

## BIOCHEMISTRY 403 CRN 10259: BIOCHEMISTRY OF SIGNAL TRANSDUCTION COURSE OUTLINE – FALL 2020

### Biochemistry of Signal Transduction

The objective of this course is to examine in detail the biochemical basis of the transmission of molecular signals from a cell's exterior to its interior and how this can bring about changes in cellular behavior and gene expression. The course emphasizes the biochemical concepts underlying signal transduction and the types of experimental analysis that are employed to study signaling pathways. A major focus will be on how signalling can be disrupted in human disease, specifically cancer and viral infection

#### Instructors: Dr John Burke

Dr. Burke:

[ieburke@uvic.ca](mailto:ieburke@uvic.ca)

Office Hours: Monday Thursday 11:30-12:30 Online (zoom link will be available on brightspace)

**Schedule:** Virtual Lecture posted Monday, Synchronous lecture/group work Thursday 10:00 am - 11:20 am, (zoom link will be available on brightspace)

**Readings:** Readings will be posted on the brightspace web site.

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#### Topics (with approximate dates)

Dates important dates in bold	Topic
Sept 10	Introduction – Principles of Signaling pathways
14, 17	Methods / Modular domains and components; Quiz 1
21, 24	Kinase signaling, Quiz 2
28, Oct 1	Receptor Tyrosine Kinases, Quiz 3
5, 8	Monomeric G-proteins GEFs and GAPs, Quiz 4
12, 15	Thanksgiving holiday / Midterm review
19, 22	<b>Midterm 1</b> / Lipid signaling, Quiz 5
26, 29	G protein coupled receptors, Quiz 6
Nov 2, 5	GPCRs
9, 12	Reading break 9-11; PI3Ks, Quiz 7
16, 19	PI3Ks / mTOR, Quiz 8
23, 26	Mis-regulation of signaling in cancer/viral infection
30, <b>Dec 3</b>	System approaches to signaling, <b>Midterm 2</b>

**Student Evaluation:**

<b>Practice quizzes (available weekly on brightspace)</b>	<b>25%</b>
Midterm Exam 1 (Oct 19 <sup>th</sup> ):	30%
Midterm Exam 2 (Dec 3 <sup>rd</sup> )	15%
In class group Assignments (3): will be assigned 1 week in advance	30%

There is no assigned text for the course; Topics will be drawn from primary and review literature, assigned in class, and posted on the course website. Students are expected to complete the reading assignments and the material will be included in the midterm, quizzes, and final exams. There will be 3 in-class group assignments throughout the course. Students must be present (digitally) and participate in the class to receive a mark for these assignments. The class will be roughly ½ recorded lecture content, with ½ synchronous lecture period, with group work occurring on Thursday from 10 am to 11:20. There will be a weekly multiple choice quiz on brightspace that will be available every Friday, with completion required before the next Wednesday. There will be a total of 8 quizzes, and they will start Sept 17<sup>th</sup>, and will occur every week except Oct 15<sup>th</sup> (midterm week), Nov 5<sup>th</sup> (reading break), and Nov 26<sup>th</sup> (Midterm 2).

Students are expected to view all the lectures, take notes, and participate in online discussions. Students are expected to submit all midterm and quizzes before their specified due dates. Late assignments will not be marked and will be given a grade of 0. The slides used for synchronous lectures will be provided on the website before class, however these should not be considered complete and students are responsible for all material presented in the online class. These will be recorded in case of difficulties in accessing the internet, and posted on brightspace.

**Grading Scheme:**

<b>A<sup>+</sup></b>	90 -100	<b>B<sup>+</sup></b>	77 - 79	<b>C<sup>+</sup></b>	65 - 69	<b>F</b>	< 50
<b>A</b>	85 - 89	<b>B</b>	73 - 76	<b>C</b>	60 - 64	<b>N **</b>	< 50
<b>A<sup>-</sup></b>	80 - 84	<b>B<sup>-</sup></b>	70 - 72	<b>D</b>	50 - 59		

**\*\* N grades**

**Students who have completed the following elements will be considered to have completed the course and will be assigned a final grade: All quizzes, Midterm 1; Midterm 2; 2 of the 3 assignments**

Failure to complete one or more of these elements will result in a grade of “N” regardless of the cumulative percentage on other elements of the course. An N is a failing grade, and it factors into a student’s GPA as 0. The maximum percentage that can accompany an N on a student’s transcript is 49.

**Course Experience Survey (CES):**

We value your feedback on this course. Towards the end of term you will have the opportunity to complete a confidential course experience survey (CES) regarding your learning experience. The survey is vital to providing feedback to both instructors regarding the course and our teaching, as well as to help the department improve the overall program for students in the future. When it is time for you to complete the survey, you will receive an email inviting you to do so for each instructor. If you do not receive an email invitation, you can go directly to your [CES dashboard](#). You will need to use your UVic NetLink ID to access the survey, which can be done on your laptop, tablet or mobile device. We will remind you nearer the time but please be thinking about this important activity.

**Centre for Accessible Learning**

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, approach the Centre for Accessible

Learning (CAL) as soon as possible in order to assess your specific needs.

<https://www.uvic.ca/services/cal/index.php>

**Expected learning Outcomes:**

**Diversity of signaling pathways:** students should be able to recognize emerging patterns of pathway organization and give examples. They should be able to identify similarity and differences between pathways and apply their knowledge to novel problems.

**How we study cellular signaling:** students should be able to articulate how different types of experiments are performed and what information is gained from different experiments. It is expected that students will be able to apply this knowledge to novel biochemical problems.

**Experimental basis for pathway summaries:** students are expected to be able to describe how we know given information about a pathway. For example, what is the experimental evidence supporting a given claim?

**Modularity of molecular components of signaling pathways:** students are expected to be able to identify and describe the function of the major domains discussed in class. They should have an appreciation for why proteins are organized into domains, and how this type of organization facilitates the evolution of multicellular organisms.

**Regulation of pathway components:** students are expected to be able to identify and describe the biochemical mechanisms of how pathways are turned on and off including allosteric mechanisms. They should be able to appreciate the type of information gathered from structural approaches and how genetic and molecular approaches are used to test molecular models. They should be able to apply this information to novel problems.

**Fidelity and specificity of signaling:** students should be able to describe mechanisms of how the cell achieves specificity in signaling pathways. They should appreciate that pathways are interconnected and form networks. A basic understanding of how network regulation is studied is expected.

**Critical Thinking:** students should be able to interpret and critically review primary literature in the field. They will demonstrate this ability through assignments and exams. Student should be able to identify the hypothesis or questions being addressed in a journal article, determine whether the appropriate experiments and controls have been applied, and describe the strengths and weakness of the article.

**DEPARTMENT INFORMATION AND POLICIES**

1. The Department of Biochemistry and Microbiology upholds and enforces the University's policies on academic integrity. These policies are described in the current University Calendar. All students are advised to read this section.

2. Cell phones, computers, and other electronic devices must be turned off at all times during live class sessions unless being used for the purpose of connecting and engaging with the class.

3. No recordings of live lectures are permitted without permission of the instructor. Many online courses will be recorded by the instructor for accessibility for students unable to attend. If you do not wish to be recorded, contact your instructor to determine if alternative arrangements can be made.

4. Course materials, such as notes, problem sheets, quizzes, examinations, example sheets, or review sheets, may not be redistributed without the explicit written permission of the instructor.

5. Students are expected to be available for all exams. Instructors may grant deferrals for midterm examinations for illness, accident, or family affliction. Although students do not require documentation, students must contact their instructor and BCMB office ([biocmicr@uvic.ca](mailto:biocmicr@uvic.ca)) with the reason for their

absence within 48 hours after the midterm exam. The Department will keep a record of the absences. It is the responsibility of the student to ensure all required components are complete, and to arrange deferred exams/assignments with the instructor, which normally should occur within one week of the original exam date.

6. The Department of Biochemistry and Microbiology considers it a breach of academic integrity for a student taking a deferred examination to discuss the exam with classmates. Similarly, students who reveal the contents of an examination to students taking an examination are considered to be in violation of the University of Victoria policy on academic integrity (see current University Calendar). Students must abide by UVic academic regulations and observe standards of scholarly integrity (no plagiarism or cheating). Online exams must be taken individually and not with a friend, classmate, or group, nor can you access notes, course materials, the internet, or other resources without the permission of the instructor. You are prohibited from sharing any information about the exam with others. Use of unauthorized electronic devices and accessing the internet and class material during exams is prohibited unless permission is granted by the instructor. Instructors may use Browser Lockdown Software to block access during classes and exams.

7. Deferral of a final exam must be requested with an Academic Concession form and submitted directly to Undergraduate Records. Deferred final exams for fall term courses will be arranged by the instructor. Deferred final exams for spring term courses will be arranged through Undergraduate Records and must be written before the end of the summer term as stipulated in the University Calendar.

6. Requests for review/remark of a midterm exam must be made within one week of the exam being returned.

7. The instructor reserves the right to use plagiarism detection software or other platforms to assess the integrity of student work.

8. Supplemental exams or assignments will not be offered to students wishing to upgrade their final Mark

9. Anonymous participation in online classes is not permitted without permission of the instructor.

The current pandemic is placing added stressors- financial, mental, and physical- on everyone. Your wellbeing is of foremost importance. If you are experiencing difficulties coping, the University has resources to help. Reach out to Counselling Services, the Centre for Academic Communication, or Learning Assistance Program for assistance.

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