

BIOL/CHEM 466 Advanced Laboratory in Cell and Molecular Biology

3 Credits

Dr. Andrej Podlutsky

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AHRB 2W04

office hrs: M W 11-12 am

and/or by appointment

TA: Robert Williams rtwilliams2@alaska.edu

Days, time: M,F 2:15 – 3:15 pm, W 2:15 – 5:15 pm

Pre-requisite: BIOL/CHEM 360 Cell and Molecular Biology (or equivalent; may be taken concurrently).

Required items: *Essential Cell Biology* (3rd or 4th edition) by Alberts *et al.* Garland Publishing, 3-ring binder for lab manual. The manual will be available for purchase in the Biology & Wildlife office at the start of the semester.

Course description: An advanced laboratory in cell and molecular biology. Students will learn modern cell/molecular biological techniques including, fluorescence microscopy, DNA damage and repair protocols, and aseptic mammalian cell culturing techniques. Lectures will be supplemented with reading from the primary literature.

Course goals: Students will master lab techniques commonly used in cell and molecular biology, learn how to write a scientific paper, sharpen critical thinking skills, and practice working with others to solve problems. A central goal of this course is to prepare students for working independently in a cell, molecular biology, or biochemistry laboratory.

Student learning outcomes: Students will design and conduct experiments to determine the impacts of radiation exposure (X-ray) on DNA damage and repair. Students will become proficient in culturing of human cells techniques, quantifying DNA damage caused by ionizing radiation and monitor DNA repair. Also, students will become proficient in writing a scientific paper. Students will also become proficient in searching, reading and discussing primary literature.

Instructional methods: This course will be taught through a combination of lectures, laboratories, and discussions of the primary literature. The laboratories this semester will be centered on understanding how the ionizing radiation affects cellular integrity. The first ~1.5 months of class will be spent learning laboratory techniques while cancerous cell lines. During the last month, each student will work with one cancerous and one “normal” cell lines. Your final lab report will be focused on this topic. Prior to each set of laboratories, we will read and discuss 1-2 articles from the scientific literature in which similar techniques have been used to address similar questions. You are expected to come to class prepared to discuss the papers. One student will be randomly selected on the day of the discussion to lead the discussion.

Capstone requirement: This course meets the requirement for a capstone project. You must also enroll in BIOL 400 to receive capstone credit. To receive credit, you must not only pass the course, but also receive a passing grade for the capstone project.

Policies: Students are expected to attend class and complete reading assignments prior to coming to class in preparation for group discussions and/or activities.

Lab assignments are due at the start of each lab period. No late assignments will be accepted unless you have a medical excuse and a doctor's note, explaining your illness. You must attend the lab to earn credit for the assignment. There will be no make-up labs.

Exams: Exams will be based on material covered in both the lecture and lab. If you anticipate missing an exam for family or work commitments, please let us know in advance so that we can make other arrangements. If you must miss an exam because of unexpected, extenuating circumstances (i.e.; family death, medical excuse) then you must call and/or email both of the instructors before the exam.

Blackboard: Blackboard will be used to post grades, announcements, lab materials, and reading assignments. Please check the Blackboard site on a regular basis. If you have a smartphone, you can download the Blackboard App, which will notify you immediately when new announcements have been posted.

Email etiquette: We will use UAF email accounts to contact students. Please check your UAF account on a regular basis. If you use an alternate account, please have your UAF email forwarded to that account. We will do our best to respond to your email inquiries within 24 hrs. Please be considerate in your letters and use proper English grammar. Think before you send and never write anything you would feel uncomfortable saying to us (or anyone else!) in person. Please use a greeting and sign your letter; addresses don't always reveal the identity of the writer.

Disabilities: Please let us know if you have a disability. We will work with the Office of Disabilities Service (203 WHIT, 474-7043) to provide accommodations in both the classroom and laboratory to provide equal access to all materials in this course to all students.

Support services: Writing Center 801 Gruening

Grading: Your final grades will be based on the following:

1. **Exams (200 pts):** There will be two exams during the semester (a mid-term and final), each worth 100 points. The purpose of these exams is to assess your understanding of the material, interpret data from the primary literature, and to develop your written communication and critical thinking skills. The exams will cover material from lectures and labs. They will be a combination of short answer and multiple-choice questions.

2. **Grading (425 points):**

- a. **Short assignments (~140 pts).** A short assignment, worth 10-25 points (~140 points total), will be given following each laboratory. Some of the questions will cover material in the lab for the following week. Many of the labs we will do are complex. You will enjoy the lab more, understand it better, and are more likely to obtain good results if you come prepared.
- b. **Lab notebook (60 pts).** Each student will maintain a lab notebook. These will be checked 3 times during the semester for completeness. The first notebook check will be worth 10 pts, the second, 20 pts, and the third, 30 pts (60 pts total). The dates of the notebook checks are indicated on the course schedule. The final check will be at the end of the semester. Requirements for the lab notebook will be explained during the lab.
- c. **Lab reports (200 pts).** The labs in this course build upon one another to assess how tissues become remodeled in response to exercise. You will write one complete lab report based on your independent study. Following each set of labs, you will write a mini-lab report that will include figures, figure legends and a summary of the results and appropriate statistical analyses. Each of these mini-lab reports will be worth 25 pts (100 pts total). Your final lab report on your independent study will include all figures, figure legends, results, a title, abstract, introduction and discussion, and will be worth 100 pts. It will be due at the start of the final exam.
- d. **Class discussions (75 pts).** You will be tasked with leading the discussion on a scientific paper at least once during the semester and will be required to participate in discussions.

In summary your grade will be based on the following:

<u>ASSIGNMENT</u>	<u>POINTS</u>
Exams:	2 X 100 = 200
Short lab assignments	140
Lab notebook	60
Final Lab report	200
<u>Class discussion</u>	<u>75</u>
675 points total	

Final grades will be calculated based on the percentage of points earned out of the total as follows:

Grade	% of Total Points
A+	97-100
A	90-96
A-	88-89
B+	86-87
B	80-85
B-	78-79
C+	76-77
C	70-75
C-	68-69
D+	66-67
D	60-65
D-	58-59
F	0-57

LABORATORY AND LECTURE SCHEDULE

Date	Topic	Reading
W Jan 17	Introduction to the course	
F Jan 19	Article discussion	Mehta, 2016
M Jan 22	Article discussion	Mehta, 2016
W Jan 24	Lab: Cell culture (Basics); Ionizing radiation; (shoes!)	
F Jan 26	Lecture: DNA repair and health	
M Jan 29	Lecture: DNA repair and mutagenesis I	ECB Ch-6
W Jan 31	Lab: Cell culture (Basics)	
F Feb 2	Lecture: DNA repair and mutagenesis II * Lab notebooks will be collected	ECB Ch-6
M Feb 5	Lecture: DNA repair and health	
W Feb 7	Lab: Cell culture, comet assay	Collins (2008)
F Feb 9	Article discussion	
M Feb 12	Lecture: Genome stability and cancer I	BoC* Ch-12
W Feb 14	Lab: Cell culture, comet assay	
F Feb 16	Lecture: Genome stability and cancer I	BoC* Ch-12
M Feb 19	Lecture: Genome stability and cancer II	BoC* Ch-12
W Feb 21	Lab: Cell culture, comet assay	
F Feb 23	Lecture: Genome stability and cancer II	BoC* Ch-12
M Feb 26	Article: DNA stability and health	Cha (2013)
W Feb 28	Lab: Cell culture, comet assay	
F Mar 2	Article discussion	Wrann et al., 2013
M Mar 4	Mid-term exam	
W Mar 6	Lab: Cell culture, comet assay	
F Mar 9	Lecture: DNA repair and aging	Vijg (2014)
	SPRING BREAK MARCH 12- 16	
M Mar 19	Lecture:	Stephens et al., 2015
W Mar 21	Lab: Cell culture, comet assay	
F Mar 23	Lecture: Epigenetics * Lab notebooks will be collected	Rönn et al., (2013)
M Mar 26		
W Mar 28	Lab:	
F Mar 30	Data analysis	

Weeks 11-14	INDEPENDENT PROJECTS	
	Final exam Friday, May 4, 1-3 pm	

* BoC – Biology of Cancer, by Robert Weinberg, Garland Science; 2nd edition (May 18, 2013)
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