

12.19 Neurology and Neurosurgery (NEUR)

COURSE LECTURERS

Associate Professor

Peter McPherson; B.Sc.(Manit.), Ph.D.(Iowa)(William Dawson Scholar) (joint appt. with Anatomy & Cell Biology)

Wayne Sossin; S.B.(M.I.T.), Ph.D.(Stan.) (joint appt. with Anatomy & Cell Biology) Course Co-ordinator

Assistant Professors

Timothy Kennedy; B.Sc.(McM.), M.Phil, Ph.D.(Columbia) (joint appt. with Anatomy & Cell Biology)

David Ragsdale; B.S.(Ill.); Ph.D.(Calif.)

It is the brain that makes us what we are, and understanding how the brain works and how it is affected by disease is a major goal of Neuroscience. Neuroscience is both pure science, offering challenging basic research pursuits, as well as medical science, with important clinical applications. The approach to problems in Neuroscience has roots in many of the basic sciences including biology, biochemistry, pharmacology, physiology, and psychology. Powerful techniques of molecular biology, biochemistry, and genetics have revealed new molecules, given insight to how gene expression is controlled, and allowed the identification of defective genes responsible for diseases of the nervous system. Neuronal and glial cells are studied in the context of adult or developing nervous systems, and how neural networks are formed and maintained. Signalling and information transfer within and between cells are investigated by studying individual cells and their synaptic connections, or through research on complex neuronal circuitry. Higher neural functions are explored by mapping neural architecture, through the study of specific systems with sophisticated physiological and imaging techniques, and by investigations of the neurobiological mechanisms of behaviour.

The Department of Neurology and Neurosurgery sponsors an undergraduate course in Neuroscience, and additional undergraduate courses are offered in the Departments of Biology, Pharmacology, Biochemistry, Psychology, Physiology, and Anatomy and Cell Biology.

Graduate studies are a very large component of the Department of Neurology and Neurosurgery. The curriculum for graduate degrees in Neurology and Neurosurgery is provided in the Graduate Studies Calendar. Inquiries should be directed to the Graduate Program Coordinator, Montreal Neurological Institute, 3801 University Street, Montreal, H3A 2B4.

COURSE DESCRIPTION

Students preparing to register are advised to consult the 2002-2003 Class Schedule on the Web, <http://www.mcgill.ca/minerva-students> for the most up-to-date information.

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

NEUR has replaced 531 as the prefix for Neurology courses.

All courses have limited enrolment.

NEUR 310 CELLULAR NEUROBIOLOGY. (3) (Winter) (2 lectures each week) (Prerequisite or corequisite: BIOL 200 and BIOL 201, or PHGY 209, or PHGY 210) A survey of the functional organization of nerve cells, signalling in the nervous system, and principles of neural development. Topics include cell polarity, neurotransmitters, neurotrophins, receptors and second messengers, cell lineage, guidance of axon outgrowth, and nerve regeneration. Emphasis will be placed on analysis of neurons at the molecular level.

12.20 Neuroscience

Minor Program in Neuroscience

Program Coordinator:

Professor Ellis Cooper, Department of Physiology

McIntyre Medical Sciences Building, Room 1127

Email: ecooper@med.mcgill.ca

Telephone: (514) 398-4334

Neuroscience is a multidisciplinary science devoted to the understanding of the nervous system. The brain is one of the most complex systems in the universe, and understanding how it functions is among the most challenging questions in science. Scientists are investigating the brain at many levels, from the molecules at synapses to complex forms of behaviour, with diverse approaches ranging from genetic, biochemical, anatomical, physiological, embryological and psychological. In addition, scientists are investigating the nervous system of many different animals, from simple invertebrates to humans. These wide-ranging investigations are providing a clearer understanding of how neurons work; how they communicate with one another; how they are organized into local or distributed networks; how the connections between neurons are established and change with experience; how neuronal functions are influenced by drugs, nutrients, toxins, and disease states. As a result, we are gaining deeper insights into the neural basis of mental activity, as well as developing new therapeutic approaches to alleviate neurological and psychological diseases.

MINOR PROGRAM IN NEUROSCIENCE (24 credits)

[Program revisions awaiting University approval. Check the Web, <http://www.mcgill.ca> (Course Calendars) in July for confirmation.]

The Minor Program in Neuroscience is a program designed for undergraduate students interested in how the nervous system functions. The program consists of courses from the departments of Anatomy and Cell Biology (ANAT), Biochemistry (BIOC), Biology (BIOL), Neurology and Neurosurgery (NEUR), Pharmacology and Therapeutics (PHAR), Physiology (PHGY), Psychiatry (PSYT), and Psychology (PSYC). The Minor is composed of 24 credits, 18 of which must be selected from two of the five topic areas listed below. Twelve credits of the 18 must be at the 400/500 level and from at least two different departments. A maximum of 6 credits can be counted both for the student's primary program and for the Minor Program in Neuroscience, where appropriate.

All course selections for the Minor Program in Neuroscience must be approved by the Program Coordinator.

Complementary Courses (24 credits)

6 credits selected from:

PSYC 308	(3)	Behavioural Neuroscience 1
or BIOL 306	(3)	Neurobiology and Behaviour
or PHGY 311	(3)	Intermediate Physiology 1
ANAT 321	(3)	Circuitry of the Human Brain
NEUR 310	(3)	Cellular Neurobiology

18 additional credits:

9 credits each from 2 of the 5 areas listed below, 6 credits in each area must be from 400- or 500-level courses

Neurobiology and Behaviour

BIOL 306	(3)	Neurobiology and Behaviour
BIOL 389	(3)	Laboratory in Neurobiology
PSYC 318	(3)	Behavioural Neuroscience 2
PHGY 311	(3)	Intermediate Physiology 1
BIOL 530	(3)	Neural Basis of Behaviour
BIOL 531	(3)	Neurobiology of Learning & Memory
PSYC 427	(3)	Sensorimotor Behaviour
PSYC 505	(3)	The Psychology of Pain
PSYC 522	(3)	Neurochemical Basis of Behaviour
PHGY 556	(3)	Topics in Systems Neuroscience
PSYT 500	(3)	Advances in the Neurobiology of Mental Disorders

Molecular and Developmental Neurobiology

ANAT 321	(3)	Circuitry of the Human Brain
NEUR 310	(3)	Cellular Neurobiology
PHGY 311	(3)	Intermediate Physiology 1
BIOL 532	(3)	Developmental Neurobiology Seminars
BIOL 588	(3)	Molecular/Cellular Neurobiology
BIOC 455	(3)	Neurochemistry
PHGY 451	(3)	Advanced Neurophysiology

Neurophysiology

BIOL 389	(3)	Laboratory in Neurobiology
ANAT 322	(3)	Neuroendocrinology
PHGY 311	(3)	Intermediate Physiology 1

BIOL 531	(3)	Neurobiology of Learning & Memory
BIOL 588	(3)	Molecular/Cellular Neurobiology
PSYC 427	(3)	Sensorimotor Behaviour
PHGY 451	(3)	Advanced Neurophysiology
PHGY 520	(3)	Ion Channels
PHGY 556	(3)	Topics in Systems Neuroscience

Neuropsychology

BIOL 306	(3)	Neurobiology and Behaviour
PSYC 311	(3)	Human Cognition and the Brain
PSYC 318	(3)	Behavioural Neuroscience 2
ANAT 321	(3)	Circuitry of the Human Brain
ANAT 322	(3)	Neuroendocrinology
PSYC 410	(3)	Special Topics in Neuropsychology
PSYC 470	(3)	Memory and Brain
PSYC 505	(3)	The Psychology of Pain
PSYC 522	(3)	Neurochemical Basis of Behaviour
PSYC 526	(3)	Advances in Visual Perception

Neuropharmacology

PHAR 300	(3)	Drug Action
PHAR 301	(3)	Drug and Disease
PSYT 301	(3)	Issues in Drug Dependence
ANAT 321	(3)	Circuitry of the Human Brain
PHGY 311	(3)	Intermediate Physiology 1
BIOC 455	(3)	Neurochemistry
PHGY 451	(3)	Advanced Neurophysiology
PSYT 500	(3)	Advances in the Neurobiology of Mental Disorders
PHGY 520	(3)	Ion Channels
PHAR 562	(3)	General Pharmacology 1
BIOL 588	(3)	Molecular/Cellular Neurobiology

12.21 Nursing

For a complete listing of Nursing courses and their descriptions, consult the School of Nursing website (<http://www.nursing.mcgill.ca>) or refer to the Health Sciences Calendar.

Students preparing to register are advised to consult the 2002-2003 Class Schedule on the Web, <http://www.mcgill.ca/minerva-students> for the most up-to-date information.

The course credit weight is given in parentheses after the title. HSEL has replaced 576 as the prefix for these Health Science Elective courses.

All courses have limited enrolment.

HSEL 308 ISSUES IN WOMEN'S HEALTH. (3) (Fall) (Prerequisite: Introductory Psychology or Sociology or permission of the instructor) (Complementary course for the Women's Studies and Social Studies of Medicine Concentrations) Exploration of a wide range of topics on the health of women. Topics include use of health care system, poverty, roles, immigration, body image, lesbian health, and violence against women. Additional topics vary by year. A Health Science elective open to students in the Faculties of Arts, Science, and Medicine.

HSEL 309 WOMEN'S REPRODUCTIVE HEALTH. (3) (Winter) (Prerequisite: Introductory Psychology or Sociology or permission of the instructor) (Restriction: not open for credit to students who have taken HSEL 308 prior to September 1997) (Complementary course for the Women's Studies and Social Studies of Medicine Concentrations) Concepts of health and medicalization. Canadian and international perspectives. Topics include contraception, abortion, infertility, menstruation, menopause, new reproductive technologies, prenatal care, childbirth. Additional topics vary by year. A Health Science elective open to students in the Faculties of Arts, Science, and Medicine.

12.22 Nutrition (NUTR)

Please see the School of Dietetics and Human Nutrition entry beginning on [page 461](#) in the Faculty of Agricultural and Environmental Sciences section for further information about the School's other courses, programs and academic staff. This information includes a Minor Program in Human Nutrition which can be taken by Science students.

Students preparing to register are advised to consult the 2002-2003 Class Schedule on the Web, <http://www.mcgill.ca/minerva-students> for the most up-to-date information.

The course credit weight is given in parentheses after the title. NUTR has replaced 382 as the prefix for Nutrition and Dietetics courses.

All courses have limited enrolment.

NUTR 307 HUMAN NUTRITION. (3) (Fall) (Prerequisites: BIOL 201 or AEBI 202, CHEM 212 or FDSC 230 or permission of the instructor.) (Not open to students who have taken ANSC 330) (3 lectures and 1 project) Cellular and organismal aspects of nutrition with emphases on biochemical and physiological roles of carbohydrates, lipids, proteins, minerals and vitamins in disease prevention and promotion of optimal health.

12.23 Pathology (PATH)

Students preparing to register are advised to consult the 2002-2003 Class Schedule on the Web, <http://www.mcgill.ca/minerva-students> for the most up-to-date information.

The course credit weight is given in parentheses after the title. PATH has replaced 546 as the prefix for Pathology courses.

All courses have limited enrolment.

PATH 300 HUMAN DISEASE. (3) (Winter) (Prerequisites: BIOL 200, BIOL 201 or BIOC 212, PHGY 209. Pre-/co-requisite: PHGY 210) Provides a fundamental understanding of the diseases prevalent in North America, for upper level students in the biological sciences. Includes: general responses of cells and organ systems to injury; assessment of individual diseases by relating the causes, symptoms, diagnosis, treatment and prevention to the primary biological abnormalities in each disorder.

12.24 Pharmacology and Therapeutics (PHAR)

McIntyre Medical Building
3655 Promenade Sir-William-Osler
Montreal, QC H3G 1Y6

Telephone: (514) 398-3623

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

Acting Chair — Radan Capek

Emeritus Professor

Theodore Sourkes; Ph.D. (Cornell)

Professors

Radan Capek; M.D., Ph.D.(Prague)

Paul B.S. Clarke; M.A.(Cantab.), Ph.D.(Lond.)

Brian Collier; B.Sc., Ph.D.(Leeds)

A. Claudio Cuello; M.D.(Buenos Aires), M.A., D.Sc.(Oxon.)

Barbara Hales; M.Sc.(Phil. Coll. of Pharmacy and Science), Ph.D.(McG.)

Peter J. McLeod; M.D.(Manit.), F.R.C.P.(C.)

John B. Richardson; B.Sc., M.D.C.M., L.M.C.C., F.R.C.P., Ph.D.(McG.)

Bernard Robaire; B.A.(Calif.), Ph.D.(McG.)(*James McGill Professor*)

Moshe Zzyf; M.Sc., Ph.D.(Hebrew U.)

Daya R. Varma; M.D.(Lucknow), Ph.D.(McG.)

Associate Professors

Guillermina Almazan; Ph.D.(McG.)

Barbara Esplin; M.D.(Warsaw)

Dusica Maysinger; Ph.D.(Los Angeles)

Stanley Nattel; B.Sc., M.D.,C.M.(McG.)

Ante L. Padjen; M.D., M.Sc., D.Sc.(Zagreb);

Alfredo Ribeiro-da-Silva; M.D., Ph.D.(Oporto)

H. Uri Saragovi; Ph.D.(Miami)

Betty I. Sasyniuk; B.S.P., Ph.D.(Man.)

Jacquetta Trasler; M.D.C.M., Ph.D.(McG.)

Edith A. Zorychta; B.Sc.(F.X.), M.Sc., Ph.D.(McG.)

Associate Members

Moulay Alaoui-Jamali; Ph.D.(Sorbonne)

Gerald Batist; M.D., C.M. (McG.)
 Claude De Montigny; M.D., Ph.D. (Montr.), F.R.C.P. (C)
 Pierre Fiset; M.D. (Laval), F.R.C.P.S. (C).
 Serge Gauthier, M.D. (Montr.)
 Yogesh C. Patel; M.D. (Otago), Ph.D. (Monash)
 Roger Prichard; B.Sc., Ph.D. (N.S.W.)
 Remi Quirion; M.Sc., Ph.D. (Sher.)
 Allan Tenenhouse; B.Sc., M.D., C.M., Ph.D. (McG.)

Adjunct Professors

Sylvain Chemtob; M.D. (Montr.), Ph.D. (McG.)
 Yves De Koninck; Ph.D. (McG.)
 Lorella Garofalo; Ph.D. (McG.)
 Joseph Mancini; M.Sc., Ph.D. (McG.)
 Kathleen Metters; Ph.D. (London)
 George S. Robertson; Ph.D. (Dal.)

Pharmacology is the science which deals with all aspects of drugs and their interactions with living organisms. Thus, it involves the physical and chemical properties of drugs, their biochemical and physiological effects, mechanisms of action, pharmacokinetics, and therapeutic and other uses. Since the word "drug" encompasses all chemical substances that produce an effect on living cells, it is evident that pharmacology is a very extensive subject. Pharmacology is a multi-disciplinary science. It has developed its own set of principles and methods to study the mode of the action of drugs, but it has also utilized many techniques and approaches from various disciplines including biochemistry, physiology, anatomy and molecular biology, as well as others. Pharmacology can be subdivided into a number of different areas such as neuropharmacology, molecular biology, reproductive pharmacology, endocrine pharmacology, receptor pharmacology, cardiovascular pharmacology, toxicology, developmental pharmacology, autonomic pharmacology, biochemical pharmacology, and therapeutics.

Training in pharmacology is conducted at both the undergraduate and graduate levels. Because of its breadth, students may be attracted to the subject from a variety of viewpoints; this includes those completing a Bachelor's degree in any number of basic science disciplines, such as biology, zoology, chemistry, physics, biochemistry, microbiology, anatomy and physiology. At the undergraduate level, seven lecture courses are offered. A course involving research projects in pharmacology is also available to provide the student with the opportunity to get first-hand experience in a pharmacology research laboratory. These courses should provide students with knowledge concerning the actions of drugs on living systems and insight into approaches to basic pharmacological research.

MINOR PROGRAM IN PHARMACOLOGY (24 credits)

The Minor Program in Pharmacology is intended for students registered in a complementary B.Sc. program who are interested in a focused introduction to specialized topics in pharmacology to prepare them for professional schools, graduate education, or entry into jobs in industry or research institutes. Students should declare their intent to enter the Minor Program in Pharmacology at the beginning of their U2 year. They must consult with, and obtain the approval of, the Coordinator for the Minor Program in the Department of Pharmacology and Therapeutics.

All courses in the Minor Program must be passed with a minimum grade C or better. Generally, no more than 6 credits of overlap are permitted between the Minor and the primary program.

Required Courses (9 credits)

PHAR 300 (3) Drug Action
 PHAR 562 (3) General Pharmacology 1
 PHAR 563 (3) General Pharmacology 2

Complementary Courses (15 credits)

3 credits, one of:

BIOL 200 (3) Molecular Biology
 BIOL 201 (3) Cell Biology and Metabolism
 BIOC 212 (3) Molecular Mechanisms of Cell Function

3 credits, one of:

PHGY 209 (3) Mammalian Physiology 1
 PHGY 210 (3) Mammalian Physiology 2

9 credits, chosen from

PHAR 301 (3) Drugs and Diseases
 PHAR 303 (3) Principles of Toxicology
 PHAR 503 (3) Drug Design and Development 1
 PHAR 504* (3) Drug Design and Development 2
 PHAR 599 (6) Research Projects in Pharmacology

* can be taken with PHAR 503 only.

COURSE DESCRIPTIONS

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

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

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

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

PHAR has replaced 549 as the prefix for Pharmacology and Therapeutics courses.

All courses have limited enrolment.

PHAR 300 DRUG ACTION. (3) (Fall) (Prerequisites: BIOL 200 and BIOL 201 or BIOC 212, PHGY 209 and PHGY 210 or permission of instructor) This course covers the fundamental principles of pharmacology and toxicology. Frequently encountered drugs are used as a focus to illustrate sites and mechanisms of action, distribution, metabolism, elimination and adverse effects.

PHAR 301 DRUGS AND DISEASE. (3) (Winter) (Prerequisites: BIOL 200, BIOL 201 or BIOC 212, PHGY 209 and PHGY 210 and PHAR 300 or permission of instructor) This course further explores the basic principles of pharmacology as illustrated by drugs used in the treatment of disease. Emphasis is placed on drugs used for diseases prevalent in North America.

PHAR 303 PRINCIPLES OF TOXICOLOGY. (3) (Winter) (Prerequisites: BIOL 200, BIOL 201 or BIOC 212, PHGY 209 and PHGY 210) Fundamental mechanisms by which toxic compounds damage a biological system (organelle, cell, organ, organism, ecosystem). Detection and quantification of toxicity and risk/benefit analysis are considered. Selected agents of current risk to human health or the environment are evaluated in depth.

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

PHAR 504 DRUG DESIGN AND DEVELOPMENT 2. (3) (Winter) (Prerequisite: PHAR 503/CHEM 503) (U3 and graduate students. Students can register only with permission of coordinators) (Not open to students who are taking or have taken CHEM 504) Interdisciplinary course in drug design and development in which teams of 2-4 students select a lead chemical compound, design the analogues, propose the preclinical and clinical studies, present possible untoward effects, and reasons for drug (dis)approval.

PHAR 562 GENERAL PHARMACOLOGY 1. (3) (Fall) (Prerequisites: PHGY 209 and PHGY 210, BIOL 200 and BIOL 201 or BIOC 311 and BIOC 312 or equivalent) (Restrictions: Open to U3 students with permission of instructors, and students registered in the Minor Pharmacology Program) Principles of pharmacology as illustrated

by current issues with an emphasis on the nervous system will be discussed. Drugs classified by their molecular target of action, their mechanism of action, and possibly a rationale for therapeutic use will be presented. Students will be required to examine and interpret scientific data, to write a paper and/or participate in small group discussions.

PHAR 563 GENERAL PHARMACOLOGY 2. (3) (Winter) (Prerequisites: PHGY 209 and PHGY 210, BIOL 200 and BIOL 201 or BIOC 311 and BIOC 312 or equivalent) (Restrictions: Open to U3 students with permission of instructors, and students registered in the Minor in Pharmacology Program) Selected topics of basic interactions between chemicals and biological systems. Actions of drugs at the molecular and cellular levels. Principles of drug development. Chemotherapy of infections and of cancer. Toxicology and pharmacokinetics/dynamics. Drug metabolism.

PHAR 599 RESEARCH PROJECTS IN PHARMACOLOGY. (6) (Minimum of 12 hours per week to be spent in the lab and/or library.) (Pre-/co-requisite PHAR 562 and PHAR 563 or PHAR 300 and PHAR 301) (Restrictions: Open to U3 students with permission of instructors, and students registered in the Minor Pharmacology Program. Students should consult instructors 3 - 4 weeks before registration. Students may not register without prior approval of the course co-ordinator(s)) (Please see regulations concerning "Project Courses") This course involves individual research work. Students select a project under the supervision of a staff member. Areas of interest include toxicology, endocrine, developmental, cardiovascular, reproductive and neuropharmacology.

PHAR 599D1 RESEARCH PROJECTS IN PHARMACOLOGY. (3) (Fall) (Minimum of 6 hours per week to be spent in the lab and/or library.) (Students must also register for PHAR 599D2) (No credit will be given for this course unless both PHAR 599D1 and PHAR 599D2 are successfully completed in consecutive terms) (PHAR 599D1 and PHAR 599D2 together are equivalent to PHAR 599) See PHAR 599 for course description.

PHAR 599D2 RESEARCH PROJECTS IN PHARMACOLOGY. (3) (Winter) (Minimum of 6 hours per week to be spent in the lab and/or library.) (Prerequisite: PHAR 599D1) (No credit will be given for this course unless both PHAR 599D1 and PHAR 599D2 are successfully completed in consecutive terms) (PHAR 599D1 and PHAR 599D2 together are equivalent to PHAR 599) See PHAR 599 for course description.

12.25 Physics (PHYS)

Rutherford Physics Building, Room 108
3600 University Street
Montreal, QC H3A 2T8

Telephone: (514) 398-6485
Fax: (514) 398-8434
Email: secretariat@physics.mcgill.ca
Website: <http://www.physics.mcgill.ca>

Chair — J. Barrette

Emeritus Professors

M.P. Langleben; B.Sc., M.Sc., Ph.D.(McG.), F.R.S.C.
E.R. Pounder; B.Sc., Ph.D.(McG.), F.R.S.C. (*William C. Macdonald Emeritus Professor of Physics*)
Douglas G. Stairs; B.Sc., M.Sc.(Queen's), Ph.D.(Harv.) (*William C. Macdonald Professor of Physics*)
Martin J. Zuckermann; M.A., D.Phil.(Oxon.), F.R.S.C. (*William C. Macdonald Emeritus Professor of Physics*)

Post-Retirement

Andreas P. Contogouris; B.A.(Athens), Ph.D.(C'neil)
Jonathan K.P. Lee; B.Eng., M.Sc., Ph.D.(McG.)
David G. Ryan; B.Sc., M.Sc.(Queen's), Ph.D.(Birm.)

Professors

Jean Barrette; B.Sc., M.Sc., Ph.D.(Montr.)
Clifford P. Burgess; B.Sc.(Waterloo), Ph.D.(Texas)
John E. Crawford; B.A., M.A.(Tor.), Ph.D.(McG.)
Subal Das Gupta; B.A., M.Sc.(Calc.), Ph.D.(McM.)
Nicholas DeTakacsy; B.Sc., M.Sc.(Montr.), Ph.D.(McG.)

Martin Grant; B.Sc.(P.E.I.), M.Sc., Ph.D.(Tor.) (*James McGill Professor*)

Hong Guo; B.Sc.(Sichuan), M.Sc., Ph.D.(Pitt.)
David Hanna; B.Sc.(McG.), M.A., Ph.D.(Harv.)
Richard Harris; B.A.(Oxon.), D.Phil.(Sus.)
Harry C.S. Lam; B.Sc.(McG.), Ph.D.(M.I.T.) (*E. Rutherford Professor of Physics*)
Shaun Lovejoy; B.A.(Cantab.), Ph.D.(McG.)
Tommy S.K. Mark; B.Sc., M.Sc., Ph.D.(McG.)
Robert B. Moore; B.Eng., M.Sc., Ph.D.(McG.)
Robert Myers; B.Sc.(Wat.), M.A., Ph.D.(Prin.)
Popat M. Patel; B.Sc., M.Sc.(Manc.), Ph.D.(Harv.)
John O. Strom-Olsen; B.A., M.S., Ph.D.(Cantab.)
Mark Sutton; B.Sc., M.Sc., Ph.D.(Tor.)
John M. Trischuk; B.Eng.(McG.), Ph.D.(Cal. Tech.)
Luc Vinet; B.Sc., M.Sc., Ph.D.(Montr.), Doctorat 3^e cycle (Paris VI) (*joint appt. with Mathematics & Statistics*)

Associate Professors

James M. Cline; B.Sc.(Calif.), M.Sc., Ph.D.(Cal Tech.)
François Corriveau; B.Sc.(Laval), M.Sc.(U.B.C.),
Docteur Sc.Nat.(Zurich)
Charles Gale; B.Sc.(Ott.), M.Sc., Ph.D.(McG.)
Peter Grutter; Dipl., Ph.D.(Basel) (*William Dawson Scholar*)
Victoria Kaspi; B.Sc.(McG.), M.A., Ph.D.(Princ.)
Kenneth J. Ragan; B.Sc.(Alta.), Ph.D.(Geneva)
Dominic H. Ryan; B.A., Ph.D.(Trin.Coll.)

Assistant Professors

Michael Hilke; B.Sc., M.Sc., Ph.D.(Geneva)
Sangyong Jeon; B.Sc.(Seoul), M.Sc., Ph.D.(Wash.)
Paul Wiseman; B.Sc.(St.F.X.), Ph.D.(W.Ont.) (*joint appt. with Chemistry*)

Lecturers

Z. Altounian; B.Sc., M.Sc.(Cairo), Ph.D.(McM.)
F. Buchinger; M.Sc., Dr.(Mainz)

Associate Members

R. Davies (*Atmospheric & Oceanic Sciences*),
B.C. Eu (*Chemistry*), G. Fallone (*Radiation Oncology*),
M. Mackey (*Physiology*), E. Podgorsak (*Radiation Oncology*),
D. Ronis (*Chemistry*)

Curator (Rutherford Museum and McPherson Collection)

M. Cohen; B.Sc., Ph.D.(Lond.), F.Inst.P., A.R.C.S.

Physics is in many ways the parent of the other natural sciences and its discoveries and laws continually affect their development. Its range and scope extend in space and time from subnuclear particles to the universe itself. The subfields of physics such as mechanics, thermodynamics, electricity, atomic physics and quantum mechanics, to mention but a few, permeate all other scientific disciplines. People trained in physics are employed in industry, government, and educational systems where they find many challenges as teachers, researchers, administrators and in the rapidly developing area of scientific business.

The two main undergraduate programs in Physics at McGill are the Honours and the Major. The Honours program is highly specialized and the courses are very demanding. This program is appropriate for students who wish to make an in-depth study of the subject in preparation for graduate work and an academic or professional career in physics. The Joint Honours in Mathematics and Physics is an even more specialized and demanding program, intended for students who wish to develop a strong basis in both mathematics and physics in preparation for graduate work and a professional or academic career. Although the program is optimized for theoretical physics, it is broad enough and strong enough to prepare students for further study in either experimental physics or mathematics. High standing in CEGEP or Freshman-year mathematics and physics is a requirement for admission to these Honours programs.

The Major program, on the other hand, offers a broad training in classical and modern physics and yet leaves room for the student to take a meaningful sequence of courses in other areas. It is intended primarily for students who wish to pursue careers in fields

for which physics provides a basis. However this program also provides a preparation for graduate studies, especially if a student chooses, in consultation with the departmental adviser, a number of Honours Physics courses in the U2 and U3 years.

There are also a number of other Major programs: Atmospheric Sciences and Physics, Physics and Computer Science, Physics and Geophysics, and Physiology and Physics, offered jointly with other departments, and a Minor program in Electrical Engineering, available only to students in the Physics Major program. In addition, there is a Minor in Physics, a Faculty program in Physics and a Joint Faculty program in Mathematics, Chemistry and Physics, which provide a broad base for students less interested in a specialized education. Almost all the Physics programs can be combined with an Internship Year, as part of the University's IYES program, which provides experience in an industrial or government laboratory as part of the degree program.

For those interested in a career as a high school science teacher, the concurrent program leading to both a B.Sc. and a B.Ed. degree provides two Physics options. Both of these combine physics courses from the Major program with Education courses. They are, respectively, the Major program in Chemistry and Physics for Teachers, and the Major program in Mathematics and Physics for Teachers. (For details, see the Science for Teachers section.)

Students from outside of the Province of Quebec will ordinarily register in the Science Freshman program. Physics offers two sequences of courses for this program: they are described below.

The list of pre- and co-requisites is not absolute. In many cases permission of the Department may be sought to have a specific prerequisite waived. The procedure is to ask the professor in charge of the course to review the request for such a waiver. The prerequisites of the 100-level courses are described in the following section entitled Science Freshman Program.

The block of numbers PHYS 205, PHYS 206, PHYS 207 and PHYS 208 has been reserved for a series of courses "Introduction to Selected Topics in Physics". These courses, of one credit each, will introduce topics in physics which are of current interest. Topics given under numbers PHYS 205 or PHYS 206 will have CEGEP Physics* as prerequisite; those given under number PHYS 208 will have no Physics prerequisite. The topics will vary from year to year. For further information, enquire at the Department of Physics.

All other 200-level courses are designed primarily for Science students and assume successful completion of CEGEP level physics* and mathematics programs. The phrase "Prerequisite CEGEP Physics*" has been inserted to make this point clear. Students who have not included Calculus III in their CEGEP program, should register in the first term of the U1 year for Mathematics MATH 222.

Students interested in any of the Physics programs should contact the Department for an Adviser

*CEGEP objectives 00UR, 00US, 00UT or equivalent.

SCIENCE FRESHMAN PROGRAM

Students entering McGill with a Québec CEGEP profile in Science will normally begin their programs in Physics with courses at the 200 level.

Students without this profile will normally take courses PHYS 131 and PHYS 142 if they have previously taken physics at the high school level and will be taking differential calculus concurrently with PHYS 131 and integral calculus concurrently with PHYS 142. Those students who have not previously taken physics at the high school level and who intend to do programs in the Biological Sciences may instead take courses PHYS 101 and PHYS 102. All students are expected to have reasonable fluency in algebra, geometry and trigonometry at the high school level. If this is not the case, then Mathematics MATH 112 should be taken concurrently with PHYS 101. Those for whom this is not necessary are advised to take MATH 139 concurrently with PHYS 101.

MINOR PROGRAM IN PHYSICS (18 credits)

The 18-credit Minor permits no overlap with any other programs. It contains no Mathematics courses, although many of the courses in it have Math pre- or co-requisites. It will, therefore, be particularly appropriate to students in Mathematics, but it is also available to any Science student with the appropriate mathematical background.

Students in certain programs (e.g. the Major in Chemistry) will find that there are courses in the Minor which are already part of their program, or which they may not take for credit because of a substantial overlap of material with a course or courses in their program. After consultation with an adviser, such students may complete the Minor by substituting any other physics course(s) from the Major or Honours Physics programs.

Required Course (3 credits)

PHYS 257 (3) Experimental Methods 1

Complementary Courses (15 credits)

15 credits to be selected as follows:

PHYS 230 (3) Dynamics of Simple Systems
or PHYS 251 (3) Classical Mechanics 1
PHYS 271 (3) Quantum Physics
or PHYS 260 (3) Relativity and Modern Physics
or PHYS 214 (3) Astrophysics
or PHYS 225 (3) Musical Acoustics
PHYS 232 (3) Heat and Waves
or PHYS 253 (3) Thermal Physics
PHYS 258 (3) Experimental Methods 2
or PHYS 241 (3) Signal Processing
PHYS 340 (3) Electricity and Magnetism
or PHYS 350 (3) Electromagnetism

FACULTY PROGRAM IN PHYSICS (54 credits)

Required Courses (36 credits)

PHYS 230 (3) Dynamics of Simple Systems
PHYS 232 (3) Heat and Waves
PHYS 257 (3) Experimental Methods 1
PHYS 258 (3) Experimental Methods 2
PHYS 333 (3) Thermal and Statistical Physics
PHYS 340 (3) Electricity and Magnetism
PHYS 436 (3) Modern Physics
PHYS 446 (3) Quantum Physics
MATH 222 (3) Calculus 3
MATH 223 (3) Linear Algebra
MATH 314 (3) Advanced Calculus
MATH 315 (3) Ordinary Differential Equations

Complementary Courses (18 credits)

at least 3 credits selected from:

PHYS 241 (3) Signal Processing
PHYS 434 (3) Optics
PHYS 439 (3) Lab in Modern Physics

the remainder selected from:

PHYS 328 (3) Electronics
PHYS 331 (3) Mechanics
PHYS 339 (3) Measurements Laboratory
PHYS 342 (3) Electromagnetic Waves
EPSC 320 (3) Elementary Earth Physics
MATH 316 (3) Functions of a Complex Variable
MATH 317 (3) Numerical Analysis
MATH 319 (3) Partial Differential Equations
COMP 202 (3) Introduction to Computing 1

JOINT FACULTY PROGRAM IN MATHEMATICS, CHEMISTRY AND PHYSICS See [page 413](#) in the Mathematics and Statistics entry for complete program information.

MAJOR PROGRAM IN PHYSICS (60 credits)**U1 Required Courses (21 credits)**

PHYS 230	(3)	Dynamics of Simple Systems
PHYS 232	(3)	Heat and Waves
PHYS 257	(3)	Experimental Methods 1
PHYS 258	(3)	Experimental Methods 2
MATH 222	(3)	Calculus 3
MATH 223	(3)	Linear Algebra
PHYS 241	(3)	Signal Processing

U2 Required courses (24 credits)

PHYS 328	(3)	Electronics
PHYS 331	(3)	Mechanics
PHYS 333	(3)	Thermal & Statistical Physics
PHYS 339	(3)	Measurements Laboratory
PHYS 340	(3)	Electricity and Magnetism
PHYS 342	(3)	Electromagnetic Waves
MATH 314	(3)	Advanced Calculus
MATH 315	(3)	Ordinary Differential Equations

U3 Required Courses (15 credits)

PHYS 434	(3)	Optics
PHYS 436	(3)	Modern Physics
PHYS 439	(3)	Lab in Modern Physics
PHYS 446	(3)	Quantum Physics
PHYS 449	(3)	Project Laboratory

JOINT MAJOR PROGRAM IN PHYSICS AND GEOPHYSICS

(68 credits)

The Joint Major program in Physics and Geophysics provides a firm basis for graduate work in Geophysics and related fields as well as a sound preparation for those who wish to embark on a career directly after the B.Sc.

U1 Required Courses (29 credits)

PHYS 230	(3)	Dynamics of Simple Systems
PHYS 232	(3)	Heat and Waves
PHYS 257	(3)	Experimental Methods 1
PHYS 258	(3)	Experimental Methods 2
EPSC 203	(3)	Structural Geology 1
EPSC 210	(3)	Introduction to Mineralogy
EPSC 231	(2)	Field School 1
MATH 222	(3)	Calculus 3
MATH 223	(3)	Linear Algebra
MATH 314	(3)	Advanced Calculus

U2 Required Courses (18 credits)

PHYS 339	(3)	Measurements Laboratory
PHYS 340	(3)	Electricity and Magnetism
EPSC 320	(3)	Elementary Earth Physics
EPSC 350	(3)	Tectonics
MATH 315	(3)	Ordinary Differential Equations
MATH 319	(3)	Partial Differential Equations

U2 or U3 Required Courses (6 credits)

EPSC 330	(3)	Earthquakes & Earth Structure
EPSC 510	(3)	Geodynamics and Geomagnetism

U3 Required Courses (15 credits)

PHYS 331	(3)	Mechanics
PHYS 332	(3)	Physics of Fluids
PHYS 333	(3)	Thermal & Statistical Physics
PHYS 342	(3)	Electromagnetic Waves
PHYS 446	(3)	Quantum Physics

JOINT MAJOR PROGRAM IN ATMOSPHERIC SCIENCE AND PHYSICS

Students should consult undergraduate advisers in both departments. See [page 372](#) in the Atmospheric and Oceanic Sciences section for complete program information.

The Major program in Physics and Atmospheric Science provides a firm basis for graduate work in Atmospheric Science and related fields as well as a sound preparation for those who wish to embark on a career directly after the B.Sc.

JOINT MAJOR IN PHYSICS AND COMPUTER SCIENCE

(66 credits)

The Joint Major in Physics and Computer Science is designed to give motivated students the opportunity to combine the two fields in a way that will distinguish them from the B.Sc.'s in either field by itself. The two disciplines complement each other, with physics providing an analytic problem-solving outlook and basic understanding of nature, while computer science enhances the ability to make practical and marketable applications, in addition to having its own theoretical interest. Graduates of this program may be able to present themselves as being more immediately useful than a pure physics major, but with more breadth than just a programmer. They will be able to demonstrate their combined expertise in the Special Project course which is the centerpiece of the final year of the program.

U1 Required Courses (21 credits)

MATH 222	(3)	Calculus 3
MATH 223	(3)	Linear Algebra
MATH 240	(3)	Discrete Structures and Computing
PHYS 230	(3)	Dynamics of Simple Systems
PHYS 257	(3)	Experimental Methods 1
PHYS 258	(3)	Experimental Methods 2
COMP 250	(3)	Introduction to Computer Science

U2 Required Courses (24 credits)

MATH 314	(3)	Advanced Calculus
MATH 315	(3)	Differential Equations
PHYS 232	(3)	Heat and Waves
PHYS 241	(3)	Signal Processing
COMP 251	(3)	Data Structures and Algorithms
COMP 302	(3)	Programming Languages and Paradigms
COMP 350	(3)	Numerical Computing
COMP 360	(3)	Algorithm Design Techniques

U3 Required Courses (21 credits)

MATH 323	(3)	Probability Theory
PHYS 331	(3)	Mechanics
PHYS 339	(3)	Measurements Laboratory
PHYS 340	(3)	Electricity and Magnetism
PHYS 446	(3)	Quantum Physics
PHYS 489	(3)	Special Project
COMP 557	(3)	Fundamentals of Computer Graphics

JOINT MAJOR PROGRAM IN PHYSIOLOGY AND PHYSICS

See [page 436](#) in the Physiology section for complete program information.

The Major program in Physiology and Physics provides a firm basis for graduate work in Bio-physics and other interdisciplinary fields involving the physical and biological sciences.

HONOURS PROGRAM IN PHYSICS (78 credits)

Students entering this program for the first time should have high standing in mathematics and physics. In addition, a student who has not completed the equivalent of MATH 222 must take it in the first term without receiving credits toward the 78 credits required in the Honours program.

A student whose average in the required and complementary courses in any year falls below a GPA of 3.00, or whose grade in any individual required or complementary course falls below a C, may not register in the Honours program the following year, or graduate with the Honours degree, except with the permission of the Department.

U1 Required Courses (27 credits)

PHYS 241	(3)	Signal Processing
PHYS 251	(3)	Classical Mechanics 1
PHYS 257	(3)	Experimental Methods 1
PHYS 258	(3)	Experimental Methods 2
PHYS 260	(3)	Relativity and Modern Physics
MATH 247	(3)	Linear Algebra
MATH 248	(3)	Advanced Calculus 1
MATH 249	(3)	Advanced Calculus 3
MATH 325	(3)	Ordinary Differential Equations

U2 Required Courses (24 credits)

PHYS 253	(3)	Thermal Physics
PHYS 350	(3)	Electromagnetism
PHYS 357	(3)	Quantum Physics 1
PHYS 359	(3)	Lab in Modern Physics
PHYS 362	(3)	Statistical Mechanics
PHYS 451	(3)	Classical Mechanics
PHYS 457	(3)	Quantum Physics 2
MATH 375	(3)	Differential Equations

U3 Required Courses (6 credits)

PHYS 551	(3)	Quantum Theory
PHYS 352	(3)	Electromagnetic Waves

U3 Complementary Courses (21 credits)

6 credits selected from:

PHYS 459D1	(3)	Honours Research Project
and PHYS 459D2	(3)	Honours Research Project
PHYS 469	(3)	Lab in Modern Physics 2
PHYS 479	(3)	Honours Project Lab

15 credits selected from:

PHYS 332	(3)	Physics of Fluids
PHYS 434	(3)	Optics
PHYS 514	(3)	General Relativity
PHYS 521	(3)	Astrophysics
PHYS 557	(3)	Nuclear Physics
PHYS 558	(3)	Solid State Physics
PHYS 559	(3)	Advanced Statistical Mechanics
PHYS 562	(3)	Electromagnetic Theory
PHYS 567	(3)	Particle Physics

or other 3-credit course approved by the Department of Physics

JOINT HONOURS PROGRAM IN MATHEMATICS AND PHYSICS (81 credits)

This is a specialized and demanding program intended for students who wish to develop a strong basis in both Mathematics and Physics in preparation for graduate work and a professional or academic career. Although the program is optimized for theoretical physics, it is broad enough and strong enough to prepare students for further study in either experimental physics or in mathematics.

The minimum requirement for entry into the program is completion with high standing of the usual CEGEP courses in physics and in mathematics. In addition, a student who has not completed the equivalent of MATH 222 must take it in the first term without receiving credits toward the 81 credits required in the Joint Honours program.

To remain in the Honours program and to be awarded the Honours degree, the student must maintain a 3.00 GPA in the required and complementary courses, and a grade of C or better in each required or complementary course.

The student will have two advisers, one from Mathematics and the other from Physics.

U1 Required Courses (27 credits)

PHYS 241	(3)	Signal Processing
PHYS 251	(3)	Classical Mechanics 1
PHYS 257	(3)	Experimental Methods 1
PHYS 258	(3)	Experimental Methods 2
PHYS 260	(3)	Relativity and Modern Physics
MATH 248	(3)	Advanced Calculus 1
MATH 249	(3)	Advanced Calculus 2
MATH 325	(3)	Ordinary Differential Equations
MATH 235	(3)	Algebra 1

U1 Complementary Course (3 credits)

3 credits selected from:

MATH 251	(3)	Algebra 2
MATH 247	(3)	Linear Algebra

U2 Required Courses (27 credits)

PHYS 253	(3)	Thermal Physics
PHYS 350	(3)	Electromagnetism
PHYS 357	(3)	Quantum Physics 1

PHYS 362	(3)	Statistical Mechanics
PHYS 451	(3)	Classical Mechanics
PHYS 457	(3)	Quantum Physics 2
MATH 242	(3)	Analysis 1
MATH 255	(3)	Analysis 2
MATH 375	(3)	Differential Equations

U3 Required Courses (12 credits)

PHYS 352	(3)	Electromagnetic Waves
PHYS 359	(3)	Lab in Modern Physics
MATH 354	(3)	Analysis 3
MATH 380	(3)	Differential Geometry

U3 Complementary Courses (12 credits)

3 credits selected from:

MATH 370	(3)	Algebra 3
MATH 355	(3)	Analysis 4

6 credits selected from:

PHYS 514	(3)	General Relativity
PHYS 551	(3)	Quantum Theory
PHYS 521	(3)	Astrophysics
PHYS 557	(3)	Nuclear Physics
PHYS 558	(3)	Solid State Physics
PHYS 559	(3)	Advanced Statistical Mechanics
PHYS 562	(3)	Electromagnetic Theory
PHYS 567	(3)	Particle Physics

3 credits in Honours Mathematics

MINOR PROGRAM IN ELECTRICAL ENGINEERING

(23 or 25 credits)

[Program registration done by Student Affairs Office]

The Minor program does not carry professional recognition. Only students who satisfy the requirements of the Major in Physics are eligible for this Minor. Students registered for this option cannot count PHYS 241 towards the requirements of the Major in Physics, and should replace this course by another Physics or Mathematics course. Students who select ECSE 334 in the Minor cannot count PHYS 328 towards the requirements of the Major in Physics, and should replace this course by another Physics or Mathematics course.

Required Courses (17 or 19 credits)

ECSE 200	(3)	Fundamentals of Electrical Engineering
ECSE 210	(5)	Circuit Analysis
ECSE 303	(3)	Signals and Systems
ECSE 330	(3)	Electronic Circuits
ECSE 305	(3)	Probability and Random Signals
or ECSE 334	(5)	Electronic Circuits 2

Complementary Courses (6 credits)**INTERNSHIP PROGRAMS – INTERNSHIP YEAR FOR ENGINEERING AND SCIENCE (IYES)**

The following programs are also available with an Internship component. For more information, please see [section 2.9](#) in the Faculty of Engineering section.

Faculty Program in Physics
Major in Physics
Honours in Physics
Joint Honours Program in Physics and Mathematics
Joint Faculty Program in Mathematics, Chemistry and Physics
Joint Major Program in Atmospheric Science and Physics
Joint Major Program in Physics and Computer Science
Joint Major Program in Physics and Geophysics

COURSE DESCRIPTIONS

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

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

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

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

PHYS has replaced 198 as the prefix for Physics courses.

All courses have limited enrolment.

NOTE: In general, Honours courses are indicated when the fifth character of the six digit course number is 5 or higher.

● Denotes courses not offered in 2002-03.

★ Denotes courses offered only in alternate years

PHYS 101 INTRODUCTORY PHYSICS - MECHANICS. (4) (Fall) (3 hours lectures; 2 hours laboratory; tutorial sessions) (Not open to students taking or having taken PHYS 131, CEGEP objective 00UR or equivalent) (Laboratory sections have limited enrolment) The object of this course is to give the students a basic understanding of the principles of physics, illustrating these, where possible, with current examples of their use in biology and medicine.

These courses, PHYS 101 and PHYS 102 together satisfy the minimum requirement in physics for Medical School.

PHYS 102 INTRODUCTORY PHYSICS - ELECTROMAGNETISM. (4) (Winter) (3 hours lectures; 2 hours laboratory; tutorial sessions) (Prerequisite: PHYS 101. Corequisite: MATH 139) (Not open to students taking or having taken PHYS 142, CEGEP objective 00UR or equivalent) (Laboratory sections have limited enrolment) Electric field and potential. D.C. circuits and measurements. Capacitance. Magnetic field and induction. A.C. circuits Semiconductor devices and their application. Electromagnetic waves.

PHYS 109D1 GENERAL PHYSICS LABORATORY. (1) (Fall) (2 hours laboratory) (Not open to students who have taken or are taking PHYS 101 or PHYS 102) (Students must also register for PHYS 109D2) (No credit will be given for this course unless both PHYS 109D1 and PHYS 109D2 are successfully completed in consecutive terms) The laboratory component of PHYS 101 and PHYS 102. May be taken only by students who have completed the lecture component but not the laboratory of PHYS 101 and PHYS 102.

PHYS 109D2 GENERAL PHYSICS LABORATORY. (1) (Winter) (Prerequisite: PHYS 109D1) (No credit will be given for this course unless both PHYS 109D1 and PHYS 109D2 are successfully completed in consecutive terms) See PHYS 109D1 for course description.

PHYS 119D1 GENERAL PHYSICS LABORATORY. (1) (Fall) (3 hours laboratory) (Students must also register for PHYS 119D2) (No credit will be given for this course unless both PHYS 119D1 and PHYS 119D2 are successfully completed in consecutive terms) The laboratory component of PHYS 131 and PHYS 142. This course may be taken only by students who have completed the lecture components of these courses but not the laboratory.

PHYS 119D2 GENERAL PHYSICS LABORATORY. (1) (Winter) (Prerequisite: PHYS 119D1) (No credit will be given for this course unless both PHYS 119D1 and PHYS 119D2 are successfully completed in consecutive terms) See PHYS 119D1 for course description.

PHYS 131 MECHANICS AND WAVES. (4) (Fall) (3 hours lectures; 1 hour tutorial, 3 hours laboratory in alternate weeks; tutorial sessions) (Corequisite: MATH 139) (Not open to students taking or having taken PHYS 101, CEGEP objective 00UR or equivalent) (Laboratory sections have limited enrolment) The basic laws and principles of Newtonian mechanics; oscillations and waves.

PHYS 142 ELECTROMAGNETISM AND OPTICS. (4) (Winter) (3 hours lectures, 3 hours laboratory in alternate weeks; tutorial sessions) (Prerequisite: PHYS 131. Corequisite: MATH 141) (Not open to

students taking or having taken PHYS 102, CEGEP objective 00UR or equivalent) (Laboratory sections have limited enrolment) The basic laws of electricity and magnetism; geometrical and physical optics.

PHYS 200 SPACE, TIME AND MATTER. (3) (Fall) (3 hours lectures) (Not open to students in a Physics program) A nonmathematical, conceptual look at physics, beginning with the idea of space and time, continuing with the historical development of Newtonian mechanics of celestial motion, electricity and magnetism, ether and light, Einstein's special and general theories of relativity, quantum mechanics, matter and antimatter, cosmology and the big bang.

PHYS 204 PLANETS, STARS AND GALAXIES. (3) (Fall and Winter) (3 hours lectures; 3 evening periods for star identification and use of telescopes) (Not open to students who have taken or are taking PHYS 214) An elementary astronomy course for non-science students (see "Science for Arts Students" in the Arts section) and for science students not taking a Physics program.

PHYS 208 INTRODUCTION TO SELECTED TOPICS IN PHYSICS. (1) (Fall) (2 hours lectures, first six weeks) (Not open to students in Physics programs) Topic for 2002-03: The Safe Use of Nuclear Radiation.

PHYS 214 INTRODUCTORY ASTROPHYSICS. (3) (Fall) (Prerequisite: CEGEP Physics) (Not open to students who have taken or are taking PHYS 204) An introduction to astrophysics with emphasis placed on methods of observation and current models. Stellar radiation and detectors, quasars, black holes. Galaxies, large scale structure of the universe, cosmology.

PHYS 224 PHYSICS AND PSYCHOPHYSICS OF MUSIC. (3) (Fall) (3 hours lectures) (Designed for students in the Faculty of Music but suitable for students with an interest in music, and how it is perceived) (Prerequisite: none) An introduction to physics and psychophysics of music with demonstrations of the relevant phenomena and the theories explaining them. Pitch, loudness and timbre in the context of the physics properties of the human ear. The basic physics of music production including modes of oscillation of mechanical systems, resonance, feedback, transmission and reflection of sound. The human voice. Modern methods of sound production using electrical analogue devices and digital computers. Room reverberation and acoustics.

PHYS 225 MUSICAL ACOUSTICS. (3) (Winter) (3 hours lectures) (Prerequisites: CEGEP physics or both MATH 112 and PHYS 224) (Designed for students in music who have interests in sound recording and reproduction and also suitable for students in science with an interest in music) Physical acoustics with applications to music. Resonators and radiators, acoustic impedance. Acoustic properties of strings, bars, membranes, pipes and horns. Application to selected musical instruments. Direction characteristics of sound sources. Room acoustics.

PHYS 230 DYNAMICS OF SIMPLE SYSTEMS. (3) (Fall) (3 hours lectures) (Prerequisite: CEGEP physics. Corequisite: MATH 222) (Not open to students taking or having passed PHYS 251) Translational motion under Newton's laws; forces, momentum, work/energy theorem. Special relativity; Lorentz transforms, relativistic mechanics, mass/energy equivalence. Topics in rotational dynamics. Noninertial frames.

PHYS 232 HEAT AND WAVES. (3) (Winter) (3 hours lectures) (Prerequisite: PHYS 230) (Not open to students taking or having passed PHYS 253) First and second laws of thermodynamics, kinetic theory of gases, optical interference, polarization, electro-optics, physics of microscopic systems.

PHYS 241 SIGNAL PROCESSING. (3) (Winter) (2 hours lectures; 3 hours laboratory alternate weeks) (Prerequisite: CEGEP physics) Linear circuit elements, resonance, network theorems, diodes, transistors, amplifiers, feedback, integrated circuits.

PHYS 242 ELECTRICITY AND MAGNETISM. (2) (Winter) (2 hours lectures) (Prerequisites: CEGEP Physics, MATH 222) Properties of electromagnetic fields, dipole and quadrupole fields and their interactions, chemical binding of molecules, electromagnetic proper-

ties of materials, Maxwell's equations and properties of electromagnetic waves, propagation of waves in media.

PHYS 251 CLASSICAL MECHANICS 1. (3) (Fall) (3 hours lectures) (Prerequisite: CEGEP physics. Corequisite: MATH 222) (Not open to students taking or having taken PHYS 230.) Newton's laws, work energy, angular momentum. Harmonic oscillator, forced oscillations. Inertial forces, rotating frames. Central forces, centre of mass, planetary orbits, Kepler's laws.

PHYS 253 THERMAL PHYSICS. (3) (Fall) (3 hours lectures) (Prerequisite: CEGEP physics. Corequisite: MATH 222) (Not open to students taking or having taken PHYS 232) Energy, work, heat; first law. Temperature, entropy; second law. Absolute zero; third law. Equilibrium, equations of state, gases, liquids, solids, magnets; phase transitions.

PHYS 257 EXPERIMENTAL METHODS 1. (3) (Fall) (6 hours of laboratory and classroom work) (Corequisite: PHYS 230 or PHYS 251) Introductory laboratory work and data analysis as related to mechanics, optics and thermodynamics. Introduction to computers as they are employed for laboratory work, for data analysis and for numerical computation. Previous experience with computers is an asset, but is not required.

PHYS 258 EXPERIMENTAL METHODS 2. (3) (Winter) (6 hours of laboratory and classroom work) (Prerequisite: PHYS 257) Advanced laboratory work and data analysis as related to mechanics, optics and thermodynamics. Computers will be employed routinely for data analysis and for numerical computation, and, particularly, to facilitate the use of Fourier methods.

PHYS 260 MODERN PHYSICS AND RELATIVITY. (3) (Fall) (3 hours lectures) (Corequisite: MATH 222) History of special relativity; Lorentz transformations: kinematics and dynamics; transformation of electric and magnetic forces; introduction to topics in modern physics.

PHYS 271 QUANTUM PHYSICS. (3) (Winter) ((3-0-6)) (Prerequisite: PHYS 251 or CIVE 281) The observed properties of atoms and radiation from atoms. Electron waves. The Schrodinger Equation in one dimension. Quantum mechanics of the hydrogen atom. Angular momentum and spin. Quantum mechanics of many electron systems. Basic ideas of electrons in solids and solid state physics.

PHYS 328 ELECTRONICS. (3) (Fall) (2 hours lectures; 3 hours laboratory) (Prerequisite: PHYS 241 or permission of instructor) Semiconductor devices, basic transistor circuits, operational amplifiers, combinatorial and sequential logic, integrated circuits, analogue to digital converters. The laboratory component covers design, construction and testing of basic electronic circuits.

PHYS 331 TOPICS IN CLASSICAL MECHANICS. (3) (Winter) (3 hours lectures) (Prerequisite: PHYS 230. Corequisite: MATH 315) (Not open to students having passed PHYS 451) Forced and damped oscillators, Newtonian mechanics in three dimensions, rotational motion, Lagrangian mechanics, small vibrations, normal modes. Introduction to Hamiltonian mechanics.

● **PHYS 332 PHYSICS OF FLUIDS.** (3) (Winter) (3 hours lectures) (Prerequisites: PHYS 230, MATH 223, MATH 314, MATH 315)

PHYS 333 THERMAL AND STATISTICAL PHYSICS. (3) (Winter) (3 hours lectures) (Prerequisite: PHYS 232) (Not open to students taking or having passed PHYS 362) Introductory equilibrium statistical mechanics. Quantum states, probabilities, ensemble averages. Entropy, temperature, Boltzmann factor, chemical potential. Photons and phonons. Fermi-Dirac and Bose-Einstein distributions; applications.

PHYS 334 ADVANCED MATERIALS. (3) (Fall) (Prerequisites: CHEM 110, CHEM 120 or CHEM 111, CHEM 121 and PHYS 101, PHYS 102 or PHYS 131, PHYS 142, or CEGEP Physics and Chemistry, or equivalent. Pre- or Co-requisite: one of CHEM 203, CHEM 204, CHEM 213, CHEM 214 or equivalent; or one of PHYS 230 and PHYS 232, or equivalent; or permission of instructor) (Not open to students who have taken or are taking CHEM 334) The physico-chemical properties of advanced materials. Topics discussed

include photonics, information storage, 'smart' materials, biomaterials, clean energy materials, porous materials, and polymers.

PHYS 339 MEASUREMENTS LABORATORY IN GENERAL PHYSICS. (3) (Winter) (6 hours) (Prerequisite: PHYS 241) Introduction to modern techniques of measurement. The use of computers in performing and analysing experiments. Data reduction, statistical methods, report writing. Extensive use of computers is made in this laboratory; therefore some familiarity with computers and computing is an advantage.

PHYS 340 ELECTRICITY AND MAGNETISM. (3) (Fall) (3 hours lectures) (Prerequisites: CEGEP physics, Mathematics MATH 222, MATH 223. Corequisites: MATH 314, MATH 315 or equivalent. Not open to students who have passed PHYS 242 or PHYS 350) The electrostatic field and scalar potential. Dielectric properties of matter. Energy in the electrostatic field. Methods for solving problems in electrostatics. The magnetic field. Induction and inductance. Energy in the magnetic field. Magnetic properties of matter. Maxwell's equations. A vector treatment.

PHYS 342 ELECTROMAGNETIC WAVES. (3) (Winter) (3 hours lectures) (Prerequisites: PHYS 340 or PHYS 242, Mathematics MATH 314, MATH 315) (Not open to students having passed ECSE 357) Maxwell's equations. The wave equation. The electromagnetic wave, reflection, refraction, polarization. Guided waves. Transmission lines and wave guides. Vector potential. Radiation. The elemental dipole; the half-wave dipole; vertical dipole; folded dipoles; Yagi antennas. Accelerating charged particles.

PHYS 350 ELECTROMAGNETISM. (3) (Fall) (3 hours lectures) (Prerequisites: MATH 248, MATH 325. Honours students or permission of the instructor) (Not open to students having taken PHYS 340) Fundamental laws of electric and magnetic fields in both integral and differential form.

PHYS 352 ELECTROMAGNETIC WAVES. (3) (Winter) (3 hours lectures) (Prerequisite: PHYS 350. Honours students, or permission of the instructor) Vector and scalar potentials; plane waves in homogeneous media; refraction and reflection; guided waves; radiation from simple systems; dipole and quadrupole radiation; introduction to fields of moving charges; synchrotron radiation; Bremsstrahlung.

PHYS 357 QUANTUM PHYSICS. (3) (Fall) (3 hours lectures) (Honours students or permission of instructor) (Not open to students taking or having passed PHYS 446) Experimental basis for quantum mechanics; wave-packets; uncertainty principle. Hilbert space formalism. Schrodinger equation: eigenvalues and eigenvectors: applications to 1-d problems including the infinite and finite potential wells and the harmonic oscillator. Tunneling. Time independent perturbation theory.

PHYS 359 LABORATORY IN MODERN PHYSICS. (3) (Winter) (6 hours) (Corequisite: PHYS 457. Honours students or permission of instructor) Advanced level experiments in modern physics stressing quantum effects and some properties of condensed matter.

PHYS 362 STATISTICAL MECHANICS. (3) (Winter) (3 hours lectures) (Prerequisites: MATH 248 or equivalents, PHYS 253. Honours students, or permission of the instructor) (Not open to students taking or having taken PHYS 333) Quantum states and ensemble averages. Fermi-Dirac, Bose-Einstein and Boltzmann distribution functions and their applications.

★ **PHYS 413 PHYSICAL BASIS OF PHYSIOLOGY.** (3) (Fall) (3 hours lectures) (Prerequisite: MATH 315, or MATH 325, and permission of the instructor) (Intended for Major or Honours students in Physics, Physiology, Physiology and Physics, or Mathematics and others with permission) Analytic and computer simulation techniques are used to examine the role of nonlinearities and time delays in determining the dynamic behaviour of physiological control systems and their relation to normal and pathophysiological states. Examples drawn from the control of respiration, cellular proliferation and differentiation, biochemical feedback networks, thermoregulatory mechanisms, and neural feedback.

PHYS 434 OPTICS. (3) (Winter) (3 hours lectures) Geometrical optics, wave optics, lasers, Fourier transform spectroscopy, holography, optical data processing, stellar interferometry.

PHYS 436 MODERN PHYSICS. (3) (Winter) (3 hours lectures) (Prerequisite: PHYS 446) (Not open to students in Honours Physics or in Joint Honours in Mathematics and Physics) One electron atoms, radiation, multielectron atoms, molecular bonds. Selected topics from condensed matter, nuclear and elementary particle physics.

PHYS 439 LABORATORY IN MODERN PHYSICS. (3) (Fall) (6 hours) (Prerequisite: PHYS 339. Corequisite: PHYS 446) (Not open to students with credit in PHYS 359 except with permission of instructor) Advanced level experiments in modern physics stressing quantum effects and some properties of condensed matter.

PHYS 446 QUANTUM PHYSICS. (3) (Fall) (3 hours lectures) (Prerequisite: PHYS 230 and PHYS 232, or PHYS 251) (Not open to students taking or having taken PHYS 357 or PHYS 457) de Broglie waves, Bohr atom. Schrodinger equation, wave functions, observables. One dimensional potentials. Schrodinger equation in three dimensions. Angular momentum, hydrogen atom. Spin, experimental consequences.

PHYS 449 PROJECT LABORATORY. (3) (Winter) (6 hours) (Prerequisite: PHYS 328, PHYS 439) Supervised project work in an area related to material covered in upper year courses.

PHYS 451 CLASSICAL MECHANICS. (3) (Winter) (3 hours lectures) (Prerequisite: PHYS 251. Honours students, or permission of instructor) (Not open to students having taken PHYS 331) Rigid bodies, angular momentum, gyroscope, moment of inertia, principal axes, Euler's equations. Coupled oscillations and normal modes. Lagrangian mechanics and applications. Hamiltonian mechanics. Topics in advanced analytical mechanics.

PHYS 457 QUANTUM PHYSICS. (3) (Winter) (3 hours lectures) (Honours students or permission of instructor) (Not open to students having taken PHYS 446) Angular momentum and spin operators. Operator methods in quantum mechanics. Coupling of spin and angular momenta. Variational principles and elements of time dependent perturbation theory (the Golden Rule). Solution of the Schrodinger equation in three dimensions. Applications to the hydrogen and helium atoms and to simple problems in atomic and molecular physics.

PHYS 459D1 HONOURS RESEARCH PROJECT. (3) (Fall) (6 hours) (Honours students or permission of instructor) (Not open to students taking the sequence PHYS 469, PHYS 479) (Students must also register for PHYS 459D2) (No credit will be given for this course unless both PHYS 459D1 and PHYS 459D2 are successfully completed in consecutive terms) An experimental project, supervised by members of staff, on some topic related to the ongoing research in the department.

PHYS 459D2 HONOURS RESEARCH PROJECT. (3) (Winter) (Prerequisite: PHYS 459D1) (No credit will be given for this course unless both PHYS 459D1 and PHYS 459D2 are successfully completed in consecutive terms) See PHYS 459D1 for course description.

PHYS 469 LABORATORY IN MODERN PHYSICS 2. (3) (Fall) (6 hours) (Honours students, or permission of instructor) (Prerequisite: PHYS 359) (Not open to students taking PHYS 459) Advanced level experiments in modern physics stressing quantum effects and some properties of condensed matter. Continuation of PHYS 359.

PHYS 479 HONOURS PROJECT LABORATORY. (3) (Winter) (6 hours) (Honours students, or permission of instructor) (Prerequisite: PHYS 469) (Not open to students taking PHYS 459) Supervised project work in an area related to material covered in upper year courses.

PHYS 489 SPECIAL PROJECT. (3) (Winter) (6 hours) (Only open to students in their final year of the Joint Major in Physics and Computer Science after consultation with the adviser(s) for the program) A project incorporating aspects of both physics and computer science, under the joint supervision of the two departments. The Physics aspect may be either laboratory-based or the-

oretical in nature. The Computational aspect will involve the development and implementation of algorithms arising from the investigation.

PHYS 514 GENERAL RELATIVITY. (3) (Winter) (3 hours lectures) (Honours students, or permission of the instructor) Transition from special to general relativity. Non-Euclidian geometry. The basic laws of Physics in co-variant form, Einstein's equations. Gravitational waves; neutron stars; black holes; cosmology.

PHYS 521 ASTROPHYSICS. (3) (Fall) (3 hours) A quantitative course in galactic and extragalactic astrophysics. Topics include observational techniques, stars and stellar evolution, compact objects, galaxy structure, kinematics, evolution and cosmology.

PHYS 534 NANOSCIENCE AND NANOTECHNOLOGY. (3) (Fall) Topics include scanning probe microscopy, chemical selfassembly, computer modeling, and microfabrication/micromachining.

PHYS 551 QUANTUM THEORY. (3) (Fall) (3 hours lectures) (Honours students, or permission of the instructor) General formulation, scattering theory, WKB approximation, time-dependent perturbation theory and applications, angular momentum, relativistic wave equations.

PHYS 557 NUCLEAR PHYSICS. (3) (Fall) (3 hours lectures) (Honours students, or permission of the instructor) General nuclear properties, nucleon-nucleon interaction and scattering theory, radioactivity, nuclear models, nuclear reactions.

PHYS 558 SOLID STATE PHYSICS. (3) (Fall) (3 hours lectures) (Honours students, or permission of the instructor) Properties of crystals, lattice vibrations and thermal properties of insulators, free electron model and band structure, semi-conductors, metals, optical properties.

PHYS 559 ADVANCED STATISTICAL MECHANICS. (3) (Fall) (3 hours lectures) (Honours students, or permission of the instructor) Self averaging and central-limit theorem; thermodynamic fluctuations; ensemble theory; surface roughening; broken symmetry and Goldstone's theorem; phase transitions; mean-field, Landau and Ornstein-Zernicke theory; Monte Carlo method; molecular dynamics; scaling; renormalization group; epsilon expansion; non-equilibrium theory.

PHYS 562 ELECTROMAGNETIC THEORY. (3) (Winter) (3 hours lectures) (Honours students, or permission of the instructor) Electrostatics, dielectrics, magnetostatics, timevarying fields, relativity, radiating systems, fields of moving charges.

PHYS 567 PARTICLE PHYSICS. (3) (Winter) (3 hours lectures) (Honours students, or permission of the instructor) Survey of elementary particles; hadrons, leptons and hadrons' constituents (quarks). Invariance principles and conservation laws. Detectors and accelerators. Phenomenology of strong, electromagnetic and weak interactions.

12.26 Physiology (PHGY)

McIntyre Medical Sciences Building, Room 1021
3655 Promenade Sir-William-Osler
Montreal, QC H3G 1Y6

Telephone: (514) 398-4316

Fax: (514) 398-7452

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

Chair — Alvin Shrier

Emeritus Professors

G. Melvill Jones; B.A., M.A., M.B., B.Ch., M.D.(Cantab.)

Kresmir Krnjacic; O.C., B.Sc., Ph.D., M.B., Ch.B.(Edin.), F.R.S.C.

Professors

Catherine Bushnell; B.A.(Maryland), Ph.D.(American U.) (*Harold Griffith Professor of Anaesthesia (joint appt. with Dentistry)*)

Thomas M.S. Chang; B.Sc., M.D., C.M., Ph.D.(McG.), F.R.C.P.(C)

Monroe W. Cohen; B.Sc., Ph.D.(McG.)

Ellis J. Cooper; B.Eng.(Sir G.Wms.), M.Sc.(Surrey), Ph.D.(McM.)

Mony M. Frojmovic; B.Sc., Ph.D.(McG.)

Leon Glass; B.S.(Brooklyn), Ph.D.(Chic.) (*Isadore Rosenfeld Professor of Cardiology*)

Phil Gold; C.C., B.Sc., M.Sc., Ph.D., M.D., C.M.(McG.), F.R.C.P.(C.), F.R.S.C. (*joint appt. with Medicine*)
 David Goltzman; B.Sc., M.D., C.M.(McG.) (*Antoine G. Massabki Professor of Medicine*) (*joint appt. with Medicine*)
 John Hanrahan; Ph.D.(U.B.C.)
 James L. Henry; B.Sc.(Tor.), M.Sc., Ph.D.(W.Ont.)
 Robert E. Kearney; B.Eng., M.Eng., Ph.D.(McG.) (*joint appt. with Biomedical Engineering*)
 Wayne S. Lapp; M.S.A.(Tor.), Ph.D.(McG.)
 Mortimer Levy; B.Sc., M.D., C.M.(McG.), F.R.C.P.(C) (*joint appt. with Medicine*)
 Michael Mackey; B.A., Ph.D.(Wash.) (*Joseph Morley Drake Professor of Physiology*)
 Jacapo P. Mortola; M.D.(Milan)
 John Orlowski; B.Sc.(McG.), M.Sc., Ph.D.(Queen's)
 Premysl Ponka; M.D., Ph.D.(Prague)
 Alvin Shrier; B.Sc.(C'dia), Ph.D.(Dal.) (*Hosmer Professor of Physiology*)
 Douglas G.D. Watt; M.D., Ph.D.(McG.)

Associate Professors

Kathleen Cullen; B.Sc.(Brown), Ph.D.(Chicago) (*William Dawson Scholar*)
 Riaz Farookhi; B.Sc., M.Sc.(M.I.T.), Ph.D.(Tufts)
 Mladen Glavinovic; B.Sc.(Zagreb), M.Sc.(Tor.), Ph.D.(McG.) (*joint appt. with Anaesthesia Research*)
 Michael Guevara; B.Sc., M.Eng., Ph.D.(McG.)
 Sheldon Magder; M.D.(Tor.) (*joint appt. with Medicine*)
 Ursula Stochaj; Ph.D.(Cologne)
 Teresa Trippenbach; M.D., Ph.D.(Warsaw)
 Ann Wechsler; B.A.(Tor.), M.Sc., Ph.D.(McG.)
 John White; B.Sc., M.Sc.(Car.), Ph.D.(Harv.)

Associate Members

Anaesthesia: Steven Backman;
 Dentistry: James Lund;
 Medicine: Albert Aguayo, Angel Alonso, Andrey Cybulsky, Samuel O. Freedman, Abraham Fuks, Claude Gagnon, Raymonde Gagnon, Harry Goldsmith, Geoffrey Hendy, Max Katz, Peter Macklem, James Martin, Shree Mulay, Mariana Newkirk, Barry Posner, Shafaat Rabbani, Ian Shrier, J. Enrique Silva, Alan Sniderman, Mary Stevenson, Simon Wing, Hans Zingg;
 Neurology & Neurosurgery: Massimo Avoli, Charles Bourque, Sal T. Carbonetto, Pierre Drapeau, Daniel Guitton, Michael Rasminsky;
 Otolaryngology: Bernard Segal;
 Pediatrics: Immanuela Moss;
 Psychiatry: Bernardo Dubrovsky, Christina Gianoulakis;
 Univ. of Montreal, Medicine: Alex Grassino

Adjunct Professors

John Milton, Chicago
 Serge Rossignol, Montreal
 Malmur R.I. Sairam, Montreal

Physiology has its roots in many of the basic sciences including biology, chemistry, mathematics, and physics. Physiology overlaps with other biomedical sciences such as anatomy, biochemistry, pathology and pharmacology, and with psychology and biomedical engineering, and is one of the prime contributors of basic scientific knowledge to the clinical medical sciences.

Members of the Department of Physiology at McGill are engaged in studies dealing with molecules, single cells, or entire systems in a variety of vertebrates, including man. A wide range of interest and expertise is represented, including cardiovascular, respiratory, gastrointestinal and renal physiology, the physiology of exercise, neurophysiology, endocrinology, immunology, biophysics and biomathematics. Some faculty members have formal or informal links with the departments of mathematics, physics, electrical engineering, chemistry and clinical departments (medicine, surgery, pediatrics, neurology, obstetrics, psychiatry, anesthesia), reflecting and reinforcing the close ties between physiology and other disciplines.

Graduates at the B.Sc. level have found rewarding careers in teaching, in secondary schools and CEGEPs, government service, and laboratory technical assistance, such as in pharmaceutical houses, hospitals, and institutions of higher learning. Moreover, physiology provides an excellent background for medicine, dentistry or other postgraduate work, in such fields as physiology, experimental medicine, pharmacology, biochemistry or physiological psychology.

The programs offered in Physiology differ in their orientation but they all have a common core of material covering cardiovascular, respiratory, gastrointestinal and renal physiology, neurophysiology, endocrinology and immunology. The specified U1 courses are identical for all programs except the Joint Major Programs in Physiology and Physics, Physiology and Mathematics, and the Joint Honours Program in Immunology and thus afford the student maximal flexibility before deciding on a particular program to follow in U2 and U3.

Academic advising is compulsory. All new students to the Department, Freshman and CEGEP, **must** see an adviser upon entering the program. Contact the Student Affairs Officer at (514) 398-3689 for more information.

Returning students are required to consult with their advisers during the advising period for returning students, and regularly throughout the year. It is important that graduating students have their record checked by their adviser at the beginning of their final year.

PLEASE NOTE:

Complementary courses are not electives. The difference between Complementary courses and Required courses is that Complementary courses are defined as offering an element of choice, however small that choice may be. **Students may choose from the two (or more) courses specified within Complementary Course segments of a program description, but ONLY from those.** For further information, refer to "**Course Nomenclature**" on page 31 of this Calendar.

FACULTY PROGRAM IN PHYSIOLOGY (55 credits)

If not previously taken CHEM 212 Organic Chemistry 1 must be completed in addition to the 55 program credits.

Required Courses (34 credits)

PHGY 209	(3)	Mammalian Physiology 1
PHGY 210	(3)	Mammalian Physiology 2
PHGY 212D1	(1)	Introductory Physiology Lab
PHGY 212D2	(1)	Introductory Physiology Lab
PHGY 311	(3)	Intermediate Physiology 1
PHGY 312	(3)	Intermediate Physiology 2
PHGY 313	(3)	Intermediate Physiology 3
PHGY 314	(3)	Integrative Neuroscience
BIOL 200	(3)	Molecular Biology
BIOL 202	(3)	Basic Genetics
BIOL 301	(4)	Cell and Molecular Laboratory
CHEM 222	(4)	Organic Chemistry 2

Complementary Courses (21 credits)

6 credits selected from:

BIOL 201	(3)	Cell Biology and Metabolism
or BIOC 212	(3)	Molecular Mechanisms of Cell Function
BIOL 373	(3)	Biostatistical Analysis
or BIOL 309	(3)	Mathematical Models in Biology

6 credits selected from physiology courses – see approved list in Department.

9 credits selected from science courses – see approved list in Department.

MAJOR PROGRAM IN PHYSIOLOGY (64-65 credits)

The Major Program includes, in addition to some intensive studies in Physiology, a strong core content of related biomedical and physical sciences. Admission to the Major Program will be in U2, upon completion of the U1 required courses, and in consultation with the student's adviser.

If not previously taken CHEM 212 Organic Chemistry 1 must be completed in addition to the 64-65 program credits.

U1 Required Courses (18 credits)

PHGY 209	(3)	Mammalian Physiology 1
PHGY 210	(3)	Mammalian Physiology 2
PHGY 212D1	(1)	Introductory Physiology Lab
PHGY 212D2	(1)	Introductory Physiology Lab
BIOL 200	(3)	Molecular Biology
BIOL 202	(3)	Basic Genetics
CHEM 222	(4)	Organic Chemistry 2

U2 and U3 Required Courses (19 credits)

PHGY 311	(3)	Intermediate Physiology 1
PHGY 312	(3)	Intermediate Physiology 2
PHGY 313	(3)	Intermediate Physiology 3
PHGY 314	(3)	Integrative Neuroscience
BIOL 301	(4)	Cell and Molecular Laboratory
BIOC 311	(3)	Metabolic Biochemistry

Complementary Courses (27-28 credits)

12-13 credits selected from:

BIOL 201	(3)	Cell Biology and Metabolism
or BIOC 212	(3)	Molecular Mechanisms of Cell Function
BIOL 373	(3)	Biostatistical Analysis
or BIOL 309	(3)	Mathematical Models in Biology
CHEM 203	(3)	A Survey of Physical Chemistry
or CHEM 204	(3)	Physical Chem./Biol. Sci. 1
ANAT 214	(3)	Systemic Human Anatomy
or ANAT 261	(4)	Introduction to Dynamic Histology

9 credits selected from physiology courses – see approved list in Department

6 credits selected from science courses – see approved list in Department

JOINT MAJOR PROGRAM IN PHYSIOLOGY AND MATHEMATICS (77 credits)**U1 Required Courses** (14 credits)

PHGY 212D1	(1)	Introductory Physiology Lab
PHGY 212D2	(1)	Introductory Physiology Lab
MATH 222	(3)	Calculus 3
MATH 247	(3)	Linear Algebra
or MATH 223	(3)	Linear Algebra
BIOL 200	(3)	Molecular Biology
BIOL 309	(3)	Mathematical Models in Biology

U1 Complementary Courses (15 credits)

9 credits selected from:

PHGY 209	(3)	Mammalian Physiology 1
and PHGY 210	(3)	Mammalian Physiology 2
or PHGY 201	(3)	Human Physiology: Control Systems
and PHGY 202	(3)	Human Physiology: Body Functions
BIOL 201	(3)	Cell Biology and Metabolism
or BIOC 212	(3)	Molecular Mechanisms of Cell Function

6 credits selected from:

MATH 248	(3)	Advanced Calculus 1
or MATH 314	(3)	Advanced Calculus
MATH 325	(3)	Ordinary Differential Equations
or MATH 315	(3)	Ordinary Differential Equations

U2 Required Courses (24 credits)

PHGY 311	(3)	Intermediate Physiology 1
PHGY 312	(3)	Intermediate Physiology 2
PHGY 313	(3)	Intermediate Physiology 3
PHGY 314	(3)	Integrative Neuroscience
MATH 242	(3)	Analysis 1
MATH 243	(3)	Real Analysis
MATH 323	(3)	Probability Theory
MATH 326	(3)	Nonlinear Dynamics and Chaos

U2 or U3 Required Courses (6 credits)

PHYS 413	(3)	The Physical Basis of Physiology
MATH 437	(3)	Mathematical Methods in Biology

U3 Required Courses (18 credits)

PHGY 461D1	(4.5)	Experimental Physiology
PHGY 461D2	(4.5)	Experimental Physiology
MATH 319	(3)	Partial Differential Equations
MATH 324	(3)	Statistics
BMDE 519	(3)	Analysis of Biomedical Systems & Signals

JOINT MAJOR PROGRAM IN PHYSIOLOGY AND PHYSICS (80 credits)

This program provides a firm foundation in physics, mathematics and physiology. It is appropriate for students interested in applying methods of the physical sciences to problems in physiology and allied biological sciences.

U1 Required Courses (17 credits)

PHGY 212D*	(2)	Introductory Physiology Lab
PHYS 230	(3)	Dynamics of Simple Systems
PHYS 232	(3)	Heat and Waves
PHYS 257	(3)	Experimental Methods 1
PHYS 258	(3)	Experimental Methods 2
MATH 222	(3)	Calculus 3

U1 Complementary Courses (9 credits)

PHGY 209	(3)	Mammalian Physiology 1
and PHGY 210*	(3)	Mammalian Physiology 2
or PHGY 201	(3)	Human Physiology: Control Systems
and PHGY 202	(3)	Human Physiology: Body Functions
MATH 223	(3)	Linear Algebra
or MATH 247	(3)	Linear Algebra

* The corequisite BIOL 200, BIOL 201 is waived for this program.

U2 Required Courses (21 credits)

PHGY 311	(3)	Intermediate Physiology 1
PHGY 312	(3)	Intermediate Physiology 2
PHGY 313	(3)	Intermediate Physiology 3
PHGY 314	(3)	Integrative Neuroscience
PHYS 328	(3)	Electronics
PHYS 339	(3)	Measurements Laboratory
MATH 326	(3)	Nonlinear Dynamics and Chaos

U2 Complementary Course (6 credits)

MATH 315	(3)	Ordinary Differential Equations
or MATH 325	(3)	Ordinary Differential Equations
MATH 314	(3)	Advanced Calculus
or MATH 248	(3)	Advanced Calculus 1

U2 or U3 Required Courses (6 credits)

PHYS 413	(3)	The Physical Basis of Physiology
MATH 437	(3)	Mathematical Methods in Biology

U3 Required Courses (21 credits)

PHGY 461D1	(4.5)	Experimental Physiology
PHGY 461D2	(4.5)	Experimental Physiology
PHYS 333	(3)	Thermal & Statistical Physics
PHYS 340	(3)	Electricity and Magnetism
PHYS 446	(3)	Quantum Physics
BMDE 519	(3)	Analysis of Biomedical Systems and Signals

HONOURS PROGRAM IN PHYSIOLOGY (75 credits)

All admissions to the Honours program will be in U2, and the student must have a U1 GPA of 3.30, with no less than a B in PHGY 209 and PHGY 210. Admission to U3 requires a U2 CGPA of 3.20 with no less than a B in U2 Physiology courses. Decisions for admission to U3 will be heavily influenced by student standing in U2 courses.

The Department reserves the right to restrict the number of entering students in the Honours programs. Students who do not maintain Honours standing may transfer their registration to the Major Program in Physiology.

The deadline to apply to the Honours Program is June 1. Application forms are available in McIntyre 1021. Students should include in their letters telephone numbers where they can be reached during the last week of August. Students are responsible

for picking up their letters of decision in McIntyre 1021 no later than one week before classes start.

Graduation: To graduate from the Honours Physiology Program the student will have a CGPA of 3.20 with a mark no less than a B in all Physiology courses.

If not previously taken CHEM 212 Organic Chemistry 1 must be completed in addition to the 75 program credits.

Required Courses (60 credits)

PHGY 209	(3)	Mammalian Physiology 1
PHGY 210	(3)	Mammalian Physiology 2
PHGY 212D	(2)	Introductory Physiology Lab
PHGY 311	(3)	Intermediate Physiology 1
PHGY 312	(3)	Intermediate Physiology 2
PHGY 313	(3)	Intermediate Physiology 3
PHGY 314	(3)	Integrative Neuroscience
PHGY 351	(3)	Research Techniques in Physiology
PHGY 359D1	(.5)	Tutorial in Physiology
PHGY 359D2	(.5)	Tutorial in Physiology
PHGY 459D1	(3)	Physiology Seminar
PHGY 459D2	(3)	Physiology Seminar
PHGY 461D1	(4.5)	Experimental Physiology
PHGY 461D2	(4.5)	Experimental Physiology
BIOL 200	(3)	Molecular Biology
BIOL 202	(3)	Basic Genetics
BIOL 301	(4)	Cell and Molecular Laboratory
CHEM 222	(4)	Organic Chemistry 2
ANAT 261	(4)	Introduction to Dynamic Histology
BIOC 311	(3)	Metabolic Biochemistry

Complementary Courses (15 credits)

9 credits selected from:

BIOL 201	(3)	Cell Biology and Metabolism
or BIOC 212	(3)	Molecular Mechanisms of Cell Function
BIOL 373	(3)	Biostatistical Analysis
or BIOL 309	(3)	Mathematical Models in Biology
CHEM 203	(3)	A Survey of Physical Chemistry
or CHEM 204	(3)	Physical Chem./Biol. Sci. 1

6 credits selected from physiology courses – see approved list in Department.

INTERDEPARTMENTAL HONOURS PROGRAM IN

IMMUNOLOGY The Departments of Biochemistry, Microbiology and Immunology, and Physiology offer an Interdepartmental Honours Program in Immunology. Physiology students interested in the program should contact Dr. W.S. Lapp. Details of this program may be found in [section 12.13](#).

COURSE DESCRIPTIONS

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

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

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

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

PHGY has replaced 552 as the prefix for Physiology courses.

All courses have limited enrolment.

● Denotes courses not offered in 2002-03.

★ Denotes courses offered in alternate years only

PHGY 100 THE BODY MATTERS. (3) (Fall) (3-hour seminar per week) (Not open to students who have taken or are taking PHGY 201, PHGY 202, PHGY 209, PHGY 210, or PHGY 211) Designed

for anyone with an interest in exercise, the course covers the principles of medicine and physiology as they apply to current lifestyles. Topics will include how and why injuries occur, the effects of exercise on the body, and general health considerations such as "Does exercise prevent or promote osteoarthritis?"

● **PHGY 198 FYS: RHYTHMS AND FEEDBACK IN BIOMEDICINE.** (3) (Fall) (3 hours seminar) (Open only to newly admitted students in U0 or U1, who may take only one FYS. Students who register for more than one will be obliged to withdraw from all but one of them.) (Maximum 25) (Corequisite: MATH 140)

● **PHGY 199 FYS: HISTORY OF GENETIC ENGINEERING.** (3) (Fall) (3 hours seminar per week) (Open only to newly admitted students in U0 or U1, who may take only one FYS. Students who register for more than one will be obliged to withdraw from all but one of them.) (Maximum 20)

PHGY 201 HUMAN PHYSIOLOGY: CONTROL SYSTEMS. (3) (Fall) (3 hours lecture weekly) (Prerequisites: collegial courses in biology or anatomy, and in chemistry and physics; with MATH 212 or equivalent, as a pre-/co-requisite) (For students in Physical and Occupational Therapy, Nursing, and others with permission of the course coordinator) (Not open to students who have taken PHGY 209) Physiology of body fluids, blood, nerve and muscle, peripheral nerves, central nervous system, special senses, autonomic nervous system, defense mechanisms.

PHGY 201 and PHGY 202 are companion courses and it is recommended that they be taken in that sequence; under special circumstances they may be taken in separate years or in the reverse sequence.

PHGY 202 HUMAN PHYSIOLOGY: BODY FUNCTIONS. (3) (Winter) (3 hours lecture weekly) (Prerequisites: collegial courses in biology or anatomy and in chemistry and physics; with CHEM 212 or equivalent, as a pre-/co-requisite) (For students in Physical and Occupational Therapy, Nursing, Education, and others with permission of the course coordinator) (Not open to students who took 552-201 in 1976-77 or earlier, or PHGY 210) Physiology of the cardiovascular, respiratory, excretory, endocrine, and digestive systems; organic and energy metabolism; nutrition; exercise and environmental stress.

PHGY 209 MAMMALIAN PHYSIOLOGY 1. (3) (Fall) (3 hours lectures weekly) (Prerequisites: as for PHGY 201 and PHGY 202. Pre-/co-requisites: BIOL 200, BIOL 201 or BIOC 212) (Not open to students who have taken PHGY 211 or PHGY 201) (For students in the Faculty of Science, and other students by permission of the instructor) The course covers the physiology of body fluids, blood, body defense mechanisms, peripheral and central nervous system, muscle. Students must be prepared to attend evening (19:00 - 20:00) class tests.

PHGY 210 MAMMALIAN PHYSIOLOGY 2. (3) (Winter) (3 hours lectures weekly) (Prerequisites: as for PHGY 201 and PHGY 202. Pre-/co-requisite: BIOL 200) (Not open to students who have taken PHGY 211 or PHGY 202) (For students in the Faculty of Science, and other students by permission of the instructor) (Although PHGY 210 may be taken without the prior passing of PHGY 209, students should note that they may have some initial difficulties because of lack of familiarity with some basic concepts introduced in PHGY 209) Physiology of the autonomic nervous system; cardiovascular, respiratory, digestive and renal systems; exercise physiology.

PHGY 212D1 INTRODUCTORY PHYSIOLOGY LABORATORY. (1) (Fall) (One 3-hour lab and one 1-hour lecture every second week) (Corequisites: PHGY 209 and PHGY 210) (Required for Physiology students enrolled in PHGY 209 and PHGY 210. Open to Honours and Major students from some other departments) (For students in a Physiology program, PHGY 212 should be taken concurrently with PHGY 209 and PHGY 210) (Students must also register for PHGY 212D2) (No credit will be given for this course unless both PHGY 212D1 and PHGY 212D2 are successfully completed in consecutive terms) Exercises illustrating fundamental principles in physiology: blood, neurophysiology, smooth mus-

cle; cardiovascular, respiratory, endocrine, exercise and renal physiology.

PHGY 212D2 INTRODUCTORY PHYSIOLOGY LABORATORY. (1) (Winter) (Prerequisite: PHGY 212D1) (No credit will be given for this course unless both PHGY 212D1 and PHGY 212D2 are successfully completed in consecutive terms) See PHGY 212D1 for course description.

PHGY 311 INTERMEDIATE PHYSIOLOGY 1. (3) (Fall) (3 hours of lectures per week; 1-3 hours optional lab/demonstration/tutorial arranged for a maximum of 3 afternoons per term) (Prerequisite: PHGY 209 and PHGY 210 or equivalent, or permission of the instructor) In-depth presentation of experimental results and hypotheses on cellular communication in the nervous system and the endocrine system.

PHGY 312 INTERMEDIATE PHYSIOLOGY 2. (3) (Winter) (3 hours of lectures per week; 1-3 hours optional lab/demonstration/tutorial arranged for a maximum of 3 Wednesday afternoons per term) (Prerequisites: PHGY 209 and PHGY 210 or equivalent, PHGY 311 or permission of the instructor) In-depth presentation of experimental results and hypotheses underlying our current understanding of topics in immunology, kidney function and respiration explored beyond the introductory level.

PHGY 313 INTERMEDIATE PHYSIOLOGY 3. (3) (Winter) (3 hours of lectures per week; 1-3 hours optional lab/demonstration/tutorial arranged for a maximum of 3 Wednesday afternoons per term) (Prerequisites: PHGY 209 and PHGY 210 or equivalent, PHGY 311 or permission of the instructor) In-depth presentation of experimental results and hypotheses underlying our current understanding of the physiology of the cardiovascular system; blood physiology including hemostasis and thrombosis; transport of fluids and cells; general cell kinetics and regulation, and gastrointestinal physiology.

PHGY 314 INTEGRATIVE NEUROSCIENCE. (3) (Fall) (3 hours of lectures per week) (Prerequisites: PHGY 209 and PHGY 210) In depth presentation of experimental results and hypotheses underlying our current understanding of how single neurons and ensembles of neurons encode sensory information, generate movement, and control cognitive functions such as emotion, learning, and memory, during voluntary behaviours.

PHGY 351 RESEARCH TECHNIQUES: PHYSIOLOGY. (3) (Winter) (2 hour lecture and 3 hour lab weekly) (Prerequisites: PHGY 209, PHGY 210 and PHGY 311. Corequisites: PHGY 312 and PHGY 313) (Restricted to Honours Physiology students) Provides an overview of common research methods in Physiology, including critical analysis and practical experience with some of the methods. Topics include research ethics of animal experimentation, data analysis, membrane biophysics, radioimmunoassay, ion sensitive dyes, immunocytochemistry, localization techniques, protein transport, cell sorting and molecular biology.

PHGY 359D1 TUTORIAL IN PHYSIOLOGY. (0.5) (Fall) (Prerequisites: PHGY 209 and PHGY 210 or equivalent. Corequisites: PHGY 311, PHGY 312 and PHGY 313. Enrolment restricted to Honours Physiology students) (Students must also register for PHGY 359D2) (No credit will be given for this course unless both PHGY 359D1 and PHGY 359D2 are successfully completed in consecutive terms) The course consists of regularly scheduled meetings between each individual student and a chosen staff member, to consider current problems in biomedical research and to develop background for a research project to be carried out in U3. Brief written summaries of each meeting are required.

PHGY 359D2 TUTORIAL IN PHYSIOLOGY. (0.5) (Winter) (Prerequisite: PHGY 359D1) (No credit will be given for this course unless both PHGY 359D1 and PHGY 359D2 are successfully completed in consecutive terms) See PHGY 359D1 for course description.

PHGY 419D1 PROJECT AND SEMINAR IN IMMUNOLOGY. (4.5) (Fall) (15-18 hours lab, 1 hour seminar weekly) (Enrolment restricted to U3 Honours Immunology students) (Please see regulations concerning "Project Courses") (Students must also register for PHGY 419D2) (No credit will be given for this course unless both PHGY 419D1 and PHGY 419D2 are successfully completed in consecu-

tive terms) Individual research projects in immunology under the guidance of staff members in the three participating departments: Physiology, Biochemistry, and Microbiology and Immunology.

PHGY 419D2 PROJECT AND SEMINAR IN IMMUNOLOGY. (4.5) (Winter) (Prerequisite: PHGY 419D1) (No credit will be given for this course unless both PHGY 419D1 and PHGY 419D2 are successfully completed in consecutive terms) See PHGY 419D1 for course description.

● **PHGY 423 PHYSIOLOGICAL DYNAMICS.** (3) (Fall) (Prerequisite: PHGY 209 and PHGY 210 or equivalent, and BIOL 309 or MATH 315, or permission of the instructor)

● ★ **PHGY 444 THEORETICAL ELECTROPHYSIOLOGY.** (3) (Fall) (3 hours lecture/seminar per week) (Prerequisites: PHGY 209 and PHGY 210 or equivalent; BIOL 309 or MATH 315) (Offered in even numbered years)

PHGY 451 ADVANCED NEUROPHYSIOLOGY. (3) (Fall) (3 hours lecture) (Prerequisite: PHGY 311 or equivalent and BIOL 301) (Departmental approval required) Topics of current interest in neurophysiology including the development of neurons and synapses, physiology of ionic channels, presynaptic and postsynaptic events in synaptic transmission and neuronal interactions in CNS function.

PHGY 459D1 PHYSIOLOGY SEMINAR. (3) (Fall) (2 hours seminar) (Prerequisite: permission of instructors) (Required course for U3 Honours students.) (Students must also register for PHGY 459D2) (No credit will be given for this course unless both PHGY 459D1 and PHGY 459D2 are successfully completed in consecutive terms) Discussion of topics in mammalian, cellular and molecular physiology. Students will be required to write one essay and make at least one oral presentation per term. A final course essay is required.

PHGY 459D2 PHYSIOLOGY SEMINAR. (3) (Winter) (Prerequisite: PHGY 459D1) (No credit will be given for this course unless both PHGY 459D1 and PHGY 459D2 are successfully completed in consecutive terms) See PHGY 459D1 for course description.

PHGY 461D1 EXPERIMENTAL PHYSIOLOGY. (4.5) (Fall) (Permission of the instructor required.) (This course is a requirement for U3 students in the Honours Physiology program, the Major Program in Physiology and Mathematics, and the Major program in Physiology and Physics, and is open to a limited number of other U3 Physiology students) (Please see regulations concerning "Project Courses") (Students must also register for PHGY 461D2) (No credit will be given for this course unless both PHGY 461D1 and PHGY 461D2 are successfully completed in consecutive terms) Individual project work under the supervision of Departmental Staff members.

PHGY 461D2 EXPERIMENTAL PHYSIOLOGY. (4.5) (Winter) (Prerequisite: PHGY 461D1) (No credit will be given for this course unless both PHGY 461D1 and PHGY 461D2 are successfully completed in consecutive terms) See PHGY 461D1 for course description.

PHGY 502 EXERCISE PHYSIOLOGY. (3) (Winter) (Prerequisite: PHGY 311, PHGY 312, and PHGY 313) Behaviour of physiological processes in response to physical effort, in areas such as structural basis of muscle contraction, thermoregulation during exercise, mechanics and energetics of muscle contraction, fuel utilization, fatigue, physiological adjustments during exercise and influence of training.

PHGY 508 ADVANCED RENAL PHYSIOLOGY. (3) (Fall) (Prerequisite: PHGY 312 or the equivalent) (Open to advanced undergraduate and graduate students) Offered in conjunction with the Department of Medicine. Lectures and seminars will cover advanced concepts in selected areas of kidney physiology (glomerular and tubular function) as well as membrane and epithelial transport. Students will be expected to critically discuss selected experimental papers.

PHGY 513 CELLULAR IMMUNOLOGY. (3) (Winter) (4 hours lectures plus term paper) (Prerequisite: MIMM 314, or permission of the instructor) This course deals with cellular interactions, regulation and effector mechanisms of the normal immune response in rela-

tion to diseases and pathogenic processes. It is taught at an advanced level.

PHGY 515 PHYSIOLOGY OF BLOOD 1. (3) (Fall) (2 hours lecture plus 1 hour seminar weekly) (Prerequisite: PHGY 313 or PHGY 312 or permission of the instructor) Study of the cell and molecular physiology of hemostasis and its pathophysiology (bleeding and thrombosis). Emphases on molecular mechanisms regulating clot formation, fibrinolysis, and cell adhesion/aggregation. Experimental approaches and specific clinical disorders will be analyzed. Weekly discussions, and a major term paper.

PHGY 516 PHYSIOLOGY OF BLOOD 2. (3) (Winter) (2 hours lecture plus 1 hour seminar weekly) Bone marrow hematopoiesis, with emphasis on regulation of stem cell proliferation and differentiation along hematopoietic pathways. Formation and differentiation of red and white blood cells and some of the diseases associated with hemopoiesis will be covered. Emphasis will be given to the molecular mechanisms involved in the normal and pathological conditions.

● **PHGY 517 ARTIFICIAL INTERNAL ORGANS.** (3) (Winter) (Prerequisite: permission of instructors.)

PHGY 518 ARTIFICIAL CELLS. (3) (Fall) (Prerequisite: permission of instructors.) Physiology, biotechnology, chemistry and biomedical application of artificial cells, blood substitutes, immobilized enzymes, microorganisms and cells, hemoperfusion, and artificial kidneys, and drug delivery systems. 552-517 and 552-518 when taken together, will give a complete picture of this field. However, the student can select one of these.

● ★ **PHGY 520 ION CHANNELS.** (3) (Winter) (Offered in odd numbered years) (1 1/2 hour lecture, 1 1/2 hour seminar) (Prerequisite: PHGY 311) (Priority to Graduate and Honours students; others by permission of instructors.)

PHGY 531 TOPICS IN APPLIED IMMUNOLOGY. (3) (Winter) (Permission of the instructor. U3 InterDept. Honours Immunology students and graduate students with strong immunology background i.e. PHGY 513 and BIOC 503) Seminar format course in which experts in immunologic mechanisms of resistance against a variety of infectious diseases, including AIDS, malaria, and tuberculosis oversee student moderators in their presentation of recent scientific literature in the field.

PHGY 550 MOLECULAR PHYSIOLOGY OF BONE. (3) (Fall) (1 hour of lecture, 2 hours of seminar per week) (Prerequisites: PHGY 311, and BIOL 202 or equivalent) (Restricted to U3 Physiology students, and graduate students in biomedical departments; others by permission of the instructor) Students will develop a working knowledge of cartilage and bone. Discussion topics will include: molecular and cellular environment of bone; heritable and acquired skeletal defects; research models used to study metabolic bone disease.

PHGY 552 CELLULAR AND MOLECULAR PHYSIOLOGY. (3) (Winter) (1 hour lecture, 2 hours seminar weekly) (Prerequisite: PHGY 311) (Preference will be given to Physiology Honours and Graduate students) Discussions of recent significant advances in our understanding of the gene products involved in diverse cellular signaling pathways. Topics will include cell-surface hormone receptors, nuclear steroid hormone receptors, and ion channels and transporters. Students will present and critically evaluate experimental approaches, results and interpretations of selected research publications.

PHGY 556 TOPICS IN SYSTEMS NEUROSCIENCE. (3) (Winter) (Permission of the instructor required.) (Not open to students who have taken PHGY 456) Topics of current interest in systems neurophysiology and behavioural neuroscience including: the neural representation of sensory information and motor behaviours, models of sensory motor integration, and the computational analysis of problems in motor control and perception. Students will be expected to present and critically discuss journal articles in class.

12.27 Psychiatry (PSYT)

Department of Psychiatry
Research and Training Building
1033 Pine Avenue West
Montreal, QC H3A 1A1
Telephone: (514) 398-4176

Chair — Joel Paris

Professors

Frances V. Abbott; B.Sc.(Trent), M.Sc., Ph.D.(McG.)
Patricia Boksa; B.Sc., Ph.D.(McG.)
Roberta Palmour; B.A.(Texas W.), Ph.D.(Texas)
Joel Paris; M.D.(McG.)
Gilbert Pinard; M.D.(Montr.)
Judes Poirier; B.Sc., Ph.D.(Montr.)
Simon Young; B.A.(Oxon.), M.Sc., Ph.D.(Lond.)

Associate Professors

Bernardo Dubrovsky; M.D.(Buenos Aires)
Kathryn Gill; Ph.D.(C'dia)
Alain Gratton; Ph.D.(C'dia)
Joseph Rochford; B.Sc., Ph.D.(C'dia)
Lalit Srivastava; B.Sc., Ph.D.(J. Nehru)
Dominique Walker; B.Sc., Ph.D.(Geneva) (*joint appt. with Anatomy & Cell Biology*)

Assistant Professor

Satyabrata Kar; Ph.D.(Lond.)

COURSES

Students preparing to register are advised to consult the 2002-2003 Class Schedule on the Web, <http://www.mcgill.ca/minerva-students> for the most up-to-date information.

The course credit weight is given in parentheses after the title. PSYT has replaced 555 as the prefix for Psychiatry courses.

All courses have limited enrolment.

PSYT 301 ISSUES IN DRUG DEPENDENCE. (3) (Winter) (3 hours) (Prerequisites: PHGY 201 or PHGY 209 or PHGY 210 or PSYC 100 or BIOL 201 or permission of instructor) The phenomenology and epidemiology of the use and abuse of alcohol, nicotine, opiates, stimulants, sedatives and psychotomimetic agents are discussed in relation to current theoretical and experimental issues. The perspective is multidisciplinary and the intention is to develop an understanding the nature of the issues surrounding drug dependence.

PSYT 500 ADVANCES: NEUROBIOLOGY OF MENTAL DISORDERS. (3) (Winter) (3 hours) (Prerequisites: BIOC 212 and BIOC 311, or BIOC 312, or BIOL 200 and BIOL 201, or PHGY 311, or PSYC 308 and an upper-level biological science course with permission of the instructors, or equivalent. Basic knowledge of cellular and molecular biology is required.) (Open to U3 and graduate students only.) (Graduate Studies: strongly recommended for M.Sc. students in Psychiatry.) Current theories on the neurobiological basis of most well known mental disorders (e.g. schizophrenia, depression, anxiety, dementia). Methods and strategies in research on genetic, physiological and biochemical factors in mental illness will be discussed. Discussion will also focus on the rationale for present treatment approaches and on promising new approaches.

PSYT 502 BRAIN EVOLUTION AND PSYCHIATRY. (3) (Fall) (Prerequisites: BIOL 115 or equivalent as authorized by instructor) The course will focus on the transcendental importance of evolution of nervous systems for normal and pathological behavior. Studies of allometric brain growth and recent evolutionary theories of brain organization as they relate to normal and abnormal behavior will be emphasized.

12.28 Psychology (PSYC)

Stewart Biological Sciences Building, Room W8/1
1205 Avenue Docteur Penfield
Montreal, QC, H3A 1B1

Telephone: (514) 398-6100
Fax: (514) 398-4896
Email: info@psych.mcgill.ca
Website: www.psych.mcgill.ca

Chair — K.B.J. Franklin

Emeritus Professors

Albert S. Bregman; M.A.(Tor.), Ph.D.(Yale)
Virginia I. Douglas; B.A.(Qu.), M.A., M.S.W., Ph.D.(Mich.)
Wallace E. Lambert; M.A.(Colgate), Ph.D.(N.Carolina), F.R.S.C.
Ronald Melzack; M.Sc., Ph.D.(McG.), F.R.S.C. (*E.P. Taylor
Emeritus Professor of Psychology*)
Peter M. Milner; B.Sc.(Leeds), M.Sc., Ph.D.(McG.)

Professors

Frances E. Aboud; B.A.(Tor.), M.A., Ph.D.(McG.)
Irving M. Binik; B.A.(N.Y.U.), B.H.L.(Jewish Theological
Seminary), M.A., Ph.D.(Penn.)
Blaine Ditto; B.S.(Iowa), Ph.D.(Ind.)
Kevin Dunbar; B.A., M.A.(University College of Dublin),
Ph.D.(Tor.)
Keith B.J. Franklin; B.A., M.A.(Auck.), Ph.D.(Lond.)
Fred H. Genesee; B.A.(W.Ont.), M.A., Ph.D.(McG.)
Jeffrey S. Mogil; B.Sc.(Tor.), Ph.D.(UCLA)
A.A.J. Marley; B.Sc.(Birm.), Ph.D.(Calif.)
Debbie S. Moskowitz; B.S.(Kirkland), M.A., Ph.D.(Ct.)
David J. Ostry; B.A.Sc., M.A.Sc., Ph.D.(Tor.)
Laura Ann Petitto; B.S.(Ramapo St.), M.A.(N.Y.U.), Ph.D.(Harv.)
Michael Petrides; B.Sc., M.Sc.(Lond.), Ph.D.(Cantab.)
Robert O. Pihl; B.A.(Lawrence), Ph.D.(Ariz.)
James O. Ramsay; B.Ed.(Alta.), Ph.D.(Prin.)
Barbara B. Sherwin; B.A., M.A., Ph.D.(C'dia) (*James McGill
Professor*)
Thomas R. Shultz; B.A.(Minn.), Ph.D.(Yale)
Yoshio Takane; B.L., M.A.(Tokyo), Ph.D.(N.Carolina)
Donald M. Taylor; B.A., M.A., Ph.D.(W.Ont.)
Norman M. White; B.A.(McG.), M.S., Ph.D.(Pitt.)
David C. Zuroff; B.A.(Harv.), M.A., Ph.D.(Conn.)

Associate Professors

A.G. Baker; B.A.(U.B.C.), M.A., Ph.D.(Dal.)
Mark Baldwin; B.A.(Tor.), M.A., Ph.D.(Waterloo)
Avi Chaudhuri; B.Sc., M.Sc.(Tor.), Ph.D.(Berk.) (*James McGill
Professor*)
Don C. Donderi; B.A., B.Sc.(Chic.), Ph.D.(C'nell)
Richard F. Koestner; B.A., Ph.D.(Roch.)
John Lydon; B.A.(Notre Dame), M.A., Ph.D.(Wat.)
Morton J. Mendelson; B.Sc.(McG.), A.M., Ph.D.(Harv.)
Gillian A. O'Driscoll; B.A.(Wellesley), M.A., Ph.D.(Harv.) (*William
Dawson Scholar*)

Assistant Professors

John R.Z. Abela; B.A.(Brown), M.A., Ph.D.(Penn.)
Baerbel Knaeuper; Diploma, Dr. phil. (U. of Mannheim), Dr. phil.
habil. (Free University of Berlin)
Daniel J. Levitin; A.B.(Stan.), M.S., Ph.D.(Oregon)
Karim Nader; B.Sc., Ph.D.(Tor.)

Lecturers

Nicole Allard; B.A.(W.Ont.), M.A.(Guelph), M.Ed.(McG.)
Rhonda Amsel; B.Sc., M.Sc.(McG.)

Associate Members

Clinical Research Institute of Montreal: Terrance J. Coderre
Douglas Hospital: Howard Steiger
Family Medicine: Vilma Patel
Montreal Neurological Institute: Barbara Jones, Marilyn Jones-
Gotman, Brenda Milner, Tomas Paus, Robert Zatorre
Psychiatry: Frances Abbott
Vision Research Unit (Ophthalmology): Curtis Baker, Robert Hess,
Frederick A.A. Kingdom, Kathleen Mullen

Part-time Appointments

Geert-Jan Boudewijnse; B.Sc., M.Sc.(U. of Leiden, The
Netherlands), Ph.D.(McG.)
Ian F. Bradley; B.Sc., M.Sc.(Tor.), Ph.D.(Wat.)
Judith LeGallais; B.A., M.A., Ph.D.(McG.)
Francesco Leri; B.A., M.A., Ph.D.(McG.)
Marco Leyton; B.Sc.(Memorial), M.A., Ph.D.(Conc.)
Sonia Lupien; B.Sc., M.Sc., Ph.D.(Montr.)
James C. Macdougall; B.A.(Car.), M.A., Ph.D.(McG.)
Zbigniew Pleszewski; M.A., Ph.D.(U. of Poznan)
Zeev Rosberger; B.Sc.(McG.), M.A., Ph.D.(Conc.)
Yuriko Oshima-Takane; B.A., M.A.(Tokyo), Ph.D.(McG.)
Carol Schopflocher; B.A.(W.Ont.), M.A.(Queen's)
Y. Steinert; B.A.(Hebrew), Ph.D.(Montr.)
Camilo Zaccchia; B.A.(McG.), M.S.(Florida State), Ph.D.(McG.)
Philip R. Zelazo; B.A.(Amer.Int'l.Coll.), M.S.(N.Carolina),
Ph.D.(Wat.)

The Department of Psychology offers programs in both Arts and Science. Students planning to do a B.A. Honours, Major or Minor Concentrations should refer to the Faculty of Arts section 12.39 for B.A. program information.

Psychology is the scientific study of mind and behaviour. It is both a social and a biological science. As a social science, psychology studies social interactions. As a biological science, it regards humans as the product of evolution and so studies them in biological perspective, comparing and contrasting human behaviour with that of other species.

The data of psychology are collected within the psychological laboratory by the use of experimental methods in the study of behaviour, and outside the laboratory by systematic observation of the behaviour of humans and animals. The aim is to formulate general principles of perception, learning, motivation, cognition and social psychology that are relevant to different aspects of human life. Experimentation, laboratory techniques, observational procedures, measurement, and statistical methods are important tools of the psychologist.

Psychology has many interdisciplinary aspects. The study of psychological problems often involves knowledge drawn from other disciplines such as biology, physiology, linguistics, sociology, philosophy, and mathematics. For this reason a student with varied interests can frequently find a place for these in psychology.

Psychology is a young science so that explanations of the processes underlying observed phenomena are often theoretical and speculative. The major objectives of psychological study are to reduce the discrepancy between theory and fact and to provide better answers about why humans think and behave as they do.

Although a number of undergraduate courses in psychology have applied implications, applied training is not the purpose of the undergraduate curriculum. Its purpose is to introduce the student to an understanding of the basic core of psychological knowledge, theory, and method, regardless of questions of practical application.

The B.Sc. or B.A. with a Major or Honours degree in psychology is not a professional qualification. It does not qualify the individual to carry on professional work in psychology. In the Province of Québec the minimum requirement for membership in the Order of Psychologists, the professional association governing the work of psychologists in the province, is an M.A. or M.Sc. degree, or other equivalent degree. All students planning to practise in the Province of Québec will be examined on their proficiency in French before being admitted to the professional association. Undergraduate courses in psychology may prove of considerable value to students planning careers in professional fields other than psychology. These include but are not restricted to medicine, education, social work, human communication sciences, or business and industry.

Students who are interested in psychology as a career must pursue graduate studies. Persons who hold graduate degrees in psychology, usually the Ph.D., may find employment in universities, research institutes, hospitals, community agencies, government departments, large corporations, or may act as self-employed consultants. At the graduate level, psychology has

many specialized branches including social psychology, physiological psychology, experimental psychology, clinical psychology, child psychology, industrial psychology, community psychology, educational psychology, and others.

Requirements for admission to graduate studies in psychology vary from one university to another and from one country to another. Nonetheless, both the Honours and Major degrees in psychology *may* qualify the student for admission to many graduate schools, provided that sufficiently high grades are obtained. During the U2 year, undergraduate students are strongly advised to verify the admission requirements of various graduate programs. This is to ensure that sufficient time is available for students to complete all necessary requirements for admission to their preferred graduate programs.

The essential differences between the Honours and the Major program are an emphasis on research methodology courses and practice in the Honours program, and that higher academic standards are required of Honours students. Honours students also have an opportunity to work in small groups closely with staff members.

INFORMATION MEETINGS FOR NEW STUDENTS

All new students entering the Psychology undergraduate program are required to attend an Information Meeting prior to registration. Students who have been accepted into a Bachelor of Science program in Psychology must attend the meeting on August 26, 2002 at 13:00. The meeting will be held in Room S1/4 of the Stewart Biological Sciences Building. Students accepted into a Bachelor of Arts program must attend a separate information meeting. For details, consult the Psychology program listing in the Faculty of Arts section. At this meeting, Nicole Allard, the Academic Adviser, will explain the requirements of the Department's programs. Incoming students will have an opportunity to ask questions and receive advice on how to plan their courses. After this meeting students will make appointments for individual advising sessions, during which they will fill out their Study Plan form for registration.

(For students entering the Psychology program in the winter term 2003, there will be an Information Meeting on December 19th at 11:30 in Room N2/2D of the Stewart Biology Building).

Entering students must bring their letter of acceptance and a copy of their collegial transcript(s). They will also need this Calendar and a preliminary Class Schedule. Students will also find the Psychology Department Handbook helpful. It contains more detailed descriptions of psychology courses, as well as providing guidelines for how students might pursue particular areas of interest. The Handbook is available on the Department website, <http://www.psych.mcgill.ca/ugrad/ugradm.htm>

MINOR PROGRAM IN PSYCHOLOGY (24 credits)

[Program revisions are under consideration for September 2002. Go to <http://www.mcgill.ca> (Course Calendars) in July for details.]

A Minor program in Psychology is available to students registered in any B.Sc. program (other than Psychology). This program is intended to complement a student's primary field of study by providing a focused introduction to specialized topics in psychology.

A separate Minor Concentration exists for students registered in a program in the Faculty of Arts. Please consult the Psychology listing in the Faculty of Arts section for more information.

The Minor program for Science students requires the completion of 24 credits, of which no more than 6 may overlap with the primary program. All courses in the Minor program must be passed with a minimum grade of C. A prerequisite to the program is PSYC 204 or equivalent, see "[Course Overlap](#)" on page 362.

Complementary Courses (24 credits)

at least 3, but no more than 6, credits selected from:

- PSYC 211 (3) Intro. Behavioural Neuroscience
- PSYC 212 (3) Perception
- PSYC 213 (3) Cognition
- PSYC 215 (3) Social Psychology

18-21 credits selected from among Psychology courses at the 300 level or above

FACULTY, MAJOR, HONOURS PROGRAMS IN PSYCHOLOGY

[Program revisions are under consideration for September 2002. Go to <http://www.mcgill.ca> (Course Calendars) in July for details.]

Recommended Background

It is expected that most students who enter a Major, Honours or Faculty Program in Psychology will have taken introductory psychology, biology and statistics at the collegial level. Recommended CEGEP courses include: Psychology 350-101 or 350-102 or equivalent, Biology CEGEP objective 00UK, 00XU or equivalent, Statistics (Mathematics) 201-307 or 201-337 or equivalent. Students must obtain a minimum grade of 75% in their CEGEP level statistics course. In the first year those students who have not taken the recommended collegial level statistics course, or those who have obtained a grade below 75%, must take Psychology PSYC 204. Those who have not taken the recommended collegial level biology must take BIOL 111 or BIOL 112, and those who have not taken Introductory Psychology in college must take PSYC 100.

Areas of Specialization:

The study of psychology covers many fields. To develop a breadth of understanding in psychology, students are expected to obtain knowledge beyond the introductory level in several areas of psychology. To ensure this requirement is met, Psychology courses are divided into six areas of specialization. Some courses are included in two or more areas of specialization. These courses may only be counted for credit in one area. The areas are listed below.

Cognitive Psychology

- PSYC 310 (3) Human Intelligence
- PSYC 311 (3) Human Cognition and the Brain
- PSYC 316 (3) Psychology of Deafness
- PSYC 341 (3) Psychology of Bilingualism
- PSYC 343 (3) Language Acquisition in Children
- PSYC 352 (3) Laboratory in Cognitive Psychology
- PSYC 353 (3) Laboratory in Human Perception
- PSYC 410 (3) Special Topics in Neuropsychology
- PSYC 413 (3) Cognitive Development
- PSYC 472 (3) Scientific Thinking and Reasoning
- PSYC 473 (3) Social Cognition and the Self
- PSYC 530 (3) Applied Topics in Deafness
- PSYC 532 (3) Cognitive Science

Health Psychology and Psychopathology

- PSYC 316 (3) Psychology of Deafness
- PSYC 332 (3) Introduction to Personality
- PSYC 337 (3) Intro: Abnormal Psychology 1
- PSYC 338 (3) Intro: Abnormal Psychology 2
- PSYC 408 (3) Principles of Cognitive Behaviour Therapy
- PSYC 412 (3) Deviations in Child Development
- PSYC 429 (3) Health Psychology
- PSYC 436 (3) Human Sexuality and its Problems
- PSYC 491D1 (3) Advanced Study: Behavioural Disorders
- and PSYC 491D2 (3) Advanced Study: Behavioural Disorders
- PSYC 505 (3) The Psychology of Pain
- PSYC 530 (3) Applied Topics in Deafness
- PSYC 533 (3) International Health Psychology
- PSYC 534 (3) Community Psychology

Behavioural Neuroscience

- PSYC 308 (3) Behavioural Neuroscience 1
- PSYC 311 (3) Human Cognition and the Brain
- PSYC 318 (3) Behavioural Neuroscience 2
- PSYC 342 (3) Hormones and Behaviour
- PSYC 353 (3) Laboratory in Human Perception
- PSYC 410 (3) Special Topics in Neuropsychology
- PSYC 427 (3) Sensorimotor Behaviour
- PSYC 470 (3) Memory and Brain
- PSYC 505 (3) The Psychology of Pain
- PSYC 522 (3) Neurochemical Basis of Behaviour
- PSYC 526 (3) Advances in Visual Perception

Social and Personality

- PSYC 331 (3) Inter-Group Relations
- PSYC 332 (3) Introduction to Personality

- PSYC 333 (3) Personality and Social Psychology
- PSYC 351 (3) Research Methods in Social Psychology
- PSYC 414 (3) Social Development
- PSYC 471 (3) Human Motivation
- PSYC 473 (3) Social Cognition and the Self
- PSYC 474 (3) Interpersonal Relationships
- PSYC 534 (3) Community Psychology
- PSYC 535 (3) Advanced Topics in Social Psychology

Developmental

- PSYC 304 (3) Child Development
- PSYC 343 (3) Language Acquisition in Children
- PSYC 412 (3) Deviations in Child Development
- PSYC 413 (3) Cognitive Development
- PSYC 414 (3) Social Development
- PSYC 416 (3) Advanced Topics in Child Development
- PSYC 511 (3) Infant Competence
- PSYC 561 (3) Methods in Developmental Psycholinguistics

Research and Measurement

- PSYC 310 (3) Human Intelligence
- PSYC 336 (3) Measurement of Psych. Processes
- PSYC 351 (3) Research Methods in Social Psychology
- PSYC 352 (3) Laboratory in Cognitive Psychology
- PSYC 353 (3) Laboratory in Human Perception
- PSYC 403 (3) Modern Psychology in Historical Perspective
- PSYC 406 (3) Psychological Tests and Measurements
- PSYC 450D1 (3) Research Project and Seminar
- and PSYC 450D2 (3) Research Project and Seminar
- PSYC 451 (3) Human Factors Research and Techniques
- PSYC 492 (3) Seminar in Special Topics
- PSYC 493 (3) Seminar in Special Topics
- PSYC 495 (3) Psychology Research Project
- PSYC 510 (3) Statistical Analysis of Tests
- PSYC 531 (3) Structural Equation Models
- PSYC 536 (3) Correlational Techniques

B.Sc. FACULTY PROGRAM IN PSYCHOLOGY (54 credits)

[Program revisions are under consideration for September 2002. Go to <http://www.mcgill.ca> (Course Calendars) in July for details.]

NOTE: Students in the Faculty of Science who select Arts courses must have a total of at least 54 credits in Science courses among the 90 credits for the B.Sc. degree. Students are expected to have whatever prerequisites are described in this Calendar.

A Faculty Program in Psychology is a sequence of courses which represents a lesser degree of specialization than a Major or an Honours program. A minimum grade of C is required in all 54 program credits.

U1 Required Courses (12 credits)

- PSYC 211 (3) Intro. Behavioural Neuroscience
- PSYC 212 (3) Perception
- PSYC 213 (3) Cognition
- PSYC 215 (3) Social Psychology

Note: PSYC 100 may be taken as a corequisite with these basic courses.

Complementary Courses (42 credits)

- 12 credits of Psychology courses:
select 6 credits from each of two of the six areas of specialization
- 12 credits of Psychology courses, selected from:
courses at the 300 level or above, at least 6 of which must be at the 400 level or higher
- 18 credits, 9 of which must be at the 300 level or higher, selected from any departments within the University other than Psychology, consistent with regulations of the Faculty of Science.

B.Sc. MAJOR PROGRAM IN PSYCHOLOGY (54 credits)

[Program revisions are under consideration for September 2002. Go to <http://www.mcgill.ca> (Course Calendars) in July for details.]

Students majoring in Psychology must obtain a minimum grade of C in all 54 credits of the program. A grade lower than C may be made up by taking another equivalent course (if there is one), by successfully repeating the course, or by successfully writing a supplemental examination (if there is one).

A course can be considered to fulfill only one requirement. For example, if PSYC 413 is taken to satisfy part of the requirement for 9 complementary credits in psychology at the 400 level, it may not be counted towards the completion of 6 credits in the Cognitive Psychology area of specialization.

U1 Required Courses (12 credits)

- PSYC 211 (3) Intro. Behavioural Neuroscience
- PSYC 212 (3) Perception
- PSYC 213 (3) Cognition
- PSYC 215 (3) Social Psychology

Note: PSYC 100 may be taken as a corequisite with these basic courses.

U1 or U2 Required Course (3 credits)

- PSYC 305 (3) Statistics for Experimental Design

Complementary Courses (39 credits)

- 18 credits of Psychology courses:
select 6 credits from each of three of the six areas of specialization.
- 9 credits of Psychology courses,
selected from courses at the 400 or 500 level.
- 12 credits at the 300 level or higher, selected from Psychology (PSYC), Anatomy and Cell Biology (ANAT), Biology (BIOL), Biochemistry (BIOC), Chemistry (CHEM), Computer Science (COMP), Mathematics (MATH), Physiology (PHGY), Psychiatry (PSYT).

B.Sc. HONOURS PROGRAM IN PSYCHOLOGY (54 credits)

[Program revisions are under consideration for September 2002. Go to <http://www.mcgill.ca> (Course Calendars) in July for details.]

Honours in Psychology prepares students for graduate study, and so emphasizes practice in the research techniques which are used in graduate school and professionally later on. Students are accepted into Honours at the beginning of their U2 year, and the two-year sequence of Honours courses continues through U3. Admission to Honours is selective. There is normally room for 25-30 new Honours students each year. Students with a cumulative grade point average of 3.00 or better are eligible to apply; however during the past several years it has been possible to accept a maximum of 30 students with averages above 3.50 based on a 27-30 graded credit program over 2 terms. Once in the Honours program, the student must obtain a GPA of 3.00 in the U2 year in order to continue in the program for U3. Students in the Honours program are required to complete a minimum of 27 graded credits per academic year (Fall and Winter semesters).

Applications can be obtained from the Undergraduate Office of the Department of Psychology, Room N7/9A, Stewart Biological Sciences Building. The applications must be completed and returned to the Undergraduate Office by August 15, 2002. Candidates will be advised of the Department's decision through a notice posted in front of the Undergraduate Adviser's Office, N7/9, before classes begin in September.

Students should note that awarding of the Honours degree will depend on both cumulative grade point average and a minimum grade of B on PSYC 380D1/PSYC 380D2, PSYC 481D1/PSYC 481D2, PSYC 482 and PSYC 483. "First Class Honours" is awarded to students who obtain a minimum cumulative grade point average of 3.50 and a minimum CGPA of 3.50 in the four Honours courses of which 12 out of 18 credits received at least an A- grade. "Honours" is awarded to students with a minimum cumulative grade point average of 3.00 and a minimum GPA of 3.00 on each of the four honours courses. Moreover, the awarding of the Honours degree normally requires completion of two full years of study, U2 and U3, in the Psychology Department. Exceptionally

good students may be admitted for the U3 year only on the basis of their marks and research experience, however these students must complete 6 credits in each of three areas of specialization.

U1 Required Courses (12 credits)

PSYC 211 (3) Intro. Behavioural Neuroscience
 PSYC 212 (3) Perception
 PSYC 213 (3) Cognition
 PSYC 215 (3) Social Psychology

Note: PSYC 100 may be taken as a corequisite with these basic courses.

U1 or U2 Required Course (3 credits)

PSYC 305 (3) Statistics for Experimental Design

U2 Required Courses (6 credits)

PSYC 380D1 (3) Honours Research Project and Seminar
 PSYC 380D2 (3) Honours Research Project and Seminar

U3 Required Courses (12 credits)

PSYC 481D1 (3) Honours Thesis Research
 PSYC 481D2 (3) Honours Thesis Research
 PSYC 482 (3) Advanced Honours Seminar 1
 PSYC 483 (3) Advanced Honours Seminar 2

Complementary Courses (21 credits)

12 credits of Psychology courses:

select 6 credits from each of two of the six areas of specialization

9 credits at the 300 level or higher selected from: Psychology (PSYC), Anatomy and Cell Biology (ANAT), Biology (BIOL), Biochemistry (BIOC), Chemistry (CHEM), Computer Science (COMP), Mathematics (MATH), Physiology (PHGY), Psychiatry (PSYT).

COURSE DESCRIPTIONS

NOTE: Prerequisites: A basic introductory course in psychology is a prerequisite for all Psychology courses with the following exceptions: PSYC 100, PSYC 204, PSYC 211, PSYC 212, PSYC 213, PSYC 215, PSYC 305. All courses are open to students other than Major and Honours students in Psychology provided the prerequisites are met and unless otherwise specified.

For more detailed information about courses and programs in Psychology consult the Department's Website <http://www.psych.mcgill.ca/courses/courses.htm>.

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

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

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

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

PSYC has replaced 204 as the prefix for Psychology courses.

All courses have limited enrolment.

● Denotes courses not offered in 2002-03.

PSYC 100 INTRODUCTION TO PSYCHOLOGY. (3) (Fall) (2 lectures; 1 conference) (Not open to students who have passed an Introductory Psychology course in CEGEP: 350-101 or 350-102 or equivalent) Introduction to the scientific study of mind and behavior. Learning, perception, motivation and thinking are explained in a way which emphasizes the continuity of human behavior and the behavior of other species, and which emphasizes the role of the central nervous system in organizing and regulating behavior.

PSYC 204 INTRODUCTION TO PSYCHOLOGICAL STATISTICS. (3) (Fall and Winter) (2 lectures, 1 conference) (Not open to students who

have passed a CEGEP statistics course(s) with a minimum grade of 75%: Mathematics 201-307 or 201-337 or equivalent or the combination of Quantitative Methods 300 with Mathematics 300) (This course is a prerequisite for PSYC 305, PSYC 406, PSYC 310, PSYC 336) (Credit for other statistics courses may preclude credit for this course and conversely.) The statistical analysis of research data; frequency distributions; graphic representation; measures of central tendency and variability; elementary sampling theory and tests of significance.

PSYC 211 INTRODUCTORY BEHAVIOURAL NEUROSCIENCE. (3) (Winter) (2 lectures) (Prerequisite: PSYC 100 or equivalent) (Section 01 Limited to Psychology Major and Honours students) (Section 02 Limited to Psychology Minor students) (Section 03 Limited to non-Psychology students) An introduction to contemporary research on learning, memory and motivation, from behavioural, biological and evolutionary perspectives. Topics include: internal and external influences on behaviour, biological constraints on motivation and learning, conditioning and cognitive processes. Much of the material will be drawn from the experimental literature on research with animals.

PSYC 212 PERCEPTION. (3) (Fall) (2 lectures, 1 conference) (Section 01 Limited to Psychology Major and Honours students) (Section 02 Limited to Psychology Minor students) (Section 03 Limited to non-Psychology students) Perception is the organization of sensory input into a representation of the environment. Topics include: survey of sensory coding mechanisms (visual, auditory, tactile, olfactory, gustatory), object recognition, spatial localization, perceptual constancies and higher level influences.

PSYC 213 COGNITION. (3) (Winter) (2 lectures, 1 conference) (Section 01 Limited to Psychology Major and Honours students) (Section 02 Limited to Psychology Minor students) (Section 03 Limited to non-Psychology students) The study of human information processing. What is the nature of thought? How does it arise in the mind and brain? How can empirical research inform these questions? This course presents a survey of major topics and controversies in the study of cognition, emphasizing interdisciplinary approaches.

PSYC 215 SOCIAL PSYCHOLOGY. (3) (Fall) (3 lectures) (Not open to students who have taken PSYC 330, MGCR 221 or SOCI 216) (Section 01 Limited to Psychology Major and Honours students) (Section 02 Limited to Psychology Minor students) (Section 03 Limited to non-Psychology students) The course offers students an overview of the major topics in social psychology. Three levels of analysis are explored beginning with individual processes (e.g., attitudes, attribution), then interpersonal processes (e.g., attraction, communication, love) and finally social influence processes (e.g., conformity, norms, roles, reference groups).

PSYC 301 LEARNING. (3) (Fall) (Prerequisite(s): PSYC 211 or PSYC 213 or permission of instructor.) (Not open to students who have taken PSYC 211 prior to the 2000-01 academic year.) An introduction to contemporary and historical psychological research on learning from a behavioural, cognitive and biological perspective. Topics include classical and instrumental conditioning, cognitive learning processes, and biological constraints. The status and history of North American behaviourism will be discussed and compared with cognitive and other approaches.

PSYC 304 CHILD DEVELOPMENT. (3) (Fall) (2 lectures, 1 conference) (Prerequisites: two courses from PSYC 211, PSYC 212, PSYC 213, and PSYC 215 or permission of the instructor) (This course is a prerequisite for PSYC 412, PSYC 413, PSYC 414, PSYC 416) (Section 01 Limited to Psychology Major and Honours students) (Section 02 Limited to Psychology Minor students) (Section 03 Limited to non-Psychology students) A basic introduction to developmental psychology. Various aspects of psychological development in children are considered, including prenatal development and infancy, perceptual and cognitive development, language acquisition, social and personality development and social interaction.

PSYC 305 STATISTICS FOR EXPERIMENTAL DESIGN. (3) (Fall and Winter) (2 lectures; 1 conference) (Prerequisite: PSYC 204 or

equivalent) (This course is required of all students who propose to enter an Honours or Major program in Psychology) (Credit for other statistics courses may preclude credit for this course and conversely) (Section 01 Limited to Psychology Major and Honours students) (Section 02 Limited to Psychology Minor students) (Section 03 Limited to non-Psychology students) An introduction to the design and analysis of experiments, including analysis of variance, planned and post hoc tests and a comparison of anova to correlational analysis.

PSYC 308 BEHAVIOURAL NEUROSCIENCE 1. (3) (Fall) (2 lectures, 1 conference) (Prerequisite: BIOL 111 or BIOL 112 or BIOL 115 or equivalent) (Not open to students who have taken or are taking PHGY 314) The neural basis of mammalian behavior. Basic neuroanatomy, neurophysiology and neurochemistry. Sensory and motor systems. How the nervous system acquires and integrates information and uses it to produce behavior.

● **PSYC 310 HUMAN INTELLIGENCE.** (3) (2 lectures) (Prerequisite: PSYC 204 or any equivalent course)

PSYC 311 HUMAN COGNITION AND THE BRAIN. (3) (Fall) (2 lectures, 1 conference) (Section 01 Limited to Psychology Major and Honours students) (Section 02 Limited to Psychology Minor students) (Section 03 Limited to non-Psychology students) The course is an introduction to the field studying how human cognitive processes, such as perception, attention, language, learning and memory, planning and organization, are related to brain processes. The material covered is primarily based on studies of the effects of different brain lesions on cognition and studies of brain activity in relation to cognitive processes with modern functional neuroimaging methods.

PSYC 316 PSYCHOLOGY OF DEAFNESS. (3) (Winter) (2 lectures; 1 conference) (Prerequisite: PSYC 100 or equivalent or permission of instructor) (Not open to students who have taken PSYC 457) (Section 01 Limited to Psychology students) (Section 02 Limited to non-Psychology students) Basic introduction to the field of deafness from a psychological perspective. Topics include effect of deafness on sensory, perceptual, cognitive, intellectual and linguistic processes. Impact of deafness on children and families. Opportunity to learn basic concepts in American Sign Language (ASL) in the context of deaf culture.

PSYC 318 BEHAVIOURAL NEUROSCIENCE 2. (3) (Winter) (2 lectures, 1 conference) (Prerequisite: PSYC 308 or PSYC 311 or BIOL 306 or PHGY 314) Physiological bases of motivation including feeding and drinking, sexual and parental behaviour. Physiological processes in reinforcement and learning.

● **PSYC 331 INTER-GROUP RELATIONS.** (3) (2 lectures) (Prerequisite: PSYC 215)

PSYC 332 INTRODUCTION TO PERSONALITY. (3) (Winter) (3 lectures) (Prerequisite: PSYC 100) (Section 01 Limited to Psychology Major and Honours students) (Section 02 Limited to Psychology Minor students) (Section 03 Limited to non-Psychology students) This course examines some of the major theories of personality, e.g., those of Freud, Rogers, and Bandura. Empirical research inspired by these theories will also be examined. Topics include the nature of human motivation, the role of the self-concept, and the consistency and stability of personality.

PSYC 333 PERSONALITY AND SOCIAL PSYCHOLOGY. (3) (Fall) (2 lectures) (Prerequisite: PSYC 215) (Section 01 Limited to Psychology Major and Honours students) (Section 02 Limited to Psychology Minor students) (Section 03 Limited to non-Psychology students) The course will consider traditional approaches to person-situation interactions and a more dynamic approach based on recent research on goals and social cognition.

● **PSYC 334 COMPUTER SIMULATION - PSYCHOLOGICAL PROCESSES.** (3) (3 hour lecture) (Prerequisites: PSYC 212, PSYC 213 and COMP 202; or permission of instructor)

● **PSYC 335 FORMAL MODELS: PSYCHOLOGICAL PROCESSES.** (3) (3 hour lecture) (Prerequisites: A basic understanding of mathematics, e.g. the contents of MATH 112, and of computer science, e.g. the contents of COMP 202 or permission of instructor)

● **PSYC 336 MEASUREMENT OF PSYCHOLOGICAL PROCESSES.** (3) (3 lectures) (Prerequisites: PSYC 204 and Introductory Calculus)

PSYC 337 INTRO: ABNORMAL PSYCHOLOGY 1. (3) (Fall) (2 lectures, 1 conference) (This course is prerequisite for PSYC 338) (Section 01 Limited to Psychology Major and Honours students) (Section 02 Limited to Psychology Minor students) (Section 03 Limited to non-Psychology students) A survey of the genetic, physiological and environmental origins of intellectual and emotional disorders.

PSYC 338 INTRO: ABNORMAL PSYCHOLOGY 2. (3) (Winter) (2 lectures, 1 conference) (Prerequisite: PSYC 337) (This course is prerequisite for PSYC 491) (Section 01 Limited to Psychology Major and Honours students) (Section 02 Limited to Psychology Minor students) (Section 03 Limited to non-Psychology students) An introduction to psychotic behaviour problems, character disorders and behaviour modification.

● **PSYC 341 THE PSYCHOLOGY OF BILINGUALISM.** (3) (2 lectures) (Prerequisites: Introductory Psychology, and PSYC 340 or introduction to linguistics; or permission of instructor)

PSYC 342 HORMONES AND BEHAVIOUR. (3) (Winter) (2 lectures) (Prerequisite: BIOL 111, BIOL 112, BIOL 115 or equivalent) (Section 01 Limited to Psychology Major and Honours students) (Section 02 Limited to Psychology Minor students) (Section 03 Limited to non-Psychology students) The role of hormones in organization of CNS function, as effectors of behaviour, in expression of behaviours and in mental illness.

● **PSYC 343 LANGUAGE LEARNING IN CHILDREN.** (3) (2 lectures plus conference)

● **PSYC 351 RESEARCH METHODS IN SOCIAL PSYCHOLOGY.** (3) (1 hour lecture, 6 hour lab and/or field work) (Prerequisite: PSYC 215. Pre-/Co-requisite: PSYC 305. U2 level and above. Requires departmental approval.)

● **PSYC 352 LABORATORY IN COGNITIVE PSYCHOLOGY.** (3) (1 hour lecture, weekly lab) (Prerequisite: PSYC 213. Requires departmental approval.)

PSYC 353 LABORATORY IN HUMAN PERCEPTION. (3) (Winter) (1 hour lecture plus 3 hour lab) (Prerequisites: PSYC 212, U2 level or above. Requires departmental approval.) (Students will be admitted on the basis of a written application on forms available from the Department (Room N7/9). Applications must be submitted by August 15) Students will be introduced to standard psychophysical procedures and data analysis techniques, and will have the opportunity to design and carry out their own experiments. Research topics include: visual acuity, form and motion perception, and visual search. Evaluation based on individually written reports on lab experiments.

PSYC 380D1 HONOURS RESEARCH PROJECT AND SEMINAR. (3) (Fall) (3 hour seminar) (For U2 honours students only. Requires departmental approval.) (Students must also register for PSYC 380D2) (No credit will be given for this course unless both PSYC 380D1 and PSYC 380D2 are successfully completed in consecutive terms) Students prepare reports on various experimental areas. They also carry out research under the direction of staff members. Students present reports on progress and write a final research report.

PSYC 380D2 HONOURS RESEARCH PROJECT AND SEMINAR. (3) (Winter) (Prerequisite: PSYC 380D1) (No credit will be given for this course unless both PSYC 380D1 and PSYC 380D2 are successfully completed in consecutive terms) See PSYC 380D1 for course description.

PSYC 403 MODERN PSYCHOLOGY IN HISTORICAL PERSPECTIVE. (3) (Fall) (2 lectures) (Section 01 Limited to Psychology students) (Section 02 Limited to non-Psychology students) A survey of the scientific and ideological influences on psychology from its philosophical beginnings through the period of the schools to its modern situation.

PSYC 406 PSYCHOLOGICAL TESTS AND MEASUREMENTS. (3) (Winter) (2 lectures) (Prerequisite: PSYC 204 or equivalent) (Section 01 Limited to Psychology students) (Section 02 Limited to non-

Psychology students) An introduction to the theory and practice of psychological measurement in health, educational, clinical and industrial/organizational settings. Attention to procedures for developing and validating assessment devices. Techniques include: intelligence tests, projective tests, questionnaires, structured interviews, rating scales, and behavioural/performance tests.

PSYC 408 PRINCIPLES OF COGNITIVE BEHAVIOUR THERAPY. (3) (Fall) (2 lectures) (Prerequisites: PSYC 337 and PSYC 211 or permission of instructor) An introduction to the theory, research and practice of cognitive behaviour therapy. The experimental approach to understanding human behaviour is used to follow basic principles of learning and their clinical application. Certain psychiatric disorders such as alcoholism and depression are highlighted to illustrate how a behaviour therapist conceptualizes problems and formulates treatments.

PSYC 410 SPECIAL TOPICS IN NEUROPSYCHOLOGY. (3) (Winter) (2 lectures) (Prerequisites: PSYC 311 or PSYC 308. Knowledge of basic neuropsychology at the level covered in PSYC 311 is assumed) This course will trace developments in human brain mapping and in cognitive neuroscience via readings from primary sources. Topics include the neural bases for perception, language, and memory, and their relationship to structural and functional brain organization. Emphasis is placed on integrating knowledge from behavioral lesion experiments and functional activation studies.

PSYC 412 DEVIATIONS: CHILD DEVELOPMENT. (3) (Fall) (2 lectures, 1 conference) (Prerequisite: PSYC 304 or PSYC 337 or permission of instructor. Students will also require a basic knowledge of research design) (Section 01 Limited to Psychology students) (Section 02 Limited to non-Psychology students) This course focuses on deviations in the perceptual, cognitive, social, and emotional development of children. Emphasis is placed on research exploring constitutional and environmental causes and symptoms associated with such disorders as depressive spectrum disorders, anxiety disorders, conduct disorder, autism, schizophrenia, attention deficit hyperactivity disorder, eating disorders, and substance abuse.

● **PSYC 413 COGNITIVE DEVELOPMENT.** (3) (3 hours) (Prerequisite: PSYC 304 or PSYC 213 or equivalent)

● **PSYC 414 SOCIAL DEVELOPMENT.** (3) (Prerequisites: PSYC 304 and PSYC 305)

PSYC 416 TOPICS IN CHILD DEVELOPMENT. (3) (Winter) (3 lectures) (Prerequisite: PSYC 304 or permission of instructor) (Section 01 Limited to Psychology students) (Section 02 Limited to non-Psychology students) Theory and recent research on child development. Topics will vary, but will concern psychological issues related to infants, children, and adolescents, and will take account of contexts, such as families, schools, peer groups, and cultures.

PSYC 427 SENSORIMOTOR BEHAVIOUR. (3) (Winter) (2 lectures) (Prerequisite: PSYC 308 or permission of instructor) A systematic examination of motor control, drawing on models and data from both behavioural and physiological studies. Topics include: mechanical properties of muscles, motor unit properties and force production; proprioceptors, spinal reflex organization, motor cortex, cerebellum, basal ganglia.

PSYC 429 HEALTH PSYCHOLOGY. (3) (Winter) (2 lectures, 1 conference) (Prerequisite: PSYC 337 or, in the case of advanced undergraduates, permission of instructor) (Section 01 Limited to Psychology students) (Section 02 Limited to non-Psychology students) A survey of health psychology including a review of psychological factors involved in the development of physical illness. Assessment and intervention strategies for problems such as cardiovascular disease, cancer, diabetes, and headaches.

PSYC 436 HUMAN SEXUALITY AND ITS PROBLEMS. (3) (Fall) (Prerequisite: either PSYC 337 or permission of the instructor) (Section 01 Limited to Psychology students) (Section 02 Limited to non-Psychology students) This course will deal with typical sexual behavior and its variations. Topics will include the history of sex research, the sexual response cycle, sexual dysfunction, gender

identity, sexual orientation, etc. Current research and theory will be emphasized.

PSYC 450D1 RESEARCH PROJECT AND SEMINAR. (3) (Fall) (Prerequisites: PSYC 204, PSYC 305. Requires departmental approval.) (Only for Major or special students in U3 who intend to proceed to graduate school) (Students will be admitted on the basis of a written application on forms available from the Department (Room N7/9). Applications must be submitted by August 15) (Students must also register for PSYC 450D2) (No credit will be given for this course unless both PSYC 450D1 and PSYC 450D2 are successfully completed in consecutive terms) Under supervision of an adviser approved by the Department, students design and carry out a research project. Students report their research in seminars throughout the year and in a final written report.

PSYC 450D2 RESEARCH PROJECT AND SEMINAR. (3) (Winter) (Prerequisite: PSYC 450D1) (No credit will be given for this course unless both PSYC 450D1 and PSYC 450D2 are successfully completed in consecutive terms) See PSYC 450D1 for course description.

PSYC 451 HUMAN FACTORS RESEARCH AND TECHNIQUES. (3) (Fall) (2 lectures; 1 lab) (Prerequisites: PSYC 204, PSYC 211, PSYC 212, PSYC 213, PSYC 215 and PSYC 305 or permission of instructor) The application of psychology to the analysis and design of systems and products to increase efficiency and reduce the probability and risk of human error. Topics include: workload and vigilance, control-display relationships, task analysis, and workstation design.

PSYC 470 MEMORY AND BRAIN. (3) (Winter) (3 hour lectures) (Prerequisites: PSYC 308 and PSYC 318 or PHGY 311 or BIOL 306) Memory and amnesia will be studied with an emphasis on the neural mechanisms of information storage in the brain. Topics include: Human memory, developmental plasticity, synaptic plasticity, memory modulators, emotion and memory, short- and long-term memory, sleep, and aging.

● **PSYC 471 HUMAN MOTIVATION.** (3) (3 hour lectures) (Prerequisite: PSYC 215)

● **PSYC 472 SCIENTIFIC THINKING AND REASONING.** (3) (2 lectures, 1 conference) (Prerequisites: U3 students only; BIOL 210 or at least 2 courses in the Faculty of Science at the 200 level)

PSYC 473 SOCIAL COGNITION AND THE SELF. (3) (Winter) (2 lectures) (Prerequisites: PSYC 215 and PSYC 333 or PSYC 331 or PSYC 474) (Not open to students who have taken PSYC 411) (Section 01 Limited to Psychology students) (Section 02 Limited to non-Psychology students) This course examines the social psychological literature emphasizing a) social cognition - how people think about and make sense of their social experiences; and b) self theory - how people create and maintain a sense of identity. These frameworks will be applied to social psychological topics including close relationships, attitudes and self-esteem.

PSYC 474 INTERPERSONAL RELATIONSHIPS. (3) (Winter) (Prerequisite: PSYC 215, PSYC 204, and PSYC 333 or permission of instructor) (Section 01 Limited to Psychology students) (Section 02 Limited to non-Psychology students) Psychological science approach to interpersonal relationships. Organized in terms of the development of relationships, focusing first on impression formation as a platform for the development of relationships. Then we focus on close relationships, examining interpersonal constructs (intimacy, trust, commitment) and reconsidering social cognitive constructs (attributions, schemas) in an interpersonal context.

PSYC 481D1 HONOURS THESIS RESEARCH. (3) (Fall) (9 hours. Research) (U3 Honours students only) (Please see regulations concerning "Project Courses") (Students must also register for PSYC 481D2) (No credit will be given for this course unless both PSYC 481D1 and PSYC 481D2 are successfully completed in consecutive terms) Under the supervision of an adviser approved by the Department, students design and carry out a research project and report their results in the form of an undergraduate thesis.

PSYC 481D2 HONOURS THESIS RESEARCH. (3) (Winter) (Prerequisite: PSYC 481D1) (No credit will be given for this course unless

both PSYC 481D1 and PSYC 481D2 are successfully completed in consecutive terms) See PSYC 481D1 for course description.

PSYC 482 ADVANCED HONOURS SEMINAR 1. (3) (Fall) (Not open to students who have taken 204-480D) (2 lectures) (For Honours students only) Critical examination of the assumptions, concepts, ethics, empirical methods and integrative ideas of modern psychology.

PSYC 483 ADVANCED HONOURS SEMINAR 2. (3) (Winter) (Not open to students who have taken 204-480D) (2 lectures) (For Honours students only) Critical examination of the assumptions, concepts, ethics, empirical methods and integrative ideas of modern psychology.

PSYC 491D1 ADVANCED STUDY: BEHAVIOURAL DISORDERS. (3) (Fall) (1-2 hours lecture or tutorial per week plus a field experience requirement) (Prerequisites: PSYC 337 and PSYC 338. Departmental permission required.) (Students will be admitted on the basis of a written application on forms available from the Department (Room N7/9). Applications must be submitted by August 15) (Students must also register for PSYC 491D2) (No credit will be given for this course unless both PSYC 491D1 and PSYC 491D2 are successfully completed in consecutive terms) A critical examination of topics in abnormal and clinical psychology. Emphasis will be on analysis of theoretical positions and empirical findings as they relate to both etiology and treatment.

PSYC 491D2 ADVANCED STUDY: BEHAVIOURAL DISORDERS. (3) (Winter) (Prerequisite: PSYC 491D1) (No credit will be given for this course unless both PSYC 491D1 and PSYC 491D2 are successfully completed in consecutive terms) See PSYC 491D1 for course description.

PSYC 492 SEMINARS IN SPECIAL TOPICS. (3) (Fall or Winter) (Restricted to U3 students. Requires departmental approval.) (Please see regulations concerning "Project Courses" .) These seminars are offered by special arrangement between interested Psychology staff and students. A student may not register in more than one of these seminars in an academic year. Note: A written proposal detailing the plans for the seminar must be approved by the Department Curriculum Committee before the student is permitted to register for this course. This proposal must be received by the Departmental Curriculum Committee well before the beginning of the term for which the seminar is proposed. Consult the Departmental Handbook for additional information.

PSYC 493 SEMINAR IN SPECIAL TOPICS. (3) (Fall or Winter) (Restricted to U3 students. Requires departmental approval.) (Please see regulations concerning "Project Courses") These seminars are offered by special arrangement between interested Psychology staff and students. A student may not register in more than one of these seminars in an academic year. Note: A written proposal detailing the plans for the seminar must be approved by the Department Curriculum Committee before the student is permitted to register for this course. This proposal must be received by the Departmental Curriculum Committee well before the beginning of the term for which the seminar is proposed. Consult the Departmental Handbook for additional information.

PSYC 495 PSYCHOLOGY RESEARCH PROJECT. (3) (Winter) (Prerequisites: 30 credits of the Psychology program including PSYC 305 or equivalent statistics course and CGPA above 3.00. Requires departmental approval.) (Restricted to U3 students) (Not open to students registered in PSYC 380, PSYC 481 or PSYC 450) (Please see regulations concerning "Project Courses") Under the supervision of Psychology faculty, students carry out a research project and write a paper describing their results and relating it to the relevant literature. Registration is by special arrangement with Psychology staff, and project proposals must be approved by the Department before registration. For more information see the Psychology Department website.

● **PSYC 503 COMPUTATIONAL PSYCHOLOGY.** (3) (Prerequisite: Permission of instructor.)

PSYC 505 THE PSYCHOLOGY OF PAIN. (3) (Fall) (2 lectures; 1 conference) (Prerequisites: any two of the following: PSYC 308, PSYC 311, PSYC 318, PSYC 422, ANAT 321, BIOL 306, PHGY

314 or permission of instructor) (Section 01 Limited to Psychology students) (Section 02 Limited to non-Psychology students) An introduction to pain research and theory, with emphasis on the interactions of psychological, cultural and physiological factors in pain perception. The role of these factors in clinical pain and its management by pharmacological and non-pharmacological means will be discussed.

● **PSYC 510 STATISTICAL ANALYSIS OF TESTS.** (3) (3 lectures) (Prerequisites: PSYC 305 or PSYC 435, PSYC 406 or permission of instructor)

● **PSYC 511 INFANT COMPETENCE.** (3) (1, 3 hour seminar) (Prerequisites: PSYC 351 or PSYC 352 or PSYC 353 or PSYC 380 or PSYC 450 and permission of instructor)

● **PSYC 522 NEUROCHEMISTRY AND BEHAVIOUR.** (3) (2 lectures) (Prerequisites: any two of the following PSYC 308, PSYC 311, PSYC 318, ANAT 321, PHGY 314, BIOL 306) (Restrictions: Not open to students who have taken or are taking PHAR 562)

PSYC 526 ADVANCES IN VISUAL PERCEPTION. (3) (Fall) (2 lectures) We examine in detail the structure of the visual system, and its function as reflected in the perceptual abilities and behaviour of the organism. Parallels are also drawn with other sensory systems to demonstrate general principles of sensory coding.

● **PSYC 528 VULNERABILITY TO DEPRESSION.** (3) (Prerequisite: PSYC 337 or PSYC 412 or permission of instructor. Requires departmental approval.)

● **PSYC 529 MUSIC COGNITION.** (3) (Prerequisites: PSYC 212, PSYC 213, PSYC 204 (or equivalent))

PSYC 530 APPLIED TOPICS IN DEAFNESS. (3) (Prerequisite: PSYC 340 or PSYC 316 or equivalent. Corequisite: PSYC 343 and permission of instructor) Covers fundamental topics in deafness (sensory, perceptual, cognitive, social, linguistic, education and health issues) from an applied psychological perspective. Lectures and seminar presentations plus field work involving ASL/LSQ.

● **PSYC 531 STRUCTURAL EQUATION MODELS.** (3) (one 2-hour lecture plus one lab) (Prerequisite: PSYC 435, PSYC 651, or equivalent, or permission of instructor)

PSYC 532 COGNITIVE SCIENCE. (3) (Fall) (Prerequisites: Admission to the Cognitive Science Minor or permission of instructor. Students should ideally have some cognitive science background in at least two disciplines) The multi-disciplinary study of intelligent systems. Problems in vision, memory, categorization, choice, problem solving, cognitive development, syntax, language acquisition, and rationality. Rule-based and connectionist approaches.

● **PSYC 533 INTERNATIONAL HEALTH PSYCHOLOGY.** (3) (Prerequisite: PSYC 305 and PSYC 215 or PSYC 429 or PSYC 304 or ANTH 227.) (Departmental permission required.)

● **PSYC 534 COMMUNITY PSYCHOLOGY.** (3) (Prerequisites: PSYC 337 and PSYC 338 or permission of instructor) (Open to Graduate students or U3 undergraduates in Psychology)

● **PSYC 535 ADVANCED TOPICS IN SOCIAL PSYCHOLOGY.** (3) (Prerequisites: PSYC 215, PSYC 333 and one additional course from the social and personality area of specialization, or PSYC 380. Departmental permission required.)

PSYC 536 CORRELATIONAL TECHNIQUES. (3) (Winter) (Prerequisites: PSYC 204 and PSYC 305 or their equivalents, and MATH 133 or equivalent. Requires departmental approval.) The statistical analysis of relations among a number of variables in situations common in psychology, ecology, and other fields. Methods include regression analysis, principal components analysis, and other techniques for modelling the structure of correlation matrices.

● **PSYC 561 METHODS: DEVELOPMENTAL PSYCHOLINGUISTICS.** (3) (3 hour lectures) (Prerequisites: PSYC 340, PSYC 343 and PSYC 305 or permission of instructor)

12.29 Science for Teachers

Rutherford Physics Building
3600 University Street
Montreal, QC, H3A 2T8

Fax: (514) 398-8434
Email: bscbed@physics.mcgill.ca

Coordinator - Science — R. Harris
Coordinator - Education — B. Alters

The training and certification of school teachers has traditionally been the responsibility of the Faculty of Education and normally requires the completion of a Bachelor of Education.

The Faculties of Education and of Science have introduced a number of measures to make the B.Ed. degree as accessible as possible to Science students, subject to Ministry of Education regulations. Those who complete a B.Sc. which includes the Minor in Education (see below) will have completed a significant part of the requirements for the McGill B.Ed. degree, and should be able to complete the B.Ed. within one year after graduation from Science. Students without the Minor face a heavier load, but, in principle, can also complete their B.Ed. in a year. Students who decide to apply for admission to Education after obtaining a B.Sc. should be eligible for Advanced Standing credit; for details, see the Faculty of Education section "[Advanced Standing/Transfer Credits](#)" on [page 250](#).

There is also another option for Science students which is intended as a very rigorous but rewarding alternative to taking the B.Sc. and the B.Ed. in sequence. The Concurrent B.Sc./B.Ed. program is specifically designed to train teacher/scientists. The program is rigidly structured and closely integrated so as to satisfy the academic requirements of both degrees.

Concurrency is an essential characteristic of the B.Sc./B.Ed.; it is not intended that the Science and Education components be taken separately and then combined. Normally students will be admitted to both components of the Concurrent Program simultaneously, but it is possible for Science students to opt into this program at any time during their B.Sc. program. However, because this is a concurrent program, both degrees must be granted at the same Convocation. It will not be possible to receive one degree first, and the other subsequently.

Students in the Concurrent Program may apply to transfer to either a conventional B.Sc. or a conventional B.Ed program. To do so, they must submit a Faculty Transfer Application to the appropriate Student Affairs Office. The decision will be based on their grades in the relevant component of the Concurrent Program. Students who do transfer to a conventional program may not transfer back to the Concurrent Program.

Students who receive an F or J in an Education Field Experience course are placed in unsatisfactory standing. Although they may complete their semester, they are required to withdraw from the Concurrent Program. However, they may apply to transfer to a conventional B.Sc. program as outlined above.

To be admitted, candidates must satisfy the admission requirements of both faculties.

Students who wish to be registered in the Concurrent Program must contact one of the coordinators through the Student Affairs Office of either faculty.

MINOR IN EDUCATION FOR SCIENCE STUDENTS (18 credits)

Program Adviser —

Mrs. Cheryl Savage, Department of Integrated Studies,
Faculty of Education

This Minor allows Science students to develop or explore an interest in Education without committing themselves to completing a B.Ed. degree. Only a few students are prepared to commit to a teaching career at the start of university, but many students see it as a viable option toward the end of their B.Sc. program. At that time, Science students who have taken the Minor in Education will have completed a substantial number of the necessary credits and might be able to complete a B.Ed. in as little as one additional year.

The 18 credits for the Minor are the same courses approved by the Faculty of Science as Education electives within the Concurrent B.Sc./B.Ed.

Required Courses (12 credits)

EDEM 405 (3) Policy issues in Quebec Education
EDPI 309 (3) Exceptional Children
EDPE 300* (3) Educational Psychology
EDEC 402 (3) Media, Technology and Education

* Students should consult the Program Adviser for clarification on the prerequisite for EDPE 300.

Complementary Courses (6 credits)

3 credits from:

EDER 400 (3) Philosophical Foundations
EDER 398 (3) Philosophy of Catholic Education

3 credits from:

EDEC 410 (3) Multi-cultural/Multi-racial Class
EDER 464 (3) Intercultural Education
EDEC 441 (3) First Nations and Inuit Education

CONCURRENT B.SC./B.ED.PROGRAM (135 credits)

The two components of the Concurrent Program are the B.Ed. General Secondary Two-Subject Option Program and one of the B.Sc. Major Programs in Two Subjects for Teachers. These two components are described in what follows, including an identification of the elements that are counted towards the requirements of both degrees. These provisions are exceptional and apply exclusively to the Concurrent Program.

The following two-subject combinations have been approved for the Concurrent Program:

- biology and chemistry
- biology and geography
- biology and mathematics
- chemistry and physics
- mathematics and chemistry
- mathematics and physics.

BACHELOR OF EDUCATION GENERAL SECONDARY TWO-SUBJECT OPTION PROGRAM (120 credits)

The aim of the B.Ed. in Secondary Education is to prepare teachers for the secondary school level through a program of academic studies in two subject areas and professional studies centred on school-based practicum components supported by courses in pedagogy, curriculum and educational foundations. In the case of the Concurrent Program the two academic subjects must correspond to one of the six combinations listed above.

A full description of the B.Ed. Secondary Program can be found in the Faculty of Education [section 5.1.1](#). In summary, it consists of the following:

Academic components (57 credits): in the present case these courses will be selected from the lists of required and complementary courses in the B.Sc. component of the Concurrent Program, and will count towards both degrees.

Professional components (57 credits): these include professional seminars, field experiences, foundation courses, pedagogy courses, and pedagogical support courses. The following 18 credits can be included as electives in the B.Sc. component of the Concurrent program, and will count towards both degrees: EDEM 405, EDPI 309, EDPE 300, EDER 400, EDEC 402, and EDEC 410.

Electives (6 credits).

BACHELOR OF SCIENCE, MAJOR PROGRAM IN TWO SUBJECTS FOR TEACHERS (90 credits)

These B.Sc. programs are designed specifically as the Science component of the Concurrent B.Sc./B.Ed. Program. Six combinations of two science subjects are approved for the Concurrent Program. These combinations are chosen to reflect compulsory subjects taught in secondary schools and common pairings of subjects taught by secondary school teachers. They also honour the requirement of the Ministère de l'éducation to train teachers in two subjects, with the possibility of a third subject which supports or is

related to the other two, since mathematics is a necessary support for physics and chemistry.

The general structure of these B.Sc. programs is as follows:

Required and complementary courses (64-67 credits).

The details of these major programs are given below. Note that 57 of these credits can be counted towards the academic component of the B.Ed. program, but only for students in the Concurrent Program.

Elective courses (23-26 credits). These are electives from the B.Sc. perspective, but they must be suitably chosen if the student wishes to complete the Concurrent Program with the minimum of 135 credits. The following Education courses can count towards both the B.Sc. and the B.Ed. components of the Concurrent Program.

EDEM 405	(3)	Policy issues in Quebec Education
EDPI 309	(3)	Exceptional Children
EDPE 300	(3)	Educational Psychology
EDER 400	(3)	Philosophical Foundations
or EDER 398	(3)	Philosophy of Catholic Education
EDEC 402	(3)	Media, Technology and Education
EDEC 410	(3)	Multi-cultural/Multi-racial Class
or EDER 464	(3)	Intercultural Education
or EDEE 441	(3)	First Nations and Inuit Education

MAJOR PROGRAM IN BIOLOGY AND CHEMISTRY FOR TEACHERS (66 credits)

Required Science courses (54 credits)

BIOL 210	(3)	Perspectives of Science
MATH 222	(3)	Calculus 3
MATH 203	(3)	Principles of Statistics 1

Biology List A
Chemistry List A

Complementary Science courses (12 credits)

Biology List B
Geoscience List

MAJOR PROGRAM IN BIOLOGY AND GEOGRAPHY FOR TEACHERS (68 credits)

Required Science courses (44 credits)

BIOL 210	(3)	Perspectives of Science
CHEM 212*	(4)	Organic Chemistry
MATH 203	(3)	Principles of Statistics 1

Biology List A
Geography List A

*Students who have the CEGEP equivalent of this course must replace it with an additional course chosen from Biology List B.

Complementary Science courses (24 credits)

Biology List C
Geography List B
Geoscience List

MAJOR PROGRAM IN BIOLOGY AND MATHEMATICS FOR TEACHERS (68 credits)

Required Science courses (50 credits)

BIOL 210	(3)	Perspectives of Science
CHEM 212*	(4)	Organic Chemistry

Biology List A
Mathematics List A

*Students who have the CEGEP equivalent of this course must replace it with an additional course chosen from Biology List B.

Complementary Science courses (18 credits)

6 additional credits in Biology or related disciplines, at 300-level or above, approved by the Biology Department.

Mathematics List C

3 additional credits in either Mathematics or related disciplines, approved by the Mathematics Department, or in Biology or related disciplines, approved by the Biology Department.

MAJOR PROGRAM IN CHEMISTRY AND PHYSICS

FOR TEACHERS (65 credits)

Required Science courses (62 credits)

BIOL 210	(3)	Perspectives of Science
Mathematics List B		
Chemistry List A		
Physics List A		

Complementary Science courses (3 credits)

Geoscience List

MAJOR PROGRAM IN MATHEMATICS AND CHEMISTRY FOR TEACHERS (64-65 credits)

Required Science courses (47 credits)

BIOL 210	(3)	Perspectives of Science
Mathematics List A		
Chemistry List A		

Complementary Science courses (17-18 credits)

Mathematics List C
Chemistry List B

MAJOR PROGRAM IN MATHEMATICS AND PHYSICS FOR TEACHERS (66 credits)

Required Science courses (57 credits)

BIOL 210	(3)	Perspectives of Science
Mathematics List A		
Physics List A and List B		

Complementary Science courses (9 credits)

Mathematics List C

COURSE LISTS USED IN THE VARIOUS OPTIONS

Biology List A: (21 credits)

BIOL 200	(3)	Molecular Biology
BIOL 201	(3)	Cell Biology and Metabolism
BIOL 202	(3)	Basic Genetics
BIOL 205	(3)	Biology of Organisms
BIOL 206	(3)	Methods in Biology of Organisms
BIOL 208	(3)	Introduction to Ecology
BIOL 301	(4)	Cell and Molecular Laboratory

Biology List B: (9 credits)

to be selected from the following:

BIOL 304	(3)	Evolution
BIOL 370	(3)	Human Genetics Applied
PHGY 201	(3)	Human Physiology: Control Systems
or PHGY 209	(3)	Mammalian Physiology 1

Biology List C: (6 credits)

to be selected from the following:

BIOL 465	(3)	Conservation Biology
BIOL 331	(3)	Ecology / Behaviour Field Course
or BIOL 334	(3)	Applied Tropical Ecology
or BIOL 336	(3)	Marine Aquaculture
or BIOL 337	(3)	Ecology and Behaviour of Fishes

Chemistry List A: (23 credits)

CHEM 150	(3)	World of Chem: Food
or CHEM 160	(3)	World of Chem: Technology
or CHEM 170	(3)	World of Chem: Drugs
or CHEM 180	(3)	World of Chem: Environment
CHEM 281	(3)	Inorganic Chemistry 1
CHEM 381	(3)	Chemistry of Transition Elements
CHEM 212/222*	(4)	Organic Chemistry
CHEM 257D1	(2)	Introductory Analytical Chemistry
and CHEM 257D2	(2)	Introductory Analytical Chemistry
CHEM 203/213*	(3)	Physical Chemistry
CHEM 350	(3)	Earth, Air, Fire, Water
or CHEM 307	(3)	Environmental Analysis

*students who have the CEGEP equivalent of any one of these courses must replace it with one course chosen from the block CHEM 273 through BIOC 404 in List B (for CHEM 203/ CHEM 213) or from the block CHEM 302 through CHEM 402 (for CHEM 212/CHEM 222).

Chemistry List B: (8 or 9 credits)

to be selected from the following, subject to the requirement that at least one course must include a laboratory.

CHEM 273	(1)	Chemical Kinetics
CHEM 345	(3)	Molecular Properties & Structure 1
CHEM 355	(3)	Molecular Properties & Structure 2
CHEM 365	(2)	Statistical Thermodynamics
CHEM 363	(2)	Physical Chemistry Lab.
CHEM 393	(2)	Physical Chemistry Lab. 2
CHEM 556	(3)	Advanced Quantum Mechanics
BIOC 404	(3)	Biophysical Chemistry
CHEM 367	(3)	Instrumental Analysis 1
CHEM 377	(3)	Instrumental Analysis 2
CHEM 567	(3)	Chemometrics: Analysis of Chemical Data
CHEM 302	(3)	Organic Chemistry 3
CHEM 362	(2)	Advanced Organic Chemistry Lab.
CHEM 402	(3)	Advanced Bio-Organic Chemistry
CHEM 531	(3)	Chemistry of Inorganic Materials
CHEM 455	(3)	Polymer Chemistry
CHEM 591	(3)	Advanced Coordination Chemistry
CHEM 543	(2)	Chemistry of Pulp & Paper
CHEM 392	(3)	Integrated Inorganic/Organic laboratory
EPSC 210	(3)	Introduction to Mineralogy
or EPSC 220	(3)	Principles of Geochemistry
or EPSC 580	(3)	Aqueous Geochemistry
or EPSC 542	(3)	Chemical Oceanography

Geography List A: (12 credits)

GEOG 201	(3)	Introductory Geo-Information Science
GEOG 203	(3)	Environmental Systems
GEOG 216	(3)	Geography of the World Economy
GEOG 272	(3)	Earth's Changing Surface

Geography List B: (15 credits)

to be selected from the following:

GEOG 200	(3)	Geographical Perspectives: World Environmental Problems
GEOG 302	(3)	Environmental Management 1
GEOG 305	(3)	Geography of Soils
GEOG 321	(3)	Climatic Environments
GEOG 322	(3)	Environmental Hydrology
GEOG 350	(3)	Ecological Biogeography
GEOG 372	(3)	Running Water Environments
GEOG 408	(3)	Geography of Unequal Development
GEOG 410	(3)	Geography of Underdevelopment: Current Problems
GEOG 306	(3)	Raster Geo-Information Science
or GEOG 308	(3)	Principles of Remote Sensing
GEOG 495	(3)	Field studies - Physical Geography
or GEOG 398	(3)	Field studies in Human Geography
or GEOG 494	(3)	Urban Field Studies
or GEOG 496	(3)	Geographical Excursion
or GEOG 497	(3)	Ecology of Coastal Waters
or GEOG 499	(3)	Subarctic field studies in Geography: Schefferville

Geoscience List: (3 credits)

to be selected from the following:

EPSC 200	(3)	The Terrestrial Planets
EPSC 201	(3)	Understanding Planet Earth
EPSC 320	(3)	Elementary Earth Physics
ATOC 210	(3)	Introduction to Atmospheric Science
ATOC 220	(3)	Introduction to Oceanic Sciences
ATOC 315	(3)	Water in the Atmosphere

Mathematics List A: (21 credits)

MATH 222	(3)	Calculus 3
MATH 235	(3)	Algebra 1
MATH 236	(3)	Linear Algebra 1
MATH 314	(3)	Advanced Calculus
MATH 315	(3)	Ordinary Differential Equations
MATH 323	(3)	Probability Theory

MATH 324	(3)	Statistics
----------	-----	------------

Mathematics List B: (15 credits)

MATH 203	(3)	Principles of Statistics 1
MATH 222	(3)	Calculus 3
MATH 223	(3)	Linear Algebra
MATH 314	(3)	Advanced Calculus
MATH 315	(3)	Ordinary Differential Equations

Mathematics List C: (9 credits)

to be selected from the following

MATH 242	(3)	Analysis 1
MATH 243	(3)	Real Analysis
MATH 317	(3)	Numerical Analysis
MATH 318	(3)	Mathematical Logic
MATH 338	(3)	History and Philosophy of Mathematics
MATH 348	(3)	Topics in Geometry
COMP 202	(3)	Introduction to Computing 1
COMP 203	(3)	Introduction to Computing 2

Physics List A: (21 credits)

PHYS 230	(3)	Dynamics of Simple Systems
PHYS 232	(3)	Heat and Waves
PHYS 241	(3)	Signal Processing
PHYS 257	(3)	Experimental Methods 1
PHYS 340	(3)	Electricity and Magnetism
PHYS 342	(3)	Electromagnetic Waves
or PHYS 434	(3)	Optics
PHYS 446	(3)	Quantum Physics

Physics List B: (12 credits)

PHYS 258	(3)	Experimental Methods 2
PHYS 342*	(3)	Electromagnetic Waves
or PHYS 434*	(3)	Optics
PHYS 436	(3)	Modern Physics
PHYS 439	(3)	Laboratory in Modern Physics

* Both of PHYS 342 and PHYS 434 are required for the Mathematics and Physics option.

12.30 Technological Entrepreneurship for Science Students

Science students who wish to become entrepreneurs or to enter small to medium sized companies in the high technology sector will find within this Minor a set of six (6) courses that cover relevant management concepts and skills.

Also available to Science students is the Minor in Management described in [section 12.15](#).

Acceptance to the program is both competitive and restricted. Application procedures will be announced in September. Please consult Ron Critchley, Student Adviser, Faculty of Management Student Affairs Office, Bronfman 176, for details.

Students registered in the Minor in Technological Entrepreneurship for Science Students may not take additional courses outside the Faculties of Arts and of Science.

To obtain the Minor, all courses must be completed with a grade of C or better.

Please note: the courses must be taken sequentially over five terms, as follows: ACCT 210, MARKT 360 and either MGCR 320 or ORGB 321, BUSA 465, MGPO 562, BUSA 466.

MINOR IN TECHNOLOGICAL ENTREPRENEURSHIP FOR SCIENCE STUDENTS (18 credits)

Required Courses (15 credits)

ACCT 210	(3)	Accounting for Managers
MRKT 360	(3)	Marketing of Technology
BUSA 465	(3)	Technological Entrepreneurship
MGPO 562	(3)	Seminar in Organizational Strategies
BUSA 466	(3)	Technological Entrepreneurship Project

Complementary Courses (3 credits)

one of the following courses:

MGCR 320	(3)	Managing Human Resources
ORGB 321	(3)	Leadership Power & Influence