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Spring 2-1-2018

CHMY 411.01: Advanced Organic Chemistry

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Recommended Citation

Priestley, Nigel D., "CHMY 411.01: Advanced Organic Chemistry" (2018). *Syllabi*. 7630.
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CHEMISTRY 411 ADVANCED ORGANIC CHEMISTRY

Nigel D. Priestley, Chemistry 312A

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Lectures will be in Chemistry 204 from 10:30 until noon on Tuesdays and Thursdays

Course objective

The objective of this course is to develop an understanding of physical organic chemistry, synthetic organic chemistry and organic reaction mechanisms beyond the sophomore level and to prepare students to succeed in advanced, graduate level organic chemistry work. The course is also aimed at providing the fundamentals of advanced organic chemistry to graduate students for whom organic chemistry will not be the main specialization and organic chemistry graduate students starting their studies. Topics covered in the course include:

- a) Structure – 2D and 3D structure representations; conversion of 2D to 3D; computer representations of structure; conformational analysis; and computer modeling as applied to organic structure including ab initio, semi-empirical and mechanics/dynamics methods; chirality and stereoselectivity/stereospecificity.
- b) Acids & bases – pKa; predicting properties based on structure; synthetic applications of acid/base chemistry (enol/enolate, for example).
- c) Kinetics and thermodynamics – Hammett relationships; transition state theory; thermodynamic/kinetic control; intra/intermolecular reactions.
- d) Mechanisms and reactivity – polar reactions (polar acidic/polar basic); free radical reactions; pericyclic reactions; metal mediated and catalyzed reactions; mechanisms and selectivity of important synthetic transformations (Wittig, Swern, Mitsunobu, Diels-Alder etc.)
- e) Synthesis – synthetic strategy (disconnection/synthon approach); protecting groups; selected syntheses of polyketides, alkaloids, terpenes and other natural products of interest; combinatorial synthesis and parallel synthesis.

Prerequisites

CHMY221 and CHMY223 or equivalent.

Textbooks

There is no required textbook for the course as we will primarily rely upon the primary literature. However, the following texts may prove useful to have around:

“Modern Organic Synthesis”, Dale L. Boger

“Organic Synthesis: The Disconnection Approach,” Stuart Warren

“Protecting Groups in Organic Synthesis,” Peter G. M. Wuts

“Advanced Organic Chemistry: Reaction Mechanisms,” Reinhard Bruckner

“The Art of Writing Reasonable Reaction Mechanisms,” Robert B. Grossman

Learning outcomes

Basic knowledge – have a thorough knowledge of important organic reaction mechanisms and structure; to understand the logic of organic synthesis; to be familiar with searching and using the primary literature in organic chemistry.

Critical thinking – students will be able to predict the mechanisms of new reactions; explain the relative reactivity of different compounds; design efficient and elegant organic syntheses of new compounds; critically evaluate recent research papers.

Grading and evaluation

The course will be graded on the A, A-, B+ ... F system. There will be ten assignments given out throughout the semester which can be completed outside of class. Each assignment will be worth 10 % of the overall grade. It is expected that you will work individually on the assignments... there will be plenty of practice problems that you can work on together. Due dates for assignments will be given when assignments are handed out. Any assignment handed in late will not be graded. Moodle will be used to submit, grade and review the assignments.

Graduate increment

Graduate students will write a 10 - 12 page review article summarizing the latest literature on a specialized area of organic chemistry covered during the course. The paper will be of publishable quality, including an introduction, literature review, and discussion of the significance of the

reviewed papers. The particular research topic will be chosen from a list of specific topics provided at the start of the course. The graduate increment is worth 15% of the course; the regular assignments will be scaled by 0.85 for graduate students.

Accommodations for disabilities

Students with documented disabilities will receive appropriate accommodations in the course. Please provide a letter from your DSS Coordinator and discuss your needs with me within the first ten days of the semester. Information about services provided to students with disabilities is available at <http://www.umt.edu/dss>.

Student conduct

All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code. The code is available for review online at <http://life.umt.edu/VPSA/documents/StudentConductCode1.pdf>