



# MCB\*3010 Dynamics of Cell Function and Signaling

Winter 2019

Section(s): C01

Department of Molecular and Cellular Biology

Credit Weight: 0.50

Version 2.00 - January 07, 2019

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## 1 Course Details

### 1.1 Calendar Description

This course examines the dynamic properties of cells as they relate to cell-cell and cell-substrate interactions and elaborates on the fundamentals of intracellular signal transduction during these interactions. Topics will include the function and regulation of signalling modules, the cytoskeleton, and membrane component in the context of cellular interactions with other cells and with the extracellular matrix. These concepts will be integrated to develop a deeper understanding of dynamic cellular function within different tissue environments and physiological settings.

**Pre-Requisite(s):** BIOC\*3560, MCB\*2050

### 1.2 Timetable

Tuesday/Thursday, 8:30-9:50, JTP 214.

Timetable and location is subject to change. Please see Courselink for the latest information.

### 1.3 Final Exam

The final exam for this course will be a take home exam. Please see Courselink for details.

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## 2 Instructional Support

### 2.1 Instructional Support Team

**Instructor:** Scott Ryan  
**Email:** sryan03@uoguelph.ca

**Telephone:** +1-519-824-4120 x52919  
**Office:** SCC 3456  
**Office Hours:** Dr Ryan is available immediately following scheduled lectures and by pre-arranged appointment. Please send an email to arrange a meeting time.

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## 3 Learning Resources

### 3.1 Required Resource(s)

**Molecular Biology of the Cell 6th ed. (2016) Alberts, Johnson, Lewis, Morgan, Raff, Roberts, Walter; Garland Science. ISBN (978 0 81 534432 2). (Textbook)**

**Courselink (Website)**

<https://courselink.uoguelph.ca/shared/login/login.html>

This course will be run using courselink

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## 4 Learning Outcomes

### 4.1 Course Learning Outcomes

By the end of this course, you should be able to:

1. Apply advanced understanding of the molecular mechanisms of cellular signaling to dissect the molecular systems that control key cellular processes (cell-cell interactions, cell-ECM interaction, cell motility, cell migration, cell differentiation).
  2. Evaluate the evidence implicating the function of cellular signaling components in cellular processes.
  3. Critically assess the methods and approaches used to analyze cell signaling pathways.
  4. Construct testable hypotheses about the protein-protein interactions that control cellular functions – cell division, cell motility, endocytosis, phagocytosis, membrane trafficking.
  5. Design experimental approaches to characterize protein function within signaling cascades.
  6. Analyze signaling cascades, and diverse cell types, as central components of physiological processes, including aspects of development.
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# 5 Teaching and Learning Activities

## 5.1 Lecture

Topic(s):

### **COURSE STRUCTURE**

#### **1. Signaling (examples: Cell-cell and Cell-ECM Adhesion)**

- a. Enzyme-couples Cell Surface Receptors
- b. Receptor recycling and degradation
- c. Posttranslational modification
- d. Feedback regulators

Readings 6th edition

Ch.15 p. 850-880  
Ch.19; p. 1042-1046, 1074-1081

#### **2. Cytoskeleton**

- a. Structure, dynamics and regulation
- b. Motors and movement (intracellular cargo)

Readings 6th edition

Ch.16 p. 889-960

#### **3. Extracellular matrix (ECM)**

- a. ECM structure
- b. ECM function

Readings 6th edition

Ch.19 p. 1047-1074, 1081-1087

#### **4. Cell-cell interactions**

- a. Cadherins, selectins, ICAMs, and integrins
- b. Cell-cell communication
- c. Signaling

Readings 6th edition

Ch.19 p. 1035-1042, 1047-1057

#### **5. Signaling in cell motility**

- a. Cytokinesis
- b. Cell polarity
- c. Phago- and endocytosis
- d. Cell migration/ Chemotaxis

Readings 6th edition

Ch.17 p. 996-1004

Ch.16 p. 940-960

Ch.13 p. 730-741

Ch.19 p. 1040-1042, 1066-1070

Ch.21 p. 1185-1186

#### **6. Cell differentiation and tissue development**

- a. Development/Gastrulation
- b. Endoderm/ Gut Epithelial Differentiation
- c. Ectoderm/Neural Differentiation
- d. Mesoderm/Muscle differentiation
- e. Stem Cells

Readings 6th edition

Ch.19 p. 1042  
 Ch.21 p. 1145-1155, 1182-1190, p. 1198-1213,  
 Ch.22 p. 1217-1234, 1247-1260

## 6 Assessments

### 6.1 Assessment Details

#### Quiz #1 (10%)

**Date:** Thu, Jan 17, JTP 214

Course Content/Activity	Learning Outcome Addressed
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Topics 1-2	1-6
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#### Midterm (40%)

**Date:** Tue, Feb 26, JTP 214

Course Content/Activity	Learning Outcome Addressed
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Topics 1-4	1-6
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#### Quiz #2 (10%)

**Date:** Thu, Mar 21, JTP 214

Course Content/Activity	Learning Outcome Addressed
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Topics 5-6	1-6
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#### Final Exam (40%)

**Date:** Take Home Exam

Course Content/Activity	Learning Outcome Addressed
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Topics 1-6	1-6
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## 7 Department of Molecular and Cellular Biology Statements

## 7.1 Academic Advisors

If you are concerned about any aspect of your academic program:

- Make an appointment with a program counsellor in your degree program. [B.Sc. Academic Advising](#) or [Program Counsellors](#)

## 7.2 Academic Support

If you are struggling to succeed academically:

- Learning Commons: There are numerous academic resources offered by the Learning Commons including, Supported Learning Groups for a variety of courses, workshops related to time management, taking multiple choice exams, and general study skills. You can also set up individualized appointments with a learning specialist. <http://www.learningcommons.uoguelph.ca/>
- Science Commons: Located in the library, the Science Commons provides support for physics, mathematic/statistics, and chemistry. Details on their hours of operations can be found at: <http://www.lib.uoguelph.ca/get-assistance/studying/chemistry-physics-help> and <http://www.lib.uoguelph.ca/get-assistance/studying/math-stats-help>

## 7.3 Wellness

If you are struggling with personal or health issues:

- Counselling services offers individualized appointments to help students work through personal struggles that may be impacting their academic performance. <https://www.uoguelph.ca/counselling/>
- Student Health Services is located on campus and is available to provide medical attention. <https://www.uoguelph.ca/studenthealthservices/clinic>
- For support related to stress and anxiety, besides Health Services and Counselling Services, Kathy Somers runs training workshops and one-on-one sessions related to stress management and high performance situations. <http://www.uoguelph.ca/~ksomers/>

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# 8 University Statements

## 8.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly:

e-mail is the official route of communication between the University and its students.

## 8.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The regulations and procedures for [Academic Consideration](#) are detailed in the Undergraduate Calendar.

## 8.3 Drop Date

Courses that are one semester long must be dropped by the end of the fortieth class day; two-semester courses must be dropped by the last day of the add period in the second semester. The regulations and procedures for [Dropping Courses](#) are available in the Undergraduate Calendar.

## 8.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

## 8.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required, however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance, and not later than the 40th Class Day.

More information: [www.uoguelph.ca/sas](http://www.uoguelph.ca/sas)

## 8.6 Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not

relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The [Academic Misconduct Policy](#) is detailed in the Undergraduate Calendar.

## **8.7 Recording of Materials**

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

## **8.8 Resources**

The [Academic Calendars](#) are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.

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