

Monday & Wednesday, 4:00 – 5:15 p.m. WC 230

Instructor: Dr. Megan E. Filbin-Wong**Contact:** mfilbin1@msudenver.edu**Office Hours:** M,W 2:00-3:30p, T 11:00a-1:00p, or by appointment**Office:** SI 3055**Instructor: Dr. Ethan Tsai****Contact:** etsai@msudenver.edu

(please put CHE 490C in e-mail subject line)

Office Hours: T 9:00a-12:00p, 2:00-4:00p**Office:** SI 3054

Overview of Awesomeness

The Chemistry of Therapeutics course is intended to be a hybrid seminar and collaborative lecture series exploring the tightly knit relationship between organic chemistry and biochemistry as it applies to a wide range of therapeutics in current medical technology. The class will explore both targeted synthetic strategies as well as the pharmacological effects of each therapeutic. The lecture series will examine classically targeted metabolic pathways and explore novel therapeutics spanning pain management, infectious disease and chemotherapeutics at the forefront of medical treatment.

What Is Expected of You?

Learning about drug synthesis and mechanism of action requires you to bridge the information you have learned in your organic and biochemistry courses. As senior-level students, you are expected to attend class regularly, read the material outlined in the schedule below and engage in thoughtful discussion. Be present, not just physically but mentally as well, and push yourself to master the material.

What Can You Expect from the Instructors?

We will give clear and on-time lectures, define your learning objectives for each topic and encourage class participation throughout the course. Your assignments will cover the material you are expected to understand and we will grade assignments fairly as outlined below. If you are unable to see either of our office hours, we will be flexible with our time to ensure your questions are answered and your concerns are addressed.

Required Materials

- 1) Willis, Christine L., Wills, Martin. Organic Synthesis. Oxford University Press; 1996
- 2) Assigned journal articles and videos (available on BlackBoard).
- 3) Materials for note taking (either a notebook or printed PowerPoint Slides).
- 4) iClickers (provided for you at the beginning of each lecture).

Reading

Reading for this course is essential – lectures will be based on the material presented in each of your textbooks. The textbooks also provide you with additional examples of therapeutics you may want to use for your review article and presentation. You will also receive several journal articles that provide additional information about the drugs and pathways discussed in class. You are expected to read these articles; you will be examined based on the content of these articles as well as what is presented in class and your textbook. It is vitally important that you also dig into each of the articles – the content may provide insight into the assignment, but background articles and works cited in your assigned reading are also fair game! It is the responsibility of the student to chase down all avenues of information!

Class Participation

Attending and participating during lectures is an essential part of learning. Throughout the semester, we will have multiple in-class group discussions as well as guest speakers. These discussions will be designed to facilitate group learning and will challenge you to work together to solve complex chemical problems. Likewise, to facilitate discussion, we will be using iClickers in class to assess your participation, which is worth 5% of your overall grade.

Exams

There will be two exams covering material presented in class (see schedule below). Reviews with study questions will be provided one week before the exam on BlackBoard. Each exam will consist of approximately 25-30 short answer / structure / synthesis and/or multiple-choice questions. Exams will cover the material stated on the schedule and will be given during the full scheduled course meeting time. *If you are caught looking at someone's paper, using any devices, or in any way cheating, you will receive an F on the assignment.* Make-up exams will not be given on a routine basis and are strictly the decision of the instructors. Exams are worth 45% of your overall grade.

Review Article

Toward the end of the course, you will be expected to write an ACS-style review article focusing on the therapeutic of your choice. You should include details of the academic and industrial synthesis as well as the biochemical pathway affected. Review articles should be no longer than 10 pages, and should include at least 10 peer-reviewed primary references. You are expected to paraphrase your references and use NLM-style citation. *If you plagiarize any of your review article, you will receive an automatic F on the assignment.* Review articles are due in class on November 15th. Every day your article is late, you will receive 5% off your final grade. After 7 days past-due, your article will not be accepted. Your article is worth 25% of your overall grade.

Presentations

You will be expected to present the information from your review article during the last two weeks or regular course meeting, week 15 and 16 as shown below in the course schedule. You should present the biochemical pathway and synthesis of a drug of your choice in a 20-minute PowerPoint presentation (and using the whiteboard), with five minutes for questions afterward. You are also expected to attend the presentations of your classmates and engage in thoughtful discussion. Your presentation is worth 25% of your overall grade.

Grade Calculation

If you have at least 92% you have earned an A. The cutoffs for the other scores are: 90-91.9% (A-), 88-89.9% (B+), 82-87.9% (B), 80-81.9% (B-), 78-79.9% (C+), 72-77.9% (C), 70-71.9% (C-), 68-69.9% (D+), 62-67.9% (D), 60-61.9% (D-), and less than 60% will be an F.

Class Participation	5%
2 Exams (lowest dropped)	45%
Review Article	25%
Presentation	25%
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Total	100%

Points are tentative and subject to change by the instructors.

If you are caught cheating on any assignment or in any way committing academic dishonesty (plagiarizing, fabrication, helping others cheat, etc.), you will receive an automatic F on that assignment. Repeat offenders may face a permanent F for the course, at the discretion of the instructor.

Please keep track of your grades throughout the semester. If you are struggling to determine exactly what your grade is, please come to my office hours or schedule an appointment to see me in person. Quiz grades will be available at the next regularly-scheduled course meeting. Final grades will be available by web and kiosk on December 22nd at <http://connectu.msudenver.edu>. ***The Family Educational Rights and Privacy Act prohibit me from releasing your grades via phone or email unless you register with the Registrar's office and obtain a non-identifying security code.***

MSU Denver College of Letters, Arts & Sciences Administrative Policies

For information regarding withdrawals, incompletes, academic integrity, sexual misconduct, accommodations to assist individuals with disabilities, attendance on religious holidays, electronic communication and Fresh Start, please visit: http://msudenver.edu/media/content/departamentofchemistry/CLAS_Syllabus_Policies_Fall2017.pdf

Specific, Measurable Student Behavioral Learning Objectives

Upon completion of this course, the student should be able to:

- 1) Provide basic retrosynthetic strategies for the synthesis of key molecular structures and motifs critical for pharmacological function.
- 2) Recognize biochemical pathways associated with specific biological activities and will understand key components of pathways that can be targeted for deregulation or extended regulation as therapy, as well as recognize alternative pathways that result in "side effects" of various therapeutics.
- 3) Produce ACS journal style papers and keynote presentations expected of conferences.

Syllabus Changes & Policy

Any changes in this syllabus we may deem necessary during the semester will be announced in class and made available in writing. We reserve the right to revise the syllabus and grading policies at any time.

CHE 490C Schedule (subject to change)

Fall 2017

Week	Dates		Lecture Topics	Tsai Reading	Filbin Reading
1	08/21 08/23	Analgesics	Design & Implementation of Therapeutics: Pharmacokinetics, Pharmacodynamics & Pathways to Target		Videos 1-3
2	08/28 08/30		Nociceptive Pain: Synthesis and Function of Prostaglandins		Video 4 Article 1
3	09/06		Inhibition of Cyclooxygenase: Aspirin & Acetaminophen		Article 2
4	09/11 09/13		Synthetic Methods: Aspirin	Review Articles #1,2	
5	09/18 09/20		Synthetic Methods: Acetaminophen		
6	09/25 09/27	Antibiotics	Exam 1: Analgesics (09/25) Introduction to Bacterial Protein Synthesis		Videos 5-6 Article 3
7	10/02 10/04		Bacterial Ribosome Inhibition: Linezolid & Spectinomycin		Video 7 Article 4
8	10/09 10/11		Synthetic Methods: Linezolid	Review Articles #3-11	
9	10/16 10/18		Synthetic Methods: Spectinomycin		
10	10/23 10/25		Exam 2: Antibiotics (10/23) Cancer: Difficulties in Treating "Self"		Articles 5 and 6
11	10/30 11/01	Antimetabolites: Methotrexate Steroid Hormone Antagonist: Tamoxifen		Video 7 Article 7	
12	11/06 11/08	Chemotherapeutics	Synthetic Methods: Methotrexate	Review Articles #12,13	
13	11/13 11/15		Synthetic Methods: Tamoxifen Review Articles Due (11/15)		
14	11/20 11/22		Fall Break!!!		
15	11/27 11/29	Student Presentations		n/a	n/a
16	12/04 12/06	Student Presentations		n/a	n/a

Tsai Article List

1. Field, L., Hughmark, P.B., Shumaker, S.H., Marshall, W.S. *J. Am. Chem. Soc.* **1961**, *83*, pp1983-1987
2. Jeon, I., Mangion, I.K. *Syn Lett.* **2012**, *23*, pp1927-1930
3. Katsuki, T., Sharpless, K.B. *J. Am. Chem. Soc.* **1980**, *102*, pp5974-5976
4. Stephenson, G.R. *Adv. Asymm. Synth.* **1996**, pp367-391
5. Hirao, A., Itsuno, S., Nakahama, S., Yamazaki, N. *J. Chem. Soc. Chem. Comm.* **1981**, *7*, pp315-317
6. Corey, E.J., Helal, C.J. *Angew. Chem. Int. Ed. Engl.* **1998**, *37*, pp1986-2012
7. Hanessian, S., Roy, R. *Can. J. Chem.* **1985**, *63*, pp163-172
8. Sawada, T., Shirai, R., Iwasaki, S. *Tetrahedron Lett.* **1996**, *6*, pp885-886
9. Angyal, S.J., Gilham, P.T., Melrose, G.J.H. *J. Chem. Soc.* **1965**, pp5252-5255
10. Suami, T., Ogawa, S., Naito, S., Sano, H. *J. Org. Chem.* **1968**, *33*, pp2831-2834
11. Ogawa, S., Suami, T. *Bull. Chem. Soc. Jpn.* **1967**, *40*, 1295
12. Dumeunier, R., Marko, I. E. *The Julia reaction. Modern Carbonyl Olefination.* **2004**, pp104-150
13. Kano, N., Kawashima, T. *The Peterson and related reactions. Modern Carbonyl Olefination.* **2004**, pp18-103.

Filbin Video List

1. Pharmacokinetics vs. Pharmacodynamics (<https://www.youtube.com/watch?v=CMRZqdrkCZw>)
2. Phase I Metabolism (<https://www.youtube.com/watch?v=GGLddVpVg9M>)
3. Phase II Metabolism (<https://www.youtube.com/watch?v=iIWAUo05GFE>)
4. Arachidonic Acid Pathways and PG Synthesis (<https://www.youtube.com/watch?v=VSc9U8JaWYg>)
5. Bacterial Translation Cartoon (<https://www.youtube.com/watch?v=KZBljAM6B1s>)
6. Bacterial Translation Structural Simulation (https://www.youtube.com/watch?v=q_n0lj3K_Ho)
7. Estrogen Receptor and Cancer (www.youtube.com/watch?v=JQcFk7J_Tf4)

Filbin Article List

1. Chen, L., Guangrui, Y., Grosser, T., *Prostaglandins Other Lipid Mediat.* **2013**, *104-105*:58-66.
2. Garavito, R.M., Mulichak, A.M., *Annu Rev Biophys Biomol Struct.* **2003**, *32*:183-206.
3. Schmeing, T.M., Ramakrishnan, V., *Nature.* **2009**, *461(7268)*: 1234-42.
4. Wilson, D.N., *Nat Rev MicroBiol.* **2014**, *12(1)*: 35-48
5. Hanahan, D., Weinberg, R.A., *Cell.* **2000**, *100*: 57-70.
6. Wilson, P.M., Danenberg, P.V., Johnston, P.G., Lenz, H.J., Ladner, R.D., *Nat Rev Clin Oncol.* **2014**, *11(5)*:282-98
7. Nilsson, S, Koehler, K.F., Gustafsson, J., *Nat Rev Drug Discov.* **2011**, *119(1)*: 104-12.