

SPECIAL TOPICS IN CHEMISTRY 395-425 – FALL 2023

Dr. Tatiana Esipova, Ph.D.

Flanner Hall, 7

e-mail: tesipova@luc.edu

LECTURE/DISCUSSION: TuTh 8:30-9:45 AM Flanner Hall 7 CHEM 395-001-5658;
CHEM 425-001-5660

OFFICE HOURS: Tuesday & Thursday 10:00-11.00 AM (right after lecture)
or e-mail me to schedule an appointment

REQUIRED RESORCES

Required Text: *Organic Chemistry*, Klein, 3rd or 2nd edition, hard copy or eText or *Organic Chemistry*, L.G. Wade, Jr., 7th or 6th Ed. or any other organic chemistry textbook.

Recommended Text: *Protecting Groups in Organic Synthesis*, T.W. Green

Course Website sakai.luc.edu

COURSE DESCRIPTION

This course will cover basic principles of retrosynthetic analysis and general strategies of organic synthesis.

Outcome: Perform retrosynthetic analysis of complex organic molecules and propose a rational scheme for their synthesis.

COURSE OBJECTIVES

At the end of the semester every student will be asked to complete an evaluation of this course via online program for instructor and course evaluation. The evaluation criteria for this course are as follows:

1. Gaining a basic understanding of the subject (e.g. factual knowledge, methods, principles, generalizations, theories)
2. Developing knowledge and understanding of diverse perspectives, global awareness, or other cultures
3. Learning to apply course material (to improve thinking, problem solving and decisions)
4. Gaining a broader understanding and appreciation of intellectual/cultural activity (music, science, literature, etc.)
5. Learning to analyze and critically evaluate ideas, arguments, and points of view

EXAMS AND GRADING**For Undergraduate Students, enrolled in CHEM-395:**

The final letter grades will be given based on the points scored in the course.

Participation	10%
Midterm 1	30%
Midterm 2	30%
Final exam	30%

For Graduate Students, enrolled in CHEM-425:

The final letter grades will be given based on the points scored in the course.

Participation	10%
Midterm 1	20%
Midterm 2	20%
Assigned Homework Problems	20%
Final Exam	30%

Final Grades

A guideline for grades is shown below.

A	=	94-100%	C+	=	71-74%
A-	=	88-93%	C	=	64-70%
B+	=	85-87%	C-	=	60-63%
B	=	79-84%	D	=	50-59%
B-	=	75-78%	F	=	0-49%

Mid-term Exams

There are two mid-term exams (75 min) during the semester on the dates listed below. The exams will be held during the Lectures. Exams will be graded and returned as quickly as possible, usually by the following class period. All grading questions, points of clarification, and grading errors must be brought to the instructor's attention no later than one week after the graded exam is returned. **Make-up take-home exams** are due no later than one week after the graded exam is returned. Note, that a coefficient 0.85 will be applied to **ALL** points collected on a make-up exam.

Mid-term Exam dates: October 5, November 16.

Final Exam

The final exam (2 hours) will take place on **Saturday, December 16 at 9:00–11:00 AM**. *The final exam is cumulative.* All topics discussed during lecture over the semester are on the final. There are NO MAKEUP final exams.

IMPORTANT: Alternate exam dates are ONLY arranged for extenuating circumstances (see below).

The Exams procedure

Calculators, phones, headphones, tablets and any electronic devices ARE NOT PERMITTED. Three items are allowed: (1) working pens, (2) model kit, and (3) your Loyola ID visible on your desk to be checked during the exam.

All purses, bags, jackets, etc must be left at front of the room. Once the exam is distributed, if you exit the room for any reason before time is up, your exam is complete and will be collected.

When you are finished with your exam, please bring your completed exam to the front, and leave the room quietly without disturbing the other students.

SYLLABUS

The current syllabus is posted on Sakai and is subject to change (dated at the top) during the semester. You are responsible for all changes announced whether or not you are in attendance.

DISCUSSION

Every class will be held in lecture/discussion format and will be devote to solving synthesis problems. Students are encouraged to actively participate in problem solving as bonus points will be available.

HOMEWORK

Students have to expect to devote at least 12 HOURS OUTSIDE OF CLASS TIME PER WEEK to studying organic chemistry. Bonus points will be available for some homework assignments.

SAKAI MATERIALS

All handouts provided in class will be mirrored on Sakai.

INTELLECTUAL PROPERTY

All lectures, videos, notes, PowerPoints and other instructional materials in this course are the intellectual property of the Instructor, and are so marked on Sakai and elsewhere. As a result, they may not be distributed or shared in any manner, either on paper or in virtual form, without written permission. In lecture and discussion, no photographs or recordings of any kind are allowed without the expressed written permission of the instructor.

STUDENT ACCOMODATIONS

The Student Accessibility Center (formerly known as Services for Students with Disabilities), Sullivan Center (773-508-3700), <http://www.luc.edu/sac>, has the mission “to support, service, and empower Loyola University Chicago students with disabilities” and to “Partner with faculty and staff to provide opportunities for collaboration, professional development, personal growth, and staff interaction, as they relate to students with disabilities.” Please direct all questions concerning accommodations of disabilities to the Student Accessibility Center. Academic accommodations afforded to students require documentation and review. The Student Accessibility Center will issue accommodation letters for registered students to present to their instructors: accommodations are not active until students present these letters to their instructors. If students’ accommodations involve attendance or deadlines, instructors and students will jointly complete and execute an Agreement Form articulating their terms. See <https://www.luc.edu/sac/faculty/facilitatingaccommodations/> for guidance about implementing various kinds of accommodations in a way that is appropriate to your class. The Student Accessibility Center stands ready to work with you.

COURSE REPEAT RULE

Course Repeat Rule: Effective with the Fall 2017 semester, students are allowed only three attempts to pass Chemistry courses with a C- or better grade. The three attempts include withdrawals (W). After the second attempt, the student must secure approval for a third attempt. Students must come to the Chemistry Department, fill out a permission to register form or print it from the Department of Chemistry & Biochemistry website:<http://www.luc.edu/chemistry/forms/> and personally meet and obtain a signature from either the Undergraduate Program Director, Assistant Chairperson, or Chairperson in Chemistry. A copy of this form is then taken to your Academic Advisor in Sullivan to secure final permission for the attempt.

ABSENCE POLICY

If you miss an exam, you can take a take-home make-up exam. But a coefficient of 0.85 will be applied to all points collected on this exam.

There are five exceptions to this rule, which apply only in very limited circumstances, as per University Regulations. In this case you will be able to take a 75 min exam in the instructor's office.

- (a) Absence due to medical emergency. This exemption will be granted only under the most extraordinary circumstances. The student must be able to demonstrate beyond doubt that it was a medical emergency. The student must supply the instructor with a doctor's verification of the emergency. If a student has a medical emergency, they must see a doctor immediately or go to a hospital emergency room that day. Colds, headaches, sore-throats, etc. do not constitute medical emergencies. Negative COVID-19 test results will not be considered as doctor's verification of the emergency.
- (b) Death of a member in the immediate family, with appropriate documentation.
- (c) Court appearance that cannot be rescheduled, with appropriate documentation.
- (d) Absence while representing Loyola University in an official capacity (academic, athletic, etc.) with appropriate documentation.
- (e) Religious obligation requiring the student to miss class, with appropriate documentation.

If you must miss an exam for one of the reasons specified in University regulations, please let me know as soon as practical, and submit supporting and verifiable documentation. In such cases your final exam will be weighted more to compensate for the missed exam. It is in your interest to not miss an exam for any reason. For appropriate final exam scheduling issues, students must e-mail a petition to Adam Patricoski, Assistant Dean for Student Academic Affairs, CAS Dean's Office (apatricoski@luc.edu).

Other exams or a heavy workload during your exam day are not valid reasons for missing your exam. Missing, stolen, or lost textbooks or class notes are not a sufficient reason to delay taking the exam at the scheduled time. Vacation travel plans or a desire to end your semester early are not valid reasons for missing an exam.

ACADEMIC INTEGRITY

All students in this course are expected to have read and to abide by the demanding standard of personal honesty, drafted by the College of Arts & Sciences, which can be viewed at: <http://www.luc.edu/cas/advising/academicintegritystatement/>

A basic mission of a university is to search for and to communicate the truth as it is honestly perceived. A genuine learning community cannot exist unless this demanding standard is a fundamental tenet of the intellectual life of the community. Students of Loyola University Chicago are expected to know, to respect, and to practice this standard of personal honesty.

Academic dishonesty can take several forms, including, but not limited to cheating, plagiarism, copying another student's work, and submitting false documents.

Any instance of dishonesty (including those detailed on the website provided above or in this syllabus) will be reported to The Chair of The Department of Chemistry & Biochemistry who will decide what the next steps may be.

WELLNESS

If there are events in your personal life that directly affects your performance in this course and others, please consult me or contact the Wellness Center (<http://www.luc.edu/wellness/>) or the Dean of Students Office (<http://www.luc.edu/dos/>). These resources are included in your tuition and may be an invaluable resource during the completion of your degree.

DROPPING AND WITHDRAWAL


- September 10: Last day to withdraw without a "W" grade
- September 10: Last day to withdraw with a 100% Bursar credit
- September 24: Last day to withdraw with a 50% Bursar credit
- October 1: Last day to withdraw with a 20% Bursar credit

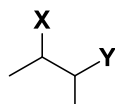
November 3: Last day to withdraw with a "W" grade, thereafter a "WF" will be assigned

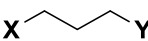
week	Monday	Tuesday	Wednesday	Thursday	Friday
1		Lecture 08/29		Lecture 08/31	
2		Lecture 09/05		Lecture 09/07	
3		Lecture 09/12		Lecture 09/14	
4		Lecture 09/19		Lecture 09/21	
5		Lecture 09/26		Lecture 09/28	
6		Lecture 10/03		Midterm 1 10/05	
7	Mid-Semester Break			Lecture 10/12	
8		Lecture 10/17		Lecture 10/19	
9		Lecture 10/24		Lecture 10/26	
10		Lecture 10/31		Lecture 11/02	
11		Lecture 11/07		Lecture 11/09	
12		Lecture 11/14		Midterm 2 11/16	
13		Lecture 11/21	Thanksgiving Break		
14		Lecture 11/28		Lecture 11/30	
15		Homework due for the class 425 12/05		Lecture 12/08	

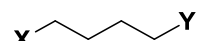
List of topics.

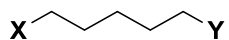
1. Introduction to *Retrosynthetic Analysis*. Main principles and terminology. Disconnections. Retrons. Synthons and Synthetic equivalents. Transforms.

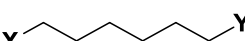
2. 1,1-Retron. . Synthesis based on 1,1-Retron. Nucleophilic addition to the carbonyl compounds. Strecker synthesis of amino acids. Addition of metalloorganic compounds to carboxylic acid derivatives.

3. 1,2-Retron. . Synthesis based on 1,2-Retron. Alkenes, Alkynes and Carbonyl compounds. Methods of preparation. Wittig reaction. Strecker synthesis.


4. 1,3-Retron. . Synthesis based on 1,3-Retron. Carbonyl compounds. Aldol condensation and Michael addition reactions.


5. 1,4-Retron. . Synthesis based on 1,4-Retron. Double bond formation. Diels-Alder reaction. Metalloorganic reactions.


6. 1,5-Retron. . Synthesis based on 1,5-Retron. Michael addition reaction. Robinson annulation.

7. 1,6-Retron. . Synthesis based on 1,6-Retron. Ozonolysis. Baeyer-Villiger oxidation.

8. Strategy to build cycles. Retrons .

9. Strategy to build cycles. Retron . Synthesis based on malonic ester. Pinacol pinacolone rearrangement. [2+2]-Cycloaddition reaction.

10. Strategy to build cycles. Retron . Reactions of 1,4- and 1,6-Retrans.

11. Strategy to build cycles. Retron . Robinson annulation. Diels-Alder cycloaddition. Reduction of aromatic compounds. Birch reduction.

12. Retron . Sigmatropic rearrangements. Claisen, Cope and Carroll rearrangements.

13. Protecting groups. (acetylene, -OH, glycols, phenols, carboxyl group, thiols, -NH₂, carbonyls)