

## **Membrane Biochemistry and Biophysics**

### **Chem 674**

**Instructor:** Kriya Dunlap, 474-2766, kldunlap@alaska.edu

**Office Hours:** Department of Chemistry and Biochemistry  
West Ridge Research Building (WRRB), 230  
In-person and zoom office hours available by appointment

**Lecture:** Tuesdays, Thursdays, 9:45 am – 11:15 am, Reichardt 202

**Text:** Mary Luckey  
Membrane Structural Biology: With Biochemical and Biophysical Foundations 2<sup>nd</sup> Ed.  
Cambridge University Press 2014  
ISBN: 978-1-107-03063-3

#### **Course:**

This 3 credit course focuses on biophysical and biochemical processes involved in membrane mediated events. These include the chemical characteristics of membrane lipids and proteins, families of membrane proteins, ion channels, excitability and membrane fusion. We will address aspects of membrane lipid rafts and lipid-dependent regulation of protein function. All course topics will be discussed in biomedical context if appropriate, while using historic, current and review literature to supplement the primary text. The use of topics pertaining to student research will be discussed in the perspective of membrane biochemistry and signaling and this incorporation will be integrated throughout the class.

#### **Course Goals:**

- Develop an understanding of the basic biochemical processes that are involved in membrane-mediated events.
- Develop an understanding of the different families of proteins classified as membrane proteins.
- Learn different research techniques and methods for studying the membrane.
- Use novel and innovative approaches to interpreting and presenting information about membrane biochemistry and biophysics.
- Discuss current research on membrane biochemistry.

#### **Learning Outcomes**

1. Identify the primary functional components and chemical characteristics of cell membranes.
2. Correlate the physical properties of cell membranes and membrane proteins with their role in cell function.
3. Describe the processes of exocytosis and membrane fusion.
4. Identify the types and characteristics of integral membrane proteins present in cell membranes.
5. Lead literature discussion(s) in a current or relevant research area in Membrane Biochemistry and Biophysics.

6. Learn to decipher key concepts and information in membrane biochemistry and how to deliver these concepts to an audience with a general chemistry or biology background.
7. Animate a membrane protein or signaling pathway relevant to your research.

**Instructional Methods:**

This course will involve a combination of traditional instructor-led lecture/PowerPoint material, student presentations, and manuscript discussion. Some student presentations will include instructions to use specific applications or methods, such as augmented reality or animation, while other presentations will be at the students' discretion. There will be in-class time allocated to learning and sharing new methods. Sharing of ideas or technologies that you are familiar with is encouraged. The hope is that these 'new' strategies will be useful in your final projects in which students will animate a membrane protein or signaling pathway relevant to your research.

Students will also be expected to select and lead discussion on relevant, current or applicable manuscripts about membrane biochemistry and/or biophysics. This is an informal discussion and should not be a presentation of the manuscript. Instead, I want students to encourage discussion. Students that are not leading a manuscript discussion will be graded on their participation. Some aspects of discussions are to identify "missing knowledge", understand the materials and methods used, and critique result interpretation.

We have a course website, <http://chem674.community.uaf.edu>. This site will be used as the central communication platform for announcements, posting of lectures and reading material. Grades will be posted on blackboard. I will sometimes email the entire class through blackboard, particularly with time sensitive material.

**Evaluation:**

Students will be evaluated in four key areas – class *participation*, leading in class discussion, in-class group and individual lectures, multi-media project, final exam.

Lead manuscript review	100 points
Participation in discussion	100 points
Presentations	100 points each
Final Project	100 points
Midterm	100 points
Final Exam:	100 points

- Participation in discussion will be based on contributing two times at each manuscript discussion. Overall score will drop one discussion to account for absences. Grading breakdown will be provided for projects.

**Course Policies:**

**Attendance:** Regular student attendance is expected to ensure consistent discussion and activities. Active student participation is expected and affects your grade.

**Presentations** Students will receive adequate preparation time for all assignments and many assignments will have time allocated in class. Content and organization of topics are the primary concern, however presentation and discussion are also subject to score.

**Final Project:** Most graduate students have fundamental pathway that either describes your work or is fundamental to the background of your work. For most of you, the membrane will be

involved. This project is designed to help you create an animation that you can incorporate into your thesis presentations. I encourage students to share resources with each other in class, whether it is applications such as drawing, model building, video and picture editing etc. and/or online resources like prezzi, slide rocket and jux.

**Exams:** There will be two take home exams: one midterm and one final exam. Late exams will only be allowed with pre-approval of the instructor or with an acceptable, documented reason such as unexpected illness, family emergencies or other unavoidable events.

**Late Work:** All assignments are due on the due date. No late work will be accepted except in the case of illness or emergency or prior arrangements are made with the instructor.

**Ethical Considerations:**

The Chemistry Department's policy of cheating is as follows: *"any student caught cheating will be assigned a course grade of F. The student's academic advisor will be notified of this failing grade and the student will not be allowed to drop the course"*.

**Plagiarism Policy:**

Plagiarism is defined as the use of "other" intellectual property without proper reference to the original author. Intellectual property includes all electronic, spoken or print media ***thus any information taken of the web is included under this statement***. Students are expected to cite all sources used. Cases of plagiarism will be taken seriously with a grade 0 for the particular assignment.

**Support Services:**

Support services will be provided by the University of Alaska Library system, online resources and the instructor. Additional services are available through Student Support Services (<http://www.uaf.edu/sssp/>) at UAF.

**Disabilities Services:**

We will work with the Office of Disabilities Services (203 WHIT, 474-7043) to provide accommodations for students with disabilities. If you have a disability and require special assistance, please contact the instructor as soon as possible. Students with disabilities must provide a written statement indicating any special requirements that will be necessary as early in the semester as possible (preferably within the first week).