



UNIVERSITY OF  
CALGARY

DEPARTMENT OF BIOLOGICAL SCIENCES  
COURSE OUTLINE

**1. Course:** BIOCHEMISTRY 547 – SIGNAL TRANSDUCTION AND REGULATION OF METABOLISM

Lecture Section(s): L01: TR 12:30-13:45 ST 132 FALL 2016

COURSE COORDINATOR/LECTURER(S):

Dr. G.B.G. Moorhead BI 144A 220-6238 moorhead@ucalgary.ca

Desire to Learn (D2L) course name: F2016BCEM547L01 - BCEM 547 L01

Biological Sciences Department BI 186 403-220-3140 biosci@ucalgary.ca

**2. Prerequisites:** Biochemistry 393 or 443

See section 3.5.C in the Faculty of Science section of the online Calendar  
[www.ucalgary.ca/pubs/calendar/current/sc-3-5.html](http://www.ucalgary.ca/pubs/calendar/current/sc-3-5.html)

**NOTE:** The role of protein kinases and protein phosphatases in the regulation of metabolic and signal transduction pathways will be emphasized. Knowledge of Biochemistry at the BCEM 393 level and of Signal Transduction/ Cell Biology at the BIOL 331 level is expected.

**3. Grading:** The University policy on grading and related matters is described sections [F.1](#) and [F.2](#) of the online University Calendar. In determining the overall grade in the course the following weights will be used:

In-Class Exam 1	(Oct. 13/16)	35 %
In-Class Exam 2	(Nov. 17/16)	35 %
Final Exam	TBA	30 %

There will be a final examination scheduled by the Registrar's Office.

Each piece of work (In-Class exams and final examination) by the student will be assigned a percentage score. The student's average percentage score for the various components listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade.

**4. Missed Components of Term Work:** The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in [Section 3.6](#). It is the student's responsibility to familiarize himself/herself with these regulations. See also [Section E.6](#) of the University Calendar

**5. Course Materials:** "Biochemistry 547 Lecture Notes" by G. Moorhead, SP Lees-Miller and A Goodarzi (2016) will be available on D2L for use during all lectures.

**RESERVE READING ROOM:** Multiple copies of the textbook, Cell and Molecular Biology: Concepts and Experiments by Gerald Karp, are available.

**6. Examination Policy:** No electronic or written aids (e.g. cell phones, tablets, computers, calculators, notes, textbooks) will be allowed during writing of any exams. Students should also read the Calendar, Section G <http://www.ucalgary.ca/pubs/calendar/current/g.html>, on Examinations.

**7.** In this course, the quality of the student's writing will be a factor in the evaluation of exams. See also [Section E.2](#) of the University Calendar.

## ETHICS IN THE BIOLOGICAL SCIENCES

Studies in the Biological Sciences involve the use of living and dead organisms. Students taking laboratory- and field-based courses in these disciplines can expect involvement with and experimentation on such materials. Students perform dissections on dead or preserved organisms in some courses. In particular courses, students experiment on living organisms, their tissues, cells, or molecules. Sometimes field work requires students to collect a variety of living materials by many methods, including humane trapping.

All work on humans and other animals conforms to the Helsinki Declaration and to the regulations of the Canadian Council on Animal Care. The Department strives for the highest ethical standards consistent with stewardship of the environment for organisms whose use is not governed by statutory authority. Individuals contemplating taking courses or majoring in one of the fields of study offered by the Department of Biological Sciences should ensure that they have fully considered these issues before enrolling. Students are advised to discuss any concern they might have with the Undergraduate Program Director of the Department.

### 8. OTHER IMPORTANT INFORMATION FOR STUDENTS:

- (a) **Academic Misconduct:** (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under [Section K. Student Misconduct](#) to inform yourself of definitions, processes and penalties
- (b) **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on [assembly points](#).
- (c) **Student Accommodations:** Students needing an Accommodation because of a Disability or medical condition should contact Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities available at [http://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities\\_0.pdf](http://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities_0.pdf).
- Students needing an Accommodation in relation to their coursework or to fulfil requirements for a graduate degree, based on a Protected Ground other than Disability, should communicate this need, preferably in writing, to the Associate Head of Biological Sciences, Dr. H. Addy by email addy@ucalgary.ca or phone 403 220-3140.
- (d) **Safewalk:** Campus Security will escort individuals day or night (<http://www.ucalgary.ca/security/safewalk/>). Call 220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.
- (e) **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). As one consequence, students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information see also: <http://www.ucalgary.ca/secretariat/privacy>.
- (f) **Student Union Information:** VP Academic Phone: 403 220-3911 Email: [suvpaca@ucalgary.ca](mailto:suvpaca@ucalgary.ca)  
SU Faculty Rep. Phone: 403 220-3913 Email: [science1@su.ucalgary.ca](mailto:science1@su.ucalgary.ca), [science2@su.ucalgary.ca](mailto:science2@su.ucalgary.ca) and [science3@su.ucalgary.ca](mailto:science3@su.ucalgary.ca);  
Student Ombuds Office: 403 220-6420 Email: [ombuds@ucalgary.ca](mailto:ombuds@ucalgary.ca);  
<http://ucalgary.ca/provost/students/ombuds>
- (g) **Internet and Electronic Device Information:** You can assume that in all classes that you attend, your cell phone should be turned off unless instructed otherwise. Also, communication with other individuals, via laptop computers, Blackberries or other devices connectable to the Internet is not allowed in class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.
- (h) At the University of Calgary, feedback provided by students through the Universal Student Ratings of Instruction (USRI) survey provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses ([www.ucalgary.ca/usri](http://www.ucalgary.ca/usri)). Your responses make a difference - please participate in USRI Surveys.

Letter Grade    Mark Cut Off

A+	90
A	85
A-	80
B+	75
B	70
B-	65
C+	60
C	55
C-	50
D	48
F	<47

**Course Learning Outcomes**

At the end of this course, the successful student will be able to:

- Appreciate the concept of extracellular and intracellular signaling events.
- Explain how covalent modification of proteins control conformation and drive protein-protein interactions.
- Explain the importance of cellular location in signaling.
- Understand how growth factor signaling interfaces with intracellular energy and nutrient status.
- Understand the types of cellular DNA damage and the pathways of repair.
- Integrate the DNA-damage response with phases of the cell cycle.
- Understand the formation and regulation of mammalian chromatin, how it is altered during the cell cycle and during the DNA damage response.

## BIOCHEMISTRY 547

### LECTURE OUTLINE

1	Tuesday	September 13	Introduction to signal transduction	GBGM
2	Thursday	September 15	Protein modifications and interaction domains	GBGM
3	Tuesday	September 20	G-protein coupled receptor pathways	GBGM
4	Thursday	September 22	Second messengers, lipid kinases	GBGM
5	Tuesday	September 27	Protein kinase structure and function	GBGM
6	Thursday	September 29	Protein phosphatase structure and function	GBGM
7	Tuesday	October 4	Small G-proteins, MAP kinase pathway	GBGM
8	Thursday	October 6	MAP kinase pathway	GBGM
9	Tuesday	October 11	Insulin signaling, pathway cross talk	GBGM
10	<b>Thursday</b>	<b>October 13</b>	<b>In class test 1</b>	<b>GBGM</b>
11	Tuesday	October 18	Nitrogen metabolism	GBGM
12	Thursday	October 20	Sensing nitrogen status	GBGM
13	Tuesday	October 25	Stress signaling: amino acids	GBGM
14	Thursday	October 27	Stress signaling: glucose and snf1	GBGM
15	Tuesday	November 1	AMP-activated PK (AMPK)	GBGM
16	Thursday	November 3	Glycogen metabolism	GBGM
17	Tuesday	November 8	Target of rapamycin signaling	GBGM

### November 10-13 READING DAYS – NO LECTURES

*Thursday November 10 No Lecture*

18	Tuesday	November 15	Target of rapamycin signaling /Paper discussion	GBGM
19	<b>Thursday</b>	<b>November 17</b>	<b>In class test 2</b>	<b>GBGM</b>
20	Tuesday	November 22	DNA damage response	SPLM
21	Thursday	November 24	DNA damage response	SPLM
22	Tuesday	November 29	The Cell Cycle and DNA damage response	AG
23	Thursday	December 1	Chromatin Dynamics and Epigenetics	AG
24	Tuesday	December 6	Chromatin Dynamics and the Cell Cycle	AG

