CHEM/BMB 751, Chemical Biology for Drug Discovery
Spring 2022

Instructor: Megan Matthews, Ph.D.
Teaching Assistant: Katelyn Bustin
Course Hours: 10:15-11:45AM, T/Th, CHEM109
Course will be held via zoom for 1/13, 1/18, & 1/20
https://upenn.zoom.us/j/92882283901?pwd=WXM5WmVKc2RObFgyTlBvV3UzT2ptQT09
Email: chem751@matthewslab.org
Website: https://canvas.upenn.edu/courses/1622068

Course description: This graduate-level course will introduce topics in Chemical Biology and pharmacology and how they are applied for both basic and translational research. The course is focused on how basic science technology can be applied to discover a drug. The main components include: (1) selection of a disease with a focus on rare diseases (2) selection of a target, and (3) determining whether or not a small molecule interaction with that target can be expected to produce a therapeutic response. Key concepts of drug discovery and other drivers of drug discovery are discussed throughout the course.

Required background: Basic knowledge of biochemistry and organic chemistry.

Textbooks and readings:
No textbook is required, but the following books are great sources for background material and as reference guide.
"The Organic Chemistry of Drug Design and Drug Action" 2nd Edition, R. Silverman.
"Introduction to Bioorganic Chemistry and Chemical Biology" 1st Edition, David Van Vranken, Gregory A. Weiss

TUES	Topic/Activity	THURS	Topic/Activity
		1/13	Lecture 1: Introduction
1/18	Lecture 2: Basic Pharmacology & Drug Development	1/20	Lecture 3: Quantitative Proteomics
1/25	Lecture 4: Chemical Proteomics I	1/27	Lecture 5: Chemical Proteomics II
2/1	Lecture 6: Metabolomics	2/3	No Class: Meetings for 1-4
2/8	No Class: Meetings for 5-8	2/10	Lit Discussions: 1&2
2/15	Lit. Discussions: 3&4	2/17	Lit Discussions:5&6
2/22	Lit Discussions: 7&8	2/24	Peer Review 1 Day 1
3/1	Peer Review 1 Day 2	3/3	Peer Review 1 Day 3
3/8	SPRING TERM BREAK	3/10	SPRING TERM BREAK
3/15	Peer Review 1 Day 4	3/17	Peer Review 1 Day 5
3/22	No Class: Meetings for 9-12	3/24	No Class: Meetings for 13-16
3/29	Lit. Discussions: 9&10	3/31	Lit Discussions: 11&12
4/5	Lit. Discussions: 13&14	4/7	Lit. Discussions: 15&16
4/12	Peer Review 2 Day 1	4/14	Peer Review 2 Day 2
4/19	Peer Review 2 Day 3	4/21	Peer Review 2 Day 4
4/26	Peer Review 2 Day 5; Last day of class		

Other important Dates:

UPenn Days Off (no classes): January 17th
Drop Period Ends: February 21st
Spring term break: March 5-March 13
Last Day to Withdraw from Course: March 28th
Passover begins/Good Friday (no assignments due): April 15
Last day of classes: April 27th
End of Spring term: May 10th

Communication Protocol: During this semester we want to be as responsive to all needs and most efficient as possible. If reaching out to Professors or TAs, please email **chem751@matthewslab.org. Please note that all TA's and professors will receive your email.** In the subject line, please state what your email is in reference about (lit discussion 1, disease target, etc.)

Lectures: Powerpoint slides and pdfs will be uploaded to canvas.

Attendance and Participation (25 points): The success of this class depends on everyone's attendance and participation in class. There are 24 mandatory classes (see schedule). Excused absences that comply with university policy will result in no points lost. For information regarding religious holidays please refer to Penn's policy https://catalog.upenn.edu/pennbook/secular-religious-holidays/. Please do not be late to class. Late students (after the first 10 minutes of class) will be marked as an unexcused absence. To receive all attendance and participation points students must:

1). Attend the class
2). Watch student presentations before the "in class" period
3). Submit a question about each student literature presentation (Replying to respective 'Announcement' on canvas)
4). Actively participate in group discussion by asking questions or making pertinent comments

If students do not show up and actively participate in class, all participation points will not be given.

Literature Presentation (25 points): Students will be assigned a relevant primary literature by 1/18 and be expected to make a set of slides (PowerPoint) and upload a pre-recorded Zoom Presentation that lasts <15min. Pre-recorded presentations allow for higher quality presentations and foster better in-class discussions. Students may work in pairs and break up their presentation into two clear sections that can be watched sequentially (each student uploads their section of the pre-recorded zoom presentation separately). If so, students will need to make a single PPT file and use the same format for recording their presentation so it can be merged. The due dates for these presentations will be updated on the Assignment for each student. Please keep the following in mind:

- See the Student Lit Presentation Schedule for student pairs and double check the canvas due dates.
- The pre-recorded presentations are due on Canvas the Friday (for Tuesday presentations) or Sunday (for Thursday presentations) before the students are to "present" (lead an in-class literature discussion) in class
- Students need to be prepared to share their merged or single PPT file during discussion.

- An announcement will be created for each presentation with the uploaded pre-recorded presentation embedded and titled DATE. NAMES. PAPER. **All students are required to read every paper, watch their peers' presentations and post a question on the associated announcement by 12PM** the day before we will discuss the papers by group in class. Students will then ask their questions live in class.
- Two papers will be discussed per Lit Discussion class day.
- Papers are assigned on the second day of class, encouraging all students to know their paper well. Time is built into the class schedule to meet with Professor Mathews about the papers. Every person/pair needs to meet with Professor Matthews about their presentation.

Papers (35 points): Students will be required to submit two written papers on topics from class relevant to drug discovery. Papers (doc, docx, or pdf) will be written as follows: 1page, 11 point font, singles paced, 1 inch margins, Ariel or Calibri font, with an additional page for appropriate citation of peer-reviewed scientific journal articles. To facilitate anonymous grading and peer review, do not put your name on the paper (you are identified by Canvas for grading).

Paper 1-Selecting a Disease (15 points): For the first paper, students will select a disease that they feel would be worth developing one or more drug treatments. Students will post their selection (in a shared google sheet) on a first-come first serve basis, if another student has already selected their disease they will need to pick another unique disease. All disease selections must be picked by 1/25 and will be approved by 1/27. The Paper 1 Grading Rubric can be found on the course website. Due February 18, 11:59 pm.

Paper 2-Selecting a Drug Target (20 points): For the second paper, students will each identify a unique druggable molecular target that they feel would be worth developing. The targets must be unique and cannot have a drug that is currently in Phase II/III, or currently approved for clinical use. Students will post their selection (on a shared google sheet) on a first-come first serve basis, if another student has already selected their target they will need to pick another unique target. All drug targets must be picked by 1/25 and will be approved by 1/27. The Paper 2 Grading Rubric can be found on the course website. Due April 8, 11:59 pm.

Peer Review Talks (15 points): Following each paper submission (Fridays, 2/18 and 4/8, 11:59 pm), students will anonymously receive a paper to peer review and present to the class. Each student presenter will submit PowerPoint slides (4 slides, 1 slide with presenter name and topic, 1-3 slides with discussion points) shortly after (Mondays, 2/21 and 4/11 uploaded to Canvas by 5:00pm). Each in class presentation will last for 5-7 minutes. The goal of these presentations is to outline the strengths and weaknesses of the disease (Paper 1, 5 points) or drug target (Paper 2, 10 points) and to identify the best scientifically defendable path forward based on the criteria outline for each paper. Your grade will be based on how clearly you present the paper, not on whether it is a good or bad disease or target. It is possible to get a good grade for clearly explaining why a disease would be a poor option to make a drug against, and likewise it is possible to get a bad grade while presenting the best disease as selected by the class. Students must be ready to present on any of the 5 days of Peer review. 4-5 students will present each day.

Building a Collaborative Mindset (contributes up to 5 *EXTRA CREDIT* points): Science progress and success is built from the foundation of collaboration. The best ideas and the best

advancements in science derive from teams of scientists combining their expertise. Inspired by guest lectures and methods learned in class, reach out to a graduate student or post doc in a lab not part of your department. Please make an effort to reach out to someone you do not know and who is part of an area of research you are unfamiliar with. Interview this person about their lab, the research they perform, and the methods they utilize. Write a summary of your interview and additionally include what you learned during this assignment, what surprised you, what opportunities/ideas can be applied to their work that are complementary to what you can provide, and what you would suggest to them moving forward. See the guidelines for the Building Collaborative Mindset Assignment on the course website. Due March 15, 11:59 pm.

GRADES: Final grades will be determined by the total points accumulated (100 points possible) using the following scale:

Points	*Letter Grade*
98-100	A+
93-97.99	A
90-92.99	A-
87-89.99	B+
83-86.99	B
80-82.99	B-
78-79.99	C+
70-77.99	C
60-69.99	D
<60	F

UPenn Academic Integrity Statement: Students are expected to be familiar with and abide by the University's Code of Academic Integrity. I will not tolerate any academic dishonesty. If any academic integrity issues arise, action will be taken accordingly based on discussion and support from UPenn's Office of Student Conduct. Please visit The Office of Student Conduct's Resources for Students page for more information. Please refer to What is plagiarism from Penn Libraries for information about plagiarism. All work submitted should be your own. If you have any concerns or questions please do not hesitate to reach out and ask.

Mental Health Resources: While focusing on academics, it important to attend to your physical and mental health as well. Anxiety and depression are all too common in high-stress environments. If you are concerned about yourself or a friend, please reach out to either the Chemistry Graduate Office or Biophysics and Molecular Biology graduate office who will direct you to the appropriate resources. If you, or anybody you know, is in need of mental health care, please refer to the following campus resources: (1) Counseling and Psychological Services, CAPS 215-898-7021 (off hours and weekends 215-349-5490); (2) Department of Public Safety 215-898- 7333, or 511 if imminent danger to themselves or others; (3) Finding Programs for Student Wellness through the VPUL; and (4) Student Health Services.

Inclusion and Diversity: At Penn Chemistry, we value the backgrounds and identities of all students (including but not limited to country of origin, race, class, religion, ethnicity, gender, sexual orientation and identity, and disability status), and are committed to providing an inclusive climate across the Department. If there are elements of your experiences, culture or identity that you would like to share with me as they relate to your success in this class, I am happy to meet to discuss. Likewise, if you have any concerns in this area or are facing any

special issues or challenges, you are encouraged to discuss the matter with me (set up a meeting by email) with an assurance of full confidentiality, or with the Chemistry Graduate Office or Biophysics and Molecular Biology graduate office.