Course syllabus for Chemistry 162B / 262B

Drug Design (Spring 2009)

Class meets: Mon, Wed, Fri 1:00 – 1:50 PM

Instructor: Professor Kalju Kahn, Office: PSB-N 2623
E-mail: kalju@chem.ucsb.edu
Phone: (805) 893-6157
Office Hours: Tue 1:30–2:30 and Thu 12:30-1:30 or by appointment
Course website: http://www.chem.ucsb.edu/~kalju/chem162

Teaching Assistant: Robert Levenson


The Course: In Chem 162, students learn principles that govern the process of modern drug discovery and development. Students will follow a path similar to that taken by real-life drug developers by learning important elements of the drug design process in a logical order. Some topics that we focus more extensively in 162B are:

- Principles of molecular recognition
- Mechanism of enzymes and enzyme inhibition
- Structure based drug design
- Drug metabolism and prodrugs

Expectations of Students:

- Attendance and taking good lecture notes is expected. Submitting completed assignments in time is required.
- The textbook provides some necessary background material. Furthermore, students are expected to read modern drug design-related research literature. Required literature will be available on the course website.
- Honesty and academic integrity must be always preserved. While discussing your ideas with others is encouraged outside the classroom, you must answer the assignment questions individually. No supplemental material should be used during an exam.
- Your grade in the course is based on points you collect from the weekly assignments (10 points each), the midterm (40 points), the final exam (50 points), and the written research proposal (50 points). This is a small class in which participating students historically have earned grades between A+ and B-.
- The course requires that you have a solid understanding of organic chemistry; good background in biochemistry and physical chemistry will be helpful.
- No student shall give, sell, or otherwise distribute to others or publish any electronically available course materials or recordings made during any course presentation without the written consent of the instructor.

Study tips:

- I am posting lecture note slides on-line before the class meets so that you can focus on following my talk. The slides are mainly illustrative and you need to follow the lecture in order to fully understand the topics I cover.
- Come in class prepared. Read the relevant textbook material and required reading before the class meets. I like to interact with students during our meetings and you enjoy the lectures more if you can think along.
- Review (or rewrite) your class notes the same day and supplement them with material from the textbook and other resources (optional reading, Internet). Ask for help if something remains unclear.
- This course is not about memorization of names, reactions, or facts. It is about understanding the process, its principles and methods. You should demonstrate good understanding of the material when answering assignment questions and the exam problems. Your creativity and originality are highly important for getting a high score in the final written proposal.
Good luck! — Kalju

Chem162B/262B Planned schedule for the Spring 2009

Mar 30th M Overview of the course, review of key concepts from Chem 162A
Apr 1st W Introduction to enzymes; enzymes as drug targets
Apr 3rd F Enzyme mechanisms
Apr 6th M Study of enzyme mechanism and kinetics
Apr 8th W Enzyme inhibition. Reversible inhibitors, Transition state analogs
Apr 10th F Tutorial: Modeling of chemical reactions and transition state analogs
Apr 13th M Enzyme inhibition. Irreversible inhibitors. Mechanism-based inactivators
Apr 15th M Enzyme inhibition case study: Antitumor drugs First assignment due
Apr 17th W Tutorial: Chemical databases and visualization of macromolecules
Apr 20th M Molecular recognition: Interactions between molecules Second assignment due
Apr 22nd W Molecular recognition: Entropy of binding; hydrophobic effect
Apr 24th F Tutorial: Calculation of binding energies between molecules
Apr 27th M Structure-based drug design: Principles
Apr 29th W Structure-based drug design: Modeling protein flexibility Third assignment due
May 1st F Tutorial: Structure-based drug design: Rational design of enzyme inhibitors
May 4th M Structure-based drug design: Modeling protein flexibility
May 6th W Structure-based drug design: Docking Fourth assignment due
May 8th F Tutorial: Target structure-based drug design: Docking
May 11th M Midterm Exam
May 13th W Introduction to pharmacokinetics
May 15th F ADMET as a challenge in drug discovery
May 18th M Drug metabolism Fifth assignment due
May 20th W Drug metabolism
May 22nd F Tutorial: Target structure-based drug design: Modulating drug metabolism
May 25th M Memorial Day
May 27th W Drug toxicity and drug-drug interactions Sixth assignment due
May 29th F Prodrugs
Jun 1st M Chemistry of prodrugs
Jun 3rd W Drug delivery technologies
Jun 5th F Open
Written proposals due

Assignments (will be posted on Wednesday one week before the due date)
1. Transition state analogs as enzyme inhibitors
2. Covalent inactivation of enzymes
3. Molecular recognition
4. Structure-based drug design
5. Molecular docking
6. Drug metabolism, prodrugs, drug delivery