

# Medicinal Chemistry: Research Techniques and Principles (16:663:501)

## Syllabus - Fall 2009

**Faculty:** Dr. Joseph Rice: Office: 320, Lab: 504, Phone: (732) 445-5382, email: [jrice@rci.rutgers.edu](mailto:jrice@rci.rutgers.edu)

**Schedule:** Monday, Wednesday 8:15 – 9:35 AM, PH 323A

### A. Searching for and Organizing Information - 3 Lectures

- The Literature Search – Computer Methods
- What if the Computer Breaks Down?
- Finding Specific Types of Information
- Web Resources
- Keeping Up With the Current Literature
- Using EndNote to Organize References

### B. Computer Methods - 2 Lectures

- Using ChemDraw for Structure Drawing
- Using PC Spartan for Molecular Modeling and Computational Chemistry

#### Quiz #1

### C. Basic Laboratory Techniques – 7 Lectures

- Record Keeping
- Safety
- Methods for Purifying Solvents and Reagents
- Setting Up Reactions
- Monitoring Reactions
- Working Up Reactions
- Preliminary Clean-up of Reaction Products
- Purification of Products
- Structural Characterization of Products

#### Quiz #2

### D. Principles of Medicinal Chemistry – 14 Lectures

- Chemical Bonding
- Stereochemistry
- Conformations

#### Exam #1

- Acids and Bases
- Substituent Constants
- Organic Reaction Mechanisms

#### Exam #2

**Required Textbooks:**

- Advanced Practical Organic Chemistry, 2<sup>nd</sup> Ed., by J. Leonard, B. Lygo, and G. Procter, CRC Press, 2004.
- The Art of Writing Reasonable Organic Reaction Mechanisms, 2<sup>nd</sup> Ed., by Robert B. Grossman, Springer, 2003.
- Modern Physical Organic Chemistry, by E.V. Anslyn and D.A. Dougherty, University Science Books, 2006.

**Grading:** Quizzes (2 x 45 pts) + Exams (2 x 100 pts) + homework problems (10 pts) = 300 pts total

**Course Goals:** This course is designed for students beginning their first year in the Medicinal Chemistry graduate program. Students entering this program come from a variety of undergraduate and graduate backgrounds with some coming with considerable research experience while others have had very little exposure to chemical research. Some students come from large schools with vast resources and others come from small schools with limited resources. The goal of this course is to bring all students up to a common level from which they can begin their research careers at Rutgers University. Advanced undergraduate students with a good knowledge of organic chemistry may take this course as an elective upon approval of the professor.

The course is divided into two sections with the first focusing on research techniques and the second on principles important to an understanding of organic medicinal chemistry. In the first part of the course the student will gain an understanding of the best methods for searching the literature as well as strategies for keeping up with current literature. A brief section dealing with the use of two computer programs widely used in medicinal chemistry research, ChemDraw and Spartan, follows next. A series of lectures detailing basic laboratory methods is intended to help orient students as they prepare to join research groups. The second half of the course will cover more traditional topics including chemical bonding, stereochemistry, conformational analysis, acid/base properties, and the electronic effects of substituents which are absolutely critical for understanding synthetic medicinal chemistry. This section will conclude with a series of lectures designed to review many of the basic reaction mechanisms that govern the synthetic transformations employed by medicinal chemists.

At the conclusion of this course the student should be able to conduct a thorough review of the literature, be able to use a computer to draw chemical structures and reaction schemes and perform simple computational chemistry tasks, have a basic understanding of how to conduct chemical research, understand the three-dimensional structures of organic compounds, understand how certain functional groups affect the properties of organic compounds, and have a knowledge of common organic reaction mechanisms.

Assessment will consist of quizzes, exams, and homework problem sets that will be collected and graded.