Physics and Astronomy and the Department of Chemistry and is described in section 11 of the Calendar.

Courses

Courses marked with an asterisk (*) are half courses, and courses marked with a pound (#) sign are quarter courses or modules. Courses marked with a plus sign (+) may differ in content from year to year and may be taken more than once. Not all courses listed are offered in a given year—please consult the department for current offerings.

The following 600-level courses, which are available to senior undergraduate students, may also be offered for graduate credit. Graduate students in 600-level courses will be required to complete extra work in addition to that required of undergraduate students in the corresponding 400-level course (e.g. lab assignment, extra questions on assignments), the nature of which will depend on the instructor.

*6B03/ Electromagnetic Theory

Potential theory, electrostatics and magnetostatics in matter, electrodynamics, electromagnetic waves and wave guides, radiation from dipoles; Special Relativity and electromagnetism.

*6E03 / Nuclear Physics

Nuclear masses and stability; radioactivity and nuclear reactions; elementary nuclear models.

*6F03 / Quantum Mechanics

A sequel to Physics 3MM3, including general structure of quantum mechanics, matrix mechanics, scattering, perturbation theory and the variational method.

*6G03 / Computational Physics (Same as Computational Engineering & Science *6G03)

A course using computers to solve selected problems in physics. The emphasis is in applying a range of computational methods to physics, rather than numerical methods or computer programming.

*6K03 / Solid State Physics

Crystal structure and binding; lattice vibrations; electron energy bands; metals and semiconductors; magnetism.

*6S03 / Introduction to Molecular Biophysics (Same as Biochemistry *6S03)

Overview of the field of biophysics and its influence on molecular biology. Topics include: structure, elasticity, and mobility of biomolecules; molecular motors; mechanical properties of cells; mobility of bacteria; cell adhesion. We will discuss both theoretical aspects (statistical mechanics models for structure and folding of DNA, RNA and proteins) and experimental techniques (optical tweezers, AFM, fluorescence, etc).

The following 700-level courses are offered for graduate credit. Among these, *729, *730, *739, *740, *746, and *750 are offered every year. Many courses are offered on a 2 or 3 year rotation. Other courses may be offered according to demand.

#715 / Incompressible Computational Fluid Dynamics (Same as Computational Engineering and Science #715)

We survey standard numerical methods for the solution of the incompressible fluid equations. Numerical properties of both the primitive (velocity-pressure) and nonprimitive (streamfunction-vorticity) formulations analyzed. Particular attention is given to various discretization techniques, such as the use of staggered grids, explicit/implicit time-stepping and spectral approximation. Additionally, certain more advanced computational techniques will be mentioned, for instance, mesh generation in complicated domains, fast solvers (FFT, multigrid, wavelet) and high-order compact schemes. Approaches alternative to grid-based techniques such as Lagrangian particle methods will also be briefly introduced. Computer codes representing solution of some simple problems will be presented.

#716 / Mathematical Introduction to Fluid Mechanics (Same as Computational Engineering and Science #716)

We derive the Euler and Navier-Stokes equations from the first principles of continuum mechanics. Mathematical properties of these systems of equations are discussed, such as the boundary conditions, potential and rotational flow and representation of the equations in different coordinate systems. We also briefly consider shocks, boundary layers and turbulence as well as the limits of small and large Reynolds number. Finally, we survey analytical solutions of the Euler and Navier-Stokes equations.

#719 / Compressible Computational Fluid Dynamics (Same as Computational Engineering and Science #721)

Numerical methods for the solution of equations governing the motion of compressible fluids. The course focuses on modelling features common to high Mach number and compressible gas flows such as the development of shocks and discontinuities. Approaches include Eulerian and Lagrangian methods, explicit artificial viscosities, flux correction and averaging, Godunov-type methods and discrete and semi-discrete schemes. Computer models in one and higher dimensions will be developed and used to compare methods on problems such as steepening waves, shock tubes and blast waves.

*721 / Nuclear Physics

Nuclear masses, moments, and gamma transitions. Single- and multi-particle models of nuclear structure.

+*724 / Advanced Topics in Nuclear Physics

Examples of possible topics: applications of many-body techniques to nuclear structure and nuclear matter; experimental methods; medium energy phenomena; theory of nuclear reactions.

*729 / Condensed Matter Physics I

Principles of condensed matter physics: a comprehensive survey of electronic and transport properties of solids with emphasis on crystalline forms.

*730 / Condensed Matter Physics II

Principles of condensed matter physics: a comprehensive survey of vibrational and magnetic properties of solids. Prerequisite: Physics and Astronomy *729.

***731 / Condensed Matter Theory**

Many-body Green's function theory. Equations of motion, boundary conditions, Feynman diagrams and rules for the perturbation theory. Applications to electron systems, magnetism and photons.

+*734 / Special Topics in Condensed Matter Physics

Topics, which could differ from year to year, include at the introductory level, group theory, neutron scattering, crystallography, applied superconductivity, quasicrystals, experimental techniques, modern optics, disordered systems, etc. One term covers three topics with different lecturers.

***735 / Superconductivity**

Survey of superconductivity with emphasis on the high T_c oxides. The Cooper pair problem, BCS theory, thermodynamic properties, anisotropy, energy dependence of the electronic density of states. The electron-photon interaction and other mechanisms.

***737 / Quantum Field Theory I**

Relativistic quantum field theory and its application to the standard model in the tree-level: quantization of relativistic fields; perturbative theory and Feynman diagram; S-matrix; introduction to gauge theories and the standard model; calculation of cross sections in the tree level.

***738 / Quantum Field Theory II**

Quantum field theory beyond the tree-level approximation: radiative corrections; renormalization group methods; critical phenomena; anomalies; topological defects and non-perturbative methods.

***739 / Advanced Quantum Mechanics I**

General principles of quantum mechanics. Potential problems and symmetry, rotations and angular momentum, potential scattering, time-independent perturbation theory, spin, identical particles and second quantization.

***740 / Advanced Quantum Mechanics II**

(Although it is usually taken after Physics and Astronomy *739, this course may be taken on its own by students who demonstrate sufficient background knowledge.) Clebsch-Gordan coefficients, the Wigner-Eckart theorem, time-dependent perturbation theory, quantization of fields, relativistic quantum mechanics, path integral formulation, modern topics.

***746 / Advanced Classical Electrodynamics**

Basic theory of radiation fields, radiative transfer, radiation from moving charges, relativistic covariance and kinematics, synchrotron radiation, Compton scattering, plasma effects, Cherenkov radiation, multiple scattering.

+*747 / Special Topics in Theoretical Physics I

This course will cover special topics in theoretical physics, taught as opportunity arises by physicists at McMaster or one of the institutions in the surrounding area (University of Guelph, Perimeter Institute for Theoretical Physics, University of Toronto, University of Waterloo, University of Western Ontario, York University).

+*748 / Special Topics in Theoretical Physics II

This course will cover special topics in theoretical physics, taught as opportunity arises by physicists at McMaster or one of the institutions in the surrounding area (University of Guelph, Perimeter Institute for Theoretical Physics, University of Toronto, University of Waterloo, University of Western Ontario, York University).

+*749 / Special Topics in Theoretical Physics III

This course will cover special topics in theoretical physics, taught as opportunity arises by physicists at McMaster or one of the institutions in the surrounding area (University of Guelph, Perimeter Institute for Theoretical Physics, University of Toronto, University of Waterloo, University of Western Ontario, York University).

***750 / Statistical Mechanics**

Statistical ensembles. Entropy and density of states. Application of canonical and grand canonical ensembles to simple physical systems. Thermal properties of a Fermi gas. Bose condensation. Superfluidity of liquid helium. Phase transitions. Fluctuations, the Fluctuation-Dissipation, and Wiener-Khinchine theorems. Liquids and dense gases.

***753 / Advanced Statistical Mechanics**

The course is devoted to phase transitions and critical phenomena. Recent topics have included scaling laws, the renormalization group, statistical mechanics in one and two dimensions, and the statistical mechanics of fluids.

***755 / Physical Properties of Polymers**

This course is intended to be an introduction to the fundamental topics in polymer physics. Topics include polymer chain conformations, elasticity of polymer chains and networks, excluded volume effects, polymer mixtures and phase behaviour, polymer crystallisation, polymer dynamics and the glass transition, mechanical properties like viscoelasticity, non-Newtonian flow, yield processes and fracture. Current research topics such as polymer self-assembly, morphologies and polymer thin films will be discussed.

756 / Special Topics in Biophysics*(Same as Computational Engineering & Science *757)**

The course will emphasize the links between statistical physics and biology, focusing on the design and use of computational models. Students will learn to design and simulate their own models. Topics will include: rugged fitness landscapes in molecular evolution; autocatalytic chemical reactions; self-organized criticality; evolutionary game theory; cellular automata.

***760 / High Energy Physics**

A qualitative description of particle physics. Basic particles and interactions, the quark model, chromodynamics, electroweak interaction, grand unified theories.

#761 / Introductory Astrophysics I

The physics of light and radiative transfer as applied to astrophysical situations; an overview of the tools and techniques of observational astronomy at all wavelengths; an introduction to astrophysical objects.

#762 / Introductory Astrophysics II

An introduction to astrophysical objects; an introduction to the structure in the universe and its formation. Intended for students who have completed Introductory Astrophysics I.

#763 / High Energy Astrophysics

A review of major topics in high energy astrophysics: X-ray and gamma ray observational techniques, physical processes for producing X-ray and gamma rays in astrophysical contexts, and the objects which emit at high energy wavelengths.

#764 / Nuclear Astrophysics

An introduction to the many connections between atomic nuclei and different areas in astrophysics, ranging from energy generation to nucleosynthesis, with emphases on both present knowledge and current research questions. Topics include elemental abundances, reaction rates, Big Bang nucleosynthesis, hydrogen and helium burning, solar neutrinos, advanced burning stages, supernovae, nucleosynthesis beyond iron, and selected experimental techniques.

#765 / Advanced Stellar Astronomy

A detailed look at stellar structure and evolution, including discussion of rotation, pulsation and binary stars.

#766 / Statistics in Astronomy

An introduction to statistical methods necessary for the evaluation of observations and the analysis of theoretical models. Topics include an introduction to robust methods, goodness-of-fit statistics, Bayesian analysis, differential and cumulative distributions and their comparison (the Kolmogorov-Smirnov test), and Monte Carlo techniques.

#768 / Observational Cosmology

A detailed overview of the principal observations that constrain our understanding of cosmology and the overall evolution of galaxies in the universe.

#769 / Optical and Infrared Instrumentation and Observational Techniques

Optical and infrared telescopes and instrumentation; observational and data analysis techniques; signal-to-noise prediction and evaluation; observing proposal requirements; data reduction best practices.

#770 / Radio and Far Infrared Instrumentation and Observational Techniques

Observational, calibration, and analysis techniques for single dish radio data; principles of radio interferometry; current space missions in the far-infrared; signal-to-noise prediction and evaluation; observing proposal requirements.

#773 / Education and Teaching in Physics

A profession in physics education is a common outcome for students with a graduate degree in Physics and Astronomy. This course is designed to provide an opportunity to discuss physics education research (PER) with peers. The course will be based on discussions of key papers in PER and lectures by invited speakers. Students will receive a pass/fail grade and this module will not count towards the required number of units for completion of the graduate program.

#775 / Planetary Astronomy

A current survey of the planets and planetary systems with attention to key processes in substellar objects and the solar system. Topics include dynamics, resonances and orbital evolution; energy transport; planetary atmospheres; an overview of mineralogy, geology, tectonics and surface morphology; impact cratering; planetary interior structure; meteorites, asteroids, comets and dust; moons, tides and rings; planet formation and extrasolar planets.

#776 / Theoretical Cosmology

This course aims to provide the theoretical foundations for the modern understanding of cosmology. Starting from a brief review of general relativity and a discussion of Friedmann models, the course lays out the main features of the Hot Big Bang model of the early universe, including the physics of the early universe at different epochs, the formation of structure, the evidence for (and ideas about the origin of) dark matter and dark energy.

#778 / Star Formation

A review of the major processes involved in star formation. Observations theory, and computational studies will be combined to give a complete modern picture of this complex process. Topics include the dynamics and structure of molecular clouds, turbulent fragmentation, gravitational collapse, the formation of protostellar disks and outflows, spectral energy distributions, multiple star formation, the initial mass function, and the formation of massive stars.

#781 / Galactic Dynamics

A theoretical underpinning of dynamical systems in astronomy. This includes stellar dynamics in star clusters, galaxies, and clusters of galaxies. Stability of dynamical stellar systems. Applications to galactic structure such as spiral waves, globular clusters, dynamics in elliptical galaxies, galactic mergers, and the dynamical influence of massive black holes on galaxies.

#782 / Galactic Astronomy

Observed internal properties and structure of the Milky Way galaxy; stellar populations in galaxies; observational properties of normal, active, and peculiar galaxies.

#785 / Interstellar Medium

Observational and theoretical understanding of the interstellar medium in the Milky Way galaxy; the diffuse interstellar medium; molecular clouds and cloud cores; structure of HII regions and photon dominated regions.

+ #788 / Special Topics in Astrophysics

Specialized topics in astrophysics that will change from year to year. Examples of current interesting topics are gamma ray astronomy, high-energy astrophysics, star formation physics, variable stars, solar seismology, particle physics and cosmology, and globular cluster systems around galaxies.

The following two courses, offered by the Department of Engineering Physics, are often taken by Physics and Astronomy graduate students and form a core for students in modern optics.

Eng Phys *721 - Lasers and Laser Physics I

Eng Phys *722 - Lasers and Laser Physics II

Research in Physics and Astronomy

Opportunities for research are described in detail on the web at <http://www.physics.mcmaster.ca/>. The areas of research are concentrated in the following fields:

Astrophysics - A. Chen, H. Couchman, W. Harris, J. Kavelaars, L. Parker, R. Pudritz, A. Sills, P. Sutherland, E. Vishniac, J. Wadsley, D. Welch, C. Wilson.

Atomic, Molecular, and Optical - P. Corkum, H. Haugen, A. Madej, D. O'Dell, J. Preston.

Computational and Theoretical Physics - J. Berlinsky, R. Bhaduri, C. Burgess, J. Carbotte, H. Couchman, C. Kallin, S. Lee, Y. Nogami, R. Pudritz, A. Sills, E. Sorensen, D. Sprung, P. Sutherland, W. van Dijk, J. Wadsley.

Condensed Matter Physics - J. Berlinsky, J. Carbotte, M. Collins, W. Datars, B. Gaulin, T. Imai, C. Kallin, S. Lee, G. Luke, E. Sorensen, T. Timusk, D. Venus, D. Walton.

Soft Condensed Matter of Biophysics - K. Dalnoki-Veress, C. Fradin, P. Higgs, N. Provatas, M. Rheinstadter, A. Shi.

In addition, J. Waddington and A. Chen work in **Nuclear Physics Experiment**.

Facilities for Research

Excellent research facilities are available for research in Physics and Astronomy. In addition to the research laboratories of individual faculty, there are shared facilities on campus, and a consistent history of access to national and international facilities. Many faculty in condensed matter physics and optics are members of the Brockhouse Institute for Materials Research (described in section 7.7), and therefore have access to electron microscopes, an atomic force microscope, x-ray diffraction equipment, materials preparation facilities, a He liquifier and the best crystal growing facilities in Canada. McMaster is half-owner of a neutron spectrometer at Chalk River and has regular access to neutron scattering facilities elsewhere. McMaster is an associate member of the TRIUMF National Laboratories in Vancouver; faculty are involved in condensed matter and nuclear (astro) physics studies there. The nuclear physics group has an 8π gamma ray spectrometer permanently installed at TRIUMF, and access to other laboratories worldwide. The astronomers frequently use the Canada-France-Hawaii optical telescope, the James Clerk Maxwell millimetre telescope, the Cerro Tololo Observatory, the Kitt Peak Observatory and the Owens Valley Radio Observatory. Theorists connected to all these groups benefit from the SHARC-NET supercomputer network and the many powerful UNIX-based computers and workstations operated by the Department.

PHYSIOTHERAPY

The Faculty of Health Sciences Graduate Program and the School of Rehabilitation Science offer a Master of Science degree program in Physiotherapy. The Master of Science in Physiotherapy will prepare students with the knowledge, skills and professional behaviours to practice as an entry level physiotherapist in a variety of health care and community settings. The M.Sc. (PT) is a full-time course-based Master's degree. Its curriculum is based on the principles of problem-based, small group, self-directed learning. Students will learn to integrate theory, evidence and practice to become evidence-based practitioners in the present and future health care environment. Graduates with a strong research bias may be eligible to proceed to thesis-based graduate programs should they wish to do so in the future.

Enquiries: 905 525-9140 Ext. 27829, Admissions Coordinator
 Fax: 905 524-0069
 Email: otpt@mcmaster.ca
 Website: <http://www.srs-mcmaster.ca>

Staff / Fall 2009

PROFESSORS

Patricia Solomon, Dip.PT (Manitoba), M.H.Sc. (McMaster), Ph.D. (Waterloo)
 Paul Stratford, Dip. PT (Mohawk), M.Sc. (McMaster)

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 Laurie Wishart, Dip. P&OT (Toronto), B.Sc. PT. (Toronto), M.Sc., Ph.D. (McMaster)

ASSOCIATE CLINICAL PROFESSOR

Anita Gross, Dip. Man. Therapy, B.Sc. PT (Toronto), M.Sc. (McMaster)

ASSISTANT PROFESSORS

Liliana Coman, M.D. (Bucharest), M.Sc. (Waterloo), B.H.Sc.PT (McMaster)
 Norma MacIntyre, B.Sc. PT (Toronto), M.Sc. (Western), Ph.D. (McMaster)
 Monica Maly, B.Sc., M.Sc., Ph.D. (Queen's)
 John McCluskie, B.Sc. (Guelph), M.Sc. PT, M.Sc. MedSci (McMaster)
 Bronwen Thomas, B.Sc.PT (Western), M.Sc. PT (Western)
 Christopher Winn, B.Sc. Kinesiology (Simon Fraser), M.Sc. PT (McMaster)
 Linda Woodhouse, B.A. (Western), B.Sc.PT (Toronto), M.A. (Western), Ph.D. (Toronto)

PROFESSOR EMERITI

Jean Wessel, B.Sc. PT (McGill), M.H.Sc. (McMaster), Ph.D. (Alberta)
 Renee Williams, Dip. P&OT (Toronto), M.H.Sc. (McMaster), Ph.D. (Waterloo)

Program Requirements

The Master of Science (PT) will meet professional accreditation and practice standards. Students will complete course work, clinical placements and an independent research project. All students will be required to complete the equivalent of 23 half-courses over 6 terms of full-time study across two extended study years.

Admission Requirements

To be eligible for admission to the M.Sc. (PT) program, applicants must have completed a four-year baccalaureate degree or the equivalent number of courses (120 units/credits), and have achieved a minimum grade-point average of "B" or 75% or 3.0/4.0 or 8.0/12.0 in their final 60 units of credit. Post-graduate coursework is also considered in this GPA calculation.

Applicants may apply during the fourth year of their degree. In this case, the pre-admission GPA for eligibility purposes is calculated using the most recent 60 units of credit towards their degree. If an applicant in this category is subsequently offered admission to the program, the offer is "conditional" upon successful completion of their four-year degree by June 30 in that year, and maintenance of a B average in their final 60 units of credit.

Additional requirements include:

- a minimum of one biological or life science course at any level with a grade of at least B (75%) or higher
- a minimum of one social science or humanities course at any level with a grade of at least B (75%) or higher

Please see program website for more details regarding prerequisites.

Application Procedure

Applicants are required to apply via the COMPASS.ORPAS on-line application service located at the Ontario Rehabilitation Sciences Programs Application Service (ORPAS), Guelph, Ontario website: <http://www.ouac.on.ca/orpas/>.

The M.Sc. (PT) International Students Brochure and International Students application package are available from the M.Sc. (OT/PT) Admissions Office, McMaster University.

The M.Sc. (PT) invites aboriginal applicants to submit applications via the COMPASS.ORPAS on-line application service located at the ORPAS website: <http://www.ouac.on.ca/orpas/>.

Top ranked applicants (based on GPA) will be invited for a personal interview, which entails a series of 7 "mini interviews." Personal qualities and life experiences are assessed at these "mini interviews." Interviewers are drawn from the faculty, the community, and current students.

Enquiries: 905 525-9140 Ext. 27829, Admissions Coordinator,
 Fax: 905 524-0069
 Email: otpt@mcmaster.ca
 Website: <http://www.srs-mcmaster.ca/>

Courses

611 / Fundamentals of Physiotherapy Practice/ Problem-based I

This Unit 1 tutorial course will introduce students to assessment, treatment and prevention of movement disorders of the upper extremity and cervical spine. There will be an introduction to the assessment of the cardiorespiratory and neurological systems. Psychosocial, cultural and ethical influences on physiotherapy assessment and treatment will be addressed.

***612 / Fundamentals of Physiotherapy Practice/ Clinical Laboratory I**

This Unit I clinical skills course focuses on the clinical assessment, diagnosis and treatment of upper extremity and cervical spine problems. The labs integrate relevant human biology, biomechanics, clinical skills and measurement concepts.

613 / Professional Issues in Physiotherapy Practice

This 1st year course will cover issues common to Physiotherapy Practice. Topics include: communication, evidence-based practice, functional movement, models of practice, and professionalism. This course is offered over three terms of study.

***621 / Fundamentals of Musculoskeletal Practice/ Problem-based II**

This Unit II course will provide an overview of physiotherapy assessment and management of common, musculoskeletal disorders of the lower extremity and the lumbar spine. Epidemiological and clinical measurement concepts will be introduced.

***622 / Fundamentals of Musculoskeletal Practice/Clinical Laboratory II**

This Unit II clinical skills course focuses on the clinical assessment, diagnosis and treatment of the lower extremity and the lumbar spine. The labs integrate relevant human biology, biomechanics, clinical skills and measurement concepts.

***624 / Physiotherapy Clinical Practice I**

This Unit II clinical practice course will provide the opportunity for students to interview, assess and design treatment programs for clients with musculoskeletal conditions in a clinical setting. Clinical facilities may include community, hospital and private practice settings. This course is evaluated on a Pass/Fail basis.

***631 / Fundamentals of Cardiorespiratory and Neurological Practice/Problem-based III**

This Unit III tutorial course will introduce students to physiotherapy assessment and management of common cardiac and pulmonary conditions. There will also be an introduction to physiotherapy assessment and management of neurological clients focusing on stroke and spinal cord injury.

***632 / Fundamentals of Cardiorespiratory and Neurological Practice/Clinical Laboratory III**

This Unit III clinical skills course will provide students with the clinical problem-solving skills to assess and treat clients with cardiorespiratory and neurological disorders (stroke, spinal cord injury). Students will use measures and models of practice to design physiotherapy management goals. Students will study relevant anatomical and physiological concepts.

***634 / Physiotherapy Clinical Practice II**

This Unit III clinical practice course will provide the opportunity for students to apply physiotherapy assessment and management skills with clients who may present with musculoskeletal, neurological and/or cardiorespiratory conditions in a clinical setting. Clinical facilities may include community, hospital and private practice settings. This course is evaluated on a Pass/Fail basis.

Year 2

***711 / Advanced Neurological Physiotherapy Practice— Problem-based IV**

This Unit IV tutorial course will further develop the knowledge, skills and behaviours that are essential for physiotherapy management of clients with neurological disorders across the lifespan. Theories of movement control and execution, neuroplasticity and development will be examined and combined with critical evaluation of the clinical literature to determine effective and efficient physiotherapy management.

***712 / Advanced Neurological Physiotherapy Practice—Clinical Laboratory Course**

The purpose of this Unit IV clinical laboratory course is to provide students with the advanced clinical reasoning and skills to assess and treat individuals with neurological disorders. Students will use standardized measures and models of practice to design physiotherapy goals and implement management.

713 / Research and Evidence-based Practice

This 2nd year course will enable students to critically analyse the literature and engage in a research project to evaluate measures and interventions relevant to physical therapy. Students will be provided with information on study design, data acquisition and data analysis. They will acquire skills in searching the literature, analysing and interpreting data, presenting results and making clinical decisions that incorporate best evidence, patient values and clinical expertise. This course is offered over three terms of study.

***714 / Physiotherapy Clinical Practice III**

This Unit IV clinical practice course will provide the opportunity for students to apply physiotherapy assessment and management skills with clients who may present with musculoskeletal, neurological and/or cardiorespiratory conditions in a clinical setting. Clinical facilities may include community, hospital and private practice settings. Prior to completing the full-time two-year program, students will gain experience in musculoskeletal, neurological and cardio respiratory practice settings. This course is evaluated on a Pass/Fail basis.

***721 / Community-based Physiotherapy—Problem-based V**

This Unit V problem-based course will provide an opportunity for students to explore the physiotherapeutic management of chronic conditions in established and emergent community roles in the context of various practice/health care environments. Students will learn skills that require them to diverge from a therapeutic role to that of a consultant and educator. Epidemiologic concepts such as natural history, risk assessment and causality will be a focus for this course.

***722 / Community-based Physiotherapy —Laboratory V**

This Unit V laboratory course will provide an opportunity for students to acquire the skills needed as a physiotherapist in community practice, such as those of an educator and consultant. These skills will be applied to people with a wide range of conditions.

***724 / Physiotherapy Clinical Practice IV**

This Unit V clinical practice course will provide the opportunity for students to apply physiotherapy assessment and management skills with clients who may present with musculoskeletal, neurological and/or cardiorespiratory conditions in a clinical setting. Clinical facilities may include community, hospital and private practice settings. Prior to completing the full time two-year program, students will gain experience in musculoskeletal, neurological and cardiorespiratory practice settings. This course is evaluated on a Pass/Fail basis.

***731 / Integrated Physiotherapy Practice —Problem-based VI**

This Unit VI tutorial course is designed to enable students to assess and manage clients with complex health problems involving multiple systems and a range of health care issues. Students are expected to utilize both previous and new knowledge and skills to design, implement and evaluate effective physical therapy treatment.

***732 / Integrated Physiotherapy Practice —Laboratory VI**

This Unit VI laboratory course is designed to enable students to assess and manage clients with complex health problems involving multiple systems and a range of health care issues. Incorporating principles of client-centred practice and evidence-based practice, students will learn to use physiotherapy management strategies designed to mesh with those of other health care practitioners to result in an outcome that best meets the clients' needs and personal values.

***734 / Physiotherapy Clinical Practice V**

This Unit VI clinical practice course will provide the opportunity for students to apply physiotherapy assessment and management skills with clients who may present with musculoskeletal, neurological and/or cardiorespiratory conditions related to complex health problems in a variety of health care environments. Prior to completing the full time two-year program, students will gain experience in musculoskeletal, neurological and cardiorespiratory practice settings. This course is evaluated on a Pass/Fail basis.

***735 / Professional Transition**

This Unit VI course is designed to provide students with the opportunity to examine current issues within the physiotherapy profession related to the health care system and the physiotherapy role within the system. Students will also learn management and business skills to enable them to create an effective practice environment upon graduation.

Accreditation

The M.Sc. (PT) Program is accredited by the Accreditation Council of Canadian Physiotherapy Academic Programs (ACCPAP).

Regulation of Practice

All physiotherapists in Canada must be registered with the appropriate provincial regulatory body in order to practice in that province. Each regulatory body has a separate and distinct registration process; however, in all circumstances, a degree in physiotherapy is required. In Ontario, successful completion of the Physiotherapy Competence Examination (PCE) is also required.

POLITICAL SCIENCE

The Department of Political Science offers graduate programs leading to the M.A. and Ph.D. degrees.

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 / LIUNA/Mancinelli Professor of Global Labour Issues / Chair
 Tony Porter, B.A. (McGill), M.A., Ph.D. (Carleton)
 Richard Stubbs, B.Sc. (Wales), M.A. (Lancaster), Ph.D. (Alberta)
 Donald M. Wells, B.A. (Western), M.A. (British Columbia), Ph.D. (Toronto)
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 Robert C.A. Andersen (Sociology), B.A. (Western), M.A. (Oxford, Honorary), Ph.D. (McMaster)
 Scott Davies (Sociology), B.A. (Toronto), M.A. (McMaster), Ph.D. (Toronto)
 John Lavis (Clinical Epidemiology & Biostatistics), M.D. (Queen's), M.Sc. (London School of Economics), Ph.D. (Harvard)

PROFESSORS EMERITI

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 William M. Chandler, B.A. (Cornell), Ph.D. (North Carolina)
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 Mark Sproule-Jones, B.Sc. (Econ) (London), M.A., Ph.D. (Indiana)
 / V.K. Coppins Chair in Urban Studies
 Michael B. Stein, B.A. (McGill), M.A., Ph.D. (Princeton)

M.A. Degree in Political Science

Admission to the M.A. in Political Science degree program requires an average of B+ or better in Honours Political Science or, with the approval of the Department's Graduate Chair, in another discipline. The Department offers a regular M.A. in Political Science program in four areas: Canadian Politics, Comparative Politics, Political Theory and Public Policy. There is also a Collaborative M.A. Program with the University of Guelph in Public Policy and Administration.

In the regular M.A. in Political Science program, studies in all areas may take the form of course work and comprehensive examinations, or course work and a thesis.

A. COURSE WORK WITH COMPREHENSIVE EXAMINATIONS

Six half courses (or equivalent) at the graduate level and written comprehensive examinations. Normally 3 half courses are taken during the Fall term and 3 half courses during the Winter term. The comprehensive examinations are written in the latter half of July. Students are responsible for one major (two subfields) and one minor (one subfield) area chosen from: Canadian Politics, Comparative Politics, International Relations, Political Theory, and Public Policy and Administration.

B. COURSE WORK WITH THESIS

Five half courses (or equivalent) and a thesis, which must demonstrate independent research skills. Full-time students who wish to write a thesis must submit a thesis proposal for departmental approval by a date to be determined by the Department. If the thesis proposal is not approved, students may continue in the course/comprehensive option. The thesis option is normally a two-year program.

C. PUBLIC POLICY AND ADMINISTRATION

The Public Policy and Administration Program is offered in collaboration with the Department of Political Science at the University of Guelph. Students concentrating in this area must satisfy the following requirements:

- Six half courses (or equivalent) at the graduate level including *783 - Comparative Public Policy, *794 - Public Policy and Administration Research Seminar, *784 - Statistical Analysis for Public Policy and either *785 - Public Sector Management or *786 - Organizational Theory and the Public Sector.
- The two half year courses beyond those required may be taken on either campus or, with the approval of the Graduate Advisor, up to six units (2 half courses) may be taken from an allied discipline at the McMaster campus; and
- Written comprehensive examinations in the major field of Public Policy and Administration with a minor field of Canadian Politics, Comparative Politics, International Relations or Political Theory.

M.A. in International Relations

Admissions to the M.A. in International Relations degree program requires an average of B+ or better in Honours Political Science or with the approval of the Department's Graduate Chair, in another discipline. The Department offers two streams in this M.A. program: (1) Global Politics; and (2) Global Political Economy. Students must indicate the stream in which they wish to major in their application.

Students in the M.A. in International Relations program are required to complete:

- Four International Relations courses; three in major stream, one other International Relations course
- One additional graduate course
- One M.A. in International Relations Colloquium course
- Major Research Paper (10,000 words)

Normally, completion of the M.A. in International Relations will take one year.

Ph.D. Degree

The Department of Political Science at McMaster University offers the Ph.D. degree in the fields of Comparative Public Policy and International Relations.

The public policy specialization will include courses and comprehensive examinations in:

- Approaches and methods for policy analysis
- A Policy field
- And at least two political systems (one of which may be Canada)

The international relations specialization will include courses and comprehensive examinations in:

- International Relations Theory
- International Political Economy
- Globalization and Transnationalism

Graduands can expect to be qualified to conduct research and teach at the university level in comparative public policy or in international relations and in one other field of political science in Canada.

A. ADMISSION PROCEDURES

Admission to the Ph.D. program normally will require an M.A. degree with an average of at least an A- from a recognized university. Applicants must complete the required online McMaster Admission Form, arrange to have 3 academic references submitted to the Department, and submit a 500 word statement of their research interests and reasons for choosing McMaster University for their Ph.D. degree in Political Science. **The deadline for submission of applications is February 1.**

B. DEGREE REQUIREMENTS

Normally, candidates for the Ph.D. will:

- Complete 18 units (6 half courses) of course work beyond the M.A. level, including the following required courses:

For Students in Public Policy

- *783 / Comparative Public Policy
- *784 / Statistical Analysis for Public Policy
- *796 / Research Design and Methods

For Students in International Relations

- *772 / Theories of International Politics
- *774 / Global Political Economy
- *796 / Research Design and Methods

Other approved courses will be drawn from other departmental courses, and courses offered by other departments and schools.

All courses are half courses (three units) unless otherwise specified.

- Demonstrate reading and research competence in French or in an approved language other than English.
- Complete the required comprehensive examinations in Public Policy or International Relations and one other field; and
- Submit a thesis on an approved subject and defend it by oral examination.

C. SUPERVISORS AND SUPERVISORY COMMITTEES

Successful applicants will be assigned a temporary supervisor of studies upon admission. Not later than six months following arrival, a supervisory committee for each Ph.D. student will be appointed by the Graduate Committee, on the recommendation of the student and a willing thesis supervisor. This committee will consist of at least three members: a thesis supervisor, one other member of the Department and a third member, whose scholarly interests include the area of the student's main interest, and who may be from outside the Department.

D. COMPREHENSIVE EXAMINATIONS

Students in the Ph.D. program will write comprehensive examinations in two fields:

For Students in Comparative Public Policy

Students will write comprehensive examinations in two fields -- public policy and a second field drawn from one of Canadian politics, comparative politics, international relations or political theory.

Major Field 1

In the Public Policy field, students will write examinations in two of three subfields of public policy:

- Theories and approaches to comparative public policy
- Administration, implementation and institutions
- International dimensions of public policy

In addition to these examinations but still part of the major field, students must write a major paper that provides a review of current literature on the politics of a specialized policy area. This paper will provide a basis for evaluating substantive knowledge of a policy area in at least two political systems. Normally, this paper must be submitted prior to the written comprehensive examinations.

Major Field 2

To be selected from Canadian politics, comparative politics, international relations, or political theory.

Normally, students will write their comprehensive examinations in December of their second year. Accordingly, the major paper that comprises part of the Comparative Public Policy field will be due in December of that year.

For Students in International Relations

Students will write comprehensive examinations in two fields -- international relations and a second field drawn from one of Canadian politics, comparative politics, political theory, or public policy.

Major Field 1

In the International Relations field, students will write examinations in two of the following subfields of international relations:

- International relations theory
- International political economy
- Globalization and transnationalism

In addition, students must write a major paper that provides a review of current literature in an area of international relations approved by the Ph.D. core group. Normally, this paper must be submitted prior to the written comprehensive examinations.

Major Field 2

To be selected from Canadian politics, comparative politics, political theory, or public policy.

Normally students will write their comprehensive examinations in December of their second year. Accordingly, the major paper that comprises part of the International Relations field will be submitted in December of that year.

E. OTHER REGULATIONS

Applicants should consult the Graduate Calendar for a complete listing of Regulations for the Degree Doctor of Philosophy.

Courses for the M.A. in Political Science and the Ph.D.

Courses marked with an asterisk (*) are half courses. The following courses are offered for graduate credit. The 600-level courses are also available to senior undergraduate Honours students. Graduate students normally may take no more than one 600-level course (or equivalent). A student may take only two half courses (or equivalent)

offered by another department in the University. Not all courses are offered each academic year. The list of courses to be offered in the following academic year can be obtained from the Department of Political Science after March.

COMPARATIVE POLITICS

- *702 / Social Policy Transformations / A. Gildiner, P. Graefe, M. Hering
- *740 / Theories of Comparative Politics / K. Bird, Staff
- *741 / Comparative Politics of Social Movements and Political Parties / D. Wells, Staff
- *742 / Politics of Developing Areas / N. Galleguillos
- *744 / Politics of Western Democracies / Staff
- *746 / Issues in Comparative Politics / Staff
- *748 / Democracy and Diversity: Multicultural Policies in Comparative Perspective / K. Bird
- *769 / The Political Economy of East Asia / R. Stubbs
- *788 / Comparative Foreign Policy: Canadian and U.S. Foreign Policy / L. Wylie
- *790 / The Politics of Economic Policy in Market Economies / H. Jacek

POLITICAL THEORY

- 6E06 / Issues in Liberal-Democratic Theory / Staff
(Not open to students who took 6U06 in 1995-96)
- 6P06 / Topics in Political Theory / C. Frost
- *750 / Issues in Political Theory / Staff
- *751 / Classic Theories of "Realpolitik" / J. Seaman
- *753 / Political Theory and Public Policy / J. Seaman
- *754 / Critics of Modernity / T. Kroeker, Z. Planinc, J. Seaman
(Same as *Religious Studies* *773)
- *755 / Lying in Politics / C. Frost
- *756 / The Autonomy of Politics / J. Ingram
- *757 / Theories of Political Community / C. Frost

CANADIAN POLITICS

- 6O06 / Canadian Public Policy / H. Jacek
- *760 / Political Institutions of the Canadian State / Staff
- *761 / The Social, Cultural and Economic Foundations of Canadian Politics / D. Wells, C. Yates
- *787 / Intergovernmental Relations and Public Policy-Making / Staff

INTERNATIONAL RELATIONS

- *705 / Global Public Policy / M. Dion (Same as *Globalization* *705)
- *769 / The Political Economy of East Asia / R. Stubbs
- *771 / Advanced Concepts in International Relations Theory / M. Beier, P. Nyers, R. O'Brien, T. Porter, R. Stubbs
- *772 / Theories of International Politics / Staff
- *773 / Selected Topics in International Politics / Staff
- *774 / Global Political Economy / Staff (Same as *Globalization* *774)
- *776 / Advanced Issues in Critical Security Studies / M. Beier, P. Nyers
- *777 / Global Governance / R. O'Brien, T. Porter
(Same as *Globalization* *777)
- *778 / Globalization / Staff
- *788 / Comparative Foreign Policy: Canadian and U.S. Foreign Policy / L. Wylie
- *789 / Global Finance / T. Porter
- *796 / Research Design and Methods / K. Bird

RESEARCH TECHNIQUES AND METHODS

- *784 / Statistical Analysis for Public Policy / Staff
- *796 / Research Design and Methods / K. Bird

SPECIAL COURSES

- *779 / Major Research Paper / Staff
(This course is not available to students taking Course Work and a Thesis.)
- *780 / Selected Political Problems I / Staff
- *781 / Selected Political Problems II / Staff

PUBLIC POLICY AND ADMINISTRATION

- *701 / Theory and Practice of Policy Analysis: Frameworks and Models / M. Sproule-Jones, H. Jacek
- *702 / Social Policy Transformation / A. Gildiner, P. Graefe, M. Hering
- *705 / Global Public Policy / M. Dion (Same as Globalization *705)
- *747 / Welfare States in Comparative Perspective / Staff (Same as Sociology *747)
- *748 / Democracy and Diversity: Multicultural Policies in Comparative Perspective / K. Bird
- *753 / Political Theory and Public Policy / J. Seaman
- *774 / Global Political Economy / Staff (Same as Globalization *774)
- *782 / Development Theory and Administration / S. Huque
- *783 / Comparative Public Policy / P. Graefe
- *784 / Statistical Analysis for Public Policy / Staff
- *785 / Public Sector Management / M. Sproule-Jones
- *786 / Organizational Theory and the Public Sector / Staff
- *787 / Intergovernmental Relations and Public Policy-Making / Staff
- *788 / Comparative Foreign Policy: Canadian and U.S. Foreign Policy / L. Wylie
- *790 / The Politics of Economic Policy in Market Economies / H. Jacek
- *792 / Public Choice / M. Sproule-Jones
- *793 / Research Seminar in Public Administration / M. Sproule-Jones
- *794 / Public Policy and Administration Research Seminar / Staff
- *795 / Research Project in Public Policy / Staff
- *796 / Research Design and Methods / K. Bird
- *797 / Readings in Comparative Public Policy / Staff
- *798 / Environmental Policies and Governance / M. Sproule-Jones

Courses for the M.A. in International Relations

Courses marked with an asterisk (*) are half courses. The following courses are offered for graduate credit. Courses with a dagger (†) are offered by the Institute on Globalization and the Human Condition.

GLOBAL POLITICS STREAM

- †*703 / Acts of Global Citizenship
- *771 / Advanced Concepts in International Relations Theory / M. Beier, P. Nyers, R. O'Brien, T. Porter, R. Stubbs
- *772 / Theories of International Politics / Staff
- *773 / Selected Topics in International Politics / Staff
- *751 / Classic Theories of "Realpolitik" / J. Seaman
- *775 / M.A. International Relations Colloquium / Staff
- *776 / Advanced Issues in Critical Security Studies / M. Beier, P. Nyers
- *777 / Global Governance / R. O'Brien, T. Porter (Same as Globalization *777)
- *778 / Globalization / Staff
- *788 / Comparative Foreign Policy: Canadian and U.S. Foreign Policy / L. Wylie

GLOBAL POLITICAL ECONOMY STREAM

- *769 / The Political Economy of East Asia / R. Stubbs
- †*712 / International Trade and Economic Development
- *774 / Global Political Economy / Staff (Same as Globalization *774)
- *775 / M.A. International Relations Colloquium / Staff

- *777 / Global Governance / R. O'Brien, T. Porter (Same as Globalization *777)
- *778 / Globalization / Staff
- *789 / Global Finance / T. Porter

Other courses of interest:

- †*704 / Global Social Policy
- *705 / Global Public Policy (Same as Globalization *705)
- †*714 / The United States and Globalization since the Late Nineteenth Century (Same as History *714)
- *740 / Theories of Comparative Politics / Staff
- *742 / Politics of Developing Areas / N. Galleguillos
- †*757 / The British Empire and Global Integration (Same as History *757)
- *782 / Development Theory and Administration / S. Huque

PSYCHOLOGY

The Department of Psychology, Neuroscience and Behaviour provides facilities for students intending to proceed to the M.Sc. and Ph.D. degrees.

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- Denys DeCatanzaro, M.A. (Carleton), Ph.D. (British Columbia)
- Betty A. Levy, B.A. (Dalhousie), M.A., Ph.D. (Toronto) / Chair
- Daphne M. Maurer, B.A. (Swarthmore), M.A. (Pennsylvania), Ph.D. (Minnesota)
- Bruce Milliken, B.A., M.A., Ph.D. (Waterloo)
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- Mel Rutherford, B.A. (Yale), Ph.D. (California, Santa Barbara)
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- Scott Watter, B.Med.Sc., M.B.B.S. (Queensland), A.M., Ph.D. (Illinois)

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M.Sc. and Ph.D. Degrees

Graduate training in Psychology at McMaster leads to the Ph.D. degree and is strongly research oriented. The basic approach is that of a research apprenticeship, with the student assigned to one faculty member as the research supervisor. The Department provides excellent opportunities for research in Animal Behaviour/Learning; Behavioural Neuroscience; Cognition/Perception; Developmental Psychology; and Social/Evolutionary Psychology. No special training is offered in the applied areas such as Clinical or Industrial Psychology, and applications in these fields are discouraged. Students are not usually required to complete a M.Sc. en route to the Ph.D., but they may do so if they wish. The general requirements for the Degree Doctor of Philosophy are described earlier in the calendar.

Applicants for graduate study in Psychology normally must have received, from a recognized university, either a Master's degree in Psychology, or a Bachelor's degree in Honours Psychology, with at least B+ standing. Occasional exceptions are made to the above requirements for students with a background in a related discipline. Students with strong backgrounds in biology, neuroscience, computer science or physics are encouraged to apply.

In the first Master's year, all students take two courses: Contemporary Problems in Psychology, Neuroscience and Behaviour (720), and Statistics and Research Design (*710). Students entering the program directly at the Ph.D. level usually are exempted from both Contemporary Problems (720) and Statistics and Research Design (*710). It is expected that at least one-half of the student's time will be devoted to research on a topic to be chosen by the student in consultation with the faculty supervisor. Each student submits a report on research progress by May 15 of the first year. Continuation to the Doctoral degree in the graduate training program is determined by the student's research progress and the student's performance in Contemporary Problems, Statistics and any other courses completed. If these performances are acceptable, students who enter without a Master's degree are permitted to proceed directly to Ph.D. studies.

In subsequent years, students complete the equivalent of an additional 1 1/2 full-year courses: Advanced Statistics and Computational Methods I and II (#711 and #712, or an approved course equivalent); two quarter courses (#713, #714); and the equivalent of one graduate half course (#721 cannot be counted towards this requirement). Students must complete *710, #711, #712 and 720 as well as a thesis to obtain a Master's degree. A variety of courses are available each year for all interested students.

Aside from these courses, the major activities of the student beyond the first year fall into two categories. First, students are expected to carry out their thesis research and report the progress of this research by May 15 of the second and each subsequent year. For the student to continue in the program this report must show that satisfactory progress is being made. Second, to satisfy the comprehensive requirement the student, in consultation with the supervisory

committee, must select one or more topics for intensive study. These topics must not be in the student's thesis topic area, and must be approved by the Chair of the Graduate Studies Committee. The study of these topics is then taken up under the guidance of the student's comprehensive examining committee, which includes the student's supervisory committee and up to two other faculty members with relevant expertise. After a period of about six weeks the student will be expected to demonstrate mastery of the material to the satisfaction of the examining committee, first in a written submission and then followed by oral examination. The comprehensive examination must be successfully completed within 24 months of entering the Ph.D. program.

Students entering at the Master's level ideally complete the doctoral thesis and all other requirements for the Ph.D. degree by the end of four years of graduate training. Students admitted directly into the Ph.D. program ideally complete all requirements for the Ph.D. degree within three years. Doctoral students are strongly encouraged to give a departmental colloquium in their final year of study.

Students desiring admission to graduate training at McMaster can obtain an application package by contacting the Department of Psychology directly or by completing the application forms available on the Department's website (www.science.mcmaster.ca/psychology/grad/gradinfo.html). Separate application for financial assistance is not required, as all applicants are automatically considered for financial support. Applicants are required to submit the results of the Graduate Record Examination (verbal and quantitative).

Courses

The following are all full courses:

720 / Contemporary Problems in Psychology, Neuroscience and Behaviour

The following are all half courses:

***710 /** Statistics and Research Design
***722 /** Developmental Psychology
***723 /** Cognitive Psychology
***724 /** Perception
***726 /** Behavioural Neuroscience
***727 /** Learning
***728 /** Animal Behaviour
***729 /** Physiological Psychology
***730 /** Quantitative Methods
***733 /** Evolutionary Psychology
***734 /** Neural Network Models of Cognition and Perception
*(Same as Computational Engineering & Science *734)*
***741 /** Advanced Topics in Psychology, Neuroscience and Behaviour I
***742 /** Advanced Topics in Psychology, Neuroscience and Behaviour II
770 / Advanced Analysis of Survey Data / M. Boyle, B. Newbold, B. Spencer
(Same as Economics 770, HRM 790, GEO 770)

The following are quarter courses:

#711 / Advanced Statistics and Computational Methods I
(Same as Computational Engineering & Science #711)
#712 / Advanced Statistics and Computational Methods II
#713 / Special Topics in Psychology, Neuroscience and Behaviour I
#714 / Special Topics in Psychology, Neuroscience and Behaviour II
#715 / Special Topics in Psychology, Neuroscience and Behaviour III
#716 / Special Topics in Psychology, Neuroscience and Behaviour IV
#721 / Scientific Ethics and Professional Issues *(Anti-requisite 720)*

Facilities for Research

The Department maintains extensive facilities for research in a variety of experimental areas including: Animal Behaviour & Learning, Behavioural & Cognitive Neuroscience, Cognition & Perception, Developmental Psychology, and Social & Evolutionary Psychology.

The Department possesses extensive facilities for human and animal research. The 20,680 square foot state-of-the-art animal facility houses rats, mice, gerbils, fish, cats, quail, and insects; a new bat colony is now operational. The procedure rooms include a physiological optical imaging laboratory, transgenic procedure suite, two animal surgery suites, electrophysiology and neurochemistry suites, and an automatic cage washing facility.

The recently renovated 19,700 square feet of human research facilities provide trainees with access to modern computing resources (Macintosh, Windows, and Linux environments), state-of-the-art eye-tracking systems (head mounted and remote), virtual reality systems, a transcranial magnetic stimulation system, and several electroencephalography (EEG) systems (the largest number of EEG systems in any single department in Canada). Human researchers also enjoy access to a 3T fMR system and an MR compatible EEG system at the Imaging Research Centre in nearby St. Joseph's Hospital through our ongoing collaborations with faculty in the Brain-Body Institute. As well, in conjunction with Brock University, we have created a mobile human electrophysiology and eye-tracking laboratory. This unique mobile facility is particularly useful in ongoing research with special populations, school-aged children, and seniors—participants for whom access to our Department-based facilities may be difficult.

In addition to these facilities, the Department maintains a full-time technical staff of 5 persons, available to members of the faculty and their students as required. Departmental technicians are well equipped to construct specialized laboratory apparatus and maintain computers and instrumentation.

Detailed descriptions of the research interests of each member of our faculty and lists of representative publications are available on our graduate studies website: www.science.mcmaster.ca/psychology/grad/gradinfo.html.

REHABILITATION SCIENCE

The School of Rehabilitation Science offers a M.Sc. and Ph.D. in Rehabilitation Sciences for individuals who have already obtained an undergraduate degree in Occupational Therapy or Physiotherapy or a related field.

There are two options within the Master's in the Rehabilitation Science program: the thesis option which may be undertaken on a full- or part-time basis on campus, and the course-based option which is offered on a full- or part-time basis with both on-campus and on-line courses offered by distance education.

The purpose of the **M.Sc. thesis option** is to educate rehabilitation scientists who have the knowledge and evaluation skills to contribute to the development of Rehabilitation Science. Through the study of theory, research design, measurement models, critical appraisal of the evidence to support current practice and examination of systems, graduates of the thesis option in Rehabilitation Science will be prepared to assume leadership positions in the rehabilitation community and contribute to rehabilitation science research.

The **M.Sc. course-based option** is a combination of web-based, distance education program and optional on-campus courses offered in partnership with the School of Rehabilitation Science, University of British Columbia. The program is designed for occupational therapists, physiotherapists and other health professionals who have a baccalaureate degree and are eligible to practice in their discipline, but who want advanced knowledge and an opportunity to enhance their qualifications.

The purpose of the **Ph.D.** in Rehabilitation Science is to educate rehabilitation scientists who will become experts in rehabilitation science, advance rehabilitation research and transfer new knowledge into practice and policy. This competency based program educates students in research design and methods, grantsmanship, scientific writing, knowledge exchange and translation, and teaching/learning strategies.

For those students wishing to pursue a graduate level diploma in Health Services and Policy Research, please refer to the Graduate Diploma Programs section at the back of this Calendar.

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Fax: 905-546-1129

Email: greenea@mcmaster.ca or wilsnl@mcmaster.ca

Website: <http://www.fhs.mcmaster.ca/grad>

Staff / Fall 2009

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 Anne Klassen (Pediatrics)
 Timothy D. Lee (Kinesiology)
 Kathleen Martin Ginis (Kinesiology)
 Martin O'Donnell (Medicine)
 John A. O'Connor (Family Medicine)
 Peter Rosenbaum (Pediatrics)
 Lina Santaguida (Clinical Epidemiology and Biostatistics)
 Harry S. Shannon (Clinical Epidemiology and Biostatistics)
 Lynn Shaw, O.T., R.S. (Western)
 Susan Stanton (Rehabilitation Science, University of British Columbia) / Part-time
 Virginia Wright (PT, Rehabilitation Science, University of Toronto)

PROFESSORS EMERITI

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 Jean Wessel, B.Sc.PT, (McGill), M.H.Sc. (McMaster), Ph.D. (Alberta)
 Renee M. Williams, Dip.P&OT (Toronto), M.H.Sc. (McMaster), Ph.D. (Waterloo)

M.Sc. Degree**M.Sc. Thesis Option**

The admission requirements for the thesis option are:

1. Graduation from a 4-year (or equivalent) undergraduate health professional degree program or other relevant program with a minimum of a B+ average in the final year of the program.
2. Two academic and two clinical or work-place related references.
3. For candidates who are occupational therapists or physiotherapists, evidence of eligibility to be registered in the applicant's professional discipline in his/her own province/country.
4. Written application outlining career plans, research interests and suitability for the thesis option of the Rehabilitation Science Master's program.

The general regulations for the M.Sc. degree appear under the Regulations for Master's degrees near the beginning of this Calendar.

For the thesis option, candidates must:

1. Complete, with at least B- standing, a minimum of four graduate half courses which must include RS *700, one of RS *701, *702, *703 or *704, an approved research methods half course (e.g. RS*707, HRM *721, *727, *730, *745, *751), and an approved data analysis half course (e.g. HRM *701 or *702, RS*758 or HB*701).
2. Complete a research thesis on an approved rehabilitation science issue and defend the thesis at a final oral examination.

Exceptional students enrolled in the McMaster M.Sc. thesis option in the Rehabilitation Science Program could apply to transfer to the Ph.D. after meeting all the course requirements of the M.Sc. and demonstrating adequate research potential as determined by the student's supervisory committee.

M.Sc. Course-based Option

The admission requirements for the course-based option are:

1. Graduation from a 4-year (or equivalent) undergraduate health professional degree program or other relevant program with a minimum of a B+ average in the final year of the program.
2. Two academic and two clinical or work-place related references.
3. For candidates who are occupational therapists or physiotherapists, evidence of eligibility to be registered in the applicant's professional discipline in his/her own province/country.
4. Written information outlining career plans and suitability for the course-based option of the Rehabilitation Science Master's program.
5. For foreign applicants whose native language is not English, evidence of proficiency in the use of the English language. The most common evidence is a score of at least 600 (paper test) or 250 (computer test) on the Test of English as a Foreign Language (TOEFL).

For the course-based option, candidates must:

1. Complete with at least B- standing, seven (7) graduate half courses. Five courses, RS *705, *706, *708, *709, *710 are mandatory. Students may take courses RS *700, *701, *702, *703, *707 as electives if they are able to be onsite at McMaster University and *704 dependent on the availability of faculty. Two elective courses may be chosen from among on-campus and other distance education courses, including those offered by other universities and may be geared towards the particular interests and clinical specialties of the student. A list of pre-approved courses for electives has been created (see the website) and approved by the Associate Dean of Rehabilitation Science and the Associate Dean of Graduate Studies (Health Sciences).
2. Complete RS 730 scholarly paper to demonstrate integrative thinking at a general and abstract level.

Ph.D. Degree

The admission requirements for the Ph.D. are:

1. Completion of a M.Sc. program in rehabilitation or related field (thesis option) with a minimum of a B+ average.
2. Exceptional students enrolled in the McMaster M.Sc. thesis option in the Rehabilitation Science Program could apply to transfer to the PhD after meeting all the course requirements of the M.Sc. and demonstrating adequate research potential as determined by the student's M.Sc. supervisory committee.

3. Completion of an entry-level professional Masters (OT or PT or health related professionals degree) or a course-based Masters in a rehabilitation related field with a minimum of a B+ average.
4. Two confidential letters of recommendation from referees attesting to your academic/research abilities.
5. An up-to-date curriculum vitae.
6. A two page letter outlining career plans, research interests, suitability for the Ph.D. Program in Rehabilitation Science including academic/research preparation for doctoral studies, identified potential supervisor(s) and expectations for financial support including any applications you have made for external funding.
7. For those applicants from non-thesis based M.Sc. programs (#3 above), evidence of scholarly writing.
8. Evidence of English proficiency where required.

The general regulations for the Degree Doctor of Philosophy appear earlier in the Calendar. The minimum course requirement for this degree is at least three half courses at the 700 level (one of which must be RS *725 Knowledge Transfer). Ph.D. students who have not previously taken a theory of research/science course or its equivalent will be required to complete RS *700 in addition to the other Ph.D. course requirements. A candidate is also required to pass the Ph.D. Comprehensive Examination. The comprehensive examination will include submission and oral defense of a Portfolio which is designed to demonstrate critical appraisal and synthesis of concepts, theories, research literature and key themes within their area of concentration; effective written and oral scientific communications; preparation of a competitive proposal for funding; and effective strategies to transfer rehabilitation research knowledge to various stakeholders. The comprehensive examination will normally take place between 16-20 months for full time students and 28 months for part-time students after registration in the program. The candidate must submit a thesis demonstrating an original contribution to rehabilitation science. A supervisory committee determines when a candidate is ready to write the thesis and ascertains whether the quality is satisfactory. The candidate must defend the thesis at a Final Oral Examination.

The School of Rehabilitation Science has a series of seminars given by rehabilitation scientists. Attendance of students at these seminars is required.

Research in Rehabilitation Science

The focus of the research in Rehabilitation Science includes the following fields:

Participation across the life course – within this field, research focuses on the study of participation in everyday life when a disability or change in health occurs. We examine the impact of activity performance and environmental factors as well as study interventions to enhance participation. We research the impact of changes in a person's body function and structure on activity and participation. Primary populations within this field include children/youth with special needs, workers, and older adults.

Evidence-based rehabilitation and knowledge transfer – within this field, our research focuses on development and validation of outcome measures, systematic reviews of rehabilitation evidence, and utilization of research knowledge by clients, families, rehabilitation practitioners, students and policymakers.

Courses

Courses marked with an asterisk (*) are half courses.

For the thesis option, research methods and statistics courses may be taken from the Health Research Methodology Program or from other departments in consultation with the supervisory committee. Only one special topics course may be counted toward the minimum degree requirements. Students taking this course cannot also receive credit for any subsequent regular course offering in the same topic.

Before students can enrol for any course they must have the permission of the course instructor and register their name in the Office of the Associate Dean of Graduate Studies (Health Sciences) in HSC-3N10. Not all courses will be offered every year.

COURSES IN THE THESIS OPTION

***700 / The Development, Evaluation and Utilization of Theories in Rehabilitation / M. Tremblay**

This course will provide the foundation for students to discuss in depth the role that theories play in the development and application of knowledge in rehabilitation science. They will develop the skills to critically evaluate the theories used in rehabilitation and become familiar with examples of macro and micro theories currently in use.

***701 / Analysis and Rehabilitation of Functional Movement / M. Pierrynowski**

This course examines the study of movement in a rehabilitation context. Different approaches to the study of movement and their utility in rehabilitation will be examined. Emphasis will be on mechanisms required for functional physical activity, particularly in persons with disability, and the role of rehabilitation interventions in maximizing function. Students will integrate evidence from movement analyses, rehabilitation models, and clinical research to make decisions about movement evaluation and intervention.

***702 / Occupation and Occupational Performance / M. Tremblay**

This course, using a problem-based seminar format, will explore theories and research related to occupation and occupational performance. Topics in the course include: definitions of occupation and occupational performance, historical overview of occupation, occupational theories of human nature, influence of personal and environmental factors on occupation, measurement methods, relationship between areas of occupation and health and well being, and interventions to change occupation and occupational performance.

***703 / Selected Topics in Rehabilitation Science / Assistant Dean, Faculty**

This selected topics course is designed to allow the development of courses that cover the leading edge of thinking about specific topics/issues in Rehabilitation Science. The specific topics will be developed in response to needs identified by faculty or students.

***704 / Independent Study in Rehabilitation Science / Assistant Dean, Faculty**

This course is designed to allow students to tailor their learning by selecting topics in Rehabilitation Science relevant to their area of study interest and do advance work in this area. A student will identify a topic, and in consultation with a faculty member with expertise in the area, a course outline will be developed that is tailor-made to meet the student's particular requirement. The student will then study under the guidance of a faculty member and examine the pertinent literature critically. The course may be taken only once during the student's graduate studies.

***707 / Research Methods in Rehabilitation Science / J. Richardson**

This course is designed to introduce students to the basic concepts and methods associated with observational and experimental research in the field of rehabilitation science. Topics include the following: clinical measurement concepts, qualitative methods, etiologic investigation, therapeutic intervention investigation, prognostic determination, and systematic review assessment. Common themes within these topics include: framing the research question, defining the patient sample, selecting the most appropriate study design, applying strategies for enhancing both internal and external validity, estimating sample size, understanding basic analytic methods, interpreting results, and considering ethical issues.

***720 / Measurement and Evaluation of Quality of Life in Rehabilitation / Faculty**

This course is designed for occupational therapists, physical therapists and practitioners in other rehabilitation disciplines who want to acquire the knowledge and skills to develop, interpret and integrate quality of life measures into clinical practice and research. Specific topics include a review of: constructs and conceptual frameworks underlying measurement of quality of life, psychometric issues relating to Quality of Life (QoL) measurement in rehabilitation, commonly used generic and rehabilitation-specific QoL measures, strategies to develop and select qualitative and quantitative QoL measures, issues relating to the administration and interpretation of QoL measures used to evaluate the impact of rehabilitation interventions.

***725 / Knowledge Exchange and Translation / J. MacDermid
(Same as HRM *725 and Nursing *725)**

This modular course will present students with an introduction to basic principles, conceptual frameworks, research design, and interventions used in knowledge exchange and translation. Faculty with specific expertise in knowledge exchange and translation for different target audiences (patients/public, policy makers, clinicians) will facilitate modules that address theoretical and practical issues around using developed knowledge to improve health or health care systems. Students will present their research protocol or KET project in the final module.

***758 / Qualitative Research Methods for Collecting, Analysing and Interpreting Data / L. Lohfeld, S. Wilkins
(Same as HRM *758 and Nursing *758)**

This intermediate-level course builds on prior knowledge about qualitative research approaches and their philosophical bases. The emphasis in this course will be on how the approaches affect sampling and data collection, data management, analysis, interpretation, and write-up. Students will also examine the writing of qualitative research proposals, including consideration of ethical issues. The course is based on active involvement of learners through student-directed discussions and hands-on experiences, guidance and facilitation by graduate faculty with expertise in qualitative research, and interdisciplinary collaboration with faculty and classmates.

Other courses that may be of interest to students in the thesis option are the following:

CLINICAL HEALTH SCIENCES

- *601 / Spiritual Work Life: Applied to Health Care
- *700 / Spirituality and Health: The Nature of the Wounded Spirit: Implications for Clinical Management
- *701 / The Wounded Spirit in the Secular World: Legal, Ethical and Cultural Perspectives
- *702 / The Impact of Spiritual and Religious Traditions on Health: Challenges for Multicultural Health Care Delivery Systems
- *703 / The Wounded Spirit: Applied Contemporary Health Practice Issues
- *707 / Post Modern Family Therapy
- *719 / Foundations of Education in the Health Sciences (formerly NUR *719)

HEALTH RESEARCH METHODOLOGY

- *745 / Qualitative Research Methods

KINESIOLOGY

- *701 / Inquiry and Research in Physical Activity
- *706 / Cardiac Rehabilitation
- *709 / Neuromuscular Function in Aging and Disease

MEDICAL SCIENCES

- *709 / Clinical Neuroanatomy
- *746 / Exercise Physiology in Health and Disease

HEALTH, AGING AND SOCIETY

- *710 / Multidisciplinary Perspectives on Aging
- *711 / The Health Care System and the Older Person

COURSES IN THE ONLINE COURSE-BASED OPTION***705 / Evaluating Sources of Evidence / B. Lammi, C. Mitchell**

The value of evidence to rehabilitation practice, and how to assess and use evidence to make practice decisions that lead to best clients outcomes.

***706 / Measurement in Rehabilitation / B. Lammi**

The theory of measurement, and the critical review, selection, interpretation and integration of outcome measures and assessment instruments in practice.

***708 / Reasoning and Decision-Making / M. Clark, S. Boblin, J. Tryssenaar, W. Jolley**

Reasoning is the process by which rehabilitation practitioners consider alternatives and make decisions on a day to day basis. Guided by relevant conceptual frameworks, participants will practice strategies such as critical reflection, narratives, and assessment of the literature and other evidence to improve their reasoning and decision-making skills.

***709 / Developing Effective Rehabilitation Programs / S. Stanton, P. Ehrlanson, S. Bressler**

The application of approaches to effective design, marketing and evaluation of rehabilitation services, and to writing and responding to Requests for Proposals (RFPs).

***710 / Facilitating Learning in Rehabilitation Contexts / E. Staples, J. Tryssenaar, D. Toal-Sullivan**

Approaches to creating positive and innovative learning experiences for clients, families, peers and students in rehabilitation. Incorporates principles of adult learning, learning styles, plain language, teaching tips and evaluation methods.

***711 / Musculoskeletal Health Assessment and Diagnostics for Advanced Practice Therapists / L. Woodhouse,**

This course will introduce students to measurement properties of diagnostic evaluations using examples related to musculoskeletal disorders or diseases. In addition to an introduction to the basic concepts of radiology and laboratory testing, students will learn and practice performing a comprehensive musculoskeletal health assessment that includes biomechanical, physical and functional assessments of patients with musculoskeletal disorders or diseases, particularly lower extremity osteoarthritis. Expert faculty members from several disciplines will facilitate all sessions.

***712 / Therapeutics for Advanced Practice Musculoskeletal Care / L. Woodhouse**

This course will focus on the management of clients with musculoskeletal disorders. Students will gain an understanding of the basic principles of pharmacology, surgical approaches, advanced counseling and the ability to critically appraise and integrate clinical practice guidelines for the conservative management of clients with musculoskeletal disease, particularly osteoarthritis of the lower extremity. Expert faculty members from several disciplines will facilitate all sessions.

730 / Scholarly Paper / J. Tryssenaar

This full course is designed as an opportunity for graduate course-based M.Sc. students to demonstrate, in writing, their ability to integrate ideas that reflect current knowledge in areas of rehabilitation practice, education, research, and/or policy. The scholarly paper is to demonstrate integrative thinking at a general and abstract level. A student will identify a topic, and in consultation with a faculty member with expertise in the area develop a proposal that is individualized to the student's area of interest. The student will then develop the paper under the guidance of a faculty member. The paper must be 25 to 30 pages, excluding references and appendices. The paper does not involve the collection or analysis of primary data or the conduct of research with subjects. It is a scholarly essay, not a thesis.

***770 / Leadership in Rehabilitation / C. Mitchell**

This course explores principles, practices, trends and issues of leadership in rehabilitation settings. Current theories of leadership with attention to styles, practices, tasks and models will be covered. Participants will be encouraged to reflect on and analyze their own leadership experiences in light of theories studied. Through the interplay of theory and practical application, participants will gain a deeper appreciation for the requirements, responsibilities, and consequences of effective leadership. The course encourages professional and personal development through action learning that is relevant and transferable to organizations.

***771 / Work Organization and Health / J. Tryssenaar**

This online, problem-based course addresses the political, economic, health system and workplace factors that contribute to workplace environments and the health of workers. Sessions initially incorporate broad based problems that will develop specific content knowledge nature of work environments, stressors, health systems and legislation and then move on to problems that target specific types of health issues requiring students to integrate knowledge across different disciplines.

RELIGIOUS STUDIES

The Department of Religious Studies offers work leading to both the M.A. and Ph.D. degrees in Religious Studies, i.e., the systematic study of religious phenomena.

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Website: <http://www.socsci.mcmaster.ca/relstud/>

Staff / Fall 2009**PROFESSORS**

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 Liyakat Takim, B.Sc. (City), M.A. (Virginia), Ph.D. (Oriental and African Studies)
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 Graeme MacQueen, M.A. (McMaster), Ph.D. (Harvard) / Retired
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ASSISTANT PROFESSORS

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 Daniel A. Machiela, B.B.A. (Grand Valley), M.A. (Jerusalem), Ph.D. (Notre Dame)
 Mark Rowe, B.A. (McGill), M.A., Ph.D. (Princeton)
 Anders Runesson, B.A., M.Div., Lic. Theol., M.A., Ph.D. (Lund)

ADJUNCT MEMBERS

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 Kay Koppedrayer, B.A. (McGill), M.A., Ph.D. (McMaster)
 Annette Yoshiko Reed, B.A. (McGill), MTS (Harvard), M.A., Ph.D. (Princeton)
 Adele Reinhartz, B.A. (Toronto), M.A., Ph.D. (McMaster)

PROFESSORS EMERITI

John G. Arapura, B.D. (Serampore, Bishop's College), S.T.M. (Union Theological Seminary), M.A., Ph.D. (Columbia)
 A. Eugene Combs, B.A. (Trinity, San Antonio), B.D. (Union Theological Seminary), Ph.D. (Columbia)
 Phyllis Granoff, B.A. (Radcliffe College), Ph.D. (Harvard)
 Louis I. Greenspan, M.A. (Dalhousie), Ph.D. (Brandeis)
 Yün-hua Jan, B.A. (Szechwan), M.A., Ph.D. (Visva-Bharati)
 Alan Mendelson, A.B. (Kenyon College), M.A. (Brandeis), Ph.D. (Chicago)
 Koichi Shinohara, B.Lett., M.Lett. (Tokyo), Ph.D. (Columbia)
 Johannis J. Mol, B.D. (Union Theological Seminary), M.A., Ph.D. (Columbia)
 John C. Robertson, B.A. (Texas Wesleyan College), B.D. (Southern Methodist), S.T.M., M.A., Ph.D. (Yale)
 Gérard Vallée, B.A. (Laval), M.A. (Montreal), Ph.D. (Münster)
 Paul Younger, A.B. (Lafayette), M.A. (Banaras), B.D. (Serampore), Th.M. (Princeton Theological Seminary), M.A., Ph.D. (Princeton)

The Department offers graduate work in seven areas of study, distributed among three fields:

- ASIAN:** Buddhism
 East Asian Religions
- BIBLICAL:** Early Judaism
 Early Christianity
- WESTERN:** Religion and Politics
 Religion and the Social Sciences
 Western Religious Thought

In order that all graduate students have the opportunity to develop both depth and breadth in their courses of study, candidates for M.A. and Ph.D. degrees are normally required to choose one major area of study and one minor area of study from the above list of seven areas.

To ensure acquaintance with the range of religious studies, and to facilitate dialogue and communication among all members of the department, all graduate students are required to have upon entry, or to acquire in the early stages of their program, some familiarity with the breadth of religious studies including both Eastern and Western religious traditions.

Upon arrival, each M.A. and Ph.D. candidate will meet with faculty members from the field in which the student's major area of study is located (see list above), who will advise the student on choice of advisory committee members, minor area of study, course work, and other requirements.

M.A. Degree

The normal minimum requirement for admission to M.A. study is graduation with B+ standing in an Honours program or equivalent in Religious Studies, or in a related discipline with significant emphasis on the study of religion. Related disciplines include Anthropology, Sociology, History, Philosophy, Theology, Classics, Near Eastern, South Asian, and East Asian studies. Graduates with preparation in related fields may be required to take a certain amount of undergraduate work in Religious Studies.

All incoming students should have completed the equivalent of six units (one full year course) of undergraduate work in Asian religions. Students who do not meet this requirement will be expected to fulfill their breadth requirement by taking six units of undergraduate courses, or by writing two Breadth Requirement examinations, or by taking a three unit undergraduate course and writing one Breadth Requirement examination.

A candidate for the M.A. degree will be required to spend at least one calendar year in full-time graduate study or the equivalent in part-time study. There are two routes to the M.A.: the thesis route and the project route.

A. M.A. WITH THESIS

The thesis route entails the following requirements:

1. The candidate must demonstrate a reading knowledge of a language other than English which is most useful in the area in which the thesis is written. Guidelines for fulfilling this requirement are specified in the Departmental Handbook. Additional languages may be required;
2. A minimum of six half courses must be completed with at least B - standing, four half courses must be at the graduate level and must be taken in the major area of study; the other two half courses must be in the minor area of study;
3. The completion of Religious Studies *701 / Issues in the Study of Religions;
4. A thesis must be completed; the thesis should show an ability to deal with first-hand material in a limited problem in Religious Studies; the thesis must be defended in an oral examination; all M.A. degree candidates who have completed their oral defence must submit their revised thesis to both the Department and the School of Graduate Studies by the deadline dates specified for the second convocation following their defence.
(Note: Text-critical studies or translation with commentary are acceptable, with the approval of the advisory/supervisory committee, as the functional equivalent of a thesis.)

B. M.A. WITH PROJECT

The project route entails the following requirements:

1. The candidate must demonstrate a reading knowledge of a language other than English appropriate to work on the project. Guidelines for fulfilling this requirement are specified in the Departmental Handbook. Additional languages may be required;
2. Completion of six half courses as defined above, plus Religious Studies *701 / Issues in the Study of Religions;
3. Completion of a project and the passing of an oral or written examination on the substance of the project. A "project" is defined by the faculty members of a departmental field. Normally a project will cover broad areas of learning. Projects will permit students to move into new areas, to read large and unfamiliar bodies of texts, and to deal comprehensively with large questions in central areas of concern.

Ph.D. Degree

Candidates for the Ph.D. program may be admitted at one of three stages in their academic work:

1. Normally, on completion of a Master's program.
2. Occasionally, after completion of one year of a Master's program.
3. In exceptional cases, an applicant with an honours degree in Religious Studies or a broad and comprehensive theological education may be admitted.

Further details and requirements for admission are specified in the Departmental Handbook.

A candidate for the Ph.D. degree must satisfy the general regulations for the degree Doctor of Philosophy of the School of Graduate Studies. The minimum requirements for a Ph.D. candidate are as follows:

1. Completion of the breadth requirement. Students who have not completed the equivalent of six units (one full year course) of undergraduate work in Asian religions may fulfil their breadth requirement by taking six units of undergraduate courses, or by writing two Breadth Requirement examinations, or by taking a three unit undergraduate course and writing one Breadth Requirement examination early in their Ph.D. program.
2. A reading knowledge of two languages other than English must be demonstrated; the method, time-limit and guidelines are specified in the Departmental Handbook; additional languages may be required.
3. At least five half courses at the graduate level at McMaster beyond the M.A. level. Two half courses may be taken outside of the Department. Additional courses may be required. Exceptions may be made by the candidate's advisory committee. Students who have completed an M.A. elsewhere must normally complete at least three units of graduate course work in the minor area of study. Students who have completed an M.A. in the Department of Religious Studies at McMaster do not have to do additional course work in the minor area, though they are encouraged to do so. Students must also complete Religious Studies *701 / Issues in the Study of Religions if they have not already done this course during their M.A. program.
4. Comprehensive examinations in the major and minor areas of study, which are chosen according to the regulation given above.
5. Completion of a thesis in the major area of study. The thesis must constitute original research and make a contribution to learning in the chosen field; the thesis must be defended in a final oral examination.

Courses

The following courses are offered for graduate credit. A list of courses offered in any one year and detailed descriptions are available each year in the Departmental Handbook. A student may take courses designated as "Topics in" more than once, as contents vary from year to year. Courses marked with an asterisk (*) are half courses. A student may receive credit for no more than two half courses entitled "Special Readings" (*705, *734, *769). Transcript credit is given for 6X06 and 6Y06, but these courses do not count toward the fulfillment of the minimum departmental course requirements.

Not all courses listed in the calendar will be offered in any given year, though the intention is to offer a listed course at least once in four years. Students should consult the Religious Studies *Graduate Handbook* for the list of courses to be offered in a particular year.

ASIAN RELIGIONS

6X06 / Introductory Sanskrit / Staff (No 400-level equivalent)

6Y06 / Introduction to Literary Chinese / Staff
(No 400-level equivalent)

General Courses

***705** / Special Readings in Asian Religions / Staff

***706** / Topics in Sanskrit Texts / S. Clarke

***707** / Tools and Methods for the Study of Asian Religions / J. Benn, S. Clarke, M. Rowe

***708** / Topics in Asian Religions / Staff

***709** / Anthropological Approaches to the Study of Asian Religions / M. Rowe

Buddhism

- *711 / Topics in Buddhist Thought and History / S. Clarke
- *712 / Topics in the Study of Chinese Buddhist Texts I: Translated Texts / J. Benn
- *713 / Topics in the Study of Chinese Buddhist Texts II: Indigenous Chinese Writings / J. Benn
- *714 / Topics in Indian Buddhist Texts / S. Clarke
- *715 / Readings in Indian Buddhist Texts / S. Clarke
- *716 / Topics in Japanese Buddhism / S. Clarke, M. Rowe
- *717 / Readings in Japanese Buddhist Texts / S. Clarke, M. Rowe
- *718 / Topics in Buddhist Studies: Recent Scholarship / J. Benn, S. Clarke, M. Rowe
- *719 / Topics in Modern and Contemporary Buddhism / M. Rowe

East Asian Religions

- *721 / Topics in East Asian Religions / J. Benn, S. Clarke, M. Rowe
- *722 / Topics in Japanese Religions / S. Clarke, M. Rowe
- *723 / Readings in Japanese Religions / S. Clarke, M. Rowe
- *724 / Topics in Taoism / J. Benn
- *725 / Readings in Taoist Texts / J. Benn
- *726 / Topics in Chinese Religions / J. Benn
- *727 / Readings in Chinese Religions / J. Benn
- *728 / Readings in Academic Japanese / S. Clarke, M. Rowe

BIBLICAL STUDIES**General Courses**

- *730 / Topics in the Relationship of Judaism and Christianity / Staff
- *731 / Topics in the Biblical Tradition / Staff
- *732 / Topics in the Theory of Interpretation / Staff
- *733 / Topics in Social History and Material Culture / Staff
- *734 / Special Readings in the Biblical Tradition / Staff

Early Judaism

- *737 / Readings in Hebrew I / E. Schuller, D. Machiela
- *738 / Readings in Hebrew II / E. Schuller, D. Machiela
- *739 / Readings in Aramaic Texts: Biblical Aramaic and Dead Sea Scrolls / E. Schuller, D. Machiela
- *740 / Readings in Aramaic Texts: Targum and Talmud / D. Machiela
- *741 / Readings in Greek Jewish Literature / Staff
- *742 / Topics in the Dead Sea Scrolls / E. Schuller, D. Machiela
- *743 / Topics in Apocrypha and Pseudepigrapha / E. Schuller, D. Machiela
- *744 / Topics in Rabbinic Judaism / D. Machiela
- *745 / Topics in Philo and Hellenistic Judaism / Staff
- *746 / Topics in Early Jewish History / E. Schuller, D. Machiela
- *747 / Topics in Early Jewish Literature / E. Schuller, D. Machiela

Early Christianity

- *751 / Readings in Gospel Literature I / S. Westerholm, A. Runesson
- *752 / Readings in Gospel Literature II / S. Westerholm, A. Runesson
- *753 / Readings in Early Christian Epistolography I / S. Westerholm, A. Runesson
- *754 / Readings in Early Christian Epistolography II / S. Westerholm, A. Runesson
- *755 / Readings in Early Christian Historiography I / S. Westerholm, A. Runesson
- *756 / Readings in Early Christian Historiography II / S. Westerholm, A. Runesson
- *757 / Topics in Gospel Literature / S. Westerholm, A. Runesson
- *758 / Topics in Early Christian Epistolography / S. Westerholm, A. Runesson
- *759 / Topics in Christian Origins / S. Westerholm, A. Runesson
- *760 / Topics in Early Christian History / S. Westerholm, A. Runesson
- *761 / Topics in Early Christian Literature / S. Westerholm, A. Runesson
- *762 / Topics in the Christian Literature and Thought of Late Antiquity: The Trinity / P. Widdicombe

- *763 / Topics in the Christian Literature and Thought of Late Antiquity: Christology / P. Widdicombe
- *764 / Topics in the Christian Literature and Thought of Late Antiquity: Themes / P. Widdicombe
- *765 / Topics in the Christian Literature and Thought of Late Antiquity: Major Figures / P. Widdicombe

WESTERN RELIGIOUS TRADITIONS**General Courses**

- *769 / Special Readings in Western Religious Traditions / Staff

Religion and Politics

- *770 / Topics in Ancient Political Philosophy / Z. Planinc
- *771 / Topics in Medieval Political Philosophy / Z. Planinc
- *772 / Topics in Modern Political Philosophy / Z. Planinc
- *773 / Critics of Modernity / T. Kroeker, Z. Planinc, J. Seaman (*Same as Political Science *754*)
- *774 / Topics in Religion and Literature / T. Kroeker, Z. Planinc
- *775 / Topics in Political Theology and Ethics / T. Kroeker
- *776 / Topics in Technology and Ethics / T. Kroeker
- *777 / Topics in Philosophy and Jewish Thought / D. Hollander (*Same as CSCT *777*)
- *778 / Topics in Modern Jewish Thought / D. Hollander (*Same as CSCT *778*)
- *779 / Phenomenology and Religious Experience II / D. Hollander
- *792 / Topics in Continental Philosophy and Religious Thought / D. Hollander, T. Kroeker

Religion and the Social Sciences

- *709 / Anthropological Approaches to the Study of Asian Religions / M. Rowe
- *780 / Topics in Religion and Society / Staff (*Same as Sociology *708*)
- *781 / Introduction to the Anthropology of Religion / E. Badone (*Same as Anthropology *704*)
- *782 / Diasporas, Transnationalism and Religious Identities / E. Badone (*Same as Anthropology *782 and Globalization *782*)
- *783 / Anthropological Approaches to Catholicism / E. Badone (*Same as Anthropology *784*)
- *784 / Myth and the Interpretation of Oral Tradition / E. Badone (*Same as Anthropology *785*)
- *785 / Death: Rituals and Meanings in Cross-Cultural Context / E. Badone (*Same as Anthropology *799*)
- *786 / Ritual and Symbolic Healing / E. Badone, C. Rothenberg (*Same as Anthropology *796*)
- *787 / Topics in Belief and the Body / C. Rothenberg
- *788 / Topics in Anthropological Approaches to Islam / C. Rothenberg (*Same as Anthropology *788*)
- *789 / Topics in Gender and Feminist Theory and Religious Studies / C. Rothenberg

Western Religious Thought

- *762 / Topics in the Christian Literature and Thought of Late Antiquity: The Trinity / P. Widdicombe
- *763 / Topics in the Christian Literature and Thought of Late Antiquity: Christology / P. Widdicombe
- *764 / Topics in the Christian Literature and Thought of Late Antiquity: Themes / P. Widdicombe
- *765 / Topics in the Christian Literature and Thought of Late Antiquity: Major Figures / P. Widdicombe
- *774 / Topics in Religion and Literature / T. Kroeker, Z. Planinc
- *775 / Topics in Political Theology and Ethics / T. Kroeker
- *777 / Topics in Philosophy and Jewish Thought / D. Hollander (*Same as CSCT *777*)
- *778 / Topics in Modern Jewish Thought / D. Hollander (*Same as CSCT *778*)
- *779 / Phenomenology and Religious Experience II / D. Hollander
- *790 / Topics in Western Religious Thought / Staff
- *791 / Topics in Philosophical Theology / T. Kroeker
- *792 / Topics in Continental Philosophy and Religious Thought / D. Hollander, T. Kroeker

- *793 / Topics in Religious Ethics / T. Kroeker
 *794 / Topics in Augustine and Augustinians / T. Kroeker, P. Widdicombe
 *795 / Topics in Modern Christian Thought: Themes / P. Widdicombe
 *796 / Topics in Modern Christian Thought: Theologians / P. Widdicombe
 *797 / Topics in German Judaism / D. Hollander
 *798 / Phenomenology and Religious Experience I: Introduction to Phenomenology / D. Hollander

Special Courses

- *600 / Studies in Religion / Staff (*No specific 400-level equivalent*)
 *700 / Topics in Religious Studies / Staff
 *701 / Issues in the Study of Religions / Staff
 *768 / Religion and Globalization / J. Stolow
 (*Same as Globalization *707 and Sociology *709*)
 *782 / Diasporas, Transnationalism, and Religious Identities / E. Badone (*Same as Anthropology *782 and Globalization *782*)

SOCIAL WORK

The School of Social Work offers a one year program leading to the degree Master of Social Work (M.S.W.). There are two areas of concentration — Analysis of Social Welfare Policy and Analysis of Social Work Practice. The program is accredited by the Canadian Association of Schools of Social Work as a graduate program in social work.

The School of Social work also offers a Ph.D. program focused on social justice. The program builds on our research-based M.S.W. and on faculty members' research strengths.

Enquiries: 905 525-9140 Ext. 24596
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 Website: <http://www.socsci.mcmaster.ca/socwork/>

Staff / Fall 2009

PROFESSORS

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 James W. Gladstone, B.A. (McGill), M.S.W. (British Columbia), Ph.D. (Toronto)
 M. Susan Watt, B.A., M.S.W., Adv. Dip. S.W. (Toronto), D.S.W. (UCLA)

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 L. William Lee, B.A. (St. Thomas, Texas), M.S.W., Adv. Dip. S.W., Ed.D. (Toronto) (Retired)
 Sheila Sammon, B.A. (Nazareth College, New York), M.S.W. (Toronto)
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 Saara Greene, B.A. B.S.W. (Manitoba), M.S.W. (McGill), Ph.D. (Edinburgh, Scotland)
 Y. Rachel Zhou, B.A. LLM (Wuhan, China), M.A., Ph.D. (Toronto)

LECTURERS

Ann Fudge Schormans, B.P.E., B.A. (McMaster), B.S.W. (York), M.S.W. (McMaster), Ph.D. candidate
 Rick Sin, B.S.W. (Hong Kong Baptist), M.S.W. (McGill), Ph.D. cand.

ASSOCIATE MEMBERS

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 Robert D. Wilton (Geography & Earth Sciences), B.A. (Hull), M.A., Ph.D. (Univ. of Southern California)

ADJUNCT MEMBER

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PROFESSORS EMERITI

Ralph A. Brown, B.A., M.S.W. (Waterloo Lutheran), D.S.W. (UCLA)
 Cyril Greenland, M.Sc. (North Wales), Ph.D. (Birmingham)
 Sally Palmer, B.A. (Western), B.S.W., M.S.W., Ph.D. (Toronto)
 Harry L. Penny, Dip. Theol. (Union College, British Columbia), B.A., M.S.W. (British Columbia), L.L.D. (McMaster)
 James J. Rice, B.A. (Sir George Williams), B.S.W., M.S.W. (Calgary), Ph.D. (Exeter)
 Michael Wheeler, B.A. (London), M.S.W. (British Columbia), Dip. Soc. Admin. (London School of Economics)

M.S.W. Degree

ANALYSIS OF SOCIAL WELFARE POLICY

The aim of this concentration is to prepare graduates for policy analysis and decision-making roles that have the potential for changing services and practices. Emphasis is on the critical analysis of existing policies and the design of new policies. An objective of fundamental importance is to assist students to ask the right questions, and to appreciate the differing contribution of values and empirical evidence in policy making.

This area of concentration prepares graduates for careers concerned with policy analysis, design, and evaluation in the public and private sectors.

ANALYSIS OF SOCIAL WORK PRACTICE

This concentration focuses on the development of analytic skills concerned with direct social work practice. Students build on their practice knowledge base to increase their ability to identify and analyze social work theories and examine how they are utilized within a changing social, political, and economic context.

This concentration prepares graduates who will have responsibility as supervisors in social agencies and social work programs, have staff training or consulting responsibilities, or have responsibility for conducting research concerning social work practice and/or programs. Others may use their analytic skills to better perform their professional practice.

In addition, the M.S.W. program prepares students for advanced study in the field of social work.

Candidates may be enrolled on a full- or part-time basis. Full-time students will complete the program in twelve consecutive months of study, beginning in September. Part-time students will normally be expected to complete the program in about three years.

Admission

To be eligible for admission to either concentration of the Master of Social Work program, applicants are required to hold a B.S.W. degree from an accredited social work program. In addition, admission requirements are:

- (a) half course in introductory statistics;
- (b) half course in introductory social research methods;
- (c) B+ standing* in senior level social work courses.

***Note:** The overall standing must include statistics and research methods if taken within the last 10 half courses or equivalent.

Applications should be made to the School of Social Work prior to January 5th for admission the following September.

Curriculum

The curriculum has three main components:

1. Required courses that provide the content and methodological skills necessary for policy and practice analysis;
2. Elective course(s) that enable students to deepen their knowledge of one substantive policy or practice field of their choice;
3. Thesis designed to integrate analytical and evaluative skills and to elucidate the contribution of knowledge to policy or practice.

ANALYSIS OF SOCIAL WELFARE POLICY

Candidates for the M.S.W. degree in Analysis of Social Welfare Policy concentration will follow a program consisting of the following:

1. Required Courses

Five half courses:

- *703 / Policy Making Process
- *706 / Social Welfare & Social Work in the Context of Globalization & Restructuring
- *721 / Community-Based Social Policy
- *737 / Critical Approaches to Social Work Knowledge
- *738 / Research Methods for Social Work

2. One elective (see below)

ANALYSIS OF SOCIAL WORK PRACTICE

Candidates for the M.S.W. degree in Analysis of Social Work Practice concentration will follow a program consisting of the following:

1. Required Courses

Five half courses:

- *726 / Institutional Structuring of Practices in Social Work
- *731 / Critical Analysis of Social Work Practice
- *736 / Social Work Practice and Social Justice
- *737 / Critical Approaches to Social Work Knowledge
- *738 / Research Methods for Social Work

2. One elective (see below)

Electives Open to Both Concentrations

Electives enable students to deepen their knowledge in a substantive field of their choice and to develop a capacity to analyze systematically existing policies or practices in that field. All students take one elective which can be selected from the following:

- *705 / Directed Readings
- *711 / Children and Families
- *721 / Community-Based Social Policy
- *722 / Topics in Advanced Social Work

In planning the course of study, students should consult with their advisor concerning possible elective(s) which may be taken outside the School of Social Work. Electives offered in a given year are subject to the availability of faculty.

3. A Thesis for Both Concentrations

Each student is required to complete a thesis. It offers students an opportunity to build upon their particular experiences and interests and upon perspectives and materials introduced in courses, and to demonstrate their capacities for the critical study and analysis of policy and practice. The thesis (12,500 words) is supervised by a faculty member and orally examined by a committee including the supervisor and two other faculty members.

Ph.D. Degree

The School of Social Work offers a Ph.D. degree in Social Work in the field of Social Justice.

Admission

To be eligible for admission to the Ph.D. program, applicants are normally required to have:

- a) a completed MSW degree with an average of at least an A-. (Applicants with Master's degrees in other subjects must be able to demonstrate substantial knowledge of the social service/ social welfare field and have experience of working in justice and equity-seeking services or organizations);
- b) a completed graduate level course in social research methods; and
- c) demonstrated interest and experience in critical approaches to policies, practices and knowledge-building in social work.

Applicants will be evaluated on the basis of their qualifications and the alignment of their interests with the research interests and availability of faculty.

Curriculum

The curriculum has three main components:

1. **Course requirements.** Candidates for the Ph.D. are required to complete a minimum of six post-MSW courses.

- *770 / Social Work and Social Justice: Theoretical Tensions
 - *771 / Research for Social Change
 - *772 / Qualitative Methods for Social Work
or a methods course selected from another department (e.g. quantitative, historical, mixed methods)
 - *773 / Doctoral Research Seminar
- Two elective courses.** Students will be encouraged to take at least one of their elective courses in another department in order to profit from the interdisciplinary opportunities at McMaster.

A Ph.D. candidate admitted without Master's level courses in epistemology (*737) and in critical analysis of practice/ policy (*731 or *703) will be expected to complete these courses in addition to the requirements of the doctoral program.

Candidates may be required to complete courses beyond the minimum course requirements of the program in order that they achieve the breadth of perspective required by the program and are sufficiently prepared for their research.

2. Comprehensive Examination

The comprehensive examination is designed to evaluate the breadth of students' knowledge of debates and developments in contemporary scholarship in social work and social justice. Ph.D. candidates are required to situate their anticipated research topics in a wide and critical review of related theory and research, and to demonstrate their capacity for the integration of ideas and their skills in scholarly inquiry and writing.

3. Thesis

Students will be required to submit a thesis and defend it during a final oral examination.

Courses

Courses marked with an asterisk (*) are half courses. Part-time students must take first either SW703 (policy) and SW731 (practice) in the fall term in their respective fields of study. The following courses are offered for graduate credit only:

*6G03 / Selected Topics

Critical examination of social work practice in respect to selected social issues. Topics will vary from year to year and the School should be consulted for details for any particular year.

*703 / Policy Making Process

Examination of theoretical perspectives on social policy, the construction of problems addressed by social policies, and the nature of policy development. Attention will be given to the contested character of the policy process and to the positioning of those engaged in its analysis.

*705 / Directed Readings

Concentrated studies in Social Welfare Policy and Social Work Practice. A course outline must be submitted to the Chair of the School of Social Work's Graduate Studies Committee.

*706 / Social Welfare and Social Work in the Context of Globalization and Restructuring (Same as Globalization *706)

This course focuses on the dynamics and consequences of the restructuring of social programs in Canada. Attention will be given to policy trends toward privatization and market models of service delivery, to changes in the practices of social welfare institutions and to changes in the meaning of citizenship and political participation.

*711 / Children and Families

Analysis of child and family policy in Canada, especially Ontario, with special attention to: (a) differential treatment of service users related to social divisions such as class, race, gender, age, sexual orientation, and ability/disability; (b) identifying and understanding gaps between policy and practice, especially in child welfare. Content will be adapted to student interests.

*721 / Community-Based Social Policy

Communities are important mediating structures between the state and individuals. Citizen participation issues and organization development are examined with a critical analysis of the social political context within which communities function. Strategy, choices, and dilemmas faced by community organizations as they develop and impact on government policies. Examination of community organizations (e.g. social planning councils, neighbourhood or interest groups, and social movements).

*722 / Topics in Advanced Social Work

Examination of social welfare policies and/or social work practice issues regarding a specific substantive area or concern.

*726 / Institutional Structuring of Practices in Social Work

The course examines dimensions of the changing forms of social service organizations and their management, e.g. supervision, consultation, team functioning, mechanisms for accountability, recording practices, participatory and other approaches to governance. Central to the course focus is critical analysis of the constraints and possibilities of fashioning practices and policies in the interests of service users and communities.

*731 / Critical Analysis of Social Work Practice

This course analyzes the development of social work practice theory in a social, political, and economic context. The use of social science knowledge to advance or ratify practice is explored as are the issues of translating theory into practice. Problem definition, what helps, end-outcome evaluations by practitioners and clients are examined as factors shaping both practice theory and its application.

*736 / Social Work Practice and Social Justice

Critical examination of the links and tensions between theoretical frameworks and front-line experiences, and the challenges of working toward transformative practice. Students are encouraged to draw on their practice backgrounds and to situate themselves reflexively within current practice debates.

*737 / Critical Approaches to Social Work Knowledge

An introduction to epistemological debates in practice and policy related research, emphasizing the challenges and possibilities of building knowledge for social change. Topics will include: different methodologies underpinning social research; power relations in knowledge production and communication; reflexivity in the research process.

*738 / Research Methods for Social Work

Review and application of methods commonly used in practice and policy related research. Students will be encouraged to use the seminar to focus their thesis research.
Prerequisite: Social Work *737

*770 / Social Work and Social Justice: Theoretical Tensions

This course addresses the fundamental tension in social work's location within social programs and state practices that have the potential both to redress and to deepen social inequalities. Theoretical and practical dimensions of this tension are explored in the contemporary context in which social programs in the public and voluntary sectors are the focus of neo-liberal restructuring and of the struggles and claims of marginalized populations.

*771 / Research for Social Change

This course addresses the complexities of formulating and carrying out research explicitly designed to be part of social change processes. It explores how social research may be engaged when issues of inequality and marginalization are embedded in the research content and process.

*772 / Qualitative Methods for Social Work

This course examines theory, techniques and issues of data analysis and interpretation in qualitative inquiry.
Prerequisite: Social Work *737 or equivalent

*773 / Doctoral Research Seminar

The course will examine key professional concerns among social work academics and researchers. Topics will include, among others, research funding and proposal writing; research publication; professional and research ethics; social work teaching, and career development among social work academics.

SOCIOLOGY

The Department of Sociology provides facilities for students intending to proceed to the M.A. and Ph.D. degrees.

Enquiries: 905 525-9140 Ext. 23613
 E-mail: sociology@mcmaster.ca
 Website: <http://www.socsci.mcmaster.ca/sociology/>

Staff / Fall 2009

PROFESSORS

W. Peter Archibald, B.A. (Mount Allison), M.A. (British Columbia), Ph.D. (Michigan)
 Scott Davies, B.A. (Toronto), M.A. (McMaster), Ph.D. (Toronto)
 / Joint appointment with Offord Centre for Child Studies
 Margaret Anne Denton, B.A., M.A., Ph.D. (McMaster) / Half-time,
 Health, Aging and Society
 John Fox, B.A. (City College of New York), M.A., Ph.D. (Michigan)
 / Senator William McMaster Chair in Social Statistics, Social Sciences
 Cyril H. Levitt, B.A., M.A. (Waterloo), Dr.Phil. (Free Univ., Berlin)
 Charlene E. Miall, B.A. (Ottawa), M.A. (Calgary), Ph.D. (York)
 Victor Satzewich, B.A., M.A. (Saskatchewan), Ph.D. (Glasgow)
 William B. Shaffir, B.A., M.A., Ph.D. (McGill)
 Philip G. White, B.Sc. (London, U.K.), M.Sc., Ph.D. (Waterloo)
 / Half-time, Kinesiology

ASSOCIATE PROFESSORS

Art Budros, B.A. (San Jose), M.A., C.Phil., Ph.D. (UCLA)
 Ivy Bourgeault, B.Sc. (Alberta), M.Sc., Ph.D. (Toronto)
 / Half-time, Health, Aging and Society
 Lori Campbell, B.A., M.A. (Western), Ph.D. (Guelph) / Half-time,
 Health, Aging and Society
 Tina Fetner, B.A. (California, Santa Cruz), M.A., Ph.D. (New York)
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 / Half-time, Labour Studies

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 Mark McKerrow, B.Sc., M.A. (Guelph), Ph.D. (Cornell)

ASSOCIATE MEMBERS

Jane Aronson (Social Work)
 Roy Cain (Social Work)
 Graham Knight (Communication Studies)

PROFESSORS EMERITI

Carl J. Cuneo, B.A., M.A., Ph.D. (Waterloo)
 Jack W. Haas, B.S. (SUNY at Brockport), Ph.D. (Syracuse)
 Rhoda E. Howard-Hassman, B.A., M.A., Ph.D. (McGill), F.R.S.C.
 Frank E. Jones, B.A., M.A. (McGill), Ph.D. (Harvard)
 David Ralph Matthews, B.A. (Memorial), M.A., Ph.D. (Minnesota)
 Peter C. Pineo, B.A. (British Columbia), M.A. (McGill), Ph.D. (Chicago)
 Carolyn Rosenthal, B.A. (Toronto), M.A., Ph.D. (McMaster)
 / Health, Aging and Society
 Vivienne Walters, B.A., M.A. (Sheffield), Ph.D. (McGill)

M.A. Degree

Normally candidates for admission to the M.A. program are expected to have completed work in sociology equivalent to the honours degree (57 units, including 9 units of theory and 12 units of methods).

A candidate for the M.A. degree in Sociology may follow either of two programs. Regardless of which M.A. program option is chosen, all students must pass one 700-level theory course, namely one of Sociology *750, *751, *757.

A. THESIS OPTION

A candidate must obtain satisfactory standing in not fewer than four half courses (two full courses) and must present a thesis based on research. The candidate must present a thesis proposal to the Department during the first term. If the proposal is approved, the candidate may then prepare a thesis.

B. COURSE WORK OPTION

A candidate must obtain satisfactory standing in not fewer than eight half courses. Of these, at least one half course must be a course in Sociological Theory and another half course in Sociological Methods. All courses will normally be completed by the end of the summer or fall term.

Ph.D. Degree

To be admitted directly to the Ph.D. program, applicants must have received a Master's degree from a recognized University.

The Department is willing to consider applications for admission to the Ph.D. program on a part-time basis. However, the Department prefers that students register for the Ph.D. on a full-time basis.

The course requirements will normally be six half courses chosen in consultation with the student's supervisor.

Any Ph.D. student admitted without 9 units of undergraduate or Master's level theory will be required to complete the requisite number of courses at the appropriate level, in addition to the regular graduate program.

Ph.D. students who have not successfully completed a 700-level theory course at the M.A. level at McMaster must take one 700-level theory course, namely, one of Sociology *750, *751, *757.

Ph.D. candidates will be required to demonstrate competence in quantitative methods by taking Sociology *740/Statistical Methods for Social Research. Persons admitted to the Ph.D. program without the equivalent of Sociology 3H06/Research Techniques and Data Analysis or Sociology *6Z03/Introduction to Social Statistics, however, will be expected to complete *6Z03 before taking Sociology *740. Admission is governed by the general regulations.

Ph.D. candidates will also be required to satisfy the Department of suitable competence in either qualitative methods or historical methods according to procedures delineated by the Department.

Students who have completed equivalent course work at another university may request to be exempted from the methodology requirements.

In addition to the theory and methods requirements, all Ph.D. students must take at least two regularly scheduled 700-level courses offered in the Department.

Ph.D. candidates are required to take two comprehensive area examinations, both in Group A, or one from Group A and one from Group B. These will constitute the student's Comprehensive Examination.

GROUP A: Individual and Society; Occupations and Organizations; Social Inequality

GROUP B: Aging; Deviance and Social Problems; Education; Gender; Health and Health Care; Ideology and Culture; Methodology; Political; Race/Ethnic Relations; Theory.

By the end of their first year in the program, doctoral students must complete six courses, or at least four courses and one comprehensive exam. By the end of their second year in the program, they must complete all six of their courses and both comprehensive exams.

The student's supervisory committee and the Graduate Committee may require Ph.D. students to demonstrate competence in a second language if their chosen area of study and research makes knowledge of a second language desirable.

Candidates for the Ph.D. degree will present a thesis which shows competence in original research. Each candidate will be required to defend the thesis in a Final Oral Examination.

Research in Sociology

The Department has the capability of supervising M.A. theses in a broad range of topics. At the Ph.D. level, the department is officially certified in three main areas: Individual and Society, Occupations and Organizations; and Social Inequality. These three areas are broadly defined and a variety of approaches and topics are possible within each. Students normally select more narrowly focused topics under the general rubric of these areas. Many are guided by the Group B list above which are further specifications of the three broad areas.

In order to ensure proper supervision, the department attempts to match as closely as possible the research interests of incoming students with those of the incoming faculty. Applicants should consult the department's web site on the Internet for the most current areas of expertise and research activities of the faculty.

While the Department has specialized in its areas of Ph.D. supervision, students are nonetheless encouraged to pursue their studies more broadly in the courses taken. The list below gives the titles of the various courses offered. Details about which of these courses will be offered in any particular year, the actual course content and the name of the instructor can be obtained from the Graduate Secretary, Department of Sociology, Room 627, Kenneth Taylor Hall.

Courses

Courses marked with an asterisk (*) are half courses. The following courses are offered for graduate credit and are also available to senior undergraduate students.

*6E03 / Self and Identity

A consideration of theoretical and empirical questions relating to self and identity viewed from historical, cross-cultural and cross-disciplinary perspectives.

*6J03 / Selected Topics in Sociology I

Topics of contemporary interest to sociologists, with emphasis upon current theory and research.

*6JJ3 / Selected Topics in the Sociology of Technology

The purpose of this course is to examine the economic, political and social organization of the internet, and its social effects, in such areas as education, work, and leisure.

*6K03 / Selected Topics in Sociology II

Topics of contemporary interest to sociologists, with emphasis upon current theory and research.

*6R03 / Individual and Society

An intensive examination of selected problems involving the relationship of individuals to social structures.

*6Z03 / Introduction to Social Statistics

This is a basic course in social statistics, which introduces students to the role of statistical methods in social research and to the fundamentals of statistical reasoning. The course is intended to equip students to read sociological research that uses basic statistical methods, to undertake elementary data analysis, and to take more advanced courses in social statistics. *(No 400-level equivalent)*

The following courses are offered for graduate credit only:

*700 / Selected Topics in Sociology I

This is a special topics course addressing current debates within sociology. Topics may be of a general nature, covering debates and new directions in the discipline as a whole, or more specific to sub-areas within the discipline.

*701 / Selected Topics in Sociology II

This is a special topics course addressing current debates within sociology. Topics may be of a general nature, covering debates and new directions in the discipline as a whole, or more specific to sub-areas within the discipline.

*702 / Doctoral Research Seminar

This capstone course has two strands. One considers the relations among theories, methods, and data. The other consists of professional development workshops: scholarship applications, publishing, dissertation proposals, careers, and research grant applications. Students work on a dissertation proposal or a publishing project. At every stage of the course, students comment on each other's work in a collaborative learning environment.

*703 / Sociology of Family

This course will examine the family as a social institution. We will explore the social norms and roles of "the" family, examine diversity in families, and consider the current social hierarchy of family forms. We will look at important social forces such as state, the economy, gender, race and class, and we will examine social problems related to families.

*704 / Social Problems

Critical consideration will be given in this course to theoretical perspectives on the origins, emergence, nature and development of social problems.

*705 / Sociology of Organizations

This course introduces students to classical and contemporary theories of organizations and to empirical (qualitative and quantitative) research that evaluates these theories. Representative theories include Weber's theory of bureaucracy, institutional theories of organizational change, and network perspectives on organizations. Representative topics include organizational downsizing and restructuring, internal labour markets, and the divergent organizational experiences of women and men.

*706 / Sociology of Deviance

This course provides an advanced theoretical and empirical analysis of the social politics involved in the deviance definition process in Canada, with emphasis placed on how individuals experience social careers as publicly labeled deviants. Prospects for the diffuse tolerance or institutional control of deviance in Canada are also highlighted, as are substantive and methodological trends in North American deviancy research.

***708 / Topics in Religion and Society
(Same as Religious Studies *780)**

This course introduces students to recent developments in the sociology of religion, with attention to theoretical debates and specific case studies. Among the topics considered are: secularization and religious revival; the dynamics of religious recruitment, conversion, defection and schisms; the social organization of religious institutions and movements; religion and the body; religious consumerism and popular culture; religion and globalization; religion and media. Emphasis will shift from year to year. (Prerequisite: Permission of the instructor)

***709 / Religion and Globalization
(Same as Globalization *707 and Religious Studies *768)**

This course will provide a critical account of debates about globalization as they relate to questions of religious identity, practice, belief and modes of affiliation. Through a combination of theoretical discussion and case studies, the course will provide students with a framework for analysing how religious movements operate on the world stage, both historically and in the contemporary situation. Thematic emphasis and selection of case studies will shift from year to year, including (but not limited to) studies of secular nationalism, religious fundamentalism, religion and global media, transnational and diasporic religious public spheres, missionaries and empire, religion and migration, pilgrimage and travel, religion and global environmentalism, or religious themes in world politics.

***710 / Introduction to Research Design in Sociology**

This course is designed for entry level Master's students to identify a critical research issue of relevance to the field of sociology and to develop a research proposal to help better understand the issue chosen. The course is structured such that each week students work on a skill that leads them further through the process of developing all of the critical elements of a research proposal. The course will also enable students to gain experience to work both within and outside of the university research setting.

***713 / Social Inequality**

This course reviews and assesses decades of sociological theory and research on inequality. It examines classic and contemporary theories and employs concepts from the burgeoning sub-fields to comprehend economic, institutional and cultural change. Using both macro and micro approaches, this course discusses ways in which forms of inequality are changing in contemporary times.

***714 / Political Sociology**

This course is an advanced treatment of theories and empirical research on the state, social and political movements, political attitudes and culture, political behaviour and voting, organization of political parties, elites, citizenship, democracy, civil society, political conflict, nations, nationalism, and globalization. The role of socio-economic factors, such as gender, race/ethnicity, education, income, occupation, and class, will also be considered.

***716 / Sociology of Education**

This course investigates the relationship between formal schooling and society. Topics include educational inequalities by class, race and gender, the expansion, institutionalization and stratification of schooling, the transformation of knowledge, and the politics of education. Students will be exposed to both current theories and research in the field at micro, meso and macro levels.

***718 / Sociology of Occupations**

This course examines theory and research in the sociology of occupations. Topics include the emergence of competing occupations in jurisdictions such as health, education, law, engineering, and academe, and their shifting demographics. Consideration will be given to macro, meso and micro factors influencing the professions with emphasis on current issues including globalization and the 'knowledge economy.'

***719 / Sociology of Health and Health Care**

This course addresses the key theoretical debates in the sociology of health, illness and health care literatures. Topics covered could include: the social determinants of health, the social construction and experience of illness, the social organization of health care, the social dynamics of the health care division of labour, the role of the state, and comparative health issues.

***720 / Sociology of Aging**

This course provides an overview of three distinct theoretical focuses in the sociology of aging: (1) the sociology of age, which analyses the ways in which age is an organizing principle in society; (2) the sociology of aging, which focuses on continuity and change in the lives of individuals as they grow older; and (3) the sociology of the aged, which tends to view older people from a social problems perspective.

***721 / Sociology of Popular Culture and Subcultures**

This course offers a selected overview of American and European theories of popular culture. Particular emphasis is given to how the politics of class, gender, ethnicity and sexuality are embedded in the material production and consumption of mass mediated cultural forms. Attention is also directed toward the ways by which pop cultural commodities and images are globally exchanged, negotiated and resisted.

***722 / Sociology of Culture**

This course offers an overview of theoretical perspectives in the sociology of culture. Theories to be discussed could include critical theory and cultural studies, the production of culture approach, neo-institutionalism, Bourdieu, neo-Gramscian, neo-Durkheimian or globalization theories. Substantive areas in the sociology of culture considered might include music, art, sports, literature, intellectuals and knowledge, love and intimacy, mass media and cultural institutions.

***730 / Supervised Research Course**

Directed study of a research problem through published material and/or field inquiry and/or data analysis. To be undertaken with a Sociology faculty member. Research courses undertaken with a faculty member from another department must obtain the appropriate course designation from that department. Coursework M.A. students may take this course twice in the same term.

***740 / Statistical Methods for Social Research**

This is a second course in social statistics, required of our Ph.D. students. The course focuses on regression analysis, linear models, and generalized linear models, such as logistic regression. Emphasis is placed on the practical application of statistical methods, including the use of modern statistical computer software. (Prerequisite: Sociology *6Z03 or equivalent, or Permission of the Instructor)

***742 / Qualitative Methods**

The seminar examines a range of qualitative research methods as a means of studying aspects of society and social life. Depending on the instructor, the emphasis may centre, for example, on participant observations and informal interviews, the content analysis of documents, or the practical application of qualitative methods for problem-solving purposes. In addition to considering the challenges and advantages of qualitative methods, the seminar also focuses on the underlying theoretical principles encompassing qualitative methods. (Prerequisite: Permission of Instructor)

***743 / Historical Methods**

This course examines how sociologists design historical research projects, and then develop systematic strategies for retrieving archival data. Students gain experience in locating, gathering and interpreting forms of historical data such as government records, personal narratives, media documents, existing statistics and other secondary sources. Critiques of classical sociology, historiography, genealogy and comparative methods are typically addressed.

***744 / Computer Applications in Qualitative Data Analysis**

This is hands-on training in qualitative computer software (QSR Nud*ist or Nvivo) in analyzing text materials: interviews, field notes, diaries, internet content, or archival documents. Covered are document format and import, inductive and deductive coding, nodes, memo writing, open text and node searching, qualitative/quantitative interface, and theoretical modeling. Students will develop a project using a qualitative software program. (Prerequisite: Permission of the Instructor)

747 / Welfare States in Comparative Perspective (Same as Political Science *747)**750 / Classical Sociological Theory**

This seminar will introduce students to the classical sociological tradition. The class will focus on selected thinkers, themes, theories and/or theoretical perspectives related to classical sociological theory. In past years, the focus of the class has been on such classical sociological theorists as Marx, Weber, and Durkheim. The specific choice of readings, theories and theorists covered and the framing of the class will depend on the instructor.

***751 / Contemporary Sociological Theory**

This seminar will introduce students to the contemporary sociological tradition. The class will focus on selected thinkers, themes, theories and/or theoretical perspectives related to contemporary sociological theory. In past years, the focus of the class has been on such contemporary sociological theorists as Giddens, Collins, Goffman, Smith and Habermas and micro-macro integration. The specific choice of readings, theories and theorists covered and the framing of the class will depend on the instructor.

***755 / Individual and Society**

This course addresses the nature of the relationship between individual and society, emphasizing normally the contributions of symbolic interactionism and other interpretive theories, though other approaches may be considered. Topics covered may include self, identity, roles, motives/accounts, the agency/structure debate, generic social processes, the construction of meaning, emotions, and negotiated order.

***756 / Media, Culture and Society**

This course explores how social relationships are generated, sustained and transformed through institutions, practices and technologies of mediated communication. Among the topics considered are: the organization of media institutions; the production of audiences; media and social movements; promotionalism, advertising and consumer culture; media and globalization; media and the human sensorium. Emphasis will shift from year to year.

***757 / History of Sociological Theory**

This seminar will introduce students to the history of sociological theory. The class will focus on the history of selected thinkers, themes, theories or theoretical perspectives within sociological theory. In past years, the focus of the class has been on such topics as the history of the Frankfurt School, Marx and Marxism, conflict theorists such as C. Wrights Mills and Alvin Gouldner, Canadian sociological theories, feminist theory, post-modernism and symbolic interactionism. The specific choice of readings, theories and theorists covered and the framing of the class will depend on the instructor.

***758 / Sociology of Race and Ethnicity**

This course will examine the major approaches and concepts used to understand patterns of race and ethnic relations. Issues such as assimilation, identity, racism, state policy and multidimensional inequalities will be addressed through historical, contemporary and comparative analysis.

***759 / Sociology of Gender**

An examination of classical and contemporary theoretical perspectives on gender relations, with an emphasis on the development of feminist thought, and the links between gender, and race, ethnicity, citizenship, and class. The discussion of analytical frameworks for understanding gender construction, gender difference, and gender inequalities will be informed by research in selected substantive areas such as: the economy, work, family, sexuality, popular culture, and law.

***761 / Topics in Statistical Methods for Social Research**

This is a moderately advanced course in social statistics, meant to introduce students to several statistical methods that are frequently used in social research. Representative topics include structural-equation modeling; survival analysis; mixed-effects models for hierarchical and longitudinal data; missing data; and data from complex survey samples. (Prerequisite: Sociology *740 or equivalent, or Permission of the Instructor)

770 / Advanced Analysis of Survey Data (Same as Economics 770, Geog 770, Psychology 770, HRM 790)

This course uses large-scale surveys to refine student skills in conducting secondary analysis and writing for publication in peer-reviewed journals. Students will develop a two-page research proposal on a topic of their choice. The proposal will identify a research question to be addressed using one or more population-based studies. The educational methods will be varied, depending on group composition and include lectures, small group tutorials, student presentations and faculty mentorship. The objective is to produce a research report for submission to a peer-reviewed journal.

Other courses that may be of interest are the following:

HEALTH, AGING AND SOCIETY COURSES

- *710 / Multidisciplinary Perspectives on Aging
- *711 / The Health Care System and the Older Person

POLITICAL SCIENCE COURSES

- *786 / Organizational Theory and the Public Sector

STATISTICS

The Department of Mathematics and Statistics offers an M.Sc. program in Statistics which is administered by a Graduate Committee with faculty from several university departments.

Enquiries should be addressed to the Coordinator, Graduate Program in Statistics, 905 525-9140, Ext. 23420
E-mail: statistics@math.mcmaster.ca
Website: http://www.math.mcmaster.ca/graduate/msc_stats/

Ph.D. in Mathematical Statistics is offered (see "Mathematics" section of this Calendar for details).

Staff / Fall 2009**PROFESSORS**

- N. Balakrishnan, B.Sc., M.Sc. (Madras), Ph.D. (I.I.T., Kanpur)
- S. Feng, B.Sc., M.Sc. (Beijing Normal), Ph.D. (Carleton)
- J. Fox, B.A. (City College of New York), M.A., Ph.D. (Michigan) / Sociology
- F.M. Hoppe, B.Sc. (Toronto), M.Sc. (Weizmann Institute of Science), M.A., Ph.D. (Princeton)
- P.D.M. Macdonald, B.Sc., M.Sc. (Toronto), D.Phil. (Oxford), P.Stat.
- L.J. Magee, B.Math. (Waterloo), M.A., Ph.D. (Western) / Economics
- M. Min-Oo, B.Sc. (Rangoon), Dip. Math., Dr.rer.nat. Habil. (Bonn)
- J.S. Racine, B.A., M.A. (McMaster), Ph.D. (Western) / Economics
- H.S. Shannon, B.A. (Oxford), M.Sc. (Birmingham), Ph.D. (London) / Clinical Epidemiology & Biostatistics

M.R. Veall, B.A. (McMaster), M.A. (Western), Ph.D. (M.I.T.) / Economics
 R. Viveros-Aguilera, B.A. (Veracruzana, Mexico), M.A. (National Polytechnic Inst., Mexico), Ph.D. (Waterloo) / Coordinator
 S.D. Walter, B.Sc. (London), Ph.D. (Edinburgh) / Clinical Epidemiology & Biostatistics
 K.M. Wong, B.Sc.(Eng.), Ph.D., D.Sc. (London), D.I.C. (Imperial College), F.I.E.E.E., F.I.E.E., F.Inst.P., F.S.S., C.Eng., P.Eng./ Electrical and Computer Engineering

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 A. Childs, B.Sc., M.Sc., Ph.D. (McMaster)
 L. Thabane, B.Sc. (Lesotho), M.Sc. (Sheffield), Ph.D. (Western) / Clinical Epidemiology & Biostatistics

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 R. Zhu, B.Sc., M.Sc., (USTC, China), Ph.D. (British Columbia)

ADJUNCT MEMBERS

A.H. El-Shaarawi, B.S., M.Sc. (Cairo), Ph.D. (Waterloo) / National Water Research Institute
 S.R. Esterby, B.A. (Queen's), Ph.D. (Waterloo) / Okanagan University College
 T. Kourti, Dipl. Eng. (Chemical) (Aristotle Univ., Greece), Ph.D. (McMaster) / GlaxoSmithKline Manufacturing

PROFESSORS EMERITI

M. Gent, B.Sc., M.Sc. (Durham) / Clinical Epidemiology & Biostatistics
 C.H. Goldsmith, B.Sc., M.Sc. (Manitoba), Ph.D. (North Carolina State) / Clinical Epidemiology & Biostatistics
 S.W. Link, B.A. (Colorado), Ph.D. (Stanford) / Psychology
 J.F. MacGregor, B.Eng. (McMaster), M.S., Ph.D. (Wisconsin), P.Eng. / Chemical Engineering
 S.G. Mohanty, B.A. (Utkal), M.A. (Punjab), Ph.D. (Alberta)
 R.S. Roberts, B.Tech. (Bradford), M.Tech. (Brunel) / Clinical Epidemiology & Biostatistics
 D. W. Taylor, B.A. (McMaster), M.A. (Western) / Clinical Epidemiology & Biostatistics
 M.L. Tikou, B.A. (Kashmir), M.A. (Punjab), M.Sc. (Patna), Ph.D., D.Sc. (Aberdeen)
 G.O. Wesolowsky, B.A.Sc. (Toronto), M.B.A. (Western), Ph.D. (Wisconsin) / Business
 A. Willan, B.A. (York), B.Ed., M.Sc. (Queen's), Ph.D. (Western) / Clinical Epidemiology & Biostatistics

Areas of Specialization

With the approval of the Ontario Council of Graduate Studies, students in the Master Program in Statistics have the opportunity to specialize in the areas of:

- Medical Statistics (Biostatistics)
- Applied Statistics
- Statistical Theory
- Applied Probability

A variety of elective courses will be available to cater to individual interests. All students will be required to complete core courses on the foundations of statistics. Students interested in a particular application area may receive graduate credit for certain courses given in other departments.

Although a student with a good undergraduate background in statistics should be able to complete the requirements for the M.Sc. degree in one calendar year of study, it is expected that some students will require longer. Students entering the program after receiving an undergraduate degree in science or engineering with minimal preparation in statistics may be required to take some background

courses. Students with a good undergraduate background in statistics may want to study statistics as applied to a particular application area. These students will be required to take courses outside of statistics to become familiar with the application area of interest. For example, a program in medical statistics would involve taking courses in health research methodology. Students will also be expected to develop their report-writing and presentation skills and become familiar with the use of statistical packages on microcomputers and workstations.

The particular areas of specialization to be emphasized in the program will be those in which the faculty members have special expertise. Statistics faculty drawn from five different faculties and schools make this program uniquely interdisciplinary. Since several of the faculty are biostatisticians in the Health Sciences Centre, one of the major areas will be health and medical statistics. Students specializing in this area will learn the various issues involved in the conduct of large multi-centre clinical trials, and the methods for analyzing survival data and multi-dimensional contingency tables. These students will interact closely with their peers enrolled in the Health Research Methodology Program, and will take courses in medical sciences. Through thesis work supervised by members of the biostatistics faculty, they will have opportunities to gain experience in statistical consulting in a health sciences context.

Students who do not wish to specialize exclusively in health and medical statistics, but rather in a broader area of applied or theoretical statistics, may obtain training in one or more of the following areas: environmetrics, time series analysis, stochastic models in biology, statistical methods in genetics, economics, nonlinear models, applied statistics, order statistics, reliability, analysis of censored data, the bootstrap and other resampling methods, non-parametric methods, comparative inference, and quality control. Our Research Data Centre, a Statistics Canada unit at McMaster, holds large real-life data sets from longitudinal surveys that are suitable for statistical analyses for theses and other research projects. Students interested in business or industrial applications may arrange to do their thesis work off-campus. Those interested in combining statistics with financial mathematics can take courses offered by the PhiMac Group at McMaster.

The Graduate Program in Statistics is subject to all existing University regulations and specifically to the general regulations governing Master's degrees as established by the School of Graduate Studies and set out near the front of this Calendar. Either a full-time or a part-time program of study may be undertaken.

A. ADMISSION STANDARDS

B.A. or B.Sc. honours degree, B+ standing, or equivalent, with a good background in statistics and mathematics. Students with a degree in engineering, science, health sciences, or social sciences will enthusiastically be considered, provided they have a B+ average with sufficient mathematics and statistics background. Students coming from other areas may be required to take additional undergraduate courses to make up any deficiencies.

B. PROGRAM REQUIREMENTS

Students can earn the M.Sc. degree following one of the options below. In both options students can take up to two 600-level courses to fulfill their graduate course requirements. All Master statistics students are required to attend the weekly Statistics seminar during the Fall and Winter terms.

Thesis Option

Students choosing the **Thesis Option** are required to complete six one-semester graduate courses (consisting of three compulsory and three elective courses) and a thesis. Equivalent in work to two one-semester courses, the thesis is written under the supervision of a faculty member of the program in a topic of mutual interest to student and supervisor. The degree requirements are normally completed in four academic terms.

Coursework Option

The **Coursework Option** requires completion of eight one-term graduate courses (consisting of three compulsory and five elective courses). The degree requirements are normally completed in four academic terms.

C. EXAMINATIONS

No examinations will be required except as stipulated by individual instructors in individual courses.

D. THESIS

For those in the **Thesis Option**, a thesis will typically be 50 to 150 pages in length, exclusive of tables, graphs and appendices, written and bound in the usual format for a thesis. Standard statistical analyses applied to a novel application, or original contributions to statistical methodology with adequate presentation of background material will be acceptable thesis work. Students will be required to defend their theses orally.

Courses

Courses marked with an asterisk (*) are half courses. Courses marked with a plus sign (+) may differ in content each time they are offered and may be taken a second time for graduate credit.

In the Statistics Program, there are required, elective, and special topics courses. Required courses, STATS 743 (two one-term courses) and STATS *752 (one one-term course), cover the basic theoretical concepts that are considered essential for all students. The elective courses are traditional statistics courses covering a sufficient variety of topics to offer students a choice based upon their individual interests. STATS *770 is an elective course that develops a broad knowledge of statistics through attendance at research seminars as well as report-writing skills through critical written reviews of the seminars. Approved courses from other graduate programs may be taken as elective courses for graduate credit. Students concentrating in Medical Statistics will be required to take courses in Health Research Methodology, such as Fundamentals of Health Research and Evaluation Methods (HRM *721) and Introduction to Research Methods for Randomized Controlled Trials (HRM *730). Some Medical Sciences courses have prerequisites and limited enrolment, so students should contact the Health Research Methodology Program office at ext. 27718 before registering. special topics courses are intended to be highly flexible and vary from year to year. They are usually offered in the areas of specialization of individual faculty members.

Graduate students taking the combined graduate/undergraduate courses *6A03, *6C03, *6D03, *6E03, *6F03, *6M03, *6P03 or *6U03 for graduate credit will be required to do more work than undergraduates in the same class. The additional work may include a project, an essay, a class presentation, or a more difficult examination, at the discretion of the instructor. For the M.Sc. in Statistics, at most two 600-level courses may be taken for graduate credit. The following 600-level courses are available for the Statistics Program.

*6A03 / Time Series

Stationary, auto-regressive and moving-average series, Box-Jenkins methods, trend and seasonal effects, tests for white noise, estimation and forecasting methods, introduction to time series in the frequency domain.

*6C03 / Generalized Linear Models

Review of the normal linear model, the exponential family, the iteratively-reweighted least squares algorithm, logistic regression for binary data, Poisson regression and log-linear models, other families of GLM's, quasi-Likelihood, analysis of deviance and model checking, residuals in generalized linear models, linear mixed models, analysis of longitudinal data, generalized linear mixed models.

*6D03 / Intermediate Probability Theory

Construction of probability spaces and random variables, integration, conditional expectation, law of large numbers, convergence of series, weak convergence, characteristic functions and central limit theorems, martingales.

*6E03 / Brownian Motion and Diffusion

Brownian motion, stochastic integrals, one-dimensional Ito's formula, diffusion processes, option pricing and other financial applications. Simulation of the Black-Scholes formula and related models.

*6F03 / Categorical Data Analysis

Two-way and three-way contingency tables, logistic regression, log-linear models for contingency tables, collapsibility, ordinal associations, multicategory logit models.

*6M03 / Multivariate Analysis

Multivariate distributions: Normal, Wishart, T^2 and others; regression, correlation, factor analysis and principal components, general linear hypothesis.

*6P03 / Advanced Applied Statistics

Statistical computing, statistical software packages; working with large data sets; exploratory data analysis; graphical methods; statistical consulting practice.

*6U03 / Nonparametric Methods in Statistics

Rank test and nonparametric methods; rank correlation; comparison with parametric methods.

The following 700-level courses are available to graduate students:

*741 / Theory of Estimation

General principles of estimation, sufficiency, completeness, Rao-Blackwell and Lehman-Scheffe theorems, Cramer-Rao inequality, maximum likelihood estimation, Bayes estimation, minimax estimation, admissibility and complete classes.

*742 / Theory of Testing Hypotheses

Statistical tests, uniformly most powerful tests, unbiased tests, invariant tests, minimax principle.

743 / Foundations of Statistics

A systematic treatment of the central concepts and methods of statistical inference, including sampling distributions, point and interval estimation, and testing of statistical hypotheses. Both frequentist and Bayesian approaches are presented. The course ends with an introduction to resampling methods, including the bootstrap and the jackknife, and to inferential aspects of regression methods, including logistic and generalized linear models.

+*744 / Special Topics

One or more SPECIAL TOPICS courses based on courses of study planned by the program Coordinator for individual students. Topics may be selected from the following list, to which others will be added from time to time: Biostatistics; Categorical data; Censored data; Comparative inference; Data analysis; Distribution theory and applications; Environmetrics; Financial mathematics; Large deviations and applications; Limit theorems in statistics; Mixture distributions; Nonparametric methods; Order statistics; Operations research; Probability; Process control; Queuing theory; Reliability; Response surfaces; Robust methods; Statistical decision theory; Stochastic processes; Survival analysis.

*752 / Linear Models and Experiment Designs

This course covers the general linear model. Applied regression analysis. Incomplete block designs, intra- and inter-block analysis, factorial designs. Random and mixed models. Distribution theory, hypothesis testing, computational techniques.

***753 / Advanced Survey Sampling**

Sampling designs, unbiased estimation for element sampling, unbiased estimation for cluster and several-stages designs, estimation through linear associations with auxiliary variables.

***754 / Stochastic Processes and Applications**

Review of probability methods for applied scientists: functional transformations, convolution, correlation, power spectral density, Monte Carlo methods, Markov processes, queuing theory.

***756 / Topics in Biostatistics**

Categorical data, multi-dimensional contingency tables. Survival analysis. Demography. Design of retrospective and prospective studies. Designs to reduce bias and confounding. Models for epidemics and chronic diseases.

***758 / Multivariate Analysis and Applications**

Multivariate normal distribution. Multivariate analysis of variance, tests of hypotheses. Canonical correlation. Principal components. Factor analysis. Discriminant functions. Computational techniques in multivariate analysis.

***761 / Advanced Time Series Analysis**

Spectral representation, inference for the spectrum, multivariate time series, state space models and the Kalman Recursions.

***770 / Statistics Seminar / Staff**

A statistics seminar is held weekly during the fall and winter terms, with presentations by faculty, visitors and students. Students are to attend the seminar, participate in discussion, and submit short written critical reviews of at least 8 seminars.

CHEMICAL ENGINEERING COURSES***762 / Time Series Analysis and Process Identification**

Methods for modelling the dynamic-stochastic behaviour of a process and its disturbances using data collected from the process. Traditional methods for impulse and frequency response identification. Discrete transfer function and ARIMA time series models. Statistical methods for structure determination, parameter estimation, model validation, design of experiments, and analysis of closed-loop data. Use of models for forecasting, analysis, and control.

ECONOMICS COURSES**770 / Advanced Analysis of Survey Data
(Same as Psychology 770, HRM 790, Geog 770,
Sociology *765)**

This course uses large-scale surveys to refine student skills in conducting secondary analysis and writing for publication in peer-reviewed journals. Students will develop a two-page research proposal on a topic of their choice. The proposal will identify a research question to be addressed using one or more population-based studies. The educational methods will be varied, depending on group composition and include lectures, small group tutorials, student presentations and faculty mentorship. The objective is to produce a research report for submission to a peer-reviewed journal.

ELECTRICAL AND COMPUTER ENGINEERING COURSES***723 / Information Theory and Coding**

Entropy and mutual information. Discrete memoryless channels and discrete memoryless sources, capacity-cost functions and rate distortion functions. The Gaussian channel and source. The source-channel coding theorem. Linear codes. BCH, Goppa, Reed-Solomon, and Golay codes. Convolutional codes. Variable-length source coding.

***760 / Stochastic Processes**

Concepts of probability, logical relations, conditional probability and expectation, Bayes theorem, Bayesian statistics, central limit theorem; continuous random variables, correlation and higher order statistics; theory of distributions: moments, heavy tailed distributions, Cauchy distribution, characteristic functions, stability / infinite divisibility; Markov property, principles of stationarity, ergodicity; power spectral density and auto-correlation; population dynamics, birth-death-immigration processes, the Poisson process; diffusion processes, the Fokker-Planck equation; Brownian motion and the Wiener process; introduction to stochastic differential equations.

***762 / Detection and Estimation**

Hypothesis testing decision criteria, detection of signals in noise; theory and parameter estimation, Bayes estimate, maximum likelihood estimate, Cramér-Rao bound, linear mean square estimation, Wiener filtering, Kalman filtering, applications to communication and radar systems.

MATHEMATICS COURSES***771 / Mathematics of Finance**

A sequel to Statistics *6E03. Binomial model of stocks, stochastic calculus, martingales and arbitrage, Black-Scholes equation and pricing derivative securities, interest rate modeling, introduction to portfolio risk management.

***782 / Probability Theory**

Probability measures, conditional expectations, martingales, convergence of probability measures, stochastic processes.

HEALTH RESEARCH METHODOLOGY COURSES***721 / Fundamentals of Health Research and Evaluation
Methods**

The major components of research activities are covered, including concept of health, formulation of research questions, literature reviews, study designs, selection of study populations, choice of measuring instruments, and study interpretation issues such as determination of causality and the effectiveness of clinical and community interventions.

***730 / Introduction to Research Methods for Randomized
Controlled Trials**

This course introduces students to the main elements of clinical trial design, execution, and analysis. Students' grasp of clinical trial methodology will allow students to prepare successful grant applications.

***731 / Advanced Linear Models for Health Data**

The course focuses on some advanced statistical techniques for the analysis of health studies that have continuous outcomes. Although these techniques are useful for many kinds of research, students interested in observational, repeated-measures, and longitudinal studies will find them especially helpful. The goal of the course is to give students the tools to develop multivariate linear models of health outcomes. The curriculum is divided into 3 modules: (1) fundamental topics in linear regression; (2) multilevel models and growth curve analysis for clustered and longitudinal data; and (3) structural equation modeling with latent variables. We take a conceptual, rather than mathematical, approach using a combination of lectures with problem-based discussion. Assignments emphasize computer analysis and interpretation of real data.

***733 / Statistical and Methodologic Issues in Randomized
Clinical Trials**

This course will consider important statistical issues relating to design, analysis and interpretation of randomized clinical trials. Specific topics will include issues in sample size determination, sequential methods, repeated data evaluation, data monitoring, analysis of survivorship data and competing risks, crossover trials, large simple trials, factorial designs, economic evaluation in clinical trials, cluster randomization and meta analysis. This course will be taught in small group tutorials.

WORK AND SOCIETY

The M.A. Program in Work and Society offers a full-time one-year program (part-time is available - see below) leading to the degree Master of Arts in Work & Society. The prime objective of this unique graduate program is to introduce students to a variety of theoretical approaches and policy debates that relate to the question of working in modern societies - from working for wages in primary industrial and service settings, to the paid and unpaid work that goes on in the home and elsewhere. Regardless of the particular focus, work is to be studied as one component of a larger life experience that incorporates family life, community relations, gender and race relations, politics and state regulations.

The M.A. is also offered on a part-time basis. To facilitate this option, Work and Society core courses are held in the evening on a rotating basis. Nevertheless, it is likely that students wishing to pursue such a program may have to complete at least some of their courses during the day. There is a time limit of five years for completion of an M.A. part-time. Students who wish to change their status from part time to full time, must apply to the Graduate Studies Committee.

Enquiries: 905 525-9140 Ext. 24692
 Email: molnars@mcmaster.ca
 Website: <http://socserv.mcmaster.ca/labourstudies>

Staff / Fall 2009

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 Ruth Frager (History)
 Richard Harris (Geography and Earth Sciences)
 Tony Porter (Political Science)
 Joe Rose (Industrial Relations)
 Robert Wilton (Geography and Earth Sciences)
 Isik Zeytinoglu (Industrial Relations)

M.A. Degree

The M.A. offers students a truly interdisciplinary program of study in the area of Work and Society combining interdisciplinary courses in Work and Society offered by core faculty and related courses offered by other departments and schools at McMaster. Program of study outside of the core courses will be approved by a Graduate Studies Committee. The interdisciplinary nature of the program will be further enhanced by welcoming students enrolled in graduate programs offered by other departments into the core Work and Society courses.

REQUIREMENTS

Students will have two options for completing their M.A.

A. Course Work and Research Paper Option

Students will be required to complete six (6) half courses, including:

- (i) At least three half courses from the menu of Work and Society core courses.

- (ii) Three additional courses, at least two of which must be from among those offered by other departments. (**Note:** In selecting the courses from other departments, students can choose from a menu of approved courses. Students will also be given some flexibility to make their own arrangements with other departments. Students could end up taking these three additional courses all from one department, an option likely to be attractive to students anticipating further graduate work, or they could select courses from more than one department. Programs of study will be subject to the approval of the Graduate Studies Committee.)
- (iii) A research paper (6,000-7,500 words, excluding endnotes and bibliography) supervised by a core or associate faculty member. The research paper will be read by the supervisor and another faculty member. (If the supervisor is an associate member, then the second reader must be a core faculty member selected by the supervisor in consultation with the student).

B. Course Work and Thesis Option

Students will be required to complete five (5) half courses, including:

- (i) At least three half courses from the menu of Work and Society core courses.
- (ii) Two additional courses, at least one of which must be from among those offered by other departments. (**Note:** In selecting the courses from other departments, students can choose from a menu of approved courses. Students will also be given some flexibility to make their own arrangements with other departments. Students could end up taking these two additional courses all from one department, an option likely to be attractive to students anticipating further graduate work, or they could select courses from more than one department. Programs of study will be subject to the approval of the Graduate Studies Committee.)
- (iii) A thesis (10,000-15,000 words excluding endnotes and bibliography) supervised by a core faculty member. The thesis will be orally examined by a committee including the supervisor and two other faculty selected by the thesis supervisor in consultation with the student.

Introduction to Methods

In addition to the required course work, all students will take a methods course which will introduce them to a variety of research concepts and methodologies utilized in the social sciences, e.g., surveys, historical, interviewing, participant observation, participatory action, etc. This course will involve six, three-hour sessions and is held in the evenings throughout the fall term.

Core Courses in Work and Society

Core courses will be selected from the following menu:

- *700 / Work, Workers and Their Workplaces
- *710 / Class, Gender & Race: Theorizing Work, Home & Society
- *720 / Labour Markets, the State and Inequality
- *730 / Work and Democracy in the Global Society
- *740 / Selected Topics in Work and Society
- *750 / Independent Study (by permission only)
- *760 / Social Justice, Work and Society

Courses

*700 / Work, Workers and Their Workplaces

The focus of this course is the worker and the workplace. It will provide students with a comprehensive historical and contemporary understanding of the organization of production in all sectors of the economy, with particular emphasis on artisan production, Fordism, Lean Production and empowerment. In addition, we will examine questions and issues pertaining to the gendering of work, how work is valued, and the organization of work in the informal sector. The course

will also be centrally concerned with alternative forms of organization such as industrial districts, cooperatives. In each set of discussions we will be addressing the role of unions in changing the workplace experience.

***710 / Class, Gender & Race: Theorizing Work, Home & Society**

The intent of this course is to explore the major theoretical debates that centre on how class, gender and race, historically and in current times, shape the relationship between work, home and society. As such, this course will critique, build on, and move beyond the mainstream theories and boundaries of the sociology of work, organizations, labour markets, etc., to investigate how the nexus of class, gender and race fundamentally condition the structuring of labour processes in all sectors, has shaped the differing relationships between the sphere of paid employment and families, has impacted on the relationship between work, sexuality and the politics of identity, and facilitates and mitigates against collective organization and resistance.

***720 / Labour Markets, the State and Inequality**

This course is aimed to provide students with an in-depth understanding of labour market and employment policy in the public and private sectors and the formal and informal labour markets. Part of the course will involve evaluating the role played by governments in regulating employment from the post-World War II period to the present. Two enduring themes inform this course. First, the course will examine labour market segmentation and how different groups, especially women and people of colour, experience different employment conditions out of which arise diverse employment issues. The second theme underlying the course involves understanding how the state and government regulations since the early 1980s have affected employment issues and the capacities or willingness of governments and/or employers to regulate employment conditions. The course will focus on Canada but will periodically introduce comparisons with other countries.

***730 / Work and Democracy in the Global Society
(Same as Globalization *730)**

This course centers on the transition from a postwar "golden age" of state-regulated labour regimes to a more disorganized capitalism of "flexible" labour regimes. The main dynamics of this transition include a new era of transnational corporate rivalry and collaboration, massive technological change, and a complex new global division of labour. Students will analyze this transition at the level of the workplace, community, nation-state, sub-national industrial districts and the supranational level, including regional trading blocs. Students will assess the impact on labour of key global institutions such as the International Monetary Fund, General Agreement on Trade and Tariffs/World Trade Organization and the International Labour Organization. The course will focus on both "first" and "third world" labour regimes. Finally, the course will examine key labour responses to globalization, including the activities of transnational labour bodies, new alignments between labour and social movements, and emerging forms of transnational labour solidarity.

***740 / Selected Topics in Work and Society**

On occasion, Work and Society faculty will offer courses on topics in the area of Work and Society that are not covered either by the core courses or by courses available in other graduate programs. Potential special topics could include: working in the service economy; workplace health and safety; women, work and trade unionism; industrial relations in the global economy; and, international labour standards.

***750 / Independent Study**

This independent study course will be available to students who wish to pursue intellectual/research interests that are not matched in course offerings. Students will be limited to one independent study course.

***760 / Social Justice, Work and Society**

The goal of this course is an exploration of contemporary struggles for social justice in the context of work and society. Although working people and their organizations have traditionally focused their energies on workplace and legislative struggles for income equalization, unions and other social movements have been

pressed to broaden their strategies and struggles to include new voices, structures, issues and tactics. Using present-day examples, this course will expose students to a range of theories and strategies for understanding and critically evaluating the concept of social justice, struggles for social justice, as well as the way that paid and unpaid work are and, at times, are not central to these struggles.

Menu of Other Courses to Complete the M.A.

It is standard policy at McMaster to have all graduate courses open to suitably prepared students. Students taking the M.A. in Work and Society will have to take courses in at least one other department. The following list contains courses that are considered to be complementary to our core listings. Students are free, however, to take courses not listed below.

ANTHROPOLOGY COURSES

- *702 / Contemporary Problems in Anthropology
- *716 / Gender and Anthropology
- *722 / Research Design in Anthropology
- *728 / Applied Anthropology
- *735 / Power, Agency and Discourse

ECONOMICS COURSES

- *710 / Population Economics I
- *727 / Microeconomic Theory for Public Policy
- *731 / Public Finance
- *751 / International Trade, Development and Investment
- *773 / Economic Policy Analysis I
- *774 / Economic Policy Analysis II
- *781 / Labour Economics I
- *785 / Economics of Human Resource Policies

EDUCATION

- *750 / Principles and Practice of University Teaching

GEOGRAPHY COURSES

- *723 / Research and Communications in Human Geography
- *726 / Feminist Geography
- *727 / Disability and Space

GLOBALIZATION COURSES

- *706 / Social Welfare and Social Work in the Context of Globalization and Restructuring
- *710 / Globalization: An Introduction
- *711 / Cosmopolitics: Community, Identity & Agency Beyond the State
- *712 / International Trade and Economic Development
- *717 / Gender and Globalization

POLITICAL SCIENCE COURSES

- *742 / Politics of Developing Areas
- *747 / Welfare States in Comparative Perspective
- *760 / Political Institutions of the Canadian State
- *761 / The Social, Cultural and Economic Foundations of Canadian Politics
- *774 / Global Political Economy
- *783 / Comparative Public Policy

SOCIAL WORK COURSES

- *703 / Policy Making Process
- *721 / Community Based Social Policy
- *724 / Racism and Social Marginalization in Canadian Society

SOCIOLOGY COURSES

- *705 / Sociology of Organizations
- *713 / Social Stratification
- *714 / Political Sociology
- *718 / Sociology of Occupations
- *747 / Welfare States in Comparative Perspective
- *759 / Sociology of Gender

WALTER G. BOOTH SCHOOL OF ENGINEERING PRACTICE

The Walter G. Booth School of Engineering Practice offers Master's degree programs:

- Master of Engineering Design degree in the following fields of study:
 - Process Systems Design and Operation
 - Product Design
 - Sustainable Infrastructure
- Master of Engineering Entrepreneurship and Innovation
- Master of Engineering and Public Policy
- Master of Engineering in Manufacturing

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Staff / Fall 2009

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 Rafik O. Loutfy, B.Sc., M.Sc. (Ain Shams), Ph.D. (Western), M.B.A. (Toronto) / Walter G. Booth Chair in Engineering Entrepreneurship and Innovation / Director, Xerox Centre for Engineering Entrepreneurship and Innovation
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ADJUNCT PROFESSORS

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 Velma Grover, B.Sc. (St. Bedes), M.Sc. (Kurukshetra), M.Sc., Ph.D. (London)
 Yahya Nazer, B.Sc. (Pahlavi), M.Sc.D., Ph.D. (Newcastle)
 Jigar Shah, B.Tech. (IIT Madras), M.S., Ph.D. (Florida)
 Mikhail Sorin, Ph.D. (Inst. of Phys. chem.-Moscow)
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INDUSTRY PROFESSORS

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ENTREPRENEUR-IN-RESIDENCE

Dominique Lalissee, ISEN, IAE (Lille), M.B.A. (Rochester)

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 John MacGregor (Chemical Engineering)
 Thomas Marlin (Chemical Engineering)
 Ghani Razaqpur (Civil Engineering)
 K.S. (Siva) Sivakumaran (Civil Engineering)
 Dieter Stolle (Civil Engineering)
 Michael Tait (Civil Engineering)
 Michael R. Thompson (Chemical Engineering)

Admission

Candidates will normally have completed an undergraduate degree in engineering or applied sciences. Applicants should have an undergraduate degree, with at least a B- average (equivalent to a McMaster 7.0 GPA out of 12). Each applicant will also be interviewed as part of the admission process. Professional work experience will be highly desirable.

Bachelor of Technology students are also required to take the Graduate Record Exam.

- Verbal >550
- Quantitative >550
- Verbal and Quantitative >1200
- Analytical Writing >3.5

Candidates may be enrolled on a full- or part-time basis. Students are admitted for September or January, except for the Master of Engineering Entrepreneurship and Innovation and Master of Engineering Design programs which only admit in September.

Application for admission to the Master of Engineering in Manufacturing Engineering program may be made through the appropriate department of the Faculty of Engineering depending on the student's area of technical interest or directly through the Walter G. Booth School of Engineering Practice. A McMaster 8.0 GPA out of 12 or B average is required for application to this program.

The delivery of the programs relies heavily on the synergy created between members of student teams, and successful operation of the program requires that each cohort have an appropriate blend of skills and experience. Therefore each applicant will be interviewed. A strong performance in the interview is a critical requirement for admission.

Prospective applicants who did not attain the required standing in their undergraduate degree, but who have at least four (4) years of relevant work experience, should discuss their situation with the appropriate program director. If the experience is deemed sufficient, the director may then recommend an interview. Evidence of ability to do graduate work will still be required. (See Sections 2.1.1 Admission Requirements for Master's Degree and 2.1.3 Admission of Students with Related Work Experience or Course Work Beyond the Bachelor's Degree in the Graduate Calendar.)

ENGINEERING DESIGN

Innovative new designs and the ability to improve performance of existing systems have become a basis for a competitive advantage in the markets. Performance, environmental sustainability, safety, and efficiency are integral parts of the requirements in the design of industrial products, large scale systems, or software solutions. Within this complex set of constraints, successful engineers and engineering managers must be able to lead transformation of an idea to a complete design by working in interdisciplinary teams. The Master of Engineering Design program provides its participants with technical expertise and leadership capabilities required to invent novel solutions and to lead technically oriented organizations. Strong emphasis on solving engineering problems from industrial practice is accomplished via industrial motivated and supported projects.

The M.Eng. Design program emphasizes development of competencies in:

- Leadership, collaboration, and management skills to lead diverse teams.
- Product design and innovations methodologies applicable to product and process design.
- Engineering disciplines leading to breakthrough design and operation of systems in:
 - Process (refining, chemicals, specialty chemicals, pharmaceuticals, power, oil and gas production, and similar)
 - Sustainable infrastructure (renewable energy systems, environmental systems, sustainable products and systems design)
 - Manufacturing of industrial and consumer products (e.g., automotive, electronics, or household items).

Curriculum

The curriculum has five main components:

1. **Leadership and Management Capabilities** courses that will enable M.Eng. Design graduates to deal with complex situations in the work environment, to lead teams, and to manage projects.
2. **Interdisciplinary engineering courses** in product design, project management, and risk management.
3. **Core technical courses** that provide expert knowledge in targeted technical areas.
4. **Elective courses** that allow students to acquire broader expertise in the technical areas which are at the centre of their studies.
5. **An industrially oriented project** that solves complex problems requiring synthesis of knowledge from several disciplines and presenting the students with an opportunity to develop the solution in an industrial environment.

Process Systems Design and Operation

Master of Engineering Design program in the field of Process Systems Design and Operation provides advanced competencies for engineers and supervisors typically working in:

- Process Design
- Advanced Process Control
- Plant Operations
- Process Industry Oriented R&D
- Control Systems and Software

The following course requirements need to be fulfilled by the participants:

1. **Leadership and Management:** Participants are required to take the following:
*734 / Leadership and Management Development
2. **Interdisciplinary Engineering:** Participants are required to take at least one of the following:
#730 / Reliability & Risk Management and
#733 / Project Management
*761 / Product Design and Development
3. **Core Technical Courses**

Students with a background or interest in *Process Design, Process Control, or Plant Operations Engineers* must take two half courses from the following list:

- *751 / Process Design and Control for Operability
- *6C03 / Statistics for Engineers
- *754 / Process Design and Integration for Minimal Environmental Impact

Students with a background or interest in *Control Systems Engineers* must take two half courses from the following list:

- ECE*726 / Local Area Networks in Manufacturing Environment
- CAS*723 / Distributed Real-Time Systems
- CAS*6CD3 / Distributed Computer Systems
- CAS*6EB3 / Database Management System Design
- ECE *6DL4 / Real-time and Distributed Computing Systems
- CAS*704 / Embedded, Real-Time Software Systems
- CAS*703 / Software Design

4. Elective Technical Courses

Participants are required to take two half courses which should be selected from graduate courses offered by departments within the Faculty of Engineering. Students are required to have their elective course selection approved by the Director of the Program.

Product Design

Innovation and creative product design are emphasized through problem solving via interdisciplinary teams in a design studio environment, while learning about the use of materials in product design and design for manufacturing are led by the faculty that are also members of McMaster's advanced centers (including Centre for Automotive Materials, Manufacturing Research Institute, Institute for Polymer Production Technology and the Centre for Advanced Polymer Processing and Design). The interdisciplinary nature of the program enables its participants to work on a variety of designs, such as industrial machinery, consumer products, automotive, etc.

The following course requirements need to be fulfilled by the participants:

1. Leadership and Management

Participants are required to take the following:

- *734 / Leadership and Management Development

2. Core Technical Courses

Participants are required to take two design half courses:

- *760 / Design and Innovation
- *761 / Product Design and Development

3. Elective Technical Courses

Participants are required to take three half courses which should be selected from graduate courses offered by departments within the Faculty of Engineering. Students are required to have their elective course selection approved by the Director of the Program.

Sustainable Infrastructure

The program provides advanced competencies for engineers and supervisors typically working in:

- Construction Project Management
- Design of Civil Infrastructures
- Materials and Quality Control
- Municipal Engineering

The following course requirements need to be fulfilled by the participants:

1. Leadership and Management

Participants are required to take:

- *734 / Leadership and Management Development

2. Interdisciplinary Engineering

Participants are required to take at least one of the following courses:

- #730 / Reliability and Risk Management and
- #733 / Project Management
- *761 / Product Design and Development

3. Core technical Courses

Participants are required to take four half technical courses which should be selected from graduate courses offered by departments within the Faculty of Engineering. Suggested courses in sustainable energy systems and manufacturing are:

- SEP *732 / Sustainable Energy – Technology and Options Selection
- SEP *6103 / Sustainable Manufacturing Processes
- SEP *705 / Green Engineering, Sustainability and Public Policy

Students are required to have their elective course selection approved by the Director of the program.

ENGINEERING ENTREPRENEURSHIP AND INNOVATION

The Master of Engineering Entrepreneurship and Innovation program is a fast paced program aimed at highly motivated students. The program will accept full- or part-time students. The full program is expected to take up to 18 months full-time study or three years part-time. A compressed program of 12 months duration may be possible.

A candidate is required to complete successfully two one-term advanced engineering courses and the five compulsory Engineering Entrepreneurship and Innovation module courses. A faculty advisor will assist the student in selecting relevant engineering courses. Students will normally be required to complete two graduate level (700-level) engineering courses in fulfillment of the requirements for Advanced Engineering Studies. Advanced engineering studies are an integral component of the program and are offered by various departments in the Faculty of Engineering and beyond. The objective is to acquire leading-edge engineering skills and apply them to the enterprise project.

Innovation and Entrepreneurial Skills Development

Five compulsory enterprise modules will focus on providing the Master's degree candidate basic skills to select an idea with good potential, manage the innovation process, then create and manage the business outcome. The skills will broadly cover all the business life cycle from start, growth and sustainability. The modules will develop an understanding of both the innovation and the entrepreneurial processes through lectures, workshops and hands-on work will enable the student to fully exploit the potential of the engineering enterprise project. Each module is considered the equivalent of a half-course as defined by the School of Graduate Studies, but will contain elements of lecture, group work, presentation and other activities as defined in the course outline. The module courses will be delivered in an intensive format; and it is expected that students will take the module courses in sequenced numerical order. The module courses are:

- *720 / Entrepreneurial Processes and Skills (Module 1)
/ R. Loutfy
- *721 / Breakthrough Technology Venture Development
(Module 2) / D. Potter
- *722 / Positioning and Shaping an Enterprise (Module 3)
/ Staff
- *723 / New Venture Business Strategy (Module 4) / T. Corr
- *724 / Taking a New Venture to Market (Module 5) / S. Treiber

Engineering Enterprise Project

The Engineering Enterprise Project will run throughout the entire study period and will result in both a business and a technical plan for an engineering prototype product (ideally with an actual prototype device or software produced) with an identified customer base and a plan outlining the way to commercialization. The project will bring together the two complementary streams of activities, one technical and the other entrepreneurial, to bring an idea to the proof of concept phase. The Entrepreneurial course stream, which will run coincidentally with the advanced engineering studies, will guide the technological work performed in the research laboratory so that the concept becomes, by the end of the degree, the nucleus of a business proposition. The Engineering Enterprise Project will have three phases, which will end with project gate assessments to determine the project's readiness to proceed to the next phase:

Phase 1 - Project Preparation: Market research to arrive at a proposed product or service with clear value proposition; define the market for the intended product or service revealing competitive threat, opportunities, and margins and volumes projections; draw up development plans for the product or service indicating the required resources and estimated investment cost; seek the resources within the university and without; build a team of support that might include a partner.

Phase 2 - Technical Research and the Development of the Engineering Prototype: Develop an engineering research plan, identifying key issues and opportunities (with the assistance of academic technical and business supervisors); conduct technical research and development; implement the engineering research plan within the research group in the host-engineering department; build a development network within the engineering research community; ready the technology for transfer to market; conduct initial market engagement to get customer feedback and reactions.

Phase 3 - Technology Transfer to Market: Apply for IP protection; develop a path-to-market strategy; develop a business case; present to funding institutions and explore business arrangements; plan for business start-up. Each phase has two equally important components, one technical and the other business:

Phase I: Concept initiation proposal; Technology development plan presentation and documentation

Phase II: Technical Proof-of-concept; Draft financial plan presentation and documentation

Phase III: Business Strategy and Go-to-market plan or a Venture feasibility presentation and documentation

The Phase III evaluation will be a defense of your project in an oral examination to your board (technical supervisor, enterprise advisor, business advisor and your business mentor). Candidates are required to complete and pass each phase in order to graduate.

Enterprise Development Lab

The MEEI program is constructed in such a way as to allow students from different engineering disciplines to work in a common learning environment – the Enterprise Development Lab. The Lab is equipped with state-of-the-art communications equipment designed to facilitate both internal and external collaboration with faculty, colleagues, mentors, technical supervisors and private sector representatives, if applicable.

ENGINEERING AND PUBLIC POLICY

In today's complex world engineers and scientists are called upon to design technical systems that provide goods and services to society in a safe, efficient and environmentally sound manner. Engineers and scientists serve as key advisors to decision makers in both the public and private sectors. Therefore, engineers and scientists need more than extensive technical skills; they need an enhanced understanding of public policy and the role of engineering and science in sustainable technological, social and ecological systems.

Within the Walter G. Booth School of Engineering Practice, a professional Master's degree in Engineering and Public Policy (MEPP) is offered. Interest in the MEPP program will come from engineers and applied scientists from a wide cross-section of organizations who want graduate training that will go substantially beyond a conventional technical Master's to develop them as future professionals in the public policy area. The ideal candidate will have an undergraduate degree in engineering or applied science and 3-5 years of professional work experience.

The Walter G. Booth School of Engineering Practice has the following program objectives for the Master's degree in Engineering and Public Policy (MEPP):

- to provide a high quality educational experience to graduate engineers in the area of engineering and public policy;
- to foster applied research in the area of engineering and public policy through the successful completion and dissemination of a research paper;
- to develop viable, working linkages between engineering and fields of study within social sciences and the humanities (public policy, economics, society);
- to nurture a diverse group of students who will be active participants within the broader range of activities in the Walter G. Booth School of Engineering Practice;
- to produce graduates who will provide inspired leadership in the engineering and public policy areas within the public, private and NGO sectors.

Candidates may be enrolled on a full- or part-time basis. Full-time students will complete the degree in twelve consecutive months of study, beginning in September or January. Part-time students will normally be expected to complete the program in two years.

Curriculum

The curriculum has four main components:

1. Core courses that provide the content and methodological skills necessary for understanding and analyzing engineering and public policy problems;
2. Focus elective courses that allow students to deepen their knowledge of a range of engineering and public policy applications;
3. The completion of a substantive research paper on a problem at the interface of engineering and public policy;
4. Attendance and participation at an intensive workshop/seminar week on engineering and public policy.

Research Project - Inquiry in Engineering and Public Policy

Students select a research topic at the interface of engineering and public policy which is of interest to them and carries out inquiry-driven research; completes a formal research paper and condenses results for release to the media.

Candidates for the MEPP degree will follow a program consisting of the following:

1. Required Courses

Four half-courses:

- *701 / Theory and Practice of Policy Analysis: Frameworks and Models
- *702 / Systems Engineering and Public Policy
- *703 / Applied Microeconomics and Environmental Economics
- *709 / Emerging Issues, Technology and Public Policy

2. Focus Elective Courses

Four half-courses are required for electives. Students may select from the following options:

- *6103 / Sustainable Manufacturing Processes
- *705 / Green Engineering, Sustainability and Public Policy
- *706 / Energy and Public Policy
- *707 / Communication Technology and Public Policy
- *708 / Special topics in Engineering and Public Policy
- *784 / Statistical Analysis for Public Policy
- *785 / Public Sector Management
- *786 / Organizational Theory and the Public Sector
- *790 / Economic Policy in Market Economics
- *792 / Public Choice

- Up to two graduate engineering half courses from departments within the Faculty of Engineering
- Other courses in other departments and Faculties with approval of the Director of the program.

Courses

Courses identified with an asterisk (*) are half courses. Courses identified with a pound (#) sign are quarter courses.

***6C03 / Statistics for Engineers / Staff (Same as Chemical Engineering *6C03)**

Linear regression analysis in matrix form, non-linear regression, multiresponse estimation, design of experiments including factorial and optimal designs. Multivariate statistics. Special emphasis on methods appropriate to engineering problems.

***6103 / Sustainable Manufacturing Processes / G. Irons (Same as Materials Science *6103)**

Sustainable development, materials cycles, methods for measuring environmental impact, life cycle analysis, waste treatment and recycling technologies.

***701 / Theory and Practice of Policy Analysis: Frameworks and Models / Staff**

Government structure and mandates for municipal, provincial and federal levels; procedures for legislation and policy setting; process of understanding societal values and preferences; establishment of policy goals and objectives; models and frameworks for the evaluation and analysis of public policy; application of frameworks and models to engineering and public policy problems.

***702 / Systems Engineering and Public Policy / B. Baetz**

Application of linear programming, integer programming and dynamic programming to public policy applications; application of simulation modeling to evaluate scenarios; application of decision analysis approaches and software for micro- and macro-policy analysis problems; coupling of GIS-based approaches with conventional systems engineering tools; project planning and project management; soft systems techniques.

***703 / Applied Microeconomics and Environmental Economics**

Marginal benefit/cost analysis; willingness to pay and indifference curves; ecological economics; allocation of environmental services; estimation of externalities; measurement of environmental benefits; taxes, trading permits and other instruments; application of approaches to infrastructure renewal and environmental management problems.

***705 / Green Engineering, Sustainability and Public Policy**

Green engineering theory and guiding principles; sustainability at the regional and neighbourhood levels; transportation and land-use interactions; new urbanism design; transit-oriented development; bicycle-friendly planning and design; building design to minimize energy, water and material resources; green manufacturing and product design; sustainability indicators.

***706 / Energy and Public Policy / N. Marketos**

Energy policy; energy planning and forecasting; energy conservation and demand side management; case studies in current topics: utility privatization, nuclear energy generation, air quality issues; renewable energy technologies.

***707 / Communication Technology and Public Policy / V. Vinodrai**

International trade and regulation; social issues relating to communication policy; research policy and funding; industrial/economic policy; relevant legislation; innovations in communication technology.

***708 / Special Topics in Engineering and Public Policy / G. Krantzberg**

Studies selected from specialized areas of research or representing special areas of expertise in areas of sustainability with regard to resource management, transportation, energy, and related fields.

***709 / Emerging Issues, Technology and Public Policy / G. Krantzberg**

Environmental threats that emerge from engineering innovation will be examined from the perspective of public policy development. Institutional effectiveness and policy implications for new programs will address greater interoperability of the institutional framework in various geographic regions. The objective of this course is to engage students in seminars, discussion and debate on contemporary ecological issues for which technology and policy can be integrated to generate sustainable solutions.

***710 / International Governance and Environmental Sustainability / V. Grover**

In a world undergoing rapid environmental changes due to global warming, achieving sustainability is ever more difficult. International governance mechanisms, including the United Nations, NGOs and international treaties, play an increasingly important role. This course examines how policymaking at the international level relates to achieving sustainability, including affordable and sustainable technology and science-based solutions. It will introduce the students to the current debates in the international environmental governance realm, as well as the methods and structures that guide policy formulation.

***720 / Entrepreneurial Processes and Skills (Module 1) / R. Loutfy**

This module course will develop an understanding of the fundamentals of sustainable businesses. Students will develop an awareness of and skills in innovation and entrepreneurial behaviour. Emphasis will be placed on becoming a more effective team player, becoming more aware of one's own learning style and entrepreneurial orientation, and understanding the process of business idea generation, development and evaluation.

***721 / Breakthrough Technology Venture Development (Module 2) / D. Potter**

This course will introduce students to the concepts of new venture creation, and will provide an understanding of the responsible use of capital, basic capability in the process and techniques of market research, and appreciation of intellectual property value and protection issues. Learning outcomes include understanding the process of business planning and valuation and understanding the main types of risk that affect the nascent entrepreneurial venture.

***722 / Positioning and Shaping an Enterprise (Module 3) / Staff**

Learning outcomes of this module course will include an understanding of the role of technology-based business in the economy; understanding the financial dimension of the venture; understanding the nature of capital investment and role of banks and VC industry; understanding business and managerial accounting; appreciating operational and resource issues; understanding project management and how the innovation process may be managed; understanding how manufacturing units may be set up and managed; and developing the ability to formulate an exit strategy.

***723 / New Venture Business Strategy (Module 4) / T. Corr**

The focus of this course is understanding the new venture value proposition and how to market it, including understanding market dynamics and competitive forces facing new venture and strategies to create customer value, understanding the role of IT infrastructure in driving the enterprise productivity, and understanding e-business as a channel.

***724 / Taking a New Venture to Market (Module 5) / S. Treiber**

The final module course in the program will address the skills and knowledge needed to launch and sustain the new venture. The module will provide an understanding of how to manage the new venture strategically for growth and sustainability; how to put together a high performance team; the role of value-chain management and timing; and the critical factors that contribute to business survival and longevity.

***725 / Practical Project Management for Today's Business Environment / Staff**

This course covers the basics of project management techniques and tools, as well as advanced, adaptive, and emerging approaches to improve project success. Students will learn how to apply effective project management to a variety of common business situations, including starting a company, bringing a product to market, doing primary research and development, constructing a physical facility, and developing a major piece of software, among others. Case studies, guest speakers, and hands-on exercises will be used to explore real-life examples of project management successes and failures.

#730 / Reliability and Risk Management / Staff

The course presents a broad treatment of the subject of engineering decision, risk, and reliability. Emphasis is on (1) the modeling of engineering problems and evaluation of systems performance under conditions of uncertainty; (2) risk-based approach to life-cycle management of engineering systems; (3) systematic development of design criteria, explicitly taking into account the significance of uncertainty; and (4) logical framework for risk assessment and risk/benefit tradeoffs in decision making. The necessary mathematical concepts are developed in the context of engineering problems.

***731 / Analytical Tools for Energy Management / Staff**

The course is designed to provide analytical tools to new professionals entering the world of energy management. It provides an overview of energy management, understanding of energy costs, appreciation for where they are incurred and how to reduce them. The context for energy management in a commercial or industrial facility with energy usage that is significant and involves complex systems. Topics covered include energy audits, life cycle costing, renewable energy systems, distributed generation, and improvement of efficiency through an understanding of combustion systems, process energy use, lighting, maintenance practices, and control systems.

***732 / Sustainable Energy – Technology and Options Selection / Staff**

Assessment of potential current and future energy systems, covering resources, extraction, conversion, and end-use, with emphasis on meeting regional and global energy needs in the 21st century in a

sustainable manner. Renewable and conventional energy technologies are presented (solar, wave and tidal, wind, hydropower, biomass, geothermal, nuclear, fossil) and their attributes described within a framework that aids in evaluation and analysis of energy technology systems in the context of political, social, economic, and environmental goals.

#733 / Project Management / Staff

Project Management is a critical skill in today's business environment. This course covers the basics of project management techniques and tools to improve project success. Students will learn how to apply effective project management to a variety of common business situations, including starting a company, bringing a product to market, constructing a physical facility, and developing a major piece of software, among others. Case studies and guest speakers will be used to explore real-life examples of project management successes and failures.

***734 / Leadership and Management Development / V. Baba**

Managerial competence is a function of knowledge, skills, and experience relevant to management. The purpose of this course is to develop skills in diagnosing situations that require change in organizational life and to facilitate such changes. Within the context of organizational behaviour, the course will emphasize the acquisition of personal, interpersonal, and group skills that are required to lead and manage people effectively in modern organizations.

***744 / Holistic Considerations for Design of Structures**

Buildings are complex systems that require at the design and major retrofit stages careful consideration of safety, serviceability and aspects dealing with environmental factors, energy consumption and movement of moisture. The design of buildings and other structures must also take into account durability of materials, life-cycle cost and general principles of sustainability.

***750 / Model Predictive Control Design and Implementation / Staff**

Majority of advanced control designs employed in practice use the Internal Model Control (IMC) structure and Model Predictive Control (MPC) concepts. The course presents theory and best implementation practices for control model identification, controller design, testing, and implementation. Upon completion of this course, the engineer will be able to perform the following: identify linear models for control, design and implement MPC controllers for an integrated plant, and optimize the process using the MPC steady-state features.

***751 / Process Design and Control for Operability / Y. Nazer**

Process design involves tradeoffs to achieve performance over a range of operations due to uncertainty, variability of inputs, and a range of production goals. A flexible design functions acceptably over the range and well at the typical conditions. Processes safety (seven layers, HAZOP, LOPA, quantitative analysis), effect of structure on reliability and plant dynamics. Classical supervisory control methods and typical applications to major equipment and systems.

***752 / Process Modeling and Optimization / V. Mahalec**

Architecture of simulation programs, solution algorithms, integration of simulation models from different simulators. Steady-state and dynamic simulation via sequential modular and equation-oriented algorithms. Optimization of steady-state and dynamic performance, sensitivity of the optimum, multi-objective optimization. Analysis of plant data, gross error detection, parameter estimation to match the plant performance. On-line monitoring and optimization of process performance.

***754 / Process Design and Integration for Minimal Environmental Impact / M. Sorin**

The course focuses on integration of process units and on the design of Energy Utility Systems, Heat Exchanger Networks (HEN) and Water Distribution Systems and presents methodologies that lead to energy efficient, water saving and economically attractive designs. Methods for heat integration (HEN, utility selection, heat engines, heat pumps, refrigeration cycles, and pinch analysis), cogeneration and integrations with industrial sites, water and cooling minimization and their applications.

***760 / Design and Innovation / H. Mahler**

This course will explore the creative design process, tools and methods that will enable students to discover, identify, and analyze opportunities and develop those opportunities into innovative design solutions. Based on a self-selected topic, students will work in small team to develop a well-conceived design concept by the end of term, supported by scheduled gate reviews, in-class presentations and peer review. The outcome of the course will be a final presentation where students will demonstrate their design concept. The course is studio-based.

***761 / Product Design and Development / R. Fleisig**

This course will explore the creative design process from concept to design. Students will learn processes, tools, and methods for prototyping, analyzing, visualizing, and validating a design with the goal of delivering innovative design solutions. Based on projects begun in SEP 760, students will work in small teams to develop a high quality appearance model by the end of the term, supported by scheduled gate reviews, in-class presentations, and peer review. The outcome of the course will be a final presentation where students will demonstrate their appearance model. The course is studio-based. Prerequisite: SEP 760 Design and Innovation.

MANUFACTURING

Enquires: 905-525-9140 Ext. 26566

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Website: <http://manufacturing.mcmaster.ca/>

Staff / Fall 2009

ASSOCIATE PROFESSOR

Michael R. Thompson, B.Sc., B.Eng., M.Eng., (McMaster), Ph.D.
(Waterloo) P.Eng. / Director, M.Eng. in Manufacturing

The Master of Engineering in Manufacturing is a one-year program aimed at highly motivated students seeking advanced training in the broad area of Manufacturing. Application for admission to the program may be made through the Walter G. Booth School of Engineering Practice.

Successful applicants will be placed in the appropriate department of the Faculty of Engineering depending on the student's area of technical interest. In addition to the general requirements for entry into a graduate program in Engineering, students must hold an Honours Bachelor's degree in Engineering with at least a B average (equivalent to a McMaster 8.0/12 GPA) in the penultimate and final years. An accelerated option for the program is available to McMaster engineering undergraduates.

Delivery of the program includes a strong emphasis on project-based experience within the Manufacturing Industry, which is obtained through a blend of industrial work experience and an industry-based project during the coursework portion of the program. Requirements for these are outlined below. Due to the strong practical orientation of the experiential and project components of the program, successful completion requires that students have strong interpersonal and communication skills. To this end, each applicant will be interviewed. A strong performance in the interview is a critical requirement for admission.

The program accepts only full-time students. The program is normally expected to take one year of study for students enrolling in May with minimal industrial experience and would normally comprise eight months of study for students enrolling in September with more extensive industrial experience.

Work Experience

Manufacturing-based employment experience is a critical component of the program. All candidates must successfully complete a minimum of eight months of industrial work experience, of which a minimum of four months must be obtained at the graduate (i.e. post baccalaureate) level. Any applicants with a minimum of four months of appropriate undergraduate work experience will be required to apply for admission to the program in May with the objective of obtaining the required graduate level employment experience prior to the start of classes in September. Obtaining employment in an appropriate setting will be facilitated by McMaster's Engineering Co-op and Career Services (ECCS). Applicants should note that suitable employment is not guaranteed and that the onus is on the student to find suitable employment. The suitability of non-ECCS derived employment should be discussed with the program Director. Applicants with a minimum of one year of post baccalaureate manufacturing-related industrial experience will normally apply for admission into the program in September. The appropriateness of this employment experience will be judged by information provided to the program Director during the application process. Students must write a suitable report on project work undertaken during the graduate work experience as part of the compulsory course MANUF 700.

Accelerated Option

This option is only available to students currently enrolled at McMaster as undergraduate engineering students in the Departments of Chemical Engineering, Materials Science and Engineering, and Mechanical Engineering. In exceptional circumstances, students from other Engineering departments may apply for entry into the accelerated option by contacting the program Director. Application for entry into the accelerated option occurs in the fall semester of the penultimate year of undergraduate studies. Applicants must have maintained a minimum CGPA of 8.0 for their undergraduate course work and successfully passed the interview with the program Director for admission into the accelerated option. The accelerated option allows students to gain specific industrial experience in the manufacturing industry through a minimum four month work experience (facilitated through ECCS) and to complete two 600 level manufacturing-related courses in their final undergraduate year which will be counted towards their M.Eng. degree requirements. Completion of the requirements for the accelerated option are embodied in completion of the course ENG 4F00. Completion of this course along with meeting all of the other admissions criteria will result in a favourable recommendation by the program Director to the School of Graduate Studies for admission into the M. Eng. program.

Project

Students must complete a suitable industry-based project. Projects will normally be performed by groups of two to three students and will ideally be multi-disciplinary in nature. Projects should address a specific problem found in a manufacturing facility. It is expected that the majority of the projects will be developed from work undertaken during the graduate employment experience and students should look for opportunities to develop projects with their employers. Students are also encouraged to develop their own ideas and find industrial sponsors. Project groups will have an industry-based supervisor (stakeholder) with whom the student team can discuss progress, arrange trials etc.. Students will also have an academic supervisor who will normally have some expertise in the subject area. It is expected that the teams will meet with their supervisors on a regular basis to discuss their progress.

Projects will have three "tollgate" stages. Student groups must submit a project proposal by the end of September to their academic and industrial supervisors for approval of scope, deliverables and timeline. The interim project report, outlining progress-to-date, is due at the end of the fall semester for approval by the academic and industrial supervisors. The final written project report is normally due at the end of the winter semester. However, if the supervisors agree that the project group has not made sufficient progress by this point, they are free to request further work to meet the standards of the program. The project team will orally defend their final project report to an examination board comprised of their industrial supervisor, academic supervisor and program Director (Chair) or designate.

Courses

Students must complete two compulsory full-year courses, one compulsory one-term (half) course and five option half courses or the equivalent combination of half-term (quarter) and half courses.

Half courses are marked with an asterisk (*) and quarter courses are marked with a pound sign (#). Students should note that not all option courses are offered every year.

COMPULSORY COURSES

MANUF 700 / Work Term Report
MANUF 701 / Project
MECH ENG *729 / Manufacturing Systems

MANUF 700 / Work Term Report

Work term report for graduate work term experience or equivalent, to be approved by their industrial supervisor(s). Report to be submitted by the end of September. Attendance at Manufacturing-related guest seminars and organised industry tours. Seminar to be given on M.Eng. project at the end of the academic year. All elements assessed on a Pass/Fail basis. Terms 1 and 2

Prerequisite: Enrolment in the M.Eng. Manufacturing program

MANUF 701 / Project

Industry-based multi-disciplinary project. Course elements are: project proposal (end of September), mid-year report (mid-December) and final report which will be examined orally. Evaluated on a Pass/Fail basis. Terms 1 and 2

Prerequisite: Enrolment in the M.Eng. Manufacturing program

OPTION COURSES

Students who did not complete the Accelerated Option will select any combination from the list below totaling two and a half courses, of which a maximum of two half courses can be taken at the 600 level. Students who completed the Accelerated Option must select any combination of courses totalling one and a half courses, all of which must be at the 700 level. Other manufacturing-related courses may be substituted with permission of the Director. Note that not all courses are offered every year.

Chemical Engineering

***6B03 /** Polymer Reaction Engineering
***6C03 /** Statistics for Engineers
***6E03 /** Digital Computer Process Control
***6X03 /** Polymer Processing
***6Z03 /** Interfacial Engineering
***742 /** Membrane Based Bioseparations
***752 /** Optimization of Chemical Processes
***761 /** Multivariable, Stochastic and Adaptive Control of Chemical Processes
***764 /** Process Control Design
***765 /** Multivariate Statistical Methods for Process Analysis and Monitoring
***770 /** Selected Topics in Polymer Science and Engineering
***772 /** Polymer Rheology
***773 /** Advanced Concepts of Polymer Extrusion
***774 /** Advances in Polymeric Materials

Materials Science and Engineering

***6C03 /** Modern Iron and Steelmaking
***6D03 /** Corrosion
***6H03 /** Thin Film Science and Engineering
***6I03 /** Sustainable Manufacturing Processes
***6J04 /** Materials Selection in Design and Manufacturing
***6P03 /** Properties of Polymeric Materials
***6R03 /** Ceramic Science
***6T03 /** Properties and Processing of Composites

- #740 / Interfacial Phenomenon in Materials Science
- #743 / Selected Topics in Oxidation and Corrosion
- #754 / Fracture Mechanics
- #755 / Deformation of Crystalline Solids
- *760 / Electronic Materials
- #765 / Selected Topics in Polymer Science and Engineering
- #771 / Principles of Heterogeneous Kinetics
- #773 / Properties of Metallurgical Slags
- #774 / Injection Metallurgy
- #775 / Physical and Mathematical Modelling of Materials Processing
- *714 / Solidification Processing
- *724 / Solid and Surface Modeling Techniques
- *728 / Manufacturing Processes I
- *734 / Theory of Plasticity
- *738 / Manufacturing Processes II
- *743 / Advanced Mechatronics
- *751 / Advanced Mechanical Engineering Control Systems
- *752 / Advanced MEMS Fabrication and Microfluidics

Mechanical Engineering

- *6K03 / Introduction to Robotic Mechanics
- *6L03 / Industrial Design
- *6Q03 / Mechanical Vibrations
- *6T03 / Finite Element Applications
- *6Z03 / CAD/CAM/CAE
- *702 / Advanced Dynamics of Machines
- *705 / Advanced Finite Element Analysis
- *710 / Machine Tool Analysis



11. COMMON PURPOSE / INTERDISCIPLINARY / COLLABORATIVE PROGRAMS

ACADEMIC RESEARCH INTEGRITY AND ETHICS

The need for the highest level of academic research integrity and ethics crosses field and discipline boundaries. This single graduate offering, required of all incoming graduate students, will ensure uniformity of message and communicate the priority that McMaster assigns to such practices to each student at an early time. Further details may be obtained by contacting the School of Graduate Studies at 905 525-9140 Ext. 23679.

SGS #101 / Academic Research Integrity and Ethics

This course will introduce incoming graduate students to the standards of academic integrity expected at McMaster. It will provide examples of acceptable and unacceptable practices and will clarify the responsibility and expectations of graduate students with respect to academic integrity. Students will be exposed to the Academic Integrity Policy of McMaster and best practices will be described that will minimize the likelihood of incorrectly attributed work from appearing in their assignments and research records.

CHEMICAL PHYSICS

The Departments of Chemistry and Physics and Astronomy jointly provide facilities for students seeking the M.Sc. or Ph.D. degree in this area. Applications for admission will be considered from students holding an Honours degree or its equivalent in Chemistry and Physics and Astronomy jointly or in either one of these subjects.

A candidate will register for the M.Sc. or Ph.D. degree in either the Chemistry or Physics and Astronomy Department and, in addition to the special regulations summarized below, will be subject to the general regulations and course/thesis requirements which govern graduate work in the department in which he/she is registered. A candidate for the M.Sc. degree will be required to spend at least one calendar year in full-time graduate study at McMaster University.

Candidates for the Ph.D. degree must pass a Comprehensive Examination in their general areas of study. The Comprehensive Examination will be conducted jointly by the Departments of Physics and Astronomy and Chemistry, and will be attempted within 24 months after the student has entered the Ph.D. program at McMaster.

The Department of Chemistry presents graduate courses in the form of modules, which are the formal equivalent of one-quarter of a standard graduate course. The Department of Physics and Astronomy presents graduate courses as half courses. A candidate for the M.Sc. or Ph.D. degree must select certain required courses and modules from the following basic list.

Courses

Courses marked with a pound sign (#) are modules; those marked with an asterisk (*) are half courses. Courses marked with a plus sign (+) may be taken twice for credit either because their content varies from year to year or because "introductory" material presented as one module is a prerequisite for more advanced material. All of the courses may not be offered every year. Students should contact the Department concerned.

CHEMISTRY COURSES

Special Topics in Inorganic Chemistry

- #724 / Solid State Chemistry
- #725 / Chemical Applications of Group Theory

Physical and Spectroscopic Methods in Chemistry

- #730 / Theory of Crystallography
- #731 / Diffraction Techniques: Neutron and Electron Diffraction
- #732 / Magnetochemistry
- #736 / Molecular Structure Determination by Diffraction Methods
- #739 / Advanced Topics in X-ray Crystallography

Magnetic Resonance Theory

- #748 / Principles of Pulse and Two-Dimensional NMR

Quantum Chemistry

- #770 / Molecular Electronic Structure Theory
- #771 / Concepts in Quantum Chemistry

Chemical Thermodynamics

- #774 / Statistical Mechanics
- #775 / Stochastic Processes

Special Topics in Physical Chemistry

- + #778 / Solid State Surface Science
- #780 / Molecular Photophysics
- #782 / Topics in Photonics
- #783 / Materials Chemistry in Photonics - Selected Topics

PHYSICS AND ASTRONOMY COURSES

- *729 / Condensed Matter Physics I
- *730 / Condensed Matter Physics II
- *739 / Advanced Quantum Mechanics I
- *740 / Advanced Quantum Mechanics II
- *750 / Statistical Mechanics
- *753 / Advanced Statistical Mechanics

Research in Chemical Physics

Research in Chemical Physics currently includes: theoretical chemistry and electronic structure theory (P.W. Ayers); crystal chemistry of oxide and mineral compounds (J. Barbier); applications of neutron spectroscopy to problems in solids (B. Gaulin); quantum molecular dynamics and NMR spectrum simulation (R. Dumont); synchrotron radiation based spectromicroscopy of soft matter, environmental and biological samples; quasi-elastic and inelastic electron scattering of gases (A.P. Hitchcock); single and multiphoton laser-based studies of negative ions and selected solid state media (H.K. Haugen); surface science of electronic materials, scanning probe microscopy and dissipative nanopatterning (P. Kruse); magnetocaloric and thermoelectric inorganic solids (Y. Mozharivskiy); fundamental studies and applications in photonics (K. Saravanamuttu), nonlinear optical processes in solid materials (I. Vargas-Baca); surface electronic and magnetic structure using spin-polarized electron scattering and optical scattering (D. Venus). A student in this program may undertake research work under the supervision of any member of the Chemistry or Physics and Astronomy Departments.

CLINICAL HEALTH SCIENCES

*601 / Spiritual Work Life: Applied to Health Care / B. Clarke

This course explores the concepts of spirituality of work life in a health care setting from theoretical, professional and personal perspectives. How does one integrate pastoral care into a comprehensive spiritual plan of an organization? Concepts of 'greater hunger', theological worlds and other tools are used to explore the spiritual needs of staff and care providers. Some contexts addressed regarding spirituality include: change; loss; transition rituals; crisis intervention; suicide; addictions; abuse; team dynamics; identity; work ethics; spiritual conversations; stress management; and systems theory. The content is applicable to non-health care work settings.

*700 / Spirituality and Health: The Nature of the Wounded Spirit: Implications for Clinical Management / B. Clarke

This course will encompass the study of suffering from the perspectives of "self" and "personhood". The scope and the dimensions of suffering as an entity separate from pain will be studied with emphasis on the power of suffering throughout the life span both in wellness and illness. Students will learn about the features that distinguish the language of suffering from the language of pain and will critically analyze the relationship between the two phenomena and the impact of suffering on health care costs (human and fiscal costs).

*701 / The Wounded Spirit in the Secular World: Legal, Ethical and Cultural Perspectives / B. Clarke

This course will explore suffering from the perspective of self and personhood in relationship with the law and current societal values. Issues for study may focus on personal freedoms and rights after traumatic injury or events, living with terminal illness, autonomy in medicine and suffering in marginalized groups such as children, the elderly and the mentally handicapped. Topics may include: the law and culture, ethical considerations, health professional and care giver concerns as well as the compatibility of the law and medicine. Students may select other relevant topics in relation to the law, societal attitudes and suffering.

*702 / The Impact of Spiritual and Religious Traditions on Health: Challenges for Multicultural Health Care Delivery Systems / B. Clarke

This course will trace the understanding of suffering from the traditions of world religions. The focus of the course will be to understand the political outcomes of such traditions and its impact on the individual and health. Emphasis will be on the power of religious teachings on spirituality and personal suffering and factors such as hope, courage, peace will be explored. The management of the suffering patient and the power of religious and spiritual beliefs will be delineated.

*703 / The Wounded Spirit: Applied Contemporary Health Practice Issues / B. Clarke

The purpose of this course will be to differentiate between pain and suffering in medical practice and to determine the economic impact of suffering in either one of the following sub-units: general practice, rehabilitation psychiatry or palliative care (private and public health care delivery system). Study will take an evidence-based approach to problem identification, and efficacy of treatment interventions.

*719 / Foundations of Education in the Health Sciences / L. Martin

This course will explore the education literature through discussion and application to health sciences issues, including health professional education. Examination of early education literature and changes over time in the philosophy and practice of education will provide the framework of approaches to teaching and learning. Topics include: recurrent issues in health professional education; teacher and learner centred educational approaches; psychomotor learning; cognitive psychology and learning; instructional and evaluational methods.

EDUCATION

Education *750 - a graduate course on the Principles and Practice of University Teaching.

This course includes both discussion of the literature (using a problem-based learning approach) and practical workshops on topics such as lecturing, working in small groups, course design, test construction, and teaching dossiers.

For more information please visit the Centre for Leadership in Learning in T-13, Room 124. Register with CLL online at: <http://www.mcmaster.ca/cll/programs.and.services/ta.program/education.750.htm>

To receive a graduate credit on your transcript you must also register on SOLAR.

Enquiries: 905 525-9140 Ext. 24540

Website: <http://www.mcmaster.ca/cll>

ENVIRONMENTAL SCIENCE AND ENVIRONMENTAL STUDIES

Environmental Science

Environmental science is concerned with the interactions between the physical and biological environment and human activity. It examines and models ecosystem dynamics involving the atmosphere, the biosphere and the hydrosphere, and the dynamic interrelations between the natural environment and human resource use and conservation. Because land and resource use places severe strain on ecosystems, much emphasis is directed towards developing knowledge, models and techniques to help ameliorate such strains, often through regulatory policies.

Environmental Studies

Environmental studies emphasize the human role in the management of the environment and is especially concerned with the economic, social and health problems which may arise from deterioration of ecosystems. Environmental studies focus on economic, political, regulatory, and sociological aspects of environmental management.

There is not a designated graduate degree for Environmental Science/Studies at McMaster. However, many departments are involved in teaching and research in this area. Interested students are encouraged to pursue graduate degrees in one of these departments or programs and to take interdisciplinary groups of courses related to the environment. This will provide students with a strong background in a fundamental subject and a high level of interdisciplinary training.

Contact people for Departments/Programs involved in Environmental Science/Environmental Studies are as follows:

H. Feit (Anthropology)
 V.S. Ananthanarayanan (Biochemistry)
 J.S. Quinn (Biology)
 J.L. Brash (Chemical Engineering)
 B. McCarry (Chemistry)
 B. Baetz (Civil Engineering)
 D. Feeny (Economics)
 P. Kanaroglou (School of Geography and Earth Sciences)
 W-K. Lu (Materials Science)
 R.J. Haslam (Medical Sciences)
 G. Browman (Health Research Methodology)
 E. Boetzkes (Philosophy)
 D. Chettle (Physics and Astronomy)
 M. Sproule-Jones (Political Science)
 M. Daly (Psychology)

Courses

Courses marked with an asterisk (*) are half courses. The following environmental science course is offered for graduate credit:

***701 / Problems in Restoring and Sustaining Healthy Ecosystems / B. White, B. McCarry, D. Feeny, M. Sproule-Jones, M. Daly, M. Wilson, E. Boetzkas**

This course is designed to allow students from different disciplines to define problems in case studies of specific ecosystems. The background of the ecosystem situation will be presented by faculty and outside speakers. Students will define the problems they wish to discuss based on the presentation and literature provided. Each discussion will be led by students from different disciplines and the team will be responsible for preparing and submitting a report on the discussions.

MOLECULAR BIOLOGY

Opportunities for graduate studies in Molecular Biology are available at McMaster University through M.Sc. and Ph.D. programs in Biochemistry, Biology, and Medical Sciences. Research interaction is fostered through the McMaster Institute for Molecular Biology and Biotechnology which maintains a Central Facility providing state-of-the-art equipment and reagents. More than 50 faculty members from 10 departments participate in the supervision of graduate students covering a broad range of research areas in molecular biology. McMaster's programs offer a flexible choice of graduate courses. Research interactions are facilitated through journal clubs, work-in-progress and formal seminars.

Enquiries should be addressed to the Graduate Programs in Biochemistry, Biology and Medical Sciences.

Courses

600-level courses are offered for graduate credit and are available to senior undergraduate students at the 400-level. 700-level courses are restricted to graduate students. Courses marked with an asterisk (*) are half courses. Not all courses are offered every year. Students should check with the Department concerned regarding course requirements.

***6H03 / Molecular Biology of Cancer / A. Bédard, P.F.M. Whyte (Same as Biochemistry *6H03 and Biology *6H03)**

Cancer at the molecular and cellular level. Topics include: properties of cancer cells; activation of proto-oncogenes; function of oncoproteins; transgenic mouse models, and tumour viruses.

***6J03 / Biochemical Immunology / M. McDermott (Same as Biochemistry *6J03 and Medical Sciences *6J03)**

This advanced course applies small group-based learning to immunological problems. Topics concern development of immunoassays, resistance to infection and immunity in health disease.

The following relevant courses are offered by other departments:

BIOCHEMISTRY COURSES

- *6E03 / Gene Expression
- *6EE3 / Advanced Topics in Gene Expression
- *6H03 / Molecular Biology of Cancer
(Same as Biology *6H03 and Molecular Biology *6H03)
- *6J03 / Biochemical Immunology
(Same as Medical Sciences *6J03 and Molecular Biology *6J03)
- *6N03 / Molecular Membrane Biology
- *707 / Mechanism of Enzyme Action

- *709 / Signal Transduction: Dynamic Mechanisms of Action of Growth Factors and Nuclear Receptors
- *723 / Topics in Molecular Biology
(Given in alternate years with Biology *723)
- *725 / Molecular Mechanisms of Membrane Functions
- *726 / Biophysical Chemistry of Membrane Structure
- *727 / Proteins

BIOLOGY COURSES

- *6B03 / Plant Metabolism and Molecular Biology
- *6H03 / Molecular Biology of Cancer
(Same as Biochemistry *6H03 and Molecular Biology *6H03)
- *6P03 / Medical Microbiology
- *6T03 / Neurobiology
- *6U03 / Radiation Biology
- *715 / Topics in Evolutionary Genetics
- *720 / Bioinformatics
- *721 / Topics in Molecular Evolution
- *723 / Topics in Molecular Genetics
- *724 / Molecular Ecology
- *762 / Developmental Biology
- *775 / Molecular Microbiology and Microbial Genomics

MEDICAL SCIENCES COURSES

- *701 / Cell Biology I
- *702 / Cell Biology II
- *708 / Signal Transduction: Dynamic Mechanisms of Action Growth Factors and Nuclear Receptors (Same as Biochemistry *709)
- *711 / Psychoneuroimmunology
- *713 / Physiology and Pathophysiology of the Gastrointestinal Tract
- *715 / Advanced Immunobiology I
- *716 / Advanced Immunobiology II
- *719 / Electrophysiology of Excitable and Non-Excitable Membranes
- *729 / Molecular and Cellular Pathology
- *732 / Vascular Diseases, Haemostasis and Thrombosis I
- *733 / Vascular Diseases, Haemostasis and Thrombosis II
- *740 / Advanced Concepts of Drug-Receptor Interaction
- *749 / Human Molecular Genetics
- *750 / Topics in Host Resistance
- *758 / Smooth Muscle Structure and Function I

Research in Molecular Biology

Cell biology and metabolism; developmental biology; DNA replication, mutation and repair; gene expression and regulation; gene targeting, transfer and therapy; hemostasis, thromboembolism and atherosclerosis; membranes and organelles; molecular biology, genetics and cancer; molecular evolution; molecular immunology; virology; molecular pharmacology and toxicology; neuroscience and behavioural sciences; oncogenesis and cancer therapy; plant biology; microbiology; protein engineering; x-ray crystallography.

NORTHERN STUDIES

The Committee on Northern Studies (chaired by Dr. Susan Dudley of the Department of Biology) allocates grants received by the Department of Indian and Northern Affairs to graduate students for research in the north. These grants are intended to offset the high costs of travel and living in the north, and students from a broad range of disciplines are eligible. For grant allocation, "north" is designated as any area that is underlain by permafrost, but students who believe they may be eligible are encouraged to inquire. Though there is no degree program in Northern Studies, many departments and schools offer graduate work in this area, particularly:

Anthropology
Biology
School of Geography and Earth Sciences

Information and application forms can be obtained in the early fall from Dr. Susan Dudley of the Department of Biology, 905 525-9140 ext. 24004. The deadline for application is November 1.

PEACE STUDIES

As there is no separate degree program, graduate work in Peace Studies at McMaster is discipline based. The Centre for Peace Studies offers interdisciplinary courses in some of its areas of specialization, and individual departments offer courses with some content relevant to different aspects of Peace Studies. These courses are listed below. The Departments of Anthropology, Economics, History, Philosophy, Religious Studies, and Sociology, offer M.A. or Ph.D. degree programs in which students can work on topics related to Peace Studies. Specific regulations concerning admissions and programs of study can be found under each department's listing.

The Centre for Peace Studies conducts peace research and peace education projects on a broad range of topics, but it has developed a primary focus in five areas: social movements against war; religious and philosophical approaches to peace and conflict; alternative security; human rights, and achieving peace through health initiatives.

Enquiries: 905 525-9140 Ext. 24729
Email: peace@mcmaster.ca
Website: <http://www.humanities.mcmaster.ca/~peace>

Courses

Courses marked with an asterisk (*) are half courses. The following courses are offered for graduate credit:

***701 / Power, Agency and Discourse
(Same as Anthropology *735)**

The focus is on the analytical tension between analyses of culture, power, agency and discourse, and what each can contribute to an understanding of emerging local and global processes and contexts. The course presents different viewpoints on these concepts and analytical tools by addressing current debates in areas like development, ethnicity, nationalism, gender, place and social movements.

The following courses are also relevant to Peace Studies. All courses may not be offered every year. Students should contact the Department.

ANTHROPOLOGY COURSES

- *725 / Seminar in Political Anthropology
- *734 / Indigenous People Within Nation States

ECONOMICS COURSES

- *751 / International Trade, Development and Investment

HISTORY COURSES

- *705 / Political Culture in Europe, 1900-1956
- *707 / European International Relations, 1890-1956
- *721 / Modern British History

PHILOSOPHY COURSES

- *759 / Selected Topics in Applied Ethics
- *764 / Selected Topics in Social & Political Philosophy
- *765 / Selected Topics in Ethical Theory

POLITICAL SCIENCE COURSES

- *750 / Issues in Political Theory
- *751 / Classic Theories of "Realpolitik"
- *773 / Selected Topics in International Politics
(Sometimes offered on Human Rights Issues)

SOCIOLOGY COURSES

- *714 / Political Sociology

REGIONAL SCIENCE

Regional Science uses the concept of a region as a basis for analysing the spatial dimensions of human activities and their structure. It examines the theoretical bases of the activities, methods to analyse the diverse nature of those activities and the assessment of impacts of decisions and policies on those activities. Specific areas of research at McMaster University include: the dynamics of regional economies; resource allocation and management; regional impact analysis; theories of spatial processes; transportation; and public policy analysis.

Graduate work in Regional Science at McMaster is discipline oriented. Expertise is found in the Department of Economics, and in the School of Geography and Earth Sciences. M.A. and Ph.D. degrees obtained through these departments allow a specialization in Regional Science by incorporating some of the courses listed below. Students wishing to specialize in Regional Science are required to complete one course in methods of regional analysis and one other methods course pertaining to their specific research interest. In addition, students must fulfill the degree requirements of the department in which they are registered.

Enquiries should be directed to the Director (School of Geography and Earth Sciences) at 905 525-9140 Ext. 23535.

Courses

Available 600- and 700-level graduate courses appropriate for Regional Science include the following list. Courses marked with an asterisk (*) are half courses. All courses may not be offered every year. Students should contact the Department concerned.

ECONOMICS COURSES

- *721 / Microeconomic Theory I
- *723 / Macroeconomic Theory I
- *731 / Public Finance
- *784 / Industrial Organization

SCHOOL OF GEOGRAPHY AND EARTH SCIENCES COURSES

- *733 / Integrated Urban Models: Design, Structure and Applications
- *735 / Topics in Urban Geography
- *739 / Spatial Population Analysis
- *746 / Advanced Statistical Methods in Geography

SCIENCE AND RELIGION

Science and religion are often thought to be necessarily in conflict, with mutually incompatible approaches to method and discordant meanings of truth. In fact, the relationships between science and religion can indeed be modeled in terms of conflict; however, they can also be seen as mutually independent or even offering fruitful engagement. In the first half of the last century A.N. Whitehead wrote, "*When we consider what religion is for [humanity] and what science is, it is no exaggeration to say that the future of history depends upon the decision of this generation as to the relation between them.*" The

generation that Whitehead was addressing has passed, but the relation between religion and science remains fluid and, in many respects, unresolved. The aim here is to draw together intellectual resources and traditions of understanding from different Faculties in order to explore if there are ways in which science and religion can work together constructively. At present one graduate seminar course is offered.

***760 / Science and Faith Interactions / J.C. Robertson, D.R. Chettle**

Do science and faith function in such different spheres as to make meaningful conversation impossible? Need they be in conflict in seeking to understand and in their pursuit of truth? Perspectives from both Religious Studies (JCR) and Science (DRC) are brought together firstly to explore whether analogies can be found in methods of enquiry and whether similarities can be identified between knowledge and underlying truth perceived to be the goals of these different disciplines. In the first part of the seminar course readings will be taken from Thomas S. Kuhn's "The Structure of Scientific Revolutions" and Ian G. Barbour's "Religion and Science: Historical and Contemporary Issues". The second part of the course consists of investigations of issues in the science-religion dialogue of special interest to individual members of the seminar. For example: Is personhood reducible to biological and chemical fundamentals? Can a single account of origins satisfy both scientific and religious quests?

URBAN STUDIES

There are a number of departments at McMaster that offer graduate courses in Urban Studies, and in certain departments a research specialization in Urban Studies is possible at both the Master's and Ph.D. levels. A listing of some of the relevant courses is given below.

Enquiries should be directed to the Director (School of Geography and Earth Sciences) at 905 525-9140 Ext. 23535.

Website: <http://www.science.mcmaster.ca/geo/>

Courses

Courses marked with an asterisk (*) are half courses. Courses marked with a pound sign (#) are quarter courses or modules. Not all of the courses are offered every year. Students should contact the Department.

CIVIL ENGINEERING COURSES

- *6C03 / Environmental Impact and Sustainability
- 6D04 / Geometric Highway Design
- *6H03 / Land Use and Transportation (*Same as GEO *6D03*)
- 6L04 / Design of Water Resources Systems
- *6U03 / Unit Operations and Processes in Environmental Engineering
(*Same as Chem. Engineering *6U03 & Engineering *4U03*)
- #791 / Municipal Solid Waste Management
- #792 / Hazardous Waste Management

ECONOMICS COURSES

- *731 / Public Finance

SCHOOL OF GEOGRAPHY AND EARTH SCIENCES COURSES

- *6LT3/ Analysis of Transportation Systems
(*Same as Civil Engineering *6H03*)
- *6HU3 / Urban Housing
- *733 / Integrated Urban Models: Design, Structure and Applications
- *735 / Topics in Urban Geography
- *739 / Spatial Population Analysis

POLITICAL SCIENCE COURSES

- *792 / Public Choice

12. DIPLOMA PROGRAMS

ADVANCED NEONATAL NURSING

The McMaster Graduate Diploma Program in Advanced Neonatal Nursing is a graduate level advanced nursing practice specialty program offered within the Faculty of Health Sciences and sponsored by the Graduate Programs in Health Sciences. It is specifically designed to meet the accreditation requirements of the United States National Certification Corporation with respect to curriculum requirements, hours of classroom instruction and of clinical practice within an accredited educational institution and coordination of the course work by a doctorally prepared, Board certified neonatal nurse practitioner. Each graduate is eligible to apply for certification as a neonatal nurse practitioner by the National Certification Corporation. Application for admission must be made through the office of the Graduate Programs in Health Sciences. Enrolment is limited.

Enquiries: 905 525-9140 Ext. 22983

Fax: 905 546-1129

E-mail: taym@mcmaster.ca

Website: <http://www.fhs.mcmaster.ca/grad>

ADMISSION

Acceptance to this program follows the established procedures and standards for admission to the Master of Science (Nursing) degree program at McMaster University. Application materials and an explanation of procedures are provided in the Nursing brochure. The Diploma Program is available to both full- and part-time students admitted from the Nursing M.Sc. (Category 1) or Post-Master's Degree students (Category 2):

Category 1-Neonatal Nursing Stream M.Sc. Program

Nursing students must have completed at least 3/4 of their course work requirements for the McMaster M.Sc. degree prior to admission, since the Diploma requirements are additional to those requirements for the M.Sc. degree (see Nursing section of this Calendar). Students may apply and register in this Diploma Program while completing their M.Sc. thesis research. However, a separate application and tuition fee are required for enrolment in the Advanced Neonatal Nursing Diploma Program.

For the Graduate Diploma Program in Advanced Neonatal Nursing, at least two years' experience in neonatal critical care will be required in addition to specific requirements of the M.Sc. degree program in Nursing.

Category 2-Post-Master's Degree Students

The Diploma Program is also open to qualified applicants who have already completed or are currently enrolled in a relevant Master's degree, having successfully completed at least 3/4 of the course requirements, either at McMaster or at another University. In this case, admission to the Diploma program as a post-degree student does not guarantee subsequent admission to the M.Sc. or Ph.D. program in Nursing (see the General Regulations of the School of Graduate Studies, section 2.1.3 of this Calendar).

The following materials are required for enrolment in the Graduate Diploma in Advanced Neonatal Nursing Program:

- Completed or currently enrolled in a Master's degree in a clinical nursing specialty with at least a B+ standing
- Evidence of eligibility to be registered or licensed in her/his own province/country
- Minimum of two years' experience in neonatal clinical care
- Current curriculum vitae
- Two clinical letters of reference
- Two academic letters of reference
- Autobiographical letter
- Original post-secondary transcripts
- Foreign applicants whose native language is not English are required to supply evidence of their proficiency in the use of the English language [e.g., TOEFL score of 92 (iBT), 580 (paper test) or 237 (computer test)]
- Completed application form and \$90.00 application fee (Canadian currency)

For both Category 1 and Category 2 students, the Ontario Public Hospitals Act requires that all persons working in a hospital setting meet certain criteria regarding surveillance for infectious diseases. In order for the requirement of the legislation to be met, once students have been enrolled in the Program, they must complete Pre-Clinical Communicable Disease Screening annually through the Student Health Services. More information will be sent to specific applicants prior to registration. Specific questions can be directed to the Office of the Associate Dean of Graduate Studies (Health Sciences).

COURSE REQUIREMENTS

Students in the neonatal stream of the M.Sc. degree program in Nursing (category 1), must complete with at least a B- standing, the following required courses: NUR *701, *709, 720, 721, *722, or HRM *701 or *702, HRM *721, HRM/NUR *745 and one additional course selected by the student in conjunction with the supervisor or supervisory committee.

Students admitted as Master's post-degree students under Category 2 must complete, with at least a B- standing, the following required courses: NUR 720, 721, and *722.

Required Diploma Courses

720 / Advanced Nursing Care of High Risk Infants and Families / J. Pinelli, Staff

This problem-based learning course allows students to apply advanced problem-solving skills using selected clinical problems relevant to neonatal critical care. Students will acquire advanced theoretical knowledge in the physiological, behavioural, medical, and nursing sciences required for solving neonatal-focused problems through the identification and analysis of literature reviews and research papers. Students will develop differential medical and nursing diagnoses and plans of care and critically analyze the health and illness management strategies and outcomes of each case study.

721 / Advanced Neonatal Nursing Clinical Practice I / A. Symington, Staff

This course provides an opportunity for students to develop advanced skills and knowledge by progressive clinical experiences through exposure to patient and family situations in the neonatal intensive care unit. Students will develop and implement a plan of care for a selected patient(s), and families utilizing a variety of skills and knowledge applications. Students will provide health and illness management of neonates who require intensive medical and nursing.

***722 / Advanced Neonatal Nursing Clinical Practice II / A. Symington, Staff**

Students will have the opportunity to consolidate their advanced skills and knowledge in an intensive clinical experience and to demonstrate increasing responsibility and independence in the care of patients and families with complex needs and problems. This experience will provide students the opportunity to refine their diagnostic and therapeutic clinical skills. Seminar discussions will cover issues relevant to the student's new role, including systems entry and clinical issues: parental support, premature infant feeding, long-term follow-up of ill neonates, pain management.

HEALTH SERVICES AND POLICY RESEARCH

The Faculty of Health Sciences Graduate Program offers a *Graduate Diploma in Health Services and Policy Research*. Health services research is research that is intended to inform policy development and decision making regarding: a) the organization, funding, and delivery of health services, or b) the allocation of resources dedicated to improving health. Increasing the number of health services researchers to address critical issues in effective and efficient health care delivery has been identified as a high priority by national research funding agencies.

Students interested in applying for the Diploma Program must plan to: a) do a thesis or final project/paper related to health services research and b) be enrolled in one of the following research-focused thesis or course-based graduate degree programs at the Master's or Ph.D. level: Anthropology, Business Administration, Economics, Geography, Health Research Methodology, Kinesiology, Medical Sciences, Nursing, Rehabilitation Sciences, Mathematics, Social Work, Sociology, or Statistics.

Through the Ontario Training Centre in Health Services and Policy Research, students accepted into the Diploma Program may be eligible for stipends.

Unique features of this Diploma Program include: availability of courses addressing important issues in health services research at any of the 6 participating universities (Lakehead, Laurentian, McMaster, Ottawa, Toronto, and York); linkages with students and faculty across universities and disciplines; and field placement opportunities in policy and research settings to work with health services researchers and decision makers across the province.

The minimum requirement for the Diploma is 1.5 full course equivalents over and above graduate degree requirements. The Program will be open to both full- and part-time students. For students who undertake the diploma requirements full-time, the expected duration of the diploma program is 2 terms.

For further information contact Miguel A. Pérez, Ph.D. (OTC Program Coordinator) by phone at 905 525-9140 extension 26203 or by email at mperez@mcmaster.ca.

Website: <http://www.fhs.mcmaster.ca/grad/hrm/otc/proginfo.htm>

For an application package, contact Rose Vonau, OTC Administrative Assistant, by phone at 905 525-9140 extension 22408, by fax at 905 526-7949, or by email at vonau@mcmaster.ca.

MANAGEMENT OF INNOVATION AND NEW TECHNOLOGY

The DeGroote School of Business offers two graduate diplomas in the Management of Innovation and New Technology called, respectively, **Graduate Diploma in the Management of Innovation and New Technology** and **Advanced Graduate Diploma in the Management of Innovation and New Technology**.

The Management of Innovation and New Technology (MINT) is of interest because technology and innovation are two principal drivers of business success. Firms that have mastered general capabilities for innovation and/or use technology in innovative ways are revolutionizing how business is done. There is a growing consensus that firms who know how to create value with science and technology hold the key to wealth creation in such industries as pharma/biotech, aerospace, electronics and computing. Many firms have found that the most effective way to sustain profits is to maintain a competitive edge over their rivals through constant innovation in all aspects of their operations, including those involving technology. These graduate diplomas provide an opportunity for managers and students to pursue these important themes at an advanced level that builds upon their already completed academic accomplishments in business. All the courses in both these diplomas are taken in classes with advanced level M.B.A. students.

GRADUATE DIPLOMA IN THE MANAGEMENT OF INNOVATION AND NEW TECHNOLOGY

The graduate diploma provides an overview of MINT and an opportunity to study, in more depth, selected topics within the field. The program consists of two required courses which provide the overview, and two elective courses which provide the opportunity to study selected topics.

ADMISSION CRITERIA

1. Successful applicants must have completed a course of study equivalent to Year I of the DeGroote School of Business M.B.A. or must be admissible to the MGD M.B.A. with advanced credit for Year I.

Applications from international students will be evaluated on a case-by-case basis to establish equivalencies.

2. Successful applicants must be proficient in English.

If the applicant does not hold a post-secondary degree from a program whose language of instruction was English, a satisfactory TOEFL score (including TSE) will be required. Other evidence of proficiency in English (such as letters from an employer and/or educator) will also be considered.

COURSE REQUIREMENTS

Required: **B730** / Strategic Management of Technology
P724 / Innovation and New Products

Elective: Two courses from the elective courses menu below.

ADVANCED GRADUATE DIPLOMA IN THE MANAGEMENT OF INNOVATION AND NEW TECHNOLOGY

The advanced graduate diploma builds upon the graduate diploma by having students focus on current issues in MINT, and by giving them the opportunity to study in more depth a number of topics in the field. The program consists of one required course which examines current issues, and three elective courses which allow students to pursue further studies on topics of particular interest to them.

ADMISSION CRITERIA

Completion of the Graduate Diploma in the Management of Innovation and New Technology

COURSE REQUIREMENTS

Required: **P734** / Current Issues in the Management of Innovation and New Technology

Elective: Three courses from the elective courses menu below

ELECTIVE COURSES MENU FOR THE GRADUATE DIPLOMA AND ADVANCED GRADUATE DIPLOMA

C727 /	Pharma/Biotech Business Issues
F724 /	Venture Capital
K725 /	Business Process Reengineering
K731 /	Project Management
K735 /	Managing the Implementation of Enterprise Systems
P715 /	Entrepreneurship
P727 /	Strategic Knowledge Management
P734 /	Current Issues in the Management of Innovation and New Technology
P737 /	Profiting from Intellectual Property
P741 /	New Venture Creation

In addition to these permanent electives a number of other courses on MINT related themes are offered from time to time by the School of Business and they can be taken for elective credit towards these graduate diplomas. Please consult the M.B.A. calendar section of the DeGroote School web page for course descriptions of all of these courses. Not all of these elective courses are offered in all semesters but all are offered at least once in each academic year.

NUCLEAR TECHNOLOGY

The Department of Engineering Physics offers a Diploma Program in Nuclear Technology. The fundamentals of nuclear reactor physics, reactor thermalhydraulics, nuclear instrumentation, nuclear environmental quality, fusion engineering and radiation damage are important for nuclear power plant design, operation and safety, as well as in the technologies of many industries which use nuclear techniques. This diploma program provides an overview of the fundamentals in these allied areas and permits an in-depth study of topics to support the student's interest in a particular industrial technology.

ADMISSION

Applicants must hold a baccalaureate degree in the fields of engineering, science or mathematics with an acceptable grade point average, similar to that for entry into a M.Eng. degree program. Consideration will be given to work experience. In addition, applicants must be deemed to have satisfactory preparation, as a result of university education and work experience, to succeed in the program. The Department Chair, upon the recommendation of the departmental Graduate Admissions Committee, will make admission recommendations to the School of Graduate Studies.

REQUIREMENTS

The student will be granted a Graduate Diploma in "Nuclear Technology" upon the completion of four half courses within a three year period with a minimum passing grade of B- for each course. The courses must be selected from the following list and at least two of the courses must be at the 700 level. With the approval of the Department Chair, one of the four half courses may be Engineering Physics 704,

Selected Topics in Engineering Physics. Exceptions to these course requirements must be granted by special permission from the Faculty of Engineering Admissions and Study Committee acting on the recommendation of the Department Chair.

Courses

The courses listed below are also listed in the Engineering Physics section of the Graduate Calendar. From time to time some of these courses may be offered using distance education tools.

*6D03 / Nuclear Reactor Analysis / Staff

Introduction to nuclear energy; nuclear physics and chain reactions; reactor statics and kinetics; multigroup analysis, core thermalhydraulics; reactor design.

*6L04 / Industrial Monitoring and Detection Techniques

Single and two-phase flow diagnostics and monitoring techniques for industrial and power plant operations; radiation monitoring; pollutant monitoring and analysis; nuclear instrumentation for industrial processes.

*6NE3 / Advanced Nuclear Engineering / J.C. Luxat

Fission power generation and distribution in a nuclear reactor core. Design and performance of natural uranium, enriched uranium and mixed oxide nuclear fuels. Energy conversion, heat transfer and heat transport in a nuclear reactor core. Thermal margins and safety limits of nuclear fuel and reactor components. Irradiation, corrosion and aging of reactor structural materials. Structural integrity of nuclear components including properties of nuclear materials, stress in piping systems, material creep and fatigue behavior.

*6P03 / Nuclear Power Plant Systems and Operation / Staff

Systems and overall unit operations relevant to nuclear power plants; includes all major reactor and process systems; nuclear power plant simulator; self-study using interactive CD-ROM.

*710 / Nuclear Reactor Dynamics and Control / J.C. Luxat

Reactor kinetics: point kinetics model; modal model for space-time kinetics; reactivity feedback mechanisms; reactor transfer functions; the inhour equation; reactor stability; Xenon stability; bulk and spatial power control; load following; control systems for CANDU and LWR reactors.

*713 / Nuclear Safety Analysis and Reactor Accidents / J.C. Luxat

Degraded fuel heat transfer; fuel failure mechanisms; fission product release and transport from nuclear fuel; leak-before-break and piping fracture mechanics; pipe ruptures; challenges to containment system integrity; severe accident progression and mitigation; off-site release of fission products; applications to CANDU and LWR reactors.

*714 / Nuclear Reactor Safety Design / Staff

Risk based design and analysis of nuclear reactors based on deterministic and probabilistic assessments. Topics include: concepts of risk; probability tools and techniques; safety criteria; design basis accidents; risk assessment; safety analysis; safety system design; and general policy and principles.

*715 / Advanced Nuclear Reactor Thermalhydraulics / Staff

Advanced topics of current interest in the area of fission and fusion nuclear reactor primary heat transport system, system safety and the transitional operations.

*716 / Nuclear Reactor Heat Transport System Design / Staff

This course covers the fundamentals of nuclear reactor heat transport system design for key reactor types, with emphasis on the CANDU and Light Water Reactor (PWR and BWR) designs. Theoretical topics and their application include reactor thermodynamics, single-phase and two-phase flow, heat and mass transfer, critical heat flux, pressure drop prediction, flow stability, design of reactor core, reactor vessel, steam generators and primary heat transport pumps. The course also covers experimental techniques, facilities and results. Course assignments are analytical problems related to these topics.

*717 / Pollution Control Plasma Technology / Staff

Combustion flue gas treatment by energetic electron processes (electron beam/plasma); toxic waste treatments by ionizing radiation; waste water treatment by electron beams and pulse electric discharges; neutron activation analyses; ICP plasma analyses; thermal plasma waste treatments.

*718 / Reactor Heat Transport System Simulation and Analysis / Staff

The course covers two-fluid two-phase modeling of thermal-hydraulic phenomena in the reactor heat transport system including modeling and simulation of postulated accidents, simulation methodology and tools, and development and qualification of selected thermal-hydraulics computer codes, including two-fluid modeling, nodalization schemes and numerical methods, computer code development, CATHENA computer code theory and numerical algorithm. This is a simulation-based course; it includes CATHENA training. Assignments include analytical problems, CATHENA code simulation and analysis, and preparing a CATHENA model and report.

SPATIAL ANALYSIS AND GIS

The School of Geography and Earth Sciences and the Centre for Spatial Analysis offer a Graduate Diploma in Spatial Analysis and GIS. The Graduate Diploma is designed to meet the needs of those with a degree in Geography, Earth & Environmental Sciences or related discipline who wish to complement their background with skills in GIS technology, spatial interaction modeling, locational analysis and spatial statistics. Emphasis is placed on critical thinking, hands-on problem-solving and communication skills.

This program is geared to suitable graduates with an interest in advanced studies in Spatial Analysis, but who do not wish to complete a Master's degree.

Enquiries: 905 525-9140 Ext. 22542

Fax: 905 546-0463

Email: maynard@mcmaster.ca

Website: <http://www.science.mcmaster.ca/geo/>

ADMISSION

Acceptance to this program follows the established procedures and standards for admission to M.A. or M.Sc. degree graduate programs at McMaster University.

Applicants must hold a B.Sc. or B.A. in Geography, Earth & Environmental Sciences or related discipline and must have completed a course in GIS, spatial statistics or a combination of the two. Although the requirements are similar to those for a M.A. or M.Sc. candidate, additional consideration will be given to work experience. The general guidelines are outlined in sections 2.1.1 and 2.1.4 of the Graduate Calendar.

COURSE REQUIREMENTS

A student will be granted a Graduate Diploma in Spatial Analysis upon the completion of four half courses with a minimum passing grade of B- within a three-year period. The courses must be from the following list, and students must take at least one at the 600-level and at least two at the 700-level. Exceptions to these course requirements must be granted by special permission of the Faculty of Science Graduate Curriculum, Policy, Admissions and Study Committee.

Graduate diploma students with at least a B+ average in their graduate course work may be eligible to transfer to a part-time Master's degree in Geography subject to the recommendation of the department and Faculty Graduate Admissions and Study Committee. See section 2.1.4 in the Graduate Calendar.

COURSES

*6D03 / Analysis of Transportation Systems / H.A. Paez (Same as Civil Engineering *6H03)

An introduction to the use of models in transportation planning. Topics include data issues, the four-stage approach to modeling transportation systems, discrete choice models and contextual factors such as land use.

*6I03 / Advanced GIS / Staff

Advanced methods in GIS using ARC/INFO. Topics will include raster based analysis, working with linear features, surface modeling and AML programming.

*6S03 / Advanced Topics in Spatial Statistics / P.S. Kanaroglou

This course explores concepts and methods in visualisation, exploration and modeling of point pattern, spatially continuous data and area data.

*715 / Special Topics / Staff

Individual reading course on an advanced level topic. A student may register only once in this course with the permission of The School of Geography and Earth Sciences.

*733 / Integrated Urban Models: Design, Structure and Applications / P.S. Kanaroglou

A review of location and transportation models used in integrated urban models. The performance of known computer implementations of integrated urban models will be evaluated in this course.

*737 / Activity Analysis: Advanced Travel Behaviour Analysis and Modeling / D.M. Scott

Theory, data and methods underlying the activity-based approach to travel behaviour analysis and modeling. The application of activity analysis to future models of urban travel demand is also emphasized.

*739 / Spatial Population Analysis / K.B. Newbold

Theories and models of migration; characteristics of contemporary migration; movement in space and models of spatial interaction.

*746 / Advanced Statistical Methods in Geography / K.L. Liaw

Applications of advanced multivariate statistical methods in geographic research, including analysis of contingency tables and regression, logistic and probit models.

*762 / Advanced Geophysical Mapping and Modeling / W.A. Morris

Airborne geophysical and satellite imagery for geological mapping application to problems in oil, and mineral exploration and to environmental contaminant mapping.

STEEL PROCESSING & MANUFACTURING

The Departments of Chemical Engineering, Materials Science & Engineering and Mechanical Engineering have developed a Graduate Diploma in Steel Processing & Manufacturing. The diploma will provide the fundamental basis for engineers involved in steel processing and manufacturing.

Enquiries:

Dept. of Chemical Engineering: 905 525-9140 Ext. 24292

Dept. of Materials Science & Engineering: 905 525-9140 Ext. 24295

Dept. of Mechanical Engineering: 905 525-9140 Ext. 23097

ADMISSION

Acceptance to this program follows established procedures and standards for admission to Master of Engineering degree graduate programs at McMaster University. Admission will be considered on the basis of university education and work experience. Students may apply for the diploma through Chemical Engineering, Materials Science & Engineering or Mechanical Engineering.

COURSE REQUIREMENTS

The student will be granted a Graduate Diploma in Steel Processing & Manufacturing upon the completion of 4 half courses, or 8 quarter modules or some equivalent combination thereof, within a three-year period and with a minimum passing grade of B- for each course. The courses must be selected from the following list and at least two of the courses must be at the 700-level. Students cannot take more than two Chemical Engineering half courses; students interested in process control should take the Advanced Automation in the Process Industries Diploma. Exceptions to these course requirements must be granted by special permission of the Faculty of Engineering Graduate Admissions and Study Committee.

COURSES

CHEMICAL ENGINEERING COURSES

*6C03 / Statistics for Engineers

*6E03 / Digital Computer Process Control

*752 / Optimization of Chemical Processes

*761 / Multivariable, Stochastic and Adaptive Control of Chemical Processes

*762 / Time Series Analysis and Process Identification

*764 / Process Control Design

*765 / Multivariate Statistical Methods for Process Analysis and Monitoring

MATERIALS ENGINEERING COURSES

*6C03 / Modern Iron and Steelmaking

#771 / Principles of Heterogeneous Kinetics

#773 / Properties of Metallurgical Slags

#774 / Injection Metallurgy

#775 / Physical and Mathematical Modeling in Materials Processing

#791 / Special Topics in Materials Science & Engineering (if topic is appropriate and approved)

*792 / Special Topics in Materials Science & Engineering (if topic is appropriate and approved)

MECHANICAL ENGINEERING COURSES

*728 / Manufacturing Processes I

*734 / Theory of Plasticity

*738 / Manufacturing Process II

*739 / Special Topics in Production (if topic is appropriate and approved)

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