

Instructor: Dr. J. Sivaguru.
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Office Hours: By appointment (e-Mail)

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Lecture Schedule: Monday 3-3.50 PM; Tuesday and Thursday: 2.00-3.15 PM

Location: 152, Dunbar; Credits: 4.

Web: http://sivagroup.chem.ndsu.nodak.edu/teaching/phy_org_chem/2008/phy_org_chem.html

Exams

First Exam: October 2nd, 2008, (Th) - 2.00 PM to 4.00 PM.

Second Exam: November 13th, 2008, (Th) - 2.00 PM to 4.00 PM.

Final exam: December 16th, 2008, (Tu) - 1.00 PM to 4.00 PM.

Grading for the course:

- Two term-time exams (25% each).
- Final exam (35%).
- Assignments – two assignments will be given (total of 15%).
- Homework problems will not be graded or collected, but will provide the background for tests and serve to stimulate student-led discussion in the classroom.
- The grades **will not** be determined based on statistics (curve), given the limited sampling pool. Instead, grades will be assigned based on the absolute total scores.
- *Attendance – Mandatory.*

Textbook:

Modern Physical Organic Chemistry, by Anslyn and Dougherty. The books will be available at the bookstore. Required reading assignments will be given during the lecture.

Supplementary reading materials: (will be available in the Library).

Carey and Sundberg's - Advanced Organic Chemistry, part A, and the 5th edition

Ernst L. Eliel - Stereochemistry of carbon compounds.

March, Advanced Organic Chemistry, 4th ed. or 5th ed.

Carpenter, Determination of Organic Reaction Mechanisms.

Course Goal:

Provide you with a set of tools / principles to rationalize, control, and predict the behavior and outcome of organic reactions.

Overview:

CHEM 741 is intended to be an overview of aspects of physical organic chemistry – understanding the nature of organic reactions and mechanisms. This course will not focus on memorizing organic reactions and mechanisms, but will concentrate instead on using physical organic techniques to come up with viable mechanisms, solve mechanistic problems, and rationalize outcomes of organic reactions. Many of the reactions covered in this course will not be new to many of you. However, we will be looking how they function in more detail to gain a better understanding of physical organic principles and how they can be used in a practical sense.

The intent of CHEM 741 is to provide new organic graduate students with all the fundamental tools and concepts for understanding advanced organic chemistry.

The first aspect of CHEM 741 will review basic principles for qualitatively analyzing and

writing organic reaction mechanisms. Also in this section, useful qualitative relationships in physical organic chemistry will be presented and examined. A systematic approach to provide some ground rules for formulating plausible mechanisms, which is a critical component of advanced organic chemistry.

The second aspect of the course will be devoted to examining how qualitative aspects of physical organic chemistry such as steric effects, stereoelectronic effects, conformation analysis, orbital symmetry, etc. can be used to rationalize the outcomes of organic reactions. In addition to overviews of these areas, we will be looking at specific examples of organic transformations where these principles apply in practice.

The third aspect of the course will concentrate on understanding and applying methods for the experimental determination of organic reaction mechanisms. This will concentrate on the "physical" part of physical organic chemistry. That is, equation solving, kinetic and thermodynamic analyses; and data interpretation. A good calculator is recommended for this section of the course.

Some Standard Class Policies

(1) **Examinable material:** Students will only be responsible for knowing the material covered in the lectures, suggested study problems, and any handouts. The assigned reading sections in the textbook and supplementary textbooks are to be used to supplement the information provided in class.

(2) **Requests for special exam writing conditions:** Requests for special exam writing conditions (e.g., separate room, extra time) will be accommodated as long as formal documentation from the Disability Services Office is received. No other office on campus is authorized to validate a disability.

(3) **Late problem sets, missed exams, and extenuating circumstances:** Late problem set solutions will be penalized 20% for each day late. Late problem sets will not be accepted once the answer key has been posted. Any person who does not had in a problem set or misses the midterm exam will automatically be given a zero for the assignment or midterm exam. Any person who misses the final exam without a documented, valid reason will automatically be given an F for the class. Students who are passing the course and miss the final exam for reason of documented illness or similar catastrophe will be given an Incomplete.

(4) **Cheating:** Any student caught cheating, or helping someone cheat, will be reported to the NDSU Honor Code Council and to the Department of Chemistry and Molecular Biology for punitive action, as described below. *Plagiarism also constitutes as cheating in this course.* Any discovered act of academic dishonesty by a student in this course will be reported to the NDSU Honor Code Council. Additionally, the incident will be reported to the Academic Ethics Committee of the Department of Chemistry and Molecular Biology. This Committee will recommend if a sanction should be applied to the student. It is expected that students will abide by the NDSU Honor Code for all exams and problem sets. For problem sets, students must work independently on their solutions. Students must abide by the NDSU Honor Code for the problem sets in that they are not allowed to simply copy solutions and answers from each other.

Syllabus: Lecture outline for Chem 741 (Fall 2008)

Tentative Class Schedule
(subject to change)

Class dates	Topics covered	
[Aug 26]	Chapter 1	Over view of basic concepts, Molecular Structure, VB & MO theory (First 20-30 min)
[Aug 26] [Aug 28] [Sep 2, 4, 8, 9 and 11]	Chapter 2	Strain and Stability; Thermochemistry; Structure and kinetics; Conformation analysis; Electronic effects;
[Sep 15, 16 and 18]	Chapter 3	Solutions and Non-Covalent Binding Forces
[Sep 22, 23 and 25]	Chapter 5	Acid-Base Chemistry
[Sep 29]	Chapter 6	Stereochemistry
[Sep 30]	Review Chapter 6 Contd...	Stereochemistry, Problem session, Review of topics.
[Oct 2]	EXAM 1	Chapters 2, 3 and 5
[Oct 6, 7, 13, and 14]	Chapter 6 Contd...	Stereochemistry
[Oct 16, 20, 21, 23 and 27]	Chapter 7	Reactivity, Kinetics and Mechanism.
[Oct 28, 30; Nov 3, 4 and 6]	Chapter 8	Experiments related to Thermodynamics and Kinetics
[Nov 10]	Review Chapter 9	Catalysis, Problem session, Review of topics.
[Nov 13]	EXAM 2	Chapters 6, 7, and 8
[Nov 17 and 18]	Chapter 9 Contd...	Catalysis
[Nov 20, 24, 25; and Dec 1]	Chapter 10	Organic reaction mechanisms (Addition and/ or eliminations)
[Dec 2, 4, 8, 9 and 11]	Chapter 11	Organic reaction mechanisms (Substitutions, isomerization and rearrangements)
[Dec 11]	Review	Problem session, Review of topics
[Dec 16]	Final EXAM	Covered from day 1 to last day in class.

Sep 1: No class (Labor Day, University Holiday)

Oct 8: No class

Nov 11: No class (Veterans Day, University Holiday)

Nov 27: No class (Thanksgiving, University Holiday)