

# 2018-2019 Graduate Calendar

The information published in this Graduate Calendar outlines the rules, regulations, curricula, programs and fees for the 2018-2019 academic year, including the Summer Semester 2018, Fall Semester 2018 and the Winter Semester 2019.

For your convenience the Graduate Calendar is available in PDF format.

If you wish to link to the Graduate Calendar please refer to the [Linking Guidelines](#).

The University is a full member of:

- Universities of Canada

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UNIVERSITY  
of GUELPH

CHANGING LIVES  
IMPROVING LIFE

## **Disclaimer**

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The Office of Graduate Studies has attempted to ensure the accuracy of this on-line Graduate Calendar. However, the publication of information in this document does not bind the university to the provision of courses, programs, schedules of studies, fees, or facilities as listed herein.

## **Limitations**

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The University of Guelph reserves the right to change without notice any information contained in this calendar, including any rule or regulation pertaining to the standards for admission to, the requirements for the continuation of study in, and the requirements for the granting of degrees or diplomas in any or all of its programs.

The university will not be liable for any interruption in, or cancellation of, any academic activities as set forth in this calendar and related information where such interruption is caused by fire, strike, lock-out, inability to procure materials or trades, restrictive laws or governmental regulations, actions taken by the faculty, staff or students of the university or by others, civil unrest or disobedience, Public Health Emergencies, or any other cause of any kind beyond the reasonable control of the university.

The University of Guelph reaffirms section 1 of the Ontario Human Rights Code, 1981, which prohibits discrimination on the grounds of race, ancestry, place of origin, colour, ethnic origin, citizenship, creed, sex, sexual orientation, handicap, age, marital status or family status.

The university encourages applications from women, aboriginal peoples, visible minorities, persons with disabilities, and members of other under-represented groups.

# **Introduction**

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## **Collection, Use and Disclosure of Personal Information**

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Personal information is collected under the authority of the University of Guelph Act (1964), and in accordance with Ontario's Freedom of Information and Protection of Privacy Act (FIPPA) [http://www.e-laws.gov.on.ca/DBLaws/Statutes/English/90f31\\_e.htm](http://www.e-laws.gov.on.ca/DBLaws/Statutes/English/90f31_e.htm). This information is used by University officials in order to carry out their authorized academic and administrative responsibilities and also to establish a relationship for alumni and development purposes. Certain personal information is disclosed to external agencies, including the Ontario Universities Application Centre, the Ministry of Advanced Education and Skills Development, and Statistics Canada, for statistical and planning purposes, and is disclosed to other individuals or organizations in accordance with the Office of Registrarial Services Departmental Policy on the Release of Student Information. For details on the use and disclosure of this information call the Office of Registrarial Services at the University at (519) 824-4120 or see <https://www.uoguelph.ca/registrar/>

## **Statistics Canada - Notification of Disclosure**

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For further information, please see Statistics Canada's web site at <http://www.statcan.gc.ca> and Section XIV Statistics Canada.

## **Address for University Communication**

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Depending on the nature and timing of the communication, the University may use one of these addresses to communicate with students. Students are, therefore, responsible for checking all of the following on a regular basis:

### **Email Address**

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The University issued email address is considered an official means of communication with the student and will be used for correspondence from the University. Students are responsible for monitoring their University-issued email account regularly.

### **Home Address**

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Students are responsible for maintaining a current mailing address with the University. Address changes can be made, in writing, through Registrarial Services.

## **Name Changes**

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The University of Guelph is committed to the integrity of its student records, therefore, each student is required to provide either on application for admission or on personal data forms required for registration, his/her complete, legal name. Any requests to change a name, by means of alteration, deletion, substitution or addition, must be accompanied by appropriate supporting documentation.

## **Student Confidentiality and Release of Student Information Policy Excerpt**

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The University undertakes to protect the privacy of each student and the confidentiality of his or her record. To this end the University shall refuse to disclose personal information to any person other than the individual to whom the information relates where disclosure would constitute an unjustified invasion of the personal privacy of that person or of any other individual. All members of the University community must respect the confidential nature of the student information which they acquire in the course of their work.

Complete policy at <https://www.uoguelph.ca/secretariat/office-services/university-secretariat/university-policies>.



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## **X. Collaborative Specializations**

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Collaborative specializations are intended to provide an additional multidisciplinary experience for students. Students complete the requirements of their home program plus those of the collaborative specialization.

## Artificial Intelligence

The Collaborative Specialization in Artificial Intelligence (AI) provides thesis-based masters students in Computer Science, Engineering, Mathematics and Statistics, and Bioinformatics with a diverse and comprehensive knowledge base in AI. Students wishing to undertake graduate studies at the masters level with emphasis on artificial intelligence will be admitted by a participating department and will register in both the participating department and in the collaborative specialization.

Students will learn from a multidisciplinary team of faculty with expertise in fundamental and applied deep learning and machine learning, while conducting AI-related research guided by a faculty advisor. By the end of this program, graduates will have comprehensive understanding of leading-edge AI techniques and will be able to apply this knowledge to solve real-world problems.

### Administrative Staff

#### Graduate Program Coordinator

Dr. Graham Taylor (3515 Thornbrough, Ext. 53644)

gtaylor@uoguelph.ca

#### TBD

Graduate Program Assistant (, Ext. )

### Graduate Faculty

#### Sarah J. Adamowicz

Associate Professor, Integrative Biology

#### R. Ayesha Ali

Associate Professor, Mathematics and Statistics

#### Luiza Antonie

Assistant Professor, Computer Science

#### Shawki Areibi

Professor, Engineering

#### Dan Ashlock

Professor, Mathematics and Statistics

#### Christine Baes

Assistant Professor, Animal Biosciences

#### Mohammad Biglarbegian

Associate Professor, Engineering

#### David Calvert

Associate Professor, Computer Science

#### Monica Cojocaru

Professor, Mathematics

#### Christopher Collier

Assistant Professor, Engineering

#### Rozita Dara

Assistant Professor, Computer Science

#### Fantahu Defersha

Associate Professor, Engineering

#### Ali Dehghantanha

Assistant Professor, Computer Science

#### Robert Dony

Associate Professor, Engineering

#### Hermann Josef Eberl

Professor, Mathematics and Statistics

#### Zeny Feng

Associate Professor, Mathematics and Statistics

#### David Flatla

Associate Professor, Computer Science

#### Andrew Gadsden

Assistant Professor, Engineering

#### Bahram Gharabaghi

Professor, Engineering

#### Karen Gordon

Associate Professor, Engineering

#### Andrew Hamilton-Wright

Associate Professor, Computer Science

#### Julie Horrocks

Professor, Mathematics and Statistics

#### Hadis Karimipour

Assistant Professor, Engineering

#### Stefan Kremer

Professor, Computer Science

#### Anna Lawniczak

Professor, Mathematics and Statistics

#### William Lubitz

Associate Professor, Engineering

#### Lewis Lukens

Associate Professor, Plant Agriculture

#### Pascal Matsakis

Professor, Computer Science

#### Edward McBean

Professor, Engineering

#### Medhat Moussa

Professor, Engineering

#### Khurram Nadeem

Assistant Professor, Mathematics and Statistics

#### Charlie Obimbo

Associate Professor, Computer Science

#### Michele Oliver

Professor, Engineering

#### Stacey Scott

Associate Professor, Computer Science

#### Fei Song

Associate Professor, Computer Science

#### Petros Spachos

Assistant Professor, Engineering

#### Deborah Stacey

Associate Professor, Computer Science

#### Graham Taylor

Associate Professor, Engineering

#### Dan Tulpan

Assistant Professor, Animal Biosciences

#### Fangju Wang

Professor, Computer Science

#### Mark Wineberg

Associate Professor, Computer Science

#### Simon Yang

Professor, Engineering

#### Yang Xiang

Professor, Computer Science

### Associated Graduated Faculty

#### Dirk Steinke

Associate Director Centre for Biodiversity and Adjunct Professor Integrative Biology

### MSc/MASc Collaborative Specialization

#### Admission Requirements

Masters students in the Collaborative Specialization in Artificial Intelligence must meet the admission requirements of the participating department in which they are enrolled. The application process has two stages. First, prospective students will apply to their primary program of interest, identifying interest in the collaborative specialization as a focus. If the student is admitted to the primary program as a thesis student, the second stage is then admission to the collaborative specialization. All applications to participate in the Collaborative Specialization in Artificial Intelligence will be vetted by the specialization's Graduate Program Coordinator.

#### Degree Requirements

Masters students in the collaborative specialization in artificial intelligence must complete:

UNIV*6080	[0.25]	Computational Thinking for Artificial Intelligence
UNIV*6090	[0.50]	Artificial Intelligence Applications and Society

One of the following Elective Core courses:

CIS*6020	[0.50]	Artificial Intelligence
ENGG*6500	[0.50]	Introduction to Machine Learning
STAT*6801	[0.50]	Statistical Learning

Two of the following Complementary AI-related courses:

BINF*6970	[0.50]	Statistical Bioinformatics
CIS*6050	[0.50]	Neural Networks
CIS*6060	[0.50]	Bioinformatics
CIS*6070	[0.50]	Discrete Optimization
CIS*6080	[0.50]	Genetic Algorithms
CIS*6100	[0.50]	Parallel Processing Architectures
CIS*6120	[0.50]	Uncertainty Reasoning in Knowledge Representation
CIS*6140	[0.50]	Software Engineering
CIS*6160	[0.50]	Multiagent Systems
CIS*6320	[0.50]	Image Processing Algorithms and Applications
CIS*6420	[0.50]	Soft Computing
ENGG*6100	[0.50]	Machine Vision
ENGG*6140	[0.50]	Optimization Techniques for Engineering
ENGG*6570	[0.50]	Advanced Soft Computing



MATH*6020	[0.50]	Scientific Computing
MATH*6021	[0.50]	Optimization I
MATH*6051	[0.50]	Mathematical Modelling
PHIL*6760	[0.50]	Science and Ethics
STAT*6841	[0.50]	Computational Statistical Inference

And an acceptable AI-related thesis. Requirements of this collaborative specialization may also serve as core and/or elective requirements in the student's home program.

## Courses

### Required Courses

#### UNIV\*6080 Computational Thinking for Artificial Intelligence U [0.25]

This course will provide students with an overview of the mathematical and computational foundation that is required to undertake artificial intelligence and machine learning research. Students will also gain an understanding of the historical context, breadth, and current state of the field. Students are expected to have already taken undergraduate courses in probability & statistics, calculus, linear algebra, and data structures & algorithms (STAT\*2120, MATH\*1210, ENGG\*1500, and CIS\*2520, or equivalents).

*Department(s):* Office of Graduate Studies

#### UNIV\*6090 Artificial Intelligence Applications and Society U [0.50]

This multidisciplinary, team-taught course provides an in-depth study of how artificial intelligence methodologies can be applied to solve real-world problems in different fields. Students will work in groups to propose solutions whilst considering social and ethical implications of artificial intelligence technologies.

*Prerequisite(s):* UNIV\*6080

*Restriction(s):* Restricted to students in the collaborative specialization in Artificial Intelligence

*Department(s):* Office of Graduate Studies

### Elective Core

#### CIS\*6020 Artificial Intelligence U [0.50]

An examination of Artificial Intelligence principles and techniques such as: logic and rule based systems; forward and backward chaining; frames, scripts, semantic nets and the object-oriented approach; the evaluation of intelligent systems and knowledge acquisition. A sizeable project is required and applications in other areas are encouraged.

*Department(s):* School of Computer Science

#### ENGG\*6500 Introduction to Machine Learning U [0.50]

The aim of this course is to provide students with an introduction to algorithms and techniques of machine learning particularly in engineering applications. The emphasis will be on the fundamentals and not specific approach or software tool. Class discussions will cover and compare all current major approaches and their applicability to various engineering problems, while assignments and project will provide hands-on experience with some of the tools.

*Department(s):* School of Engineering

#### STAT\*6801 Statistical Learning U [0.50]

Topics include: nonparametric and semiparametric regression; kernel methods; regression splines; local polynomial models; generalized additive models; classification and regression trees; neural networks. This course deals with both the methodology and its application with appropriate software. Areas of application include biology, economics, engineering and medicine.

*Department(s):* Department of Mathematics and Statistics

### Complementary AI-related

#### BINF\*6970 Statistical Bioinformatics W [0.50]

This course presents a selection of advanced approaches for the statistical analysis of data that arise in bioinformatics, especially genomic data. A central theme to this course is the modelling of complex, often high-dimensional, data structures.

*Prerequisite(s):* Introductory courses in statistics, mathematics and programming

*Restriction(s):* Restricted to students in Bioinformatics programs. Students in other programs may consult with course instructor.

*Department(s):* Dean's Office, College of Biological Science

#### CIS\*6050 Neural Networks U [0.50]

Artificial neural networks, dynamical recurrent networks, dynamic input/output sequences, communications signal identification, syntactic pattern recognition.

*Department(s):* School of Computer Science

#### CIS\*6060 Bioinformatics U [0.50]

Data mining and bioinformatics, molecular biology databases, taxonomic groupings, sequences, feature extraction, Bayesian inference, cluster analysis, information theory, machine learning, feature selection.

*Department(s):* School of Computer Science

#### CIS\*6070 Discrete Optimization U [0.50]

This course will discuss problems where optimization is required and describes the most common techniques for discrete optimization such as the use of linear programming, constraint satisfaction methods, and genetic algorithms.

*Department(s):* School of Computer Science

#### CIS\*6080 Genetic Algorithms U [0.50]

This course introduces the student to basic genetic algorithms, which are based on the process of natural evolution. It is explored in terms of its mathematical foundation and applications to optimization in various domains.

*Department(s):* School of Computer Science

#### CIS\*6100 Parallel Processing Architectures U [0.50]

Parallelism in uniprocessor systems, parallel architectures, memory structures, pipelined architectures, performance issues, multiprocessor architectures.

*Department(s):* School of Computer Science

#### CIS\*6120 Uncertainty Reasoning in Knowledge Representation U [0.50]

Representation of uncertainty, Dempster-Schafer theory, fuzzy logic, Bayesian belief networks, decision networks, dynamic networks, probabilistic models, utility theory.

*Department(s):* School of Computer Science

#### CIS\*6140 Software Engineering U [0.50]

This course will discuss problems where optimization is required and describes the most common techniques for discrete optimization such as the use of linear programming, constraint satisfaction methods, and meta-heuristics.

*Department(s):* School of Computer Science

#### CIS\*6160 Multiagent Systems U [0.50]

Intelligent systems consisting of multiple autonomous and interacting subsystems with emphasis on distributed reasoning and decision making. Deductive reasoning agents, practical reasoning agents, probabilistic reasoning agents, reactive and hybrid agents, negotiation and agreement, cooperation and coordination, multiagent search, distributed MDP, game theory, and modal logics.

*Department(s):* School of Computer Science

#### CIS\*6320 Image Processing Algorithms and Applications U [0.50]

Brightness transformation, image smoothing, image enhancement, thresholding, segmentation, morphology, texture analysis, shape analysis, applications in medicine and biology.

*Department(s):* School of Computer Science

#### CIS\*6420 Soft Computing U [0.50]

Neural networks, artificial intelligence, connectionist model, back propagation, resonance theory, sequence processing, software engineering concepts.

*Department(s):* School of Computer Science

#### ENGG\*6100 Machine Vision U [0.50]

Computer vision studies how computers can analyze and perceive the world using input from imaging devices. Topics covered include image pre-processing, segmentation, shape analysis, object recognition, image understanding, 3D vision, motion and stereo analysis, as well as case studies.

*Department(s):* School of Engineering

#### ENGG\*6140 Optimization Techniques for Engineering U [0.50]

This course serves as a graduate introduction into combinatorics and optimization. Optimization is the main pillar of Engineering and the performance of most systems can be improved through intelligent use of optimization algorithms. Topics to be covered: Complexity theory, Linear/Integer Programming techniques, Constrained/Unconstrained optimization and Nonlinear programming, Heuristic Search Techniques such as Tabu Search, Genetic Algorithms, Simulated Annealing and GRASP.

*Department(s):* School of Engineering

#### ENGG\*6570 Advanced Soft Computing U [0.50]

Neural dynamics and computation from a single neuron to a neural network architecture. Advanced neural networks and applications. Soft computing approaches to uncertainty representation, multi-agents and optimization.

*Prerequisite(s):* ENGG\*4430 or equivalent

*Department(s):* School of Engineering

#### MATH\*6020 Scientific Computing U [0.50]

This course covers the fundamentals of algorithms and computer programming. This may include computer arithmetic, complexity, error analysis, linear and nonlinear equations, least squares, interpolation, numerical differentiation and integration, optimization, random number generators, Monte Carlo simulation; case studies will be undertaken using modern software.

*Department(s):* Department of Mathematics and Statistics

**MATH\*6021 Optimization I U [0.50]**

A study of the basic concepts in: linear programming, convex programming, non-convex programming, geometric programming and related numerical methods.

*Department(s):* Department of Mathematics and Statistics

**MATH\*6051 Mathematical Modelling U [0.50]**

The process of phenomena and systems model development, techniques of model analysis, model verification, and interpretation of results are presented. The examples of continuous or discrete, deterministic or probabilistic models may include differential equations, difference equations, cellular automata, agent based models, network models, stochastic processes.

*Department(s):* Department of Mathematics and Statistics

**PHIL\*6760 Science and Ethics U [0.50]**

A consideration of the problems which arise in the conjunction of science and ethics.

*Department(s):* Department of Philosophy

**STAT\*6841 Computational Statistical Inference U [0.50]**

This course covers Bayesian and likelihood methods, large sample theory, nuisance parameters, profile, conditional and marginal likelihoods, EM algorithms and other optimization methods, estimating functions, Monte Carlo methods for exploring posterior distributions and likelihoods, data augmentation, importance sampling and MCMC methods.

*Department(s):* Department of Mathematics and Statistics

## International Development Studies

The International Development Studies (IDS) collaborative specialization provides a focal point for graduate teaching and research in the area of international development. The collaborative specialization combines training in a particular discipline with exposure to a broad range of social science perspectives. Faculty expertise encompasses various aspects of development in Asia, Africa, Eastern and Western Europe and the Americas. Students wishing to pursue a Master's or PhD degree with the designation "International Development Studies" must enter the collaborative specialization in International Development through a participating department.

### Administrative Staff

#### Acting Director

Craig Johnson (805 MacKinnon, Ext. 53134)  
cjohns06@uoguelph.ca

#### Graduate Program Coordinator

Adam Sneyd (535 MacKinnon, Ext. 53568)  
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#### Graduate Program Assistant

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### From Capacity Development and Extension

#### Graduate Program Coordinator

Al Lauzon (145 Landscape Architecture, Ext. 53379)

#### Graduate Program Assistant

Patricia Van Asten (100 Landscape Architecture, Ext. 56780)

### From Economics

#### Graduate Program Coordinator

Thanasis Stengos (715 MacKinnon, Ext. 53917)

#### Graduate Program Assistant

Stephanie Juhasz (726 MacKinnon, Ext. 56341)

### From Engineering

#### Associate Director, Graduate Studies

Bahram Gharabaghi (2417 Thornbrough, Ext. 58451)

#### Graduate Program Assistant

Jacqueline Floyd (1405 Thornbrough, Ext. 56187)

#### Graduate Program Assistant

Natasha Wismark (1407 Thornbrough, Ext. 52404)

### From English

#### Graduate Program Coordinator

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#### Graduate Program Assistant

Olga Petrik (427 MacKinnon, Ext. 56315)

### From Environmental Sciences

#### Program Coordinator

Emmanuelle Arnaud (126 Alexander Hall, Ext. 58087)

#### Graduate Program Assistant

Jennifer LaPorte (275 Alexander Hall, Ext. 53937)

### From Food, Agricultural and Resource Economics

#### Graduate Program Coordinator (MSc/MFARE)

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#### Graduate Program Coordinator (PhD)

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#### Graduate Program Assistant

Kathryn Selves (311 MacLachlan, Ext. 52771)

### From Geography

#### Graduate Program Coordinator

Noella Gray (121 Hutt, Ext. 58155)

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Nance Grieve (123a Hutt, Ext. 56721)

### From History

#### Graduate Program Coordinator

Susan Nance (2008 MacKinnon, Ext. 56327)

#### Graduate Program Assistant

Audra Bolton (2010 MacKinnon, Ext. 56847)

### From Latin American and Caribbean Studies

#### Graduate Program Coordinator

Gordana Yovanovich (277 MacKinnon, Ext. 53180)

#### Graduate Program Assistant

Bethany Presley (267 MacKinnon, Ext. 56887)

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### From Philosophy

#### Graduate Program Coordinator

Don Dedrick (329 MacKinnon, Ext. 53203)

#### Graduate Program Assistant

Janet Thackray (348 MacKinnon, Ext. 56265)

### From Plant Agriculture

#### Graduate Program Coordinator

Istvan Rajcan (317 Crop Science Building, Ext. 53564)

#### Graduate Program Assistant

Tara Israel (1105 Bovey, Ext. 56077)

### From Political Science

#### Graduate Program Coordinator

Candace Johnson (551 MacKinnon Ext., Ext. 52179)

#### Graduate Program Assistant

Renee Tavascia (533 MacKinnon, Ext. 53469)

### From Population Medicine

#### Graduate Program Coordinator

David Pearl (207B CLRE, Ext. 54748)

#### Graduate Program Assistant

Ariah Easley (102 CLRE, Ext. 54005)

### From Public Health

#### Graduate Program Coordinator

Andrew Papadopoulos (110 FVMI, Ext. 53894)

#### Graduate Program Assistant

Ariah Easley (102 CLRE, Ext. 54005)

### From Rural Planning and Development

#### Graduate Program Coordinator

Wayne Caldwell (LA Rm 110A, Ext. 56420)

#### Graduate Program Assistant

Patricia Van Asten (100 Landscape Architecture, Ext. 56780)

### From Sociology and Anthropology

#### Sociology Graduate Program Coordinator

Jeji Varghese (634 MacKinnon Ext., Ext. 56333)

#### Public Issues in Anthropology Graduate Program Coordinator

Satsuki Kawano (603 MacKinnon, Ext. 53912)

#### Graduate Program Assistant

Shelagh Daly (624 MacKinnon, Ext. 53895)

### Master's Collaborative Specialization

Students wishing to pursue a Master's degree with the designation "International Development Studies" must enter the collaborative specialization in International Development through a participating department.

### Admission Requirements

Students must meet the University's general requirement a four-year Honours degree, or equivalent, from a recognized post-secondary institution with a B- average over the last two years of full-time equivalent study. Note that some departments set their admission requirement higher than B-.

Students must have completed the following:

- One undergraduate course in economics.
- One undergraduate course in a social science discipline
- One course in social science research methods or equivalent.

### Degree Requirements

Students complete International Development Studies core requirements and the requirements of their home department. The following are requirements for select departments; consult the IDS Graduate website for other departments.

### IDS Master's Core Courses\*

IDEV*6200	[1.00]	Development Theory, Issues and Process
IDEV*6300	[0.50]	Research and Analysis in a Development Context

### Optional IDS Courses

Students in the collaborative specialization may undertake two optional interdisciplinary courses:

IDEV*6000	[0.50]	Regional Context
IDEV*6500	[0.50]	Fieldwork in International Development Studies

### Departmental or Program Requirements

Programs not listed below are designed by special arrangements. All departmental requirements are subject to change. Students should confirm the departmental course requirements with the respective Graduate Program Coordinator.

**Capacity Development and Extension (MSc)**

CDE*6070	[0.50]	Foundations of Capacity Building and Extension
CDE*6260	[0.50]	Research Design
One of:		
RPD*6380	[0.50]	Application of Quantitative Techniques in Rural Planning and Development
EDRD*6000	[0.50]	Qualitative Analysis in Rural Development
Two additional courses from the following CDE restricted electives group:		
CDE*6290	[0.50]	Special Topics in Capacity Building and Extension
CDE*6311	[0.50]	Community Engagement and Public Participation
CDE*6320	[0.50]	Capacity Building for Sustainable Development
CDE*6330	[0.50]	Facilitation and Conflict Management
CDE*6410	[0.50]	Readings in Capacity Building and Extension
CDE*6420	[0.50]	Communication for Social and Environmental Change
CDE*6690	[0.50]	Community Environmental Leadership
One open elective [0.50] (one IDS Master's Core Course will fulfill this requirement)		
A thesis OR		
CDE*6900	[1.00]	Major Research Paper
plus two more courses from the restricted electives group (see course list above)		

**Economics (MA)**

ECON*6000	[0.50]	Microeconomic Theory I
ECON*6020	[0.50]	Macroeconomic Theory I
ECON*6940	[1.00]	Research Project

One of:

ECON*6050	[0.50]	Introduction to Econometric Methods
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AND

ECON*6180	[0.50]	Econometric Methods
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OR

ECON*6140	[0.50]	Econometrics I
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**Engineering (MEng in Environmental Engineering or Water Resources Engineering)**

Six courses from the list of required graduate courses in Engineering (to be selected in consultation with advisor)

Plus one of:

ENGG*6950	[1.00]	Final Project in Environmental Engineering
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ENGG*6900	[1.00]	Final Project in Water Resources Engineering
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**Engineering (MAsc in Environmental Engineering or Water Resources Engineering)**

Three courses from the list of required graduate courses in Engineering (to be selected in consultation with advisor)

Plus:

Thesis

**English (MA)**

Four English courses and a thesis

OR

Six English courses and

ENGL*6803	[1.00]	Research Project
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**Environmental Sciences (MSc)**

ENVS*6900	[0.50]	Research Seminar in Environmental Sciences
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Two other courses in consultation with the department.

Plus:

Thesis

**Family Relations and Applied Nutrition (MSc)****Applied Human Nutrition**

For all students in the MSc program in the field of Applied Human Nutrition, a minimum of 2.25 graduate credits will be chosen in consultation with the student's advisor and advisory committee including:

FRAN*6000	[0.50]	Research Methods
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FRAN*6010	[0.50]	Applied Statistics
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FRAN*6020	[0.50]	Qualitative Methods
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FRAN*6550	[0.25]	Research Seminar
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One additional [0.5] graduate elective course such as FRAN\*6610, FRAN\*6510 or another graduate level elective course related to the student's research specialization. It can be taken within Family Relations and Applied Nutrition or in other academic units of the university.

Students who enter the MSc-AHN program from a non-nutrition undergraduate program will also be required to take those undergraduate and/or graduate courses necessary to meet foundational knowledge in applied human nutrition. In addition, students must complete a research thesis.

**Food, Agricultural and Resource Economics (MSc or MFARE)****Thesis based MSc**

FARE*6380	[0.50]	Applied Microeconomics for Agricultural Economists
FARE*6970	[0.50]	Applied Quantitative Methods for Agricultural Economists

FARE*6910	[0.50]	Applied Policy Analysis I
FARE*6100	[0.50]	The Methodologies of Economics
FARE*6600	[0.50]	Food Security and the Economics of Agri-Food Systems in Developing Countries
FARE*6800	[0.00]	Seminar in Agricultural Economics
One additional course		
A thesis		

**Course Work and Major Research Paper MFARE**

FARE*6380	[0.50]	Applied Microeconomics for Agricultural Economists
FARE*6910	[0.50]	Applied Policy Analysis I
FARE*6970	[0.50]	Applied Quantitative Methods for Agricultural Economists
FARE*6100	[0.50]	The Methodologies of Economics
FARE*6600	[0.50]	Food Security and the Economics of Agri-Food Systems in Developing Countries
FARE*6400	[0.50]	Advanced Topics in Agricultural Economics
FARE*6800	[0.00]	Seminar in Agricultural Economics
FARE*6140	[1.00]	Major Paper in Food, Agricultural and Resource Economics

One additional course

**Course Work MFARE**

In order to satisfy the degree requirements of the course work option, students will complete successfully the following courses:

FARE*6380	[0.50]	Applied Microeconomics for Agricultural Economists
FARE*6910	[0.50]	Applied Policy Analysis I
FARE*6970	[0.50]	Applied Quantitative Methods for Agricultural Economists
FARE*6100	[0.50]	The Methodologies of Economics
FARE*6600	[0.50]	Food Security and the Economics of Agri-Food Systems in Developing Countries

FARE*6800	[0.00]	Seminar in Agricultural Economics
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along with three additional graduate courses approved by the student's advisory committee. Students in this option are restricted from taking FARE\*6140

**Geography (MA or MSc)**

GEOG*6090	[0.50]	Geographical Research Methods I
GEOG*6091	[0.50]	Geographical Research Methods II

One other Geography course (which can be taken from the IDS core)

Either a thesis OR

GEOG*6180	[1.00]	Research Project in Geography plus one other Geography course not taken as part of the IDS core
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**History (MA)**

Three History courses

One of:

Thesis

HIST*6400	[1.00]	Major Paper
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**Latin American and Caribbean Studies (MA)**

LACS*6010	[0.50]	Latin American Identity & Culture
LACS*6020	[0.50]	Re-Imagining Community in Latin America
LACS*6030	[0.50]	Globalization & Insecurity in the Americas

Plus:

Thesis

Or:

LACS*6100	[1.00]	Research Project
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One other LACS course

**Management (MA)****Degree Requirements**

Students are required to take 8 courses (4.0 credits) plus the major research project (1.0 credit).

**Core Courses:**

MGMT*6100	[0.50]	Evidence Based Management Research
MGMT*6200	[0.50]	Leadership Assessment and Development

**Fields:****Management Research**

MGMT*6300	[0.50]	Business Consulting
MGMT*6400	[0.50]	Project Management
BUS*6800	[0.50]	Readings in Leadership I
BUS*6810	[0.50]	Readings in Leadership II
BUS*6820	[0.50]	Readings in Management
BUS*6840	[0.50]	Foundational Theories of Management

**Accounting**

ACCT*6100	[0.50]	Integrated Cases I
ACCT*6200	[0.50]	Integrated Cases II
ACCT*6300	[0.50]	Taxation
ACCT*6400	[0.50]	Performance Management
ACCT*6500	[0.50]	Assurance
ACCT*6600	[0.50]	Financial Management

Other courses from the Department of Management with permission from the Graduate Program Coordinator.

### Restricted Electives:

One quantitative or qualitative research methods course (0.5 credits) with permission:

ANTH*6140	[0.50]	Qualitative Research Methods
FRAN*6020	[0.50]	Qualitative Methods
MGMT*6120	[0.50]	Quantitative Methods for Evidence Based Management
MGMT*6830	[0.50]	Applied Univariate Statistical Analysis for Management
MGMT*6840	[0.50]	Quantitative Research Methods: Multivariate Techniques
MGMT*6850	[0.50]	Qualitative Research Methods
PSYC*6060	[0.50]	Research Design and Statistics
SOC*6130	[0.50]	Quantitative Research Methods
SOC*6140	[0.50]	Qualitative Research Methods

### Major Research Paper:

MGMT*6500	[1.00]	Major Research Project
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### Philosophy (MA)

PHIL*6950	[0.50]	MA Seminar
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Additional philosophy courses in consultation with the department

Either a thesis or research paper (in conjunction with)

PHIL*6990	[1.00]	Major Research Project
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### Political Science (MA)

#### IDS Requirements:

POLS*6900	[0.25]	Communications
POLS*6940	[0.75]	Research Design and Methods
POLS*6730	[0.50]	Development and Global Justice

One of:

Thesis

OR

POLS*6970	[1.00]	Major Paper
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plus one additional course from the Political Science Department (elective)

### Population Medicine (MSc course work)

POPM*6200	[0.50]	Epidemiology I
POPM*6210	[0.50]	Epidemiology II
POPM*6250	[1.00]	Project in Epidemiology

### Note

\*NB: A student's Population Medicine advisor may require a student to take POPM\*6100, Seminar.

### Public Health (MPH)

PABI*6500	[0.50]	Infectious Diseases and Public Health
POPM*6200	[0.50]	Epidemiology I
POPM*6510	[0.50]	Community Health Promotion
POPM*6520	[0.50]	Introduction to Epidemiological and Statistical Methods
POPM*6530	[0.50]	Health Communication
POPM*6540	[0.50]	Concepts in Environmental Public Health
POPM*6550	[0.50]	Public Health Policy and Systems
POPM*6560	[1.00]	Public Health Practicum
POPM*6570	[0.00]	Public Health Capstone
POPM*6580	[0.50]	Public Health Administration

### Public Issues in Anthropology (MA)

#### IDS Requirements:

ANTH*6080	[0.50]	Anthropological Theory
ANTH*6140	[0.50]	Qualitative Research Methods
ANTH*6000	[0.50]	Public Issues Anthropology

Either a Thesis and one additional course or

ANTH*6660	[1.00]	Major Paper
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and three additional courses

### Rural Planning and Development (MSc Planning)

#### Departmental Requirements

RPD*6030	[0.50]	International Rural Development Planning: Principles and Practices
RPD*6170	[0.50]	Rural Research Methods
RPD*6240	[0.50]	Planning and Development Theory
RPD*6291	[0.50]	Rural Development Administration
RPD*6380	[0.50]	Application of Quantitative Techniques in Rural Planning and Development

Plus a thesis and one additional RPD course

OR

RPD*6360	[1.00]	Major Research Paper
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plus three additional RPD courses

### Sociology (MA)

SOC*6070	[0.50]	Sociological Theory
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SOC*6700	[0.00]	Pro-seminar
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One of:

SOC*6130	[0.50]	Quantitative Research Methods
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SOC*6140	[0.50]	Qualitative Research Methods
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Plus a thesis and one additional Sociology course OR

SOC*6660	[1.00]	Major Paper
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Plus three additional Sociology courses

### PhD Collaborative Specialization

The collaborative specialization in International Development Studies (IDS) in a PhD program provides an opportunity for advanced students to engage with interdisciplinary development theories and to conduct research on international development issues based on approaches of selected academic disciplines. The collaborative specialization in IDS is undertaken jointly with a discipline-based degree. Students enter IDS through a participating department with a PhD program. At present these include Sociology; Plant Agriculture, Philosophy, Political Science; Population Medicine, Geography; Food, Agricultural and Resource Economics; Economics; History; Engineering; Environmental Sciences.

Based on the experience of faculty advisors in key participating departments, the program focuses on issues such as international political economy, food security, environmental dynamics and governance, gender inequality, rural development, long-term economic change, and other interdisciplinary cutting-edge topics in international development.

### Admission Requirements

To be considered for admission, an applicant must have a recognized Bachelor's degree and a Master's degree in a relevant discipline or related interdisciplinary field. Applicants to the IDS collaborative specialization must meet the specific departmental admission requirements, which vary from one department to another. For information on the admission requirements and application deadlines of your selected department, please contact the relevant department directly.

In addition to the specific departmental admission requirements, applicants are expected to have a strong background in the social sciences a demonstrable track record of experience in the course-based study of development issues, development research and/or development practice and a stated research interest relating to international development.

### Degree Requirements

Students complete requirements for the departmental degree as well as the IDS components which consist of two core courses, including an interdisciplinary course on theories and debates in development and a course on development research and practice. Students must obtain a minimum final grade of 75% in each of the two IDS PhD core courses to remain in the IDS collaborative specialization. While the students have to successfully complete these courses to remain in the IDS collaborative specialization, they do not have to pass a separate qualifying examination in addition to the departmental qualifying exam. Furthermore, the expectation is that the IDS students' PhD research will bridge two or more disciplines in a way that relates to the field of IDS. The departmental supervisor must have knowledge and understanding of International Development Studies as it relates to the requirements of the IDS collaborative specialization. One of the members on the student's advisory committee needs to be an appointed IDS affiliated faculty member approved by the IDS Admissions Committee.

For further information regarding course offering, please contact the IDS Graduate Program Assistant.

### IDS PhD Core Courses

IDEV*6800	[0.50]	Theories and Debates in Development
IDEV*6850	[0.50]	Development Research and Practice

### Departmental PhD Requirements

Departmental requirements are assigned in collaboration with the student's home department. See respective departmental web pages.

### Courses

#### IDEV\*6000 Regional Context U [0.50]

This reading course provides an opportunity for in-depth investigation about a particular region in preparation for a thesis, major paper or research project. The course normally is directed by the student's advisor.

*Department(s):* Dean's Office, College of Social and Applied Human Sciences

#### IDEV\*6200 Development Theory, Issues and Process F-W [1.00]

This course will examine key issues in development, for example: social justice, poverty and inequality, sustainability, governance and inclusiveness, and how perspectives on these issues have changed over time and differ across disciplinary perspectives. The course will be writing-intensive and focus on the development of skills in oral communication of development issues.

*Department(s):* Dean's Office, College of Social and Applied Human Sciences

**IDEV\*6300 Research and Analysis in a Development Context S [0.50]**

Students will explore alternative approaches to development research and analysis across documentary, qualitative and quantitative methods and the ethical issues associated with research in a development context. The course involves guided readings and seminar based discussions related to development research. There will be emphasis on written and oral communication of development research and analysis to diverse audiences. The course will be taught over a two-week period at the start of the summer semester. Subsequently, students will reflect on their own positionality and the development context of their research of practicum through the remainder of the Summer semester and while engaged in this activity.

*Department(s):* Dean's Office, College of Social and Applied Human Sciences

**IDEV\*6500 Fieldwork in International Development Studies U [0.50]**

This course recognizes an intensive commitment to research in an archival repository, 'in the field' or at an appropriate development institution in Canada or abroad. The course normally is directed by the student's advisor in consultation with the advisory committee

*Department(s):* Dean's Office, College of Social and Applied Human Sciences

**IDEV\*6800 Theories and Debates in Development F [0.50]**

This course examines recent approaches in development theory explaining international inequality, poverty and long-term change. It also investigates selected current debates in international development – such as food security, trade, good governance, sustainability or gender – from various discipline-based and interdisciplinary perspectives, and analyzes selected regional experiences of development.

*Restriction(s):* Restricted to students in doctoral IDEV collaborative specializations. A minimum final grade of 75% is required to remain in the IDEV collaborative specialization.

*Department(s):* Dean's Office, College of Social and Applied Human Sciences

**IDEV\*6850 Development Research and Practice W [0.50]**

In this course students establish the linkages between their doctoral research topic and the wider field of development studies and practice. The course will examine development policies and projects, ethical issues related to (cross-cultural) development research, and relationships between research and development practice.

*Restriction(s):* Restricted to students in doctoral IDEV collaborative specializations. A minimum final grade of 75% is required to remain in the IDEV collaborative specialization.

*Department(s):* Dean's Office, College of Social and Applied Human Sciences

## Neuroscience

The Neuroscience collaborative specialization provides an opportunity for MSc/MBS/PhD students engaged in research in the rapidly expanding field of neuroscience, to combine their departmental degree program with multidisciplinary exposure to the field of neuroscience. This unique combination of multidisciplinary studies provides students with the best possible foundation for academic careers in neuroscience and related areas. The collaborative specialization includes participation from core faculty in the following departments: Animal Biosciences, Biomedical Sciences, Human Health and Nutritional Sciences, Integrative Biology, Molecular and Cellular Biology, Pathobiology, Population Medicine and Psychology. Students wishing to pursue a Master's or PhD degree with the designation Neuroscience must enter the collaborative specialization in International Development through a participating department.

### Administrative Staff

#### Boyer Winters

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### Graduate Faculty

#### Naseem Al-Aidroos

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#### Craig D. Bailey

Assistant Professor, Biomedical Sciences

#### Andrew J. Bendall

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#### Leah R. Bent

Associate Professor, Human Health and Nutritional Sciences

#### Nicholas J. Bernier

Professor, Integrative Biology

#### Elena Choleris

Professor, Psychology

#### Donald Dedrick

Associate Professor, Philosophy/Psychology

#### Mark J. Fenske

Associate Professor, Psychology

#### Christopher Fiacconi

Assistant Professor, Psychology

#### George Harauz

Professor and Canada Research Chair, Molecular and Cellular Biology

#### Andreas Heyland

Assistant Professor, Integrative Biology

#### Fiona James

Assistant Professor, Clinical Studies

#### Nina Jones

Associate Professor and Canada Research Chair, Molecular and Cellular Biology

#### Bettina E. Kalisch

Associate Professor, Biomedical Sciences

#### Jibran Khokhar

Assistant Professor, Biomedical Sciences

#### Frederic Laberge

Assistant Professor, Integrative Biology

#### Jasmin Lalonde

Assistant Professor, Molecular and Cellular Biology

#### Francesco Leri

Professor, Psychology

#### Ray Lu

Associate Professor, Molecular and Cellular Biology

#### David W.L. Ma

Associate Professor, Human Health and Nutritional Sciences

#### Neil J. MacLusky

Professor and Chair, Biomedical Sciences

#### Georgia Mason

Professor and Canada Research Chair, Animal Biosciences

#### Robert L. McLaughlin

Associate Professor, Integrative Biology

#### Daniel V. Meegan

Associate Professor, Psychology

#### Jennifer Murray

Assistant Professor, Psychology

#### Lee Niel

Assistant Professor, Population Medicine

#### Linda A. Parker

Professor and Canada Research Chair, Psychology

#### John Z. Srbley

Assistant Professor, Human Health and Nutritional Sciences

#### Lana M. Trick

Professor, Psychology

#### Lori A. Vallis

Associate Professor, Human Health and Nutritional Sciences

#### Terry Van Raay

Assistant Professor, Molecular and Cellular Biology

#### Tina Widowski

Professor, Animal Biosciences

#### Boyer D. Winters

Associate Professor, Psychology

#### John L. Zettel

Assistant Professor, Human Health and Nutritional Sciences

As a practical matter, any faculty member who is approved by the Board of Graduate Studies for graduate faculty status and is a member of a participating unit within the collaborative specialization will be able to advise a master's or doctoral student.

### Associated Graduate Faculty

#### Geoffrey Power

Contractually Limited Faculty, Human Health and Nutritional Sciences

### MSc/MBS Collaborative Specialization

The MSc/MBS collaborative specialization in Neuroscience enables students engaged in neuroscience research to combine their departmental degree program with a multidisciplinary specialization in the field of neuroscience.

#### Admission Requirements

MSc/MBS students in the collaborative specialization in Neuroscience must meet the admission requirements of the participating department in which they are enrolled. The application process has two stages: first, application to the primary program of interest, identifying interest in the collaborative specialization as a secondary focus. If the student is admitted to the primary program, the second stage is then admission to the collaborative specialization.

#### Degree Requirements

In addition to coursework in their respective departments, students in the MSc/MBS collaborative specialization must complete NEUR\*6000 as well as registering for NEUR\*6100 each term that they are in the collaborative specialization. In NEUR\*6100, students and faculty will meet once a month to discuss issues/ hear talks/ present research in neuroscience.

### PhD Collaborative Specialization

The PhD collaborative specialization in Neuroscience enables students engaged in neuroscience dissertation research to combine their departmental degree program with a multidisciplinary specialization in the field of neuroscience.

#### Admission Requirements

PhD students in the collaborative specialization in Neuroscience must meet the PhD admission requirements for the participating department in which they are enrolled.

#### Degree Requirements

If a student enters the PhD collaborative specialization in Neuroscience at the doctoral level, in addition, to coursework in their respective departments, students must complete NEUR\*6000, or show evidence of course equivalence in prior training. Students must be engaged in neuroscience dissertation research. During each term of their program of studies, doctoral students must enroll in NEUR\*6100. The seminar will meet monthly. Students must take their qualifying exams within five semesters of entering the program, as required by University graduate policies. One member on the qualifying exam committee must be a core member of the collaborative specialization in Neuroscience outside the student's home department or a faculty member from another university approved by graduate studies. As well one member of the student's advisory committee must be a core member of the neuroscience collaborative specialization outside the student's home department or a faculty member from another university approved by graduate studies.

**Courses****NEUR\*6000 Principles of Neuroscience U [0.50]**

This course is designed to ensure that graduate students with diverse neuroscience backgrounds registered in the collaborative specialization in Neuroscience are exposed to the fundamentals in all areas of neuroscience.

*Department(s):* Department of Biomedical Sciences

**NEUR\*6100 Seminar in Neuroscience U [0.00]**

This course will expose graduate students to some of the major theories, issues and methodologies driving research in neuroscience. Students will learn to critically evaluate presentations by researchers in this field as well as to communicate the results of their own research.

*Department(s):* Department of Psychology



## Toxicology

The collaborative specialization is the focal point for graduate teaching and research in toxicology. Students wishing to undertake graduate studies at the masters or doctoral level with emphasis on toxicology will be admitted by a participating department and will register in both the participating department and in the collaborative specialization. The participating academic units include the Departments of Animal Biosciences, Biomedical Sciences, Chemistry, Food Safety and Quality Assurance, Human Health and Nutritional Sciences, Integrative Biology, Molecular and Cellular Biology, Pathobiology, Plant Agriculture and the School of Environmental Sciences.

### Administrative Staff

#### Director and Graduate Program Coordinator

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### Graduate Faculty

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Assistant Professor, Biomedical Sciences

#### Jibran Khokhar

Assistant Professor, Biomedical Sciences

#### Hung Lee

Professor, School of Environmental Sciences

#### Francesco Leri

Professor, Psychology

#### Richard A. Manderville

Associate Professor, Chemistry

#### Linda A. Parker

Professor, Psychology and Canada Research Chair

#### Leonard Ritter

Professor, School of Environmental Sciences

#### Cynthia Scott-Dupree

Associate Professor, School of Environmental Sciences

#### Paul K. Sibley

Assistant Professor, School of Environmental Sciences

#### E. James Squires

Professor, Animal Biosciences

#### Glen J. Van Der Kraak

Professor, Integrative Biology and Associate Dean, Research, CBS

## Masters Collaborative Specialization

### Admission Requirements

Masters students in the collaborative specialization in toxicology must meet the masters admission requirements of the participating department in which they are enrolled.

### Degree Requirements

Masters students in the collaborative specialization in toxicology must complete a minimum of 1.50 graduate credits, which must include the toxicology courses TOX\*6000 and TOX\*6200 and courses required by the participating department in which they are enrolled. It is expected that students' research (MRP or Thesis) or at least 30% of the courses in a course-based program be in the area of toxicology.

## Doctoral Collaborative Specialization

### Admission Requirements

Doctoral students in the collaborative specialization in toxicology must meet the doctoral admission requirements of the participating department in which they are enrolled.

### Degree Requirements

Doctoral students in the collaborative specialization in toxicology must meet all the academic requirements specified by the participating department in which they are enrolled. They must also complete the courses TOX\*6000 and TOX\*6200 if they, or equivalent courses, were not taken as part of a masters program. It is expected that the students' doctoral research be in the area of toxicology.

### Courses

#### TOX\*6000 Advanced Principles of Toxicology S [0.50]

An intensive course in the principles of modern aspects of toxicology, taught in a lecture/case study format.

*Department(s):* Department of Chemistry

#### TOX\*6200 Advanced Topics in Toxicology W [0.50]

Advanced topics in toxicology will include oral presentations by students, faculty members, and guest lecturers. The emphasis will be on advanced concepts and techniques in toxicology research with particular relevance to mechanistic, molecular and interpretive toxicology.

*Restriction(s):* Credit may be obtained for only one of TOX\*6200 or TOX\*4200

*Department(s):* Department of Chemistry

#### TOX\*6590 Biochemical Toxicology F [0.50]

The molecular mechanisms of action of carcinogens and other toxic compounds. Enzymes of biotransformation, including a detailed study of cytochrome P-450. Interactions of reactive species with DNA and other macromolecules. (Credit may be obtained for only one of TOX\*4590 and TOX\*6590).

*Department(s):* Department of Chemistry

### Other courses

BIOM*6721	[0.25]	Special Topics in Pharmacology-Toxicology
BIOM*6722	[0.50]	Special Topics in Biomedical Pharmacology-Toxicology
CHEM*7310	[0.50]	Selected Topics in Biochemistry
CHEM*7600	[0.50]	Selected Topics in Organic Chemistry