

**DEPARTMENT OF MOLECULAR AND CELLULAR BIOLOGY  
UNIVERSITY OF GUELPH**

**MCB\*3010  
Dynamics of Cell Function and Signaling  
Winter 2016, 0.5 credits**

**I) COURSE INFORMATION**

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 signaling 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.

**Lectures:**

**LECTURES in room CRSC 116 on Tuesday and Thursday, 11:30AM-12:50PM**

All material covered in lectures and the assigned readings are the responsibility of the student.

**Instructor**

Dr. Scott Ryan

SSC Room 3456

Office hours: Tues, Thurs 1:30-3:00PM

**II) SPECIFIC LEARNING OUTCOMES**

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.

### III) COURSE STRUCTURE

	Topics	Readings 6 <sup>th</sup> edition
1.	Signaling (examples: Cell-cell and Cell-ECM Adhesion) <ul style="list-style-type: none"><li>a. Enzyme-couples Cell Surface Receptors</li><li>b. Receptor recycling and degradation</li><li>c. Posttranslational modification</li><li>d. Feedback regulators</li></ul>	Ch.15 p. 850-880 Ch.19; p. 1042-1046, 1074-1081
2.	Cytoskeleton <ul style="list-style-type: none"><li>a. Structure, dynamics and regulation</li><li>b. Motors and movement (intracellular cargo)</li></ul>	Ch.16 p. 889-960
3.	Extracellular matrix (ECM) <ul style="list-style-type: none"><li>a. ECM structure and function</li><li>b. Cell walls</li></ul>	Ch.19 p. 1047-1074, 1081-1087
4.	Cell-cell interactions <ul style="list-style-type: none"><li>a. Cadherins, selectins, ICAMs, and integrins</li><li>b. Cell-cell communication</li><li>c. Signaling</li></ul>	Ch.19 p. 1035-1042, 1047-1057
5.	Signaling in cell motility <ul style="list-style-type: none"><li>a. Cytokinesis</li><li>b. Cell polarity</li><li>c. Phago- and endocytosis</li><li>d. Cell migration/ Chemotaxis</li></ul>	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 <ul style="list-style-type: none"><li>a. Development/Gastrulation</li><li>b. Endoderm/ Gut Epithelial Differentiation</li><li>c. Ectoderm/Neural Differentiation</li><li>d. Mesoderm/Muscle differentiation</li><li>e. Stem Cells</li></ul>	Ch.19 p. 1042 Ch.21 p. 1145-1155, 1182-1190, p. 1198-1213, Ch.22 p. 1217-1234, 1247-1260

### IV) Resources

#### Required Text:

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

#### Reserves at the library:

The textbook is on reserve in the library

**Courselink:**

This course will be run using : [Courselink](#)

**V) GRADE ASSESSMENT**

Form of Assessment	Weight of Assessment	Due Date of Assessment	Course Content /Activity	Learning Outcome Addressed
In class quiz #1	5%	January 26	Topics 1-2	1-6
Take home assignment #1	5%	February 9	Topics 1-4	1-6
Midterm examination	35%	February 23	Topics 1-4	1-6
Take home assignment #2	5%	March 10	Topics 5-6	1-6
In class quiz #2	5%	March 22	Topics 5-6	1-6
Final examination	45%	April 20	Topics 1-6	1-6

**Assignments:**

Assignments are designed to assess progress towards the course learning outcomes for the students and the instructors. Assignments will provide feedback to students to help them correct misconceptions early in the course, and to allow instructors to identify areas of weakness in the class and students who are at risk.

**Midterm Exam:**

**In class CRSC 116, February 23, 2015 11:30AM-12:50PM**

Specific details: Covering the material from Topics 1 to 4.  
35 multiple choice and 5 short answer questions

**Final Exam:**

**Location TBA, April 20<sup>th</sup>, 2016 11:30AM-1:30 PM**

Specific details: Cumulative final exam, covering all of the material in the course,  
40 multiple choice and 6 short answer questions; cumulative

**Deferrals policy:**

Only medical or compassionate accommodations will be granted a deferred examination. Documentation is required within 1 week following the exam.

**Technology in exams:**

Students may use a numerical calculator with In and log functions for exams. Advanced calculators, computers, tablets or smart phones may **not** be used.

**VI) COURSE POLICIES****E-mail Communication**

As per university regulations, all students are required to check their <mail.uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students.

**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. See the undergraduate calendar for information on regulations and procedures for Academic Consideration: [Academic Consideration](#)

**Drop Date**

The last date to drop one-semester courses, without academic penalty, is the 40<sup>th</sup> class day. To confirm the actual date please see the schedule of dates in the Undergraduate Calendar. For regulations and procedures for Dropping Courses, see the Undergraduate Calendar: [Undergraduate Calendar - Dropping Courses](#)

**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.

**Accessibility**

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact the Centre for Students with Disabilities as soon as possible.

For more information, contact CSD at 519-824-4120 ext. 56208 or email [csd@uoguelph.ca](mailto:csd@uoguelph.ca) or see the website: [Centre for Students with Disabilities](#)

**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: [Academic Misconduct](#)

### **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.

### **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: [Academic Calendars](#)