Chem 532/732 Organic Chemistry

Fall 2020

Schedule number: 25037/35040

Professor Jeffrey Gustafson

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****Please note that due to the COVID 19 pandemic all lectures will be done virtually via zoom. Lectures will be recorded and posted on canvas, However **I do not consider this class asynchronous**. There will be several synchronous activities ****

COURSE INFORMATION

Class Days: MW
Class Times: 5:00-6:15 PM
Class Location: via zoom (986 4921 5852)

Office Hours: MF 4:00PM-5:00 PM
Office Hours Location: CSL 208

Course Overview

Chem 732/532 is a graduate level organic reactions and mechanisms class. My goal is to use modern drug discovery as a platform to further your knowledge of chemistry. As such there will be no textbook rather a great organic reaction encyclopedia (SANROS) and a recent review (https://dx.doi.org/10.1021/acs.jmedchem.0c00345, attached at end of syllabus) that discusses the syntheses of 19 FDA approved small molecule drugs from 2018.

My lecture will start with going over the most used reactions in drug discovery as well as the leading methods in heterocycle synthesis. At that point We well have a 2 day mid-term. On **October 12th** we will have a written midterm from 5-6:15 PM (virtually of course). Then on **October 14th** there will be a 'team' mid-term project, wherein the class will be divided into team of ~3, and each team will be given a FDA approved drug and the class period to come up with a draft synthetic plan (in a breakout rook on zoom). Teams will be allowed access to Scifinder to refine their strategy (come up with synthesis of fragments, etc). The following week, the teams will present their synthetic strategy and compare it to the actual strategy used in the literature.

From there we will go through the syntheses in the aforementioned paper. The Final exam will be a take home exam that is due on **Friday December 11**. The first part of the exam will be similar a traditional written exam. The 2nd part will be a proposed synthesis of an FDA approved drug (provided by the professor). Graduate students (those in 732) will be required to turn in a short paper comparing their route with the

1) **Outcome**: Students will be able to identify, classify and explain the most used reactions in drug discover and display an cursory understanding of their reaction mechanism.
Activity: Each lecture will cover the synthesis of an FDA approved drug followed a details mechanism of each new reaction, drawing analogies to previous reactions (i.e comparing Suzuki coupling to a Stille coupling).
Assessment: This will be assessed by performance on mid-term exam, one final exam, and performance in the group activities (which I will be observing).

2) **Outcome** Students should be able to propose a reasonable synthesis of a moderately complex 'drug-like' molecule
Activity: The described group activities (see below)
Assessment: This will be assessed by performance on mid-term exam, one final exam, and the reports and presentations that each team turns in after the group activity.

3) **Outcome** Students should be able to apply SciFinder to aid in the planning of syntheses of molecules with moderate complexity.
Activity: The described group activities (see below)
Assessment: This will be assessed by performance on mid-term exam, one final exam, and the reports and presentations that each team turns in after the group activity.

4) **Outcome** Students should be able to effectively as a team to solve problems in synthetic chemistry, and effectively communicate proposed solutions to their peers
Activity: The group activities will be self driven. However the lecturer will be around to help direct discussion as needed. The team presentations will be led by graduate students. 30% of the class periods (1 day team work, 1 day presentations) will be group activities. 70% of periods will be lectures.
Assessment: The lecturer will observe how each student participates in group activities as well as the quality of their contribution. In addition, each of the team members fill out a short survey describing how each of the team member contribute.

5) **Outcome** Students should be able to apply concepts from chem 232/432 to solve mechanisms of reactions with relevance to pharmaceuticals
Activity: Each lecture covered the synthesis of a different FDA approved drug. Students are expected to find the similarity to those reactions covered in their undergraduate organic classes and make the analogies between mechanisms.
Assessment: This will be assessed by performance on mid-term exam, one final exam, and performance in the group activities.

Enrollment Information

Prerequisites: A grade of 'C' or better in Chem 432 or corresponding course or graduate standing.

Course Materials

- ***Book:*** Author Kurti and Czako
- Title: Strategic applications of named reactions in organic synthesis (SANROS)
- Publisher: Elsivier
- Year 2017 (newest edition)

Course Structure and Conduct

My goal is to use modern drug discovery as a platform to further your knowledge of chemistry. As such there will be no textbook rather a great encyclopedia (SANROS) and a few papers that will be posted on canvas prior to the class. 80% of the class periods will be lectures. 20% of the periods will be designated for group activities where the class will be broken up in teams. Students that take this class will be expected to become proficient in the use of scifinder and Chemdraw (or a similar program).

Course Assessment and Grading

There will be one mid term and a final exam. The midterm is worth 250 points (25% of the final grade), The final is worth 250 points (25%). The Team mid-term project/presentation will be worth 250 points, and the final proposed synthesis of the FDA approved drug will be 250 points. The effectiveness of communicating the synthetic strategy will be assessed for botht he presentations and the final paper. For the presentations, and written work I expect all chemical structures to be drawn on chem draw. If you do not have a copy, the computers in the chemistry computer lab have chem draw. You can also use free chemical drawing programs (Chem sketch from ACD labs), however Chemdraw is the standard drawing program throughout chemistry.

Letter Grade Assignment: Undergraduates grades will be assigned based on class performance, with the undergraduate average assigned as a ' low B'. Graduate students will be graded on a different scale as they have more experience with organic reactions and typically perform better. The graduate average will also be assigned as a low B and assigned accordingly.

Students with Disabilities

If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact Student Disability Services at (619) 594-6473. To avoid any delay in the receipt of your accommodations, you should contact Student Disability Services as soon as possible. Please note that accommodations are not retroactive, and that accommodations based upon disability cannot be provided until you have presented your instructor with an accommodation letter from Student Disability Services. Your cooperation is appreciated.

Academic Honesty

The University adheres to a strict policy regarding cheating and plagiarism. These activities will not be tolerated in this class. Become familiar with the policy (http://www.sa.sdsu.edu/srr/conduct1.html). Any cheating or plagiarism will result in failing this class and a disciplinary review by Student Affairs.

Examples of Plagiarism include but are not limited to:

- Using sources verbatim or paraphrasing without giving proper attribution (this can include phrases, sentences, paragraphs and/or pages of work)
- Copying and pasting work from an online or offline source directly and calling it your own
- Using information you find from an online or offline source without giving the author credit
- Replacing words or phrases from another source and inserting your own words or phrases
- Submitting a piece of work you did for one class to another class

If you have questions on what is plagiarism, please consult the policy (http://www.sa.sdsu.edu/srr/conduct1.html) and this helpful guide from the Library:(http://infodome.sdsu.edu/infolit/exploratorium/Standard_5/plagiarism.pdf)