CHE 325
ORGANIC CHEMISTRY II
Spring 2017

Instructor: Professor James Kallmerten
4-014A Center for Science and Technology
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Office Hours: Monday 11 am -1 pm, Wednesday 1-3 pm and by appointment

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Required Texts: Carey and Giuliano, "Organic Chemistry" 10th Edition
"Solutions Manual for Organic Chemistry"
Molecular Models

Course Webpage: Access the web-based course materials through http://blackboard.syr.edu. Log in with your NetID and password, go to My Courses and select CHE 325.

Chemistry 325 is the second course of a two-semester sequence presenting a foundational introduction to the science of organic chemistry. In CHE 325 we will continue our discussion of the chemistry of carbon-based molecular systems, with an emphasis on the chemistry of the carbon-oxygen and carbon-nitrogen bonds, reactions of organic compounds and structural analysis of organic systems. A primary focus of the course will be the manipulation of the carbonyl and related functional groups, the addition of skills for interpretation of spectroscopic data and mechanistic analysis and proficiency in the design of multi-step organic syntheses. We will apply the principles of organic chemistry to molecules and reactions of biological significance.

An understanding of the fundamentals of chemical bonding, structure and reactivity is required for this course, and enrollment is limited to those who have successfully completed CHE 275 or an equivalent introductory level organic chemistry course.

Problem Sets. Problem sets will be distributed on Monday of each week, and will consist of selected problems from the text in addition to supplemental problems. These problem sets will not be graded; their purpose is to serve as an ongoing assessment of your understanding of the subject matter and a mechanism to focus questions you may have about the lecture or reading material. In addition, these exercises represent a rough approximation of the scope and difficulty of problems that you will encounter on the exams. Solutions to each week's problem sets will be posted online at the course website on the Monday following their distribution.

Lecture Notes. PowerPoint outlines for the upcoming week's lectures will be posted on Blackboard each Friday afternoon. These outlines are intended to help you organize lecture content and provide you with content that cannot be easily transcribed during a lecture (for example, a complex structure or the NMR spectrum of an organic compound).

Recitation Sections. Recitation sections will convene weekly at the following times and locations:

Monday	5:15-6:35 PM	LSB 011	(Kayleigh)
Monday	6:45-8:05 PM	Shaffer 221D	(Alex)
Tuesday	3:30-4:50 PM	Link 103	(Alex)
Tuesday	6:30-7:50 PM	LSB 105	(Tamie)
Wednesday	3:45-5:05 PM	LSB 011	(Kayleigh)
Wednesday	6:45-8:05 PM	LSB 011	(Michael)
Thursday	3:30-4:50 PM	LSB 011	(Michael)
Thursday	6:30-7:50 PM	LSB 011	(Rowan)

Recitation sections will be utilized for development and elaboration of basic concepts developed in lecture, in addition to providing an interactive forum for addressing student questions about lecture material, assigned readings and problem sets. *Attendance at the recitation sections is at the option of the student; however, you are strongly encouraged to take advantage of this resource.*

During exam weeks, there will be no recitations on Thursday. Recitations on Monday, Tuesday and Wednesday will function as review sessions and any student may attend *any* recitation.

Examinations and Grading. Grades will be based on the results of three examinations (25% each) and a cumulative final exam (25%). Examinations will be held on Thursday evenings from 5-6:20 PM. Exam locations will be announced in class.

Exam 1: Thursday, February 23

Exam 2: Thursday, March 30

Exam 3: Thursday, April 27

Final: Tuesday, May 9 (8 AM)

Office Hours. My office hours are held Monday 11:00 am-1:00 pm, Wednesday 1-3 pm and by appointment. Recitation instructors will be available for consultation at the times shown in the table on page 3. All graduate assistant office hours will be held in LSC xxx.

Mechanism Workshops and Exam Reviews. A series of interactive sessions reviewing the use of arrow-pushing mechanisms to solve problems in organic chemistry will meet on selected Sunday afternoons for students wishing to strengthen their understanding in this area. On the Sunday preceding each exam, a question-driven review session will be held in place of the workshop.

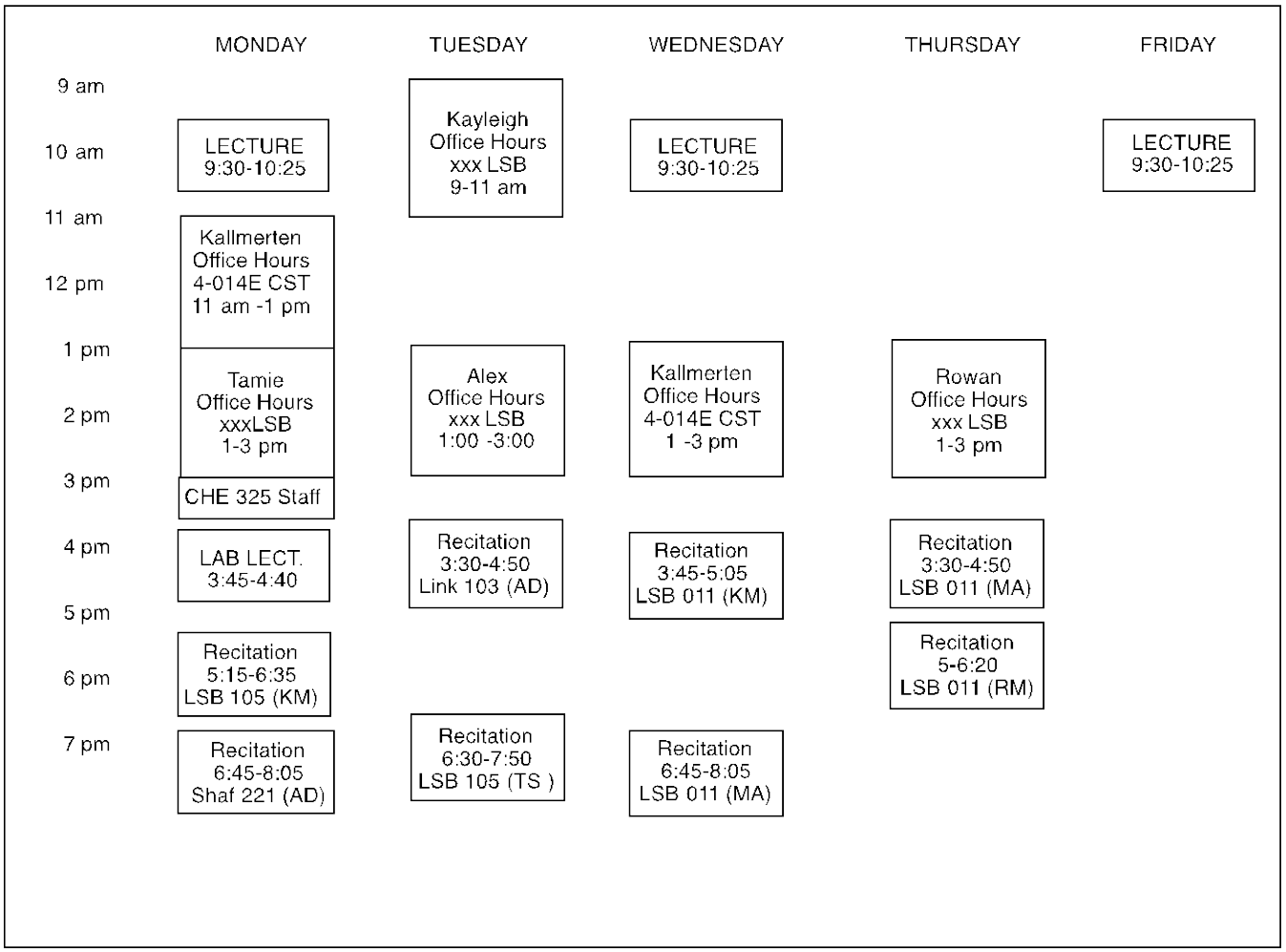
Academic Honesty: Students are allowed and encouraged to work and study together in this course. Student examinations, however, must reflect the efforts of the *individual* student. Any incident of academic dishonesty, as defined by the SU Academic Integrity Policy (http://academicintegrity.syr.edu)

will result in both course sanctions and formal notification of the student's home College. *Any established violation in this course may result in course failure regardless of violation level.*

Disability Accommodation: Students with disabilities who will be requesting special accommodation must be registered with the Office of Disability Services and have an updated accommodation letter. Students requesting accommodations ***must*** schedule an appointment with me by February 1; come to our meeting prepared to discuss your disability and to assist in formulating a study plan suited to your specific needs. Optional exercises such as problem sets and recitation attendance may be *required* for students requesting accommodations.

Religious Observances: Syracuse University recognizes the diversity of faiths among the campus community and protects the rights of students to observe religious holy days according to their tradition (http://supolicies.syr.edu/emp_ben/religious_observance.htm). Students who anticipate that work may be missed due to a religious observance must notify me by February 1 using the online notification process, accessible through MySlice/Student Services/Enrollment/My Religious Observances.

CHE 325 WEEKLY CALENDAR



CHE 325 Spring 2017

COURSE OUTLINE AND READING ASSIGNMENTS

Week 1. Introduction to Organic Structure Determination

Combustion analysis and mass spectroscopy. Molecular formulae from high resolution mass spectroscopy. Calculation of degrees of unsaturation. The nitrogen rule. Use of infrared spectroscopy to determine organic functional groups. Basic strategies for structure determination.

Reading: Carey, Chapter 14.20-14.25

Weeks 2-3. Nuclear Magnetic Resonance Spectroscopy

Theory of the NMR experiment. Nuclear shielding and the chemical shift. Integration of a proton NMR spectrum. Interpretation of spin-spin splitting patterns. Complex spin-spin splitting. NMR spectra using other nuclei: ^{13}C NMR. Applications of NMR to structure determination.

Reading: Chapter 14.1-14.13, 14.14-14.18

Week 4. Organometallic Reagents: Nucleophilic C-C Bond Formation

Preparation of organolithium and magnesium compounds. Bronsted basicity of organometallic compounds. Nucleophilic addition reactions of lithium and magnesium reagents; synthesis of alcohols. Catalytic hydrogenation. Introduction to organic synthesis; retrosynthetic analysis.

Reading: Chapter 15.1-15.10

Week 5. Alcohol sand Thiols

Preparation of alcohols via reduction reactions of the carbonyl group. Oxidation of alcohols. Spectroscopy of the alcohol group. Reactions of alcohols: conversion to ethers and esters. Synthesis and oxidative cleavage of diols.

Reading: Chapter 16

FIRST HOUR EXAM

Week 6. Ethers and Epoxides

Structure and bonding of ethers and epoxides. Williamson etherification. Preparation of epoxides from alkenes. Ring opening reactions of epoxides. Spectroscopy of ethers and epoxides.

Reading: Chapter 17

Weeks 7- 8. Introduction to the Carbonyl Group

Spectroscopic identification of ketones and aldehydes. Synthesis of ketones and aldehydes from carboxylate derivatives. Reaction of the carbonyl group with organometallic reagents and reversible nucleophiles. Acetals and cyanohydrins. Imines and enamines. The Wittig Reaction.

Reading: Chapter 18

Weeks 9-10. Carboxylic Acids and Carboxylate Derivatives

Structure and physical properties of carboxylic acids. Structure effects on acidity of carboxylic acids. Spectroscopic identification of acids, nitriles and carboxylate derivatives. Reaction of the carboxyl group with organometallic reagents. Fisher esterification. Carbonyl interconversion. Nucleophilic substitution of the carboxylate group: conversion of acids to esters and amides.

Reading: Chapters 19, 20

SECOND HOUR EXAM

Week 11-12. Nucleophile Chemistry of the Carbonyl Group.

Nucleophiles from carbonyl compounds: enols and enolates. Alkylation of active methylene groups. Halogenation of enolates. The aldol reaction. Unsaturated carbonyl systems: the Michael reaction. Synthesis and reactivity of enones; conjugate addition of organocopper reagents. The intramolecular aldol and other ring forming reactions. Malonic ester and acetoacetic ester syntheses.

Reading: Chapter 21

Week 13-14. Amines

Chemistry of the carbon-nitrogen single bond. Structure and physical properties of amines. Strategies for synthesis of primary and secondary amines. Reactions of amines: elimination and substitution. Diazotization of amines. Aromatic substitution via diazo coupling reactions.

Reading: Chapter 22

THIRD HOUR EXAM

FINAL EXAM