BIOCHEMISTRY 403: BIOCHEMISTRY OF SIGNAL TRANSDUCTION
COURSE OUTLINE – FALL 2015

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.

Instructors: **Dr. Perry Howard**
Petch 207b, phoward@uvic.ca
Office Hours: Monday & Thursday 3:00 PM- 4 PM or by appointment

Dr. John Burke
Petch 270a, jeburke@uvic.ca
Office Hours: Tuesday and Wednesday 2:00 PM – 3:00 PM or by appointment.

Schedule: Mondays and Thursdays, 10:00 am - 11:20 am, ECS 124
Readings: Readings will be posted on the course web site.

Topics (with approximate dates)

Dates	Topic	Instructor
Sept 10	Introduction – Principles of Signaling pathways	Howard
14, 17	Modular architecture and evolution of signaling proteins; Specificity versus affinity SH2 example 1	Howard
21, 24	Specificity SH2 example 2 ; Information transfer across biological membranes: RTK signaling;	Howard
28, Oct 1	kinases; modular allostery example 3 FES	Howard
5, Oct 8	**Midterm 1 ;** CML BCR ABL introduction	Howard
12, 15	**Thanksgiving holiday**: example 4 BCR-ABL Modular allostery	Howard
19, 22	Rewiring signaling pathways; Monomeric G-proteins GEFs and GAPs example 6 Ras	Howard
26, 29	Assignment 1 due; Signal transduction diversity	Howard
Nov 2, **5**	Signaling networks, **Midterm 2**	Howard
Nov 9, 12	**Reading break 9-11**; Lipid compartments and signaling,	Burke
16,19	Membrane recruitment; G protein coupled receptors	Burke
23, 26	Integration of signaling pathways	Burke
30, Dec 3	PI3K/Akt; review	Burke
		Burke

Student Evaluation:

Midterm Exams **(Oct 5, Nov 5)**:	40%
Final Exam (comprehensive):	50%
Assignments 1 and 2 :	10%

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 and final exams. There will be several 1-page, research or reading assignments made throughout the course. We expect students to attend all the lectures, take notes, and participate in classroom discussions. Students are expected to attend all midterm exams on the specified dates. Late assignments will not be marked and given a grade of 0. The slides used for 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 class.

Grading Scheme:

A$^+$	90 -100	**B$^+$**	77 - 79	**C$^+$**	65 - 69	**F**	< 50
A	85 - 89	**B**	73 - 76	**C**	60 - 64	**N ****	< 50
A$^-$	80 - 84	**B$^-$**	70 - 72	**D**	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: Midterm 1 or 2; Final Exam

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, as in all other courses at UVic, you will have the opportunity to complete a confidential survey regarding your learning experience (CES). The survey is vital to providing feedback to us 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. Please ensure that your current email address is listed in MyPage (http://uvic.ca/mypage) . If you do not receive an email invitation, you can go directly to http://ces.uvic.ca . 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 and provide you with more detailed information nearer the time but please be thinking about this important activity during the course.

Accessibility:
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 Resource Centre for Students with a Disability (RCSD) as soon as possible (http://rcsd.uvic.ca/.) in order to assess your specific needs.

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 unless being used for a purpose relevant to the class. Students having a cell phone, tablet, or computer on their person during an exam will be assumed to have it for the purpose of cheating.

3. Any recordings of lectures may only be performed with written permission of the instructor, and are for personal use only. The instructor retains copyright to such recordings and all lecture materials provided for the class (electronic and otherwise); these materials must not be shared or reposted on the Internet.

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 present for the midterm and final exams. Instructors may grant deferrals for midterm examinations for illness, accident, or family affliction, and students must provide appropriate documentation 48 hours after the midterm exam. 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 a deferred examination are considered to be in

violation of the University of Victoria policy on academic integrity (see current University Calendar). 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. Multiple choice scan sheets for machine scoring (bubble sheets) are considered the authentic exam answer paper and will be retained by the department for 1 year.

7. Professors may refuse to review/remark exams not written in indelible ink. In addition, requests for review/remark of a midterm exam must be made within one week of the exam being returned. Students are expected to promptly pick up midterm exams after marking has been completed, either in class or from the instructor.

8. Examination papers that have pages removed, or are mutilated will not be marked.

Revised Mar 2015