SYLLABUS - FALL '05
CHEMICAL SYSTEMS I (CHEM 3110-1)
MWF 9:00-9:50, Olin 103

Instructor: Andrei Kutateladze

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Office hours: Friday 12-2 pm

Text: Advanced Organic Chemistry. F. Carey & R. Sundberg (A & B), KA/PP, Fourth Edition

Exams:

Midterm exam: October 19^{th}, Wed.

The final Exam: (cumulative), Tuesday, Nov. 22

Homeworks: Every Part comes with homework (not graded, but extra points are assigned for just attempting to solve the problems.). Homeworks are due at the class period immediately following the last lecture of each respective chapter.

Named Reactions to Know: Every class will start with a 5-7 minute mini-presentation (students take turns) covering one Organic Named Reaction (the list is included). A good reference source for this is March's Advanced Organic Chemistry (Wiley-Interscience). On the day of presentation, you are expected to come 5 min earlier and write the essential mechanisms on the blackboard before the class begins.

You final grade will be a weighted sum of:

Homeworks (15%)
Named Reactions (20%) - your presentations are graded by your classmates
Midterm Exam (25%);
Final Exam (40%)

Part 1. Stereoelectronic Principles.
Enantiomers, diastereomers, dynamic stereochemistry, stereospecific vs. stereoselective reactions, racemization, prochirality.

Part 2. Conformational, Steric and Stereoelectronic Effects.
Steric strain, molecular mechanics, conformational analysis of acyclic and carbocyclic compounds, anomeric effect in heterocycles, conformational effects on reactivity, other steric effects on reactivity.

Part 3. Mechanisms
Study and description of organic reaction mechanisms, thermodynamics, kinetics, substituent effects and linear free energy relationships, basic mechanistic concepts: kinetic versus thermodynamic control, Hammond's postulate, the Curtin-Hammett principle, isotope effects, acid-base catalysis, Bronsted equation.

Part 4. Nucleophilic Substitution.
The S_N1, S_N2 mechanisms, borderline mechanisms, carbocations, ion pairs; effects of solvent, leaving groups, substituents, neighboring groups etc. on the rates; non-classical carbocations.

Part 5. Polar Addition and Elimination Reactions.
Regio- and stereochemistry of additions, Ad_E mechanism; β-elimination reactions: E1, E2 and E1cb mechanisms; variable nature of E2 transition state, More O'Ferrall diagrams.

Part 6. Concerted Reactions.
Electrocyclic reactions, sigmatropic rearrangements, cycloadditions. Symmetry rules, correlation diagrams, frontier orbitals theory.