



# CHM 6306

## Special Topics in Biological Chemistry: “Structural Pharmacology”

Fall 2022 (Aug 24 – Dec 7)

### Instructor

Dr. Matthew Eddy  
 matthew.eddy@ufl.edu  
 CBB 302C, 352 294 1048 (office)

### Office Hours

Wed 4:00 - 5:00 PM & by appointment. I will be available to meet both in-person and via Zoom. I am also generally available via email and will make every attempt to respond in 24 hours. If you wait to the last minute to contact me regarding questions for an assignment, I may not get back to you before the assignment due date.

### Lectures

M,W,F 3:00 – 3:50 PM. Most lectures will be held in-person. Some lectures will be made available online via the course Canvas site, as discussed by the instructor in advance. All lecture slides will be made available on the course Canvas site.

### Required Textbooks

There are no required textbooks for this course.

### Recommended Reading

The following textbooks are recommended and provide information that complements lecture material. These textbooks are made available through the UF Libraries Reserve and are found either as electronic texts or available to check out for a limited time from the science library.

- “Molecular Biology of the Cell”, 6<sup>th</sup> edition, by Bruce Alberts, Alexander Johnson, et al.

FALL SEMESTER 2022							
	S	M	T	W	T	F	S
Aug.	21	22	23	24	25	26	27
		Registration		Drop/Add			
	28	29	30	31			
Sept.					1	2	3
	4	5	6	7	8	9	10
	11	12	13	14	15	16	17
	18	19	20	21	22	23	24
	25	26	27	28	29	30	
Oct.							1
	2	3	4	5	6	7	8
	9	10	11	12	13	14	15
	16	17	18	19	20	21	22
	23	24	25	26	27	28	29
	30	31					
Nov.			1	2	3	4	5
	6	7	8	9	10	11	12
	13	14	15	16	17	18	19
	20	21	22	23	24	25	26
	27	28	29	30			
Dec.					1	2	3
	4	5	6	7	8	9	10
	11	12	13	14	15	16	17
	18	19	20	21	22	23	24
	25	26	27	28	29	30	31

#### LEGEND

Classes Exams

- “Pharmacology in Drug Discovery and Development: Understanding Drug Response” (2017) by Terry Kenakin
- “A Pharmacology Primer: Techniques for More Effective and Strategic Drug Discovery” (2015), 4<sup>th</sup> edition, by Terry Kenakin
- “Cell Biology” (2008) by Pollard, Earnshaw, Lippincott-Schwartz, and Johnson
- “The Membranes of Cells” by Philip L. Yeagle.

Additional selections from both scientific literature and textbooks will be announced on the canvas site and provided by the instructor.

## Course Description

This course presents an overview to cellular signaling, especially signaling in response to the detection of extracellular stimuli. How do cells sense their surrounding environments? How is this information used to change cellular processes? How does ligand-stimulated cell signaling lead to physiological changes at an organism level? We will be surveying and exploring these questions from the perspective of pharmacological studies of membrane sensory proteins. We will also survey approaches used to provide mechanistic insights into the functions of sensory proteins from modern biophysical and structural biology techniques. Applications to drug discovery and to understanding the modes of actions of existing drugs will be discussed. The class will also serve as a foundation for students to critically evaluate and present current relevant literature. Broadly, topics include: structural biology (i.e., x-ray crystallography, cryo-EM, and nuclear magnetic resonance), pharmacology, biological membranes and their properties, protein engineering, and additional applicable biophysical and biochemical methods.

## Course Objectives

The overall learning objective of this course is to develop an understanding of modern experimental techniques used to study cell surface signaling. The following are more specific course objectives.

- Understand fundamental concepts in pharmacology
- Develop an understanding of biological signaling pathways involving human receptor proteins
- Develop an understanding of modern techniques used to study sensory proteins
- Understand how to evaluate protein structure-function relationships
- Learn to use software for evaluation protein structures and their chemical and physical properties

A secondary goal of this course is to provide training in oral and written professional scientific communication. The following learning objectives related to this goal are covered in this course.

- Effectively search the scientific literature

- Read and understand scientific literature and critically assess presented data in publications
- Organize a professional quality scientific publication
- Design professional quality scientific figures
- Organize an effective oral presentation review of a scientific topic

## Course Grade Computation

Your letter grade will be derived from weighting the following components of your performance in the class:

30%	Project-Based Assignments & Additional Written Assignments
20%	Online Quizzes
30%	Written topical review paper assignments
10%	In-class oral presentations
10%	Final presentations

Your course grade will be determined from your total course performance percentage as follows:

>95%	A
93% - 95%	A-
91% - 93%	B+
87% - 91%	B
85% - 87%	B-
82% - 85%	C+
78% - 82%	C
74% - 78%	D
< 74%	E

All grades will be posted in the Canvas GradeBook, as available. Final grades will include rounding. Please note, Canvas does NOT round. Example: If you earn an 89.5 or greater, I will round your final grade up when submitting grades. There is no “curving” grades for the class.

UF's Grading Policy: <http://www.registrar.ufl.edu/catalog/policies/regulationgrades.html>

## Cell Phones

Please put all cell phones and other digital devices on “silent mode” during all class periods and avoid use during class.

## Class Attendance and Make-Up Policy

Class attendance and participation is expected. Excused absences are allowed in accordance with UF policy. If you are feel sick, stay home and let me know you will not be able to attend lecture. I will work with you so that you can obtain lecture materials, information on assignments, and sufficient time to complete your work for the class.

Please note that because there is a deadline for assigning and submitting a grade for your performance in the class, late final project proposal papers and presentations will not be accepted.

## **COVID Policy**

In response to COVID-19, the following recommendations are in place to maintain your learning environment, to enhance the safety of our in-classroom interactions, and to further the health and safety of ourselves, our neighbors, and our loved ones.

- If you are not vaccinated, get vaccinated. Vaccines are readily available and have been demonstrated to be safe and effective against the COVID-19 virus. Visit [one.ufl.edu](http://one.ufl.edu) for screening / testing and vaccination opportunities.
- If you are sick, stay home. Please call your primary care provider if you are ill and need immediate care or the UF Student Health Care Center at 352-392-1161 to be evaluated.
- Course materials will be provided to you with an excused absence, and you will be given a reasonable amount of time to make up work.

## **Late Submission Policy**

Assignments received past posted due dates will receive a late penalty of 10% per day unless the late submission is approved through prior communication with course instructor. If something arises that prevents you from completing the assignment on time, contact the course instructor right away to request an extension.

## **Students Requiring Accommodations**

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, [www.dso.ufl.edu/drc/](http://www.dso.ufl.edu/drc/)) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

## **Course Evaluations**

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>

## **Materials and Supplies Fees**

There are no additional fees for this course.

## **University Honor Policy**

This class will operate under the policies of the student honor code, which can be found at: <http://www.registrar.ufl.edu/catalog/policies/students.html>. The students and instructor are honor-bound to comply with the Honors Pledge: *We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.*

**More specific to this course is the expectation that any submitted written assignments are in your own language. This means that submission of verbatim or nearly-verbatim text taken from other sources and repurposed for your own assignments without proper acknowledgement of the original citation will be considered a violation of the honor code and treated as such.**

## **Zoom Presence Policy**

This class may contain hybrid lectures, i.e. lectures that are simultaneously given in-person and broadcast online via Zoom. Our class lectures may be audio and visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

## **Counseling and Wellness Center**

Contact information for the Counseling and Wellness Center:

<http://www.counseling.ufl.edu/cwc/Default.aspx>, 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

## **Policy on In-class Recording**

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in

preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student

## Tentative Lecture Schedule

Week	Dates	Topics	Review Article Dates
1	Aug 24 – 28	Introduction to pharmacology and receptor theory	
2	Aug 29 – Sep 4	Pharmacology: orthosteric agonists, antagonists, allosteric modulators	
3	Sep 5 – 11		
4	Sep 12 – 18	Molecular biology of cell signaling	
5	Sep 19 – 25	Molecular biology of GPCR signaling	
6	Sep 26 – Oct 2	Molecular biology of GPCR signaling	
7	Oct 3 – 9	GPCR structural biology (part 1): x-ray crystallography and protein engineering	
8	Oct 10 – 16	GPCR structural biology (part 2): x-ray crystallography & cryo-EM	
9	Oct 17 – 23	Biophysical Methods Part 1: NMR in solution	
10	Oct 24 – 30	Biophysical Methods Part 2: NMR in solution and in solids	
11	Oct 31 – Nov 6	Biophysical Methods Part 3: fluorescence techniques	
12	Nov 7 – Nov 13	Chemical, and physical properties of biological membranes	
13	Nov 14 – 20	GPCRs, membrane proteins, and methods for studying lipid-protein interactions	
14	Nov 21 – 27	GPCRs & biological membranes continued	
15	Nov 28 – Dec 4	Advanced topics: polypharmacology, biased signaling, structure-based drug design	
16	Dec 5 – Dec 7	Final Presentations; Last day of class Dec 7	

### Disclaimer for this document

**Note: All aspects of course operations, including grading, course policy and policy execution, are subject to change at the discretion of the course instructor.**

**If you have further questions, please contact me. Have a great semester!**

Sincerely,  
Matthew Eddy