

Drexel University
Chemistry Department

Course Information: CHEM 542, Organic Chemistry II

Credit: 3.0

Course Schedule: M 06:00 pm - 07:20 pm
W 07:30 pm - 08:50 pm
Room

Term/Year: Winter 2015

Instructor: Dr. Fraser Fleming and Dr. Venu Gudipati

Email: fleming@drexel.edu

Office Hours: By appointment, request time by email.

Course Description: The course will be structured around compiling a review that will illustrate the topics covered in the course: static and dynamic stereochemistry; conformational theory; relationships between structure and reactivity in organic reactions; and applications to asymmetric synthesis, physical measurements, and biochemical mechanisms. Students will use their knowledge of these ideas in abstracting key stereochemical information from research papers and will learn how to present this information in a format suitable for publication as a review.

Stereochemistry is a prerequisite for life, spanning fields as diverse as pre-biotic evolution to intricate drug delivery. Stereochemistry provides a perspective for understanding organic, biochemical, physical, and inorganic molecular processes from the atomic to macromolecular levels. Four Nobel prizes demonstrate the centrality of stereochemistry in science: Barton and Hassel (1969, **conformational analysis**), Conforth and Prelog (1975, **stereochemistry of enzymatic and organic reactions**), Pederson, Cram and Lehn (1987, **molecular and chiral recognition**) and Knowles, Noyori and Sharpless (2001, **catalytic asymmetric reduction and oxidation processes**). This course will survey key elements of stereochemistry employed in the quest for new and improved medicines in industry and academia.

Required Text: *Stereoelectronic Effects* by A. J. Kirby; Oxford Chemistry Primers; 1996. ISBN 0-19-855893-7

Course Readings: Course readings will be provided on Bb Learn. Students are expected to read the material and bring printed copies to class for discussion.

Required Models: Molecular models are required and may be used in the exams: HGS model kit "005A/Organic Chemistry Standard Set Edition 2" is recommended.

http://www.maruzen.info/hgs/catalog/product_info.php?products_id=633

Learning Objectives: On completion of this course participants will be able to:

1. Identify controlling steric interactions in cyclic and acyclic systems
2. Perform semi-quantitative analysis of steric interactions
3. Draw diagrams to explain steric interactions
4. Be able to use molecular models to identify steric interactions
5. Understand how to use steric constraints to control stereoselectivity
6. Understand how orbital orientations influence reactivity and stereoselectivity
7. Be able to differentiate between kinetic and thermodynamical control
8. Evaluate and design stereoselective reactions
9. Be able to search the primary literature
10. Be able to write synopses of research papers for a literature review

Prerequisites The course will assume familiarity with basic concepts of undergraduate organic chemistry. Students should have mastered the Drexel undergraduate sequence CHEM 241, 242, 243, or a similar undergraduate equivalent.

TOPICAL OUTLINE

1. Acyclic conformational analysis
2. Cyclic Conformations
3. Baldwin's Rules
4. Gem-dimethyl effect
5. Allylic Strain
6. Flexible molecules with defined shape
7. Configuration and conformation of cyclic molecules
8. Anomeric Effect
9. Anti-periplanar lone-pair hypothesis
10. Memory of chirality

11. Bronstead Base Catalysis
12. Transfer Hydrogenation
13. Stereodivergent Dual Catalysis

FINAL EXAM: March 14 – all dates are subject to change. Students will be alerted to any changes through Bb Learn.

Style

The material for this graduate course will be presented in discussion format. Students will be expected to read over material before class and to work problems and build models during classes. The classes will consist of an overview of the key points, elaboration of important topics, and discussion.

Each class will begin with time to answer questions and provide direction on the assignment. Some of this time will be used for brief updates and presentations.

ASSESSMENT AND GRADING POLICY

Grading

The course grade will be based on two exams (100 points, Monday, January 25 and Monday, February 29) and one final assignment (200 points, Monday, March 14). The tests will probe an aptitude to use stereochemistry in solving synthetic problems and NOT memorization. The assignment will be available on Bb Learn. The course will be graded on a curve because the focus on fundamental concepts tends to lead to lower scores than the standard letter grade ranges. Notes will be provided on exams for individual feedback.

DREXEL STUDENT LEARNING PRIORITIES (DSLPS)

Students graduating from Drexel University achieve competency in a field of study evidenced by achievement of a set of program-specific learning outcomes. In addition to demonstrating competency in their fields of study, students graduating from Drexel University also will demonstrate meaningful progress in six core intellectual and practical skill areas and five experiential and applied learning areas, achieving levels of competency in each core area appropriate to their program of study, their individual interests, and their abilities. Learning in these core areas supports, and is integrated with, learning in the disciplines and provides the foundation for a broad education across disciplines. <http://www.drexel.edu/provost/irae/assessment/outcomes/dslp/>

The DSLPs that are integrated with the course objectives for this course are:

ACADEMIC HONESTY

Drexel University is committed to a learning environment that embraces academic honesty. In order to protect members of our community from results of dishonest conduct, the University has adopted policies to deal with cases of academic dishonesty. Please read, understand, and follow the academic policies on Academic Dishonesty located at http://www.drexel.edu/provost/policies/academic_dishonesty.asp.

AMERICANS WITH DISABILITIES ACT

In compliance with the Americans With Disabilities Act of 1990, Section 504 of the Rehabilitation Act of 1973, and Drexel University's policies and procedures, the University is committed to the non-discrimination of students with disabilities.

Students with disabilities requesting accommodations and services at Drexel University need to present a current Accommodation Verification Letter (AVL) to faculty before accommodations can be made. AVL's are issued by the Office of Disability Resources (ODR). For additional information, visit the ODR website at <http://www.drexel.edu/oed/disabilityResources>, or contact the Office for more information: 215-895-1401 (V), or disability@drexel.edu.

STUDENT ENROLLMENT RESPONSIBILITIES

It is the student's responsibility to ensure that he/she is properly enrolled for the course. Students whose names do not appear in Banner at the time final grades are entered at the end of the term will not be entitled to a grade by the instructor.

If the student stops attending the class, she/he will not be automatically dropped from the course and she/he will receive a grade according to her/his overall performance which will include grades for completed and incomplete work. Incomplete work will be graded as no-credit. It is the student's responsibility to make sure that she/he is properly enrolled or withdrawn from the course.

COURSE DROP/WITHDRAWAL POLICY

Once a student is registered, it is his/her responsibility to attend the course, drop the course, or withdraw from the course. Dropping and withdrawing are distinct actions that impact your course enrollment status. For information on policies, please see <http://drexel.edu/provost/policies/overview/>.

For information on adding or dropping a course, please see <http://drexel.edu/drexelcentral/courses/adjustments/Adding%20and%20Dropping%20Courses/>. For information on withdrawing from a course, please see <http://drexel.edu/drexelcentral/courses/adjustments/course-withdraw/>.

Students should note the deadlines for add/drop/withdrawal noted in the University's Academic Calendar on the Drexel University website <http://drexel.edu/drexelcentral/courses/calendars/>

FINANCIAL OBLIGATIONS

Students who do not satisfy financial obligations to Drexel University cannot be entitled to a grade by the instructor or the University.

COURSE MATERIAL COPYING/RECORDING AND USAGE

Copying, recording, and use of course content and/or materials outside of the course is prohibited without the consent of the instructor.

SPECIAL CIRCUMSTANCES/ SPECIAL REQUESTS

Please note that the instructor reserves the right to evaluate special requests or circumstances, determine if an alternate educational assignment is warranted, and of what the content/process of that alternate assignment would consist. No special consideration for alternate educational assignments will be given after the term has ended.

TECHNOLOGY SUPPORT

24/7 technology support is available to students by phone or online:

- itg@drexel.edu
- 215-895-1224

Should you have questions about the functioning of any portion of the course, please do not hesitate to email the instructor for guidance and assistance.

Please Note: The instructor may make modifications to the syllabus and/or outline during the course. Students will be notified of any changes.