NOTE: Please consult the instructor for the topics offered in a particular year. This course is suitable for advanced undergraduates and graduate students from both mathematics and computer science.
FORMAT: Seminar
PREREQUISITE: MATH 3030X/Y.06 or MATH 3500X/Y.06, or CSCI 3110.03 and CSCI 3136.03, or permission of the instructor.
Suggested prerequisites for math students are algebra or analysis at honours undergraduate level. Students from computer science should be familiar with formal language theory and concepts of programming languages. All students should be comfortable with writing mathematical proofs. When in doubt about prerequisites, please consult the instructor.
CROSS-LISTING: MATH 5680.03

### MATH 4800.03: Introduction to Mathematical Research.

This course is intended to introduce students to the science and methodology of research in the mathematical sciences. The course will be organized around topics from a wide spectrum of mathematics from which students will be guided to investigate open problems. Conjectures will be formulated and evidence will be developed.
FORMAT: Lecture 3 hours
PREREQUISITE: MATH 2002.03, 2040.03 or 2135.03; MATH 3030X/Y.06 or permission of the instructor
CROSS-LISTING: MATH 5800.03, CSCI 4800.03

### MATH 4900.03: Combinatorial Game Theory.

This course looks at 2-player games of strategy where there are no chance devices and both players have perfect information. The surprising mathematical structure underlying these games will be introduced along with the evaluation scheme and its application to specific games in the coursees of hot, all-small and impartial games.
PREREQUISITE: MATH 2030.03/2040.03, 2001.03/2002.03
CROSS-LISTING: MATH 5900.03

### MATH 4950.03: Honours Research Project.

A requirement for the mathematics honours degree, this course consists of a supervised research project culminating in a written report and an oral presentation in the honours seminar. Enrollment must be approved by the mathematics honours coordinator.
NOTE: Students will be required to take two full 4000-level coursees in addition to this one.

### MATH 8891.00: Co-op Work-Term I.

PREREQUISITE: SCIE 2700.03

### MATH 8892.00: Co-op Work-Term II.

PREREQUISITE: MATH 8891.00

### MATH 8893.00: Co-op Work-Term III.

PREREQUISITE: MATH 8892.00

### MATH 8894.00: Co-op Work-Term IV.

PREREQUISITE: MATH 8893.00

# Medical Sciences

* Pending MPHEC approval


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### Dean

Moore, C., BA (Hons) (Cambridge), PhD (Cambridge), Professor (Psychology)

### Assistant Dean

Lee, T., BSc (Hons), MSc (Toronto), PhD (Glasgow), Professor (Immunology) - cross-appointment in Surgery & Pathology

### Program Coordinator

Jordan, J., BSc (St FX), PhD (Dalhousie)

### Administrative Assistant


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## I. Introduction

The Medical Sciences program is a new program at Dalhousie aimed at students who wish to initiate studies in medical science as undergraduates. The program will introduce students to subjects such as human anatomy and physiology, neuroscience, epidemiology and medical ethics.

In the first two years of the program, students will take core courses in Biology, Chemistry, Math, Physics, Physiology, Microbiology, Social Determinants of Health, and Psychology. These courses will not only provide a solid background in basic sciences, but will prepare students for admission tests for various medical sciences disciplines (such as the MCAT), meet (or exceed) the early pre-requisites for acceptance into medically related professional faculties (such as Medicine, Dentistry, and Pharmacy) locally and across the country, and meet (or exceed) the early pre-requisites required for acceptance into biomedical sciences graduate programs at Dalhousie and across the country. In their third and fourth years, students take core and elective courses in various subjects within the medical sciences. Students will graduate with a broad biomedical science background that will prepare them for a variety of clinical/professional programs, graduate school, or employment in the biotechnology industry or government.

Career path advising and the course selection process are critical to the success of the Medical Sciences undergraduate program. In addition to guidance with respect to professional schools and their entry requirements, academic advising is provided so that students are aware of what courses are required should they want to enter graduate programs in the various biomedical science disciplines. Opportunities are available to concentrate in areas of special interest (e.g., Immunology, Microbiology, Pharmacology). In addition, students may choose to loop out and join the undergraduate programs in Biology, Biochemistry & Molecular Biology, Microbiology & Immunology, or Psychology & Neuroscience, if that better suits their interests or career goals.

## II. Degree Programs

The core required courses not only provide a broad background in biomedical science but they are also designed to meet prerequisites of more advanced selectives and to provide a guided learning experience through the program content.

The program also includes "Selective" courses in a number of relevant biomedical fields (a selective is a course from a predetermined list provided by the program - see below). Students will be encouraged to choose their selective courses carefully such that they result in more specialized education in a particular area of emphasis (in Immunology or Biochemistry, for example). This will allow them to take advanced courses in the chosen area in their fourth year, to pursue Honour's research if they wish, and to be excellent candidates for graduate programs in a specialized field at Dalhousie or elsewhere in Canada.

The program includes four full credits in open "Electives", which allows students to take any course offered at Dalhousie (at the appropriate level). Students will be encouraged to fulfill the Writing requirement using one or both of the Electives in the first year. Students can fill the elective slots with selectives if they wish; the reverse will not be allowed.

NOTE: Most second and third year core courses in the Medical Sciences curriculum have pre-requisites with minimum grade requirements in those pre-requisite courses. Please consult the appropriate calendar section for these requirements.

## A. BSc (20 credit) Honours in Medical Sciences

An Honours degree in the Medical Sciences program aims to prepare students for graduate studies in a number of medically related fields. The Medical Sciences Honours program will be restricted to students with a minimum cumulative GPA of 3.3. Honours students will produce a research-based thesis that will represent a full credit in their program. Students will have the flexibility to do their Honours research in a laboratory of their choice, subject to the approval of the Honours class director. Students may choose to conduct their research in a laboratory within the Faculty of Medicine or the Faculty of Science or in a government lab. All students conduct an independent research project in their final year under the supervision of a faculty member, and a presentation of the thesis research in an Honours student research forum will be required for completion of this honours course.

Students should consult with an advisor and choose their electives and selectives carefully in their second, third and fourth years to ensure that they are prepared for graduate studies in their field of interest. Students with an Honours degree will also be well prepared for entry into professional schools.

### Requirements

In addition to the courses listed below, students must ensure that they satisfy the requirements outlined in the "Degree Requirements" section for the College of Arts and Science (page xx). For the required Writing class, students can choose from the list of "Writing Across the Curriculum" approved courses. SCIE 1111 allows BSc students to fulfill this requirement in a one-semester course. However, before selecting a writing course, students are encouraged to consult the advising sheet available on the Medical Sciences program website, as some professional schools require an ENGL course.

***1000 Level***

- BIOL 1010.03/1011.03 or BIOL 1020.03/1021.03 or SCIE 1505X/Y.18 Integrated Science
- CHEM 1011.03/1012.03
- MATH 1215.03 (or equivalent)
- STAT 1060.03 or SCIE 1505X/Y.18 Integrated Science
- PSYO 1021.03/1022.03 or PSYO 1011.03/1012.03 or SCIE 1505X/Y.18 Integrated Science
- PHYC 1310.03 or PHYC 1300X/Y
- Writing course

***2000 Level***

- BIOL 2020.03
- BIOL 2030.03
- CHEM 2441.03 or CHEM 2401.03/2402.03
- BIOC 2300.03
- PHYL 2032.03
- MICI 2100.03
- NESC 2570.03
- PHIL 2810.03

***3000 and 4000 Level***

- MICI 3115.03
- BIOL 4404.03
- Social Determinants of Health*
- Anatomy*
- Introductory Pathology*
- Introductory Epidemiology*
- MSCI Honours thesis
- 21 credit hours of Selectives (see list below) including at least three credit hours of Advanced Selectives

## B. BSc (20 credit) Major in Medical Sciences

Medical Sciences offers a 4-year, 20 credit Major program. Although the program does not provide the required preparation for graduate school, it will provide an educational experience that offers a broad, interdisciplinary background in all relevant subjects in biomedical sciences. The Major degree also meets the general degree requirements for the Faculty of Science.

### Requirements

In addition to the courses listed below, students must ensure that they satisfy the requirements outlined in the "Degree Requirements" section for the College of Arts and Science (page xx). For the required Writing class, students can choose from the Writing Across the Curriculum approved courses. SCIE 1111 allows BSc students to fulfill this requirement in a one-semester course. However, before selecting a writing course, students are encouraged to consult the advising sheet available on the Medical Sciences program website, as some professional schools require an ENGL course.

***1000 Level***

- BIOL1010.03/1011.03 or BIOL1020.03/1021.03 or SCIE 1505X/Y.18 Integrated Science
- CHEM 1011.03/1012.03
- MATH 1215.03 (or equivalent)
- STAT 1060.03 or SCIE 1505X/Y.18 Integrated Science
- PSYO 1021.03/1022.03 or PSYO 1011.03/1012.03 or SCIE 1505X/Y.18 Integrated Science
- PHYC 1310.03 or PHYC 1300X/Y

***2000 Level***

- BIOL 2020.03
- BIOL 2030.03
- CHEM 2441.03 or CHEM 2401.03/2402.03
- BIOC 2300.03
- PHYL 2032.03
- MICI 2100.03
- NESC 2570.03
- PHIL 2810.03

***3000 and 4000 Level***

- MICI 3115.03
- BIOL 4404.03
- Social Determinants of Health*
- Anatomy*
- Introductory Pathology*
- Introductory Epidemiology*
- 21 credit hours of Selectives (see list below) including at least three credit hours of Advanced Selectives

# III. Course Descriptions

For course descriptions, please see section of the calendar corresponding to the department offering the course (e.g. BIOL = Biology).

Courses marked with an asterisk (*) above are upper level courses that are being developed especially for students in the Medical Sciences program.

# IV. List of Selectives and Advanced Selectives

Students in the Medical Sciences program must include at least seven of the following courses in their program, one of which must be at an Advanced Selective in the fourth year. For course descriptions, please see section of the calendar corresponding to the department offering the course (e.g. BIOL = Biology).

### Selectives:

**Biochemistry/ Molecular Biology**

BIOC 2610 - Introductory Biochemistry Lab
BIOC 3300 - Intermediary Metabolism
BIOC 3400 - Nucleic Acid Biochemistry & Molecular Biology
BIOC 3700 - Biomolecular Chemistry

**Biology**
BIOL 2040 - Evolution
BIOL 2060 - Introductory Ecology
BIOL 3020 - Advanced Cell Biology
BIOL 3036 - Transgenic Organisms
BIOL 3046 - Molecular Evolution
BIOL 3050 - Developmental Biology
BIOL 3322 - Parasitology
BIOL 3328 - Medical Entomology
BIOL 3430/ANAT 2160 - Introduction to Human Histology
BIOL 3421/ANAT 3421- Comparative Vertebrate Histology

**Chemistry**
CHEM 2301 - Introduction to Physical Chemistry I
CHEM 2304 - Introduction to Physical Chemistry II

**Humanities and Social Sciences**
INTD 3115 - Global Health in the 21st Century
PHIL 2805 - Ethics and Health Care: Patient Care
SOSA 2400 - Health & Illness Across Cultures
SOSA 2502 - Biomedicine and the Illness Experience
SOSA 3135 - The Social Organization of Health Care
SOSA 3141 - Sociology of Mental Disorders
SOSA 3143 - Health, Illness, and the World System
SOSA 3145 - Gender and Health (cross-listed with GWST 3145.03)
SOSA 3147 - Social Gerontology
SOSA 3148 - The Sociology of Addiction/ Drugs, Health, and Society

**Medical Neuroscience**
ANAT 2160/BIOL 3430 - Introduction to Human Histology
ANAT 3421/BIOL 3421 - Comparative Vertebrate Histology

**Microbiology/Immunology**
MICI 3114 - Virology
MICI 3119- Physiology of Prokaryotic Cell
MICI 4115 - Immunology of Host Resistance
MICI 4218 - Clinical Microbiology

**Neuroscience**
NESC 2007 - Neuroscience Principles & Methods
NESC 2470 - Systems Neuroscience
NESC 3270 - Developmental Neuroscience
NESC 3670 - Genes, Brain and Behaviour

**Physics**
PHYC 2250 - Physics of Biological and Medical Technology

**Physiology & Biophysics**
PHYL 3120 - Exercise Physiology in Health & Disease
PHYL 3320 - Human Cell Physiology
PHYL 3420 - Sensory Physiology
PHYL 3520 - Core Concepts in Medical Physiology

**Psychology**
PSYO 2000 - Research Methods in Experimental Psychology
PSYO 2080 - Social Psychology
PSYO 2090 - Developmental Psychology
PSYO 2170 - Hormones and Behaviour
PSYO 2220 - Abnormal Behaviour
PSYO 2501 - Statistical Methods I
PSYO 2770 - Brain & Behaviour
PSYO 3082 - Experimental Social Psychology
PSYO 3122 - Methods in Experimental Clinical Psychology
PSYO 3129 - Childhood Psychopathology
PSYO 3180 - Psychoneuroimmunology/Ecological Immunology
PSYO 3225 - Health Psychology
PSYO 3237 - Drugs and Behaviour

## Advanced Selectives:

**Biochemistry/Molecular Biology**
BIOC 4010 - Bioinformatics
BIOC 4302 - Biochemistry of Lipids
BIOC 4305 - Mechanisms of Signal Transduction
BIOC 4306 - Nutritional Biochemistry
BIOC 4403 - Genes and Genomes
BIOC 4404 - Gene Expression
BIOC 4501 - Medical Biotechnology I
BIOC 4700 - Proteins
BIOC 4701 - Enzymes
BIOC 4702 - Biophysical Characterization of Macromolecules
BIOC 4811- Biochemistry of Clinical Disorders I
BIOC 4812 - Biochemistry of Clinical Disorders II
BIOC 4835/BIOL 4035 - Human Genetics

**Biology**
BIOL 4035/BIOC 4835 - Human Genetics
BIOL 4050 - Advanced Topics in Developmental Biology

**Humanities and Social Sciences**
PHIL 4801 - Topics in Ethics and Health Care
POLI 4260 - The Politics of Health Care

**Microbiology/ Immunology**
MICI 4027 - Molecular Mechanisms of Cancer
MICI 4033 - Advanced Microbial Genetics
MICI 4100 - Processes & Mediators of Inflammation
MICI 4114 - Advanced Topics in Molecular & Medical Virology
MICI 4116 - Current Topics in Mucosal Immunology
MICI 4118 - Molecular Bacterial Pathogenesis
MICI 4302 - Molecular Immunology

**Neuroscience**
NESC 4000 - Senior Seminar

**Physiology & Biophysics**
PHYL 4000 - Current Advances in Synaptic Function and Plasticity
PHYL 4324 - Endocrine Physiology
PHYL 4680 - Cardiovascular Physiology

**Psychology**
PSYO 4000 - Senior Seminar