

BIOL 437 Cell Signaling

Instructor: Dr. Edward Eivers

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Office location: 392 La Kretz Hall

Office Hours: Wednesday 1-2, or by appointment

Lecture: Tuesday, Thursday, 1.00-1.50pm, **Room:** BIOS 247

Laboratory: Tuesday, Thursday, 2.00-4.30pm, **Room:** ASCL 230

Textbook: *None required*

Additional Materials required: Lab Coat

Prerequisites: BIOL3400 and BIOL3401 (essential)

Course description

Cell Signaling is an upper division course given by the Department of Biological Sciences. This course builds on the biological concepts and skills explored in BIOL 3400 and BIOL 3401. I will assume that you are already familiar with topics taught in prerequisite courses. The course will be presented at a level suitable for advanced undergraduates and will cover both developmental and physiological cell signaling. The laboratory portion of this course will be somewhat linked to lecture material dealing with crossing transgenic fruit flies, RNAi experiments, phenotypic analysis of *Drosophila* wings, immunostaining of *Drosophila* embryos, cell culture and western blot analysis.

Course objectives

- Understand the basics of signal transduction
 - Learn about vesicular trafficking, endocytosis and exocytosis
 - Gain exposure to the experimental methods used by cell biologists and physiologists
 - Gain in depth understanding of the BMP signaling pathway, how its regulated and its developmental consequences
 - Learn about *Xenopus* and *Drosophila* embryonic development
 - Gain an in depth understanding of neurotransmission: electrical and chemical signaling
 - Learn about the physiological actions to maintain blood glucose levels
 - Develop your presentation skills and literature review
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Evaluation

There will be three written exams covering all lecture material, including student presentations. Exam 1 and 2 (midterms) and final exam (comprehensive) will be a combination of short answer questions, definitions, essays and experimental questions. 1 lab exam (final) will be given on week 14 and will cover material from the lab manual and lab sections. **No** make-up exams will be given. Exception will **ONLY** be given with documentation of a serious and compelling reason for a missed exam.

Student Presentation

Students groups will have to prepare one presentation during the semester, starting week 11. Students will be divided into groups of 2 and will be given a topic to present from a list of pre-selected journal articles. Articles will be related to material covered in lectures. The PowerPoint presentation must be 20 minutes in length. Questions will be asked after the presentation is completed. Students are encouraged to ask questions. The presentation will be subdivided as follows:

- **Title:**
- **Introduction/Background:**
- **Experimental techniques:**
- **Results:**
- **Discussion and Conclusions:**

Students will be evaluated on content and layout of the presentation (20 points), knowledge of the topic (20 points), presentation skills (20 points), teamwork (20 points) and handling of questions (20points), totaling 100 points.

Rubric for each of the graded topics above

Excellent 20 points

Very good 15 points

Good 10 points

Poor 5 points

Student groups will also be required to write up a 10-15 line summary of the presentation topic, which will be graded (50 points).

Overall Grading Breakdown

Grading Breakdown:	Points
Midterm Exam 1	190
Midterm Exam 2	190
Final Exam	270
Class presentation	100
Presentation write up	50
Lab results/write-ups	100
Lab Final	100
Total	1000

Grades in this course are not curved. Course grades will be assigned as follows:

A = (93% - 100%) C+= (77% - 79%)

A- = (90% - 92%) C = (73% - 76%)

B+ = (87% - 89%) C- = (70% - 72%)

B = (83% - 86%) D = (60% - 69%)

B- = (80% - 82%) F = (Below 59%)

Lecture Expectations

Textbook: None Required

PowerPoint material: PowerPoint material will be available online (MOODLE). In addition to this material, students should also take notes during class as not all information will be on the PowerPoint slides.

Additional Materials: Some lectures will use additional reading materials to explore topics in greater detail. These resources will be handed out in class or available online. These materials may also be used as a basis for course discussion and exam questions.

Attendance: Attendance and class participation is expected. As upper-level students you are responsible for your education and so it is in your best interest to be present in class and be an active participant in both class and labs.

Lab Expectations

Weekly attendance to your assigned laboratory session is **required**. Arrive on time and ensure you have your lab manual/handout (available on MOODLE) and any lab safety material (lab coat), disposable gloves will be provided. You are expected to have prepared and read the protocol for each session in advance of the laboratory class. Four lab reports (25 points each) are required:

Report 1. Handling fruit flies, cross flies and phenotypic analysis

Report 2. *Drosophila* embryo collection and immunostaining

Report 3. S2 cell culture and Dpp luciferase assay

Report 4. Mammalian cell culture and western blotting

Additional Policies

Cell phones: must be switched off during class, no texting or answering calls.

Computers: Always back up your course work on a reliable device. I encourage everyone to get a flashdrive that can be used for this class, in particular for transferring images from one computer to the other. Image files tend to be large and tedious to email.

“Reasonable accommodation will be provided to any student who is registered with the Office of Students with Disabilities and requests needed accommodation.”

ACADEMIC HONESTY—Students are expected to read and abide by the University’s Academic Honesty Policy, which can be found at:

<http://www.calstatela.edu/academic/senate/handbook/ch5a.htm>

Students who violate this policy will be subject to disciplinary action.

	Wk	Lecture Topic	Lab
Jan 24 th	1	Signaling Overview	Check-in
Jan 26 th	1	Signaling Overview	Check-in
Jan 31 st	2	Signaling Overview	Handling fruit flies (Review) Solution preparation
Feb 2 nd	2	Review	Handling fruit flies (Review) Solution preparation
Feb 7 th	3	BMP signaling: Introduction	Mad RNAi cross Wg RNAi cross Mad overexpression cross
Feb 9 th	3	Regulation of BMP signaling	Mad RNAi cross Wg RNAi cross Mad overexpression cross
Feb 14 th	4	Embryonic development and model systems	Drosophila cell transfection
Feb 16 th	4	BMP signaling and development	Drosophila cell transfection
Feb 21 st	5	Review	Dpp Luciferase assay
Feb 23 rd	5	Midterm Exam I	Dpp Luciferase assay
Feb 28 th	6	Electrical and Chemical Signaling Neurotransmission	<i>Drosophila</i> crosses: Phenotypic analysis
Mar 2 nd	6	Electrical and Chemical Signaling Neurotransmission	<i>Drosophila</i> crosses: Phenotypic analysis
Mar 7 th	7	Regulation of Blood glucose: Insulin signaling	<i>Drosophila</i> embryo collection
Mar 9 th	7	Regulation of Blood glucose: Glucagon signaling	<i>Drosophila</i> embryo collection
Mar 14 th	8	Glucose and calcium: human diseases	Embryo Immunostaining 1
Mar 16 th	8	Regulation of Blood calcium	Embryo Immunostaining 1
Mar 21 st	9	Regulation of Blood calcium	Embryo Immunostaining 2
Mar 23 rd	9	Review	Embryo Immunostaining 2
Mar 28th	M	Spring Break	No Lab: Spring break
Mar 30th	W	Spring Break	No lab: Spring break
Apr 4 th	10	Midterm Exam II	Mammalian Cell Culture
Apr 6 th	10	Presentation prep class	Mammalian Cell Culture
Apr 11 th	11	Student presentations	Cell Harvest, Viability and Cell Number, Protein Quantitation
Apr 13 th	11	Student presentations	Cell Harvest, Viability and Cell Number, Protein Quantitation
Apr 18 th	12	Student presentations	Western Blot 1
Apr 20 th	12	Student presentations	Western Blot 1
Apr 25 th	13	Student presentations	Western Blot 2
Apr 27 th	13	Student presentations	Western Blot 2
May 2 nd	14	Student presentations	Lab Final
May 4 th	14	Student presentations	Lab Final
May 9 th	15	Student presentations	-----
May 11 th	15	Course review	-----
May		Final	