

# Medicinal Chemistry

## CHEM 4170

MWF 11:00-11:50, 103 Schlundt Hall

**Professor: Dr. Kent Gates**

**Office: 325.1 Chemistry Building**

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**Course WebPage:** <http://www.chem.missouri.edu/GatesGroup/Research.html>

**Text:** *The Organic Chemistry of Drug Design and Drug Action*; 2nd Edition; Richard B. Silverman, Academic Press: San Diego, 2004.

**Schedule** (Topics and Dates Are Subject to Change)

- Introduction, our approach, hist of drug disc and dev (READ Introduction in the text)
- Structure of biol macromol, weak bonding interactions (READ pp 123-130)
- Concept: drug binding pockets on biol macromolecules, how weak bonds affect  $K_{eq}$
- Structures of biological macromolecules by X-ray crystallography and NMR
- Modern drug discovery methods - disease choices, bioassays, (READ Chapter 2)
- Modern methods for finding drugs - libraries, leads, and lead modif. QSAR, Log P (READ Chapter 2)
- Introduction to receptors as drug targets (READ Chapter 3)
- Examples of receptor-targeted drugs - cimetidine (READ Chapter 3 and pp 527-528)  
⇒Mar 16<sup>th</sup>, Friday - **EXAM 1**
- What is an enzyme, how do they work? (READ Chapter 4)
- The chemistry of enzyme-targeted drugs (READ Chapter 5)
- March 24-March 30: Spring Break
- The chemistry of enzyme-targeted drugs (continued)
- DNA targeted drugs (READ Chap 6)
- RNA-targeted drugs
- Membrane-targeted drugs
- Drug metabolism and prodrugs (READ Chapters 7 and 8)  
⇒April 10<sup>th</sup>, Friday - **EXAM 2**
- Metabolism, prodrugs and drug delivery  
⇒May 8, Reading Day  
⇒May 11<sup>th</sup> Monday – Comprehensive **FINAL EXAM**, 8-10 AM, 103 Schlundt Hall

### **Attendance**

Class attendance will not be recorded. Please be aware, however, that significant amounts of important material that will be discussed in lecture do *not* appear in the textbook. Lecture notes represent a central part of the course material. If you come to class, be respectful of your classmates and professor. Turn off all electronic communications devices.

### **Aims of this course**

In this course, we will study the organic chemistry of drug design and drug action. Many pharmacy and pharmacology courses are organized by *disease* (e.g. cancer, depression, inflammation). Such a disease-based approach provides an effective practical education for those who will be prescribing, dispensing, and administering drugs. On the other hand, CHEM 4170 (this course) is divided into sections based upon the major medicinally-relevant categories of *biological targets* found inside cells. There are five major categories of biochemical drug targets in the cell: receptors, enzymes, DNA, RNA, and membranes.

In this manner, the course takes a fundamentally *chemical* approach to the study of drug action. For example, we will consider how chemical synthesis plays a role in the discovery and production of drugs. In addition, we will study the chemical interactions between drugs and biological macromolecules. A chemical approach to the topic of drug action leads naturally to consideration of cellular drug targets in terms of the “big five” categories mentioned above. For instance, the multitude of drugs that interact with enzymes can be considered as a single group because the fundamental chemical principles underlying the action of all enzymes and the interaction of any drug an enzyme target *are the same* – regardless of the particular enzyme that is involved. We will consider the fundamental concepts underlying the interaction of drugs with all of the important classes of cellular drug targets: receptors, enzymes, DNA, RNA and membranes. In the final portion of the semester we will address chemical principles of drug delivery and drug metabolism.

The goal is to provide you with the tools to understand the molecular interactions underlying the medicinal action of *any given drug*.

### **Exams - Grade Breakdown**

- There will be three exams in the course. A two midterm exams (each worth 30% of your grade) and a comprehensive final worth (30% of your grade).
- A computer graphical protein-drug visualization project will be 5% of your grade.
- A literature research project summarizing a drug found in a current Physicians Desk or a new drug under development will be assigned. This project is worth 5% of your grade.

### **Course Information on the Internet**

The syllabus, assignments, problem sets, and answers to problem sets will be posted at: <http://www.chem.missouri.edu/GatesGroup/Research.html>

### **Academic Honesty**

Academic dishonesty of any form will be reported to the Provost for Academic Affairs and to your Dean.

### **Students with Special Needs**

Students who have special conditions as addressed by the Americans with Disabilities Act and who wish to request academic accomodations should register with disability services (A038 Brady Commons, 882-4696) and also notify the instructor immediately.