

# 2019-2020 Graduate Calendar

---

The information published in this Graduate Calendar outlines the rules, regulations, curricula, programs and fees for the 2019-2020 academic year, including the Summer Semester 2019, Fall Semester 2019 and the Winter Semester 2020.

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

Contact Information:

University of Guelph  
Guelph, Ontario, Canada  
N1G 2W1

519-824-4120

Revision Information:

Date	Description
May 1, 2019	Initial Publication
June 28, 2019	Revision 1
September 2, 2019	Revision 2
December 10, 2019	Revision 3
January 28, 2020	Revision 4



## Disclaimer

---

The Office of Graduate and Postdoctoral 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

---

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

---

## Collection, Use and Disclosure of Personal Information

---

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

---

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

---

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

---

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

---

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

## Name Changes

---

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, their 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

---

The University undertakes to protect the privacy of each student and the confidentiality of their 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>.

# Learning Outcomes

---

## Graduate Degree Learning Outcomes

---

On May 27, 2013, the University of Guelph Senate approved the following five University-wide Learning Outcomes as the basis from which to guide the development of graduate degree programs, specializations and courses:

1. Critical and Creative Thinking
2. Literacy
3. Global Understanding
4. Communication
5. Professional and Ethical Behaviour

These learning outcomes are also intended to serve as a framework through which our educational expectations are clear to students and the broader public; and to inform the process of outcomes assessment through the quality assurance process (regular reviews) of programs and departments.

An on-line guide to the learning outcomes, links to the associated skills, and detailed rubrics designed to support the development and assessment of additional program and discipline-specific outcomes, are available for reference on the [Learning Outcomes website](#)

### Critical and Creative Thinking

---

Critical and creative thinking is a concept in which one applies logical principles, after much inquiry and analysis, to solve problems with a high degree of innovation, divergent thinking and risk taking. Those mastering this outcome show evidence of integrating knowledge and applying this knowledge across disciplinary boundaries. Depth and breadth of understanding of disciplines is essential to this outcome. At the graduate level, originality in the application of knowledge (master's) and undertaking of research (doctoral) is expected.

In addition, Critical and Creative Thinking includes, but is not limited to, the following outcomes: Independent Inquiry and Analysis; Problem Solving; Creativity; and Depth and Breadth of Understanding.

### Literacy

---

Literacy is the ability to extract information from a variety of resources, assess the quality and validity of the material, and use it to discover new knowledge. The comfort in using quantitative literacy also exists in this definition, as does using technology effectively and developing visual literacy.

In addition, Literacy includes, but is not limited to, the following outcomes: Information Literacy, Quantitative Literacy, Technological Literacy, and Visual Literacy.

### Global Understanding

---

Global understanding encompasses the knowledge of cultural similarities and differences, the context (historical, geographical, political and environmental) from which these arise, and how they are manifest in modern society. Global understanding is exercised as civic engagement, intercultural competence and the ability to understand an academic discipline outside of the domestic context.

In addition, Global Understanding includes, but is not limited to, the following outcomes: Global Understanding, Sense of Historical Development, Civic Knowledge and Engagement, and Intercultural Competence.

### Communication

---

Communication is the ability to interact effectively with a variety of individuals and groups, and convey information successfully in a variety of formats including oral and written communication. Communication also comprises attentiveness and listening, as well as reading comprehension. It includes the ability to communicate and synthesize information, arguments, and analyses accurately and reliably.

In addition, Communication includes, but is not limited to, the following outcomes: Oral Communication, Written Communication, Reading Comprehension, and Integrative Communication.

### Professional and Ethical Behaviour

---

Professional and ethical behaviour requires the ability to accomplish the tasks at hand with proficient skills in teamwork and leadership, while remembering ethical reasoning behind all decisions. The ability for organizational and time management skills is essential in bringing together all aspects of managing self and others. Academic integrity is central to mastery in this outcome. At the graduate level, intellectual independence is needed for professional and academic development and engagement.

In addition, Professional and Ethical Behaviour includes, but is not limited to, the following outcomes: Teamwork, Ethical Reasoning, Leadership, Personal Organization and Time Management, and Intellectual Independence.

# Table of Contents

<b>Molecular and Cellular Biology .....</b>	<b>133</b>
Administrative Staff .....	133
Graduate Faculty .....	133
Associated Graduate Faculty .....	133
MSc Program .....	134
PhD Program .....	134
Interdepartmental Programs .....	134
Collaborative Specializations .....	134
Courses .....	134



## Molecular and Cellular Biology

The MCB graduate program offers opportunities for interdisciplinary studies in molecular and cellular biology leading to the MSc and PhD degrees in the following five fields:

- **Biochemistry**
- **Cell Biology**
- **Microbiology**
- **Molecular Biology and Genetics**
- **Plant Biology**

The research groups directed by the faculty pursue fundamental and applied research questions involving diverse biological systems (plants, humans and other animals, prokaryotic and eukaryotic microbes). In general, they follow lines of scientific enquiry at the level of molecules to cells. See the [department website](#) for additional information.

### Administrative Staff

#### Chair

Marc Coppolino (4477 Science Complex, Ext. 53031)  
mcbchair@uoguelph.ca

#### Graduate Program Coordinator

Ray Lu (3443 Science Complex, Ext. 56247)  
mcbgrad@uoguelph.ca

#### Graduate Program Assistant

Bertilla Moroni (4480 Science Complex, Ext. 56246)  
cbismcbgrad@uoguelph.ca

#### CBS Graduate Admissions Secretary

Karen White (3479 Science Complex, Ext. 52730)  
cbsgrad@uoguelph.ca

### Graduate Faculty

#### Tariq Akhtar

BSc, MSc Waterloo, PhD Florida - Assistant Professor

#### Emma Allen-Vercoe

BSc London UK, PhD Open UK - Professor

#### Mark D. Baker

BSc Laurentian, MSc, PhD Waterloo - Professor

#### Andrew J. Bendall

BSc Australian National, PhD Macquarie - Associate Professor and Graduate Program Coordinator

#### Manfred Brauer

BSc Calgary, MSc, PhD Wisconsin - Associate Professor

#### Malcolm Campbell

BSc Guelph, MA Oxford, PhD Guelph - Professor and Vice-President (Research)

#### Joseph L. Colasanti

BSc, PhD Western Ontario - Associate Professor

#### Marc Coppolino

BSc Waterloo, MSc, PhD Toronto - Associate Professor and Chair

#### Georgina Cox

BSc, PhD Leeds - Assistant Professor

#### John Dawson

BSc Wilfrid Laurier, PhD Alberta - Professor

#### Michael J. Emes

BSc, PhD Sheffield - Professor

#### Jennifer Geddes-McAlister

BSc, MSc Lethbridge, PhD British Columbia - Assistant Professor

#### Steffen P. Graether

BSc, MSc, PhD Queen's - Associate Professor

#### Nina Jones

BSc Guelph, PhD Toronto - Professor

#### David Josephy

BSc Toronto, PhD British Columbia - Professor

#### Azad Kaushik

BVSc, MVSc Haryana, DSc Inst. Pasteur - Associate Professor

#### Cezar Khursigara

BSc Ryerson, PhD McGill - Associate Professor

#### Matthew S. Kimber

BSc, PhD Toronto - Associate Professor

#### Jasmin Lalonde

BA Ottawa, MA, PhD McGill - Assistant Professor

#### Ray Lu

BSc Wuhan (China), MSc Beijing Medical, PhD Saskatchewan - Associate Professor

#### Jaideep Mathur

BSc, MSc Lucknow (India), PhD Gorakhpur (India) - Associate Professor

#### Baozhong Meng

BSc, MSc Hebei Agricultural Univ. (China) - Associate Professor

#### Rod Merrill

BSc Lethbridge, PhD Ottawa - Professor

#### Richard D. Mosser

BSc, PhD Waterloo - Associate Professor

#### Robert T. Mullen

BSc, PhD Alberta - Professor

#### Lucy M. Mutharia

BSc, MSc Nairobi, PhD British Columbia - Associate Professor

#### Annette Nassuth

BSc, MSc Free University, Amsterdam, PhD Leiden - Associate Professor

#### Melissa Perreault

BSc, MSc, PhD McMaster University - Assistant Professor

#### Steven Rothstein

BA Swarthmore College, PhD Wisconsin - Professor

#### Scott Ryan

BSc Memorial, PhD Ottawa - Assistant Professor

#### Stephen Y.K. Seah

BSc, MSc National University of Singapore, PhD Sheffield - Associate Professor

#### Rebecca Shapiro

BSc McGill, PhD Toronto - Assistant Professor

#### Ian Tetlow

BSc Newcastle (UK), PhD North Wales - Associate Professor

#### James Uniacke

BSc, PhD Concordia University - Associate Professor

#### George van der Merwe

BSc, MSc, PhD Stellenbosch (South Africa) - Associate Professor

#### Terry Van Raay

BSc Windsor, MSc Guelph, PhD Utah - Associate Professor

#### John Vessey

BSc, MSc Dalhousie, PhD Eberhard Karls University of Tübingen - Assistant Professor

#### Christopher Whitfield

BSc Newcastle, PhD Edinburgh - Professor

#### Krassimir (Joseph) Yankulov

BSc Sophia, PhD ICRF London - Professor

#### Wei Zhang

BSc Beijing, MA York, PhD Toronto - Assistant Professor

### Associated Graduate Faculty

#### Hany Anany

BSc MSc Cairo, PhD Guelph - Research Scientist AAFC

#### Marc Aucoin

BASc, MSc Waterloo, PhD Montreal - Associate Professor, Chemistry, University of Waterloo

#### Anthony J. Clarke

BSc, MSc, PhD Waterloo - Professor

#### George Harauz

BASc, MSc, PhD Toronto - Professor

#### Peter J. Krell

BSc, MSc Carleton, PhD Dalhousie - Professor Emeritus, Molecular and Cellular Biology, University of Guelph

#### Joseph S.L. Lam

BSc, PhD Calgary - Professor Emeritus, Molecular and Cellular Biology, University of Guelph

#### Roselynn M.W. Stevenson

BSc, PhD Manitoba - Professor Emeritus, Molecular and Cellular Biology, University of Guelph

#### Melanie Wills

BSc, PhD Guelph - Director G. Magnotta Lyme Disease Research Lab, University of Guelph

#### Janet M. Wood

BSc Victoria, PhD Edinburgh - Professor Emeritus, Molecular and Cellular Biology, University of Guelph

## MSc Program

The MCB MSc program is offered in five fields: 1) biochemistry; 2) cell biology; 3) microbiology; 4) molecular biology and genetics; and 5) plant biology. The objective of the program is to provide graduate students with a high level of relevant knowledge and expertise in contemporary molecular and cellular biology, including experimental techniques, library research, writing and communication skills. Graduates will have the knowledge and skills needed to carry out high quality scientific research and will be prepared for employment in positions with some responsibility in the research and teaching enterprises of academic institutions (as instructors and technical staff), in science-related positions in the broad biotechnology sector (e.g. food and beverage industries, pharmaceuticals, biomedical, and agriculture-related industries), or in government sector institutes and laboratories. They will be well prepared to continue their graduate education at the PhD level. Alternatively they may opt to complete a professional degree (such as law, medicine, or business) or a teaching certificate.

### Admission Requirements

To be considered, applicants must have completed a four-year honours undergraduate science degree (or its equivalent) in a relevant discipline. Normally, the applicant must have achieved a "B" (75%) average or higher during the last two years of full-time study. In exceptional circumstances, students with a "B-minus" average (70%) will be considered provided there is strong supporting evidence of research aptitude and potential.

Each applicant must obtain the support of a faculty member willing to serve as their thesis advisor.

Admission may be granted for entry in September, January or May. Completed applications should be uploaded at least one full semester (four months) before the expected date of admission (at least eight months for international students).

All components of the application, including transcript(s), graduate certificate(s), grading scale(s), language test results, assessment forms, a statement of interest, and the name of the faculty advisor must be uploaded no later than two months after an application is submitted through the OUAC portal. Applications that are incomplete after this time period will be closed.

### Admission Process

Graduate student applications to programs in the College of Biological Science are handled by the Office of the Associate Dean, Research (ADR). Before submitting an application, applicants are strongly encouraged to view the "[Before you Apply](#)" and "[Admission Process](#)" webpages on the ADR Future Student's site.

Complete application instructions may also be found on the [Office of Graduate Studies](#) webpage or in the Graduate Calendar

### Program Requirements

Students in the MSc program must complete a minimum of 2 courses (1.5 credits) at the graduate level. The course MCB\*6500 MSc Research Topics in Molecular & Cellular Biology (1.0) is mandatory. This two-semester should be completed in the first year of study and normally in the first two semesters. Senior undergraduate courses may be taken on the recommendation of the Advisory Committee but these will not count towards the 1.5 credit requirement. An average of "B-minus" (70%) must be achieved in the prescribed courses.

The MSc thesis research must involve original enquiry into a well-defined question in the molecular biosciences. It is expected that the research will not have been previously reported in the literature and, wherever possible, the research should yield publishable data.

All students beyond year 1 in the program are required to participate annually in the CBS Graduate Student Symposium by presenting a poster or giving a short talk describing their research progress.

## PhD Program

The MCB PhD program is offered in five fields: 1) biochemistry; 2) cell biology; 3) microbiology; 4) molecular biology and genetics; and 5) plant biology. The objective of the program is to develop independent and creative scientists specializing in molecular and cellular biology. Graduates will be prepared for positions as scholars in academic institutions, as leaders in the research and development sector of the biomedical and other industries or government agencies, and in social institutions.

### Admission Requirements

There are three pathways for admission to the PhD program:

1. Students who have achieved an "A-minus" (80%) average or higher during the last two years of full-time study while completing a four-year honours BSc program (or its equivalent) and who provide evidence of research aptitude and potential based on laboratory research experience may apply to enter the PhD program directly, or

2. An MSc student may apply to transfer to the PhD program before completing the MSc degree. To be eligible for transfer, the student must have completed a high quality undergraduate degree with a grade average of B+ or higher. Before applying for transfer to the PhD program students must complete MCB\*6500 (MSc Research Topics in Molecular and Cellular Biology) plus an additional course with at least 0.5 graduate course credit, attaining an overall A minus average (at least 80%). Applications for transfer must be approved by the end of the fourth semester in the MSc program.
3. Applicants may have completed a recognized Masters degree in a relevant discipline with a minimum academic standing of "A-minus" (80%).

Each applicant must obtain the support of a faculty member willing to serve as their thesis advisor.

All components of the application, including transcript(s), graduate certificate(s), grading scale(s), language test results, assessment forms, a statement of interest, and the name of the faculty advisor must be uploaded no later than two months after an application is submitted through the OUAC portal. Applications that are incomplete after this time period will be closed.

Admission may be granted for entry in September, January or May. Completed applications should be uploaded at least one full semester (four months) before the expected date of admission (at least eight months for international students).

### Admission Process

Graduate student applications to programs in the College of Biological Science are handled by the Office of the Associate Dean, Research (ADR). Before submitting an application, applicants are strongly encouraged to view the "[Before you Apply](#)" and "[Admission Process](#)" webpages on the ADR Future Student's site.

Completed application instructions may also be found on the [Office of Graduate Studies](#) webpage or in the Graduate Calendar.

### Program Requirements

Students in the PhD program must complete MCB\*7500 PhD Research Topics in Molecular & Cellular Biology. This two-semester course should be completed in the first year of study and normally within the first two semesters. Students without an MSc degree in Molecular and Cellular Biology or the equivalent are required to take one additional graduate course. Other courses may be taken on the recommendation of the Advisory Committee. An average of "B-minus" (70%) must be achieved in the prescribed courses. To be a candidate for the PhD degree, each student must pass a PhD Qualifying Exam. The Qualifying Examination is completed before the end of the fifth semester (for students with an MSc) or the end of the seventh semester (for students without an MSc).

The PhD thesis research must involve original enquiry into a well-defined question in the molecular biosciences. It is expected to result in the publication of one or more papers in high-quality peer-reviewed journals. The research must represent a significant contribution to the relevant research field.

All students beyond year 1 in the program are required to participate annually in the CBS Graduate Student Symposium by presenting a poster or giving a short talk describing their research progress.

### Interdepartmental Programs

Faculty in Molecular and Cellular Biology also participate in the interdepartmental programs in Bioinformatics, Biophysics and Biotechnology

### Collaborative Specializations

Faculty in Molecular and Cellular Biology also participate in the collaborative specializations in One Health, Neuroscience or Toxicology

### Courses

#### MCB\*6310 Advanced Topics in Molecular and Cellular Biology F [0.50]

This course will consider fundamental cellular processes from multiple perspectives: biochemistry, cell biology, microbiology, molecular biology and genetics, and plant biology. Topics will vary from semester to semester but a multi-disciplinary approach to advanced concepts and experimental strategies will be a common theme.

*Department(s):* Department of Molecular and Cellular Biology

#### MCB\*6370 Protein Structural Biology and Bioinformatics U [0.50]

This course explores structural biology from three perspectives: 1) the fundamental concepts in structural biology; 2) the methods used to determine structures (including x-ray crystallography, NMR, electron microscopy, and computational modeling); 3) the bioinformatic concepts and tools used to compare, contrast and assign biochemical function to protein structures and sequences. The course emphasizes building a conceptual and practical skill set that will be applicable to any structure related problem.

*Department(s):* Department of Molecular and Cellular Biology



**MCB\*6500 MSc Research Topics in Molecular and Cellular Biology U [1.00]**

This mandatory two semester course emphasizes the development and refinement of the skills of scientific communication. Students submit a written thesis proposal and present a public seminar on a contemporary subject in the molecular biosciences. MCB MSc students normally complete this course within the first two semesters of their program. Students will register in each semester and receive a grade of INP (in progress) at the end of the first semester and a grade at the end of the second semester.

*Department(s):* Department of Molecular and Cellular Biology

**MCB\*7500 PhD Research Topics in Molecular and Cellular Biology U [1.00]**

This mandatory two semester course emphasizes the development and refinement of the skills of scientific communication. Students submit a written thesis proposal and present a public seminar on a contemporary subject in the molecular biosciences. MCB PhD students normally complete this course within the first two semesters of their program. Students will register in each semester and receive a grade of INP (in progress) at the end of the first semester and a grade at the end of the second semester.

*Department(s):* Department of Molecular and Cellular Biology

BINF\*6110 [0.50] Genomic Methods for Bioinformatics

BIOT\*6500 [0.50] Molecular Biotechnology