

THE DEPARTMENT OF CHEMISTRY AND ENVIRONMENTAL SCIENCE

CHEM 605 – Advanced Organic Chemistry, Structure and Mechanism Fall 2024 Course Syllabus

<u>NJIT Academic Integrity Code</u>: All Students should be aware that the Department of Chemistry & Environmental Science (CES) takes the University Code on Academic Integrity at NJIT very seriously and enforces it strictly. This means that there must not be any forms of plagiarism, i.e., copying of homework, class projects, or lab assignments, or any form of cheating in quizzes and exams. Under the University Code on Academic Integrity, students are obligated to report any such activities to the Instructor.

COURSE INFORMATION

Course Description: Structure of organic molecules and mechanisms of organic reactions. Topics include atomic and molecular structure, stereochemistry, reactive intermediates (cations, anions, radicals, and carbenes), orbital symmetry, and spectroscopy. Additional topics include chemical databases, as well as reading and writing organic chemistry articles.

Number of Credits: 3

Prerequisites:	Undergraduate organic chemistry. Students that are not fully comfortable with the material of undergraduate organic chemistry will need to revisit it on their own in order to do well in this class.
Instructor:	Dr. Trevor Del Castillo Office: Tiernan Hall (TIER) 370 Email: trevor.delcastillo@njit.edu
Lectures:	 Thursdays, 6:00-8:50 PM, Tiernan Hall (TIER) 107 Simultaneously, on Zoom. Check Canvas page (canvas.njit.edu) for links. For legal reasons, international students on F1/J1 visas MUST attend class in person, and attendance will be recorded every week for this reason.
Discussion Hours:	Thursdays, 5:00-6:00 PM Tiernan Hall (TIER) 107 You can meet Dr. Del Castillo for questions/discussion during the time listed above. Dr. Del Castillo will always be available at those times, in his office. If you are not available at the scheduled time, Dr. Del Castillo will be happy to meet at another time, either in person or on Zoom. Send an email to Dr. Del Castillo to schedule your appointment.
Material:	This class will involve a mixture of Powerpoint slides, in-class note taking, and worksheets. The Powerpoint slides and worksheets will be posted ahead of class on the Canvas page for the course.

Textbooks: Material for this class is from two main textbooks. None are required but they are recommended:

Title	Intermediate Organic Chemistry	Advanced Organic Chemistry, Part A: Structure and Mechanisms	
Authors	Ann M. Fabirkiewicz, John C. Stowell	Francis A. Carey, Richard J. Sundberg	
Edition	3 rd edition	5 th edition	
Publisher	Wiley	Springer	
ISBN #	978-1-118-30881-3	978-0387448978	

Molecular Model Kit: Students are encouraged to purchase a molecular model kit. Such a kit will also be allowed during the exams.

LEARNING OUTCOMES

After completing this course, students will be able to:

- Find information on compounds, reactions and authors in the chemical databases;
- Identify the key scientific journals in the field of organic chemistry and use their websites;
- Actively read and critique research articles by identifying important features, learning about precedents and analyzing the data presented.
- Discuss research results in a written and oral format;
- Relate the molecular structure to orbital arrangement, stability and reactivity;
- Distinguish between the various types of stereoisomers and conformations;
- Propose experimental techniques for the study of specific reaction mechanisms
- Propose plausible reaction mechanisms based on experimental data, using the curved-arrow formalism.
- Use molecular orbital theory to describe sigma and pi bonds, conjugated, or aromatic systems
- Describe the mechanisms of reactions happening to conjugated and aromatic systems;
- Describe the mechanisms of substitution reactions such as the S_N1 and S_N2 reactions;
- Estimate the stability and reactivity of various cationic, anionic and radical intermediates;
- Describe the mechanisms of addition and elimination reactions;
- Describe the mechanisms involved in the addition or substitution reactions of carbonyl compounds;

POLICIES

All CES students must familiarize themselves with, and adhere to, all official university-wide student policies. CES takes these policies very seriously and enforces them strictly.

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: <u>http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf</u>.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online resources and/or software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu

Grading Policy: The final grade in this course will be determined as follows:

Biweekly forum participation	15%
Literature presentation	15%
Problem sets	25%
Midterm exam	20%
Final exam	25%

Your final letter grade in this course will be based on the following tentative curve:

A	100-90%	С	74-70%
B+	89-85%	D	69-65%
В	84-80%	F	Below 65%
C+	79-75%		

Participation: As this is a graduate course, class participation is expected. Students are expected to join class on time. Students are also expected to arrive prepared through reading on the material before the lecture, and to ask and answer questions during class.

Biweekly forum participation: Every two weeks, the instructor will post a discussion topic regarding the course material on the Canvas page. Each student is expected to:

1) Make a detailed post about the discussion topic, within the first week after discussion is opened;

2) Engage with the other students' posts by answering their questions and/or making constructive comments, within two weeks after the discussion was assigned.

The instructor will assess the thoughtfulness and effort deployed by each student to determine their grade. Each student's post will count toward 60% of the forum grade, and interaction with others 40%. In total, forum participation will be worth 15% of the final grade.

Questions about the course material or assignments should be posted on the forum as well, so that all students can benefit from the answers. The instructor will visit the discussion board regularly to answer questions and comment on discussions.

Literature presentation: Reading research papers and presenting results are key skills in organic chemistry. You will be asked to present a 10-minute presentation about one organic chemistry paper of your choice that was published in 2023 or 2024. Detailed assignment information will be provided during the semester. Both the preparation and the presentation itself will be graded, for a total of 15% of the final grade. The presentations will take place <u>in-person on November 21st</u>, November 26th (Tuesday), and December 5th. All students must be available and attend in person those three dates.

Problem sets: Problem sets will be assigned during the semester, approximately one every two weeks. Problem set answers will need to be submitted on paper (<u>no electronic submissions allowed</u>). Students must turn in their own answers to the problems, written legibly or prepared using an appropriate software. Students are responsible for the legibility of the work they turn in. Overall the problem sets will be worth a total of 25% of the final grade.

Exam: There will be two exams. <u>Exams will happen in-person only, in the regular classroom.</u> The midterm exam, worth 20% of the final grade, is tentatively scheduled for the October 17th meeting date and will last only 90 minutes. The final exam will be scheduled in the final week of the semester and is worth 25%. The date will be confirmed later.

Attendance Policy: Except when Powerpoint slides will be used, the notes will not be provided. If students don't attend the lectures, they will not have access to the material covered. Exceptions can be made if the absence is excused by the Dean of Students.

Make-up Exam Policy: There will be **no make-up exams** during the semester. In the event that a student has a legitimate reason for missing an exam, the student should contact the Dean of Students office and present written verifiable proof of the reason for missing the exam, e.g., a doctor's note, police report, court notice, etc. clearly stating the date AND time of the mitigating problem. The student must also notify Dr. Del Castillo that the exam will be missed, in advance, so that appropriate steps can be taken to make up the grade.

Generative AI Tools

The use of generative AI tools, such as ChatGPT or other language models, is permitted in this course. Students are encouraged to explore and utilize these tools as they see fit to enhance their learning experience.

However, it is essential that students **document and disclose** whenever they have used AI to assist with their coursework. This includes, but is not limited to, generating text, proposing mechanistic or synthetic steps, or summarizing information.

Students should be prepared to discuss the methods they used, the benefits and limitations of the AI tools, and how they integrated AI into their own understanding of the course material.

It is crucial to note that while AI can be a valuable tool, it cannot replace the need for students to fully grasp the course concepts. Relying solely on AI to bridge gaps in understanding may hinder future success. Students are expected to demonstrate a deep understanding of the material through their assignments, quizzes, and exams. The midterm and final will be pencil and paper exams with no outside books or computers allowed, ultimately you will need to be able to demonstrate your personal mastery of the subject.

ADDITIONAL RESOURCES

Chemistry Tutoring Center: Located in the Central King Building, Lower Level, Rm. G12. Hours of operation are Monday - Friday 10:00 am - 6:00 pm.

Accommodation of Disabilities: Office of Accessibility Resources and Services (formerly known as Disability Support Services) offers long term and temporary accommodations for undergraduate, graduate and visiting students at NJIT.

For further information regarding self-identification, the submission of medical documentation and additional support services provided please visit the Accessibility Resources and Services (OARS) website at: https://www.njit.edu/accessibility/

Important Dates: See the Fall 2024 Academic Calendar: <u>https://www.njit.edu/registrar/fall-2024-academic-calendar</u>

Date	Day	Event
September 2	Μ	Labor Day
September 3	Т	First Day of Classes
September 9	Μ	Last Day to Add/Drop a Class Last Day for 100% Refund, Full or Partial Withdrawal
September 10	Т	W Grades Posted for Course Withdrawals
November 11	Μ	Last Day to Withdraw
November 26	Т	Thursday Classes Meet
November 27	W	Friday Classes Meet
November 28	R	Thanksgiving Recess Begins
December 1	Su	Thanksgiving Recess Ends
December 11	W	Last Day of Classes
December 12-13	R - F	Reading Days
December 15 -21	Su - S	Final Exams
December 23	Μ	Final Grades Due

COURSE OUTLINE

Date	Торіс	Pre-lecture reading	Assignments and due dates
Sept. 5 th	Syllabus	IOC Chap. 2	
	Organic chemistry general review		
	Chapter 1: Chemical Databases and the Literature		
Sept. 12 th	Chapter 2: Stereochemistry	IOC Chap. 3	
Sept. 19 th	Chapter 3: Study and description of organic reaction mechanisms	IOC Chap. 4	Problem set #1 due
Sept. 26 th	Chapter 3: Study and description of organic reaction mechanisms		
Oct. 3 rd	Chapter 4: Conjugation, aromaticity and pericyclic reactions		Problem set #2 due
Oct. 10 th	Chapter 4: Conjugation, aromaticity and pericyclic reactions	IOC Chap. 5	
Oct. 17 th	Midterm exam (90 minutes) IN-PERSON REQUIRED		
	Chapter 4: Conjugation, aromaticity and pericyclic reactions		
Oct. 24 th	Chapter 5: Substitution reactions	AOC Chap. 4	
Oct. 31 st	Chapter 5: Substitution reactions		Problem set #3 due
Nov. 7 th	Chapter 6: Addition and elimination reactions	AOC Chap. 5	
Nov. 14 th	Chapter 6: Addition and elimination reactions		Problem set #4 due
Nov. 21 st	Oral presentations IN-PERSON REQUIRED		
Nov. 26 th	Oral presentations IN-PERSON REQUIRED		
(Tuesday)			
Dec. 5 th	Oral presentations IN-PERSON REQUIRED		Problem set #5 due
	Review		
Dec. 15-21	Final exam (date to be confirmed) IN-PERSON REQUIRED		

IOC: Intermediate Organic Chemistry, by Fabirkiewicz and Stowell AOC: Advanced Organic Chemistry, by Carey and Sundberg

Template updated by Genti' Price - August, 2020 Department of Chemistry & Environmental Sciences (CES) Course Syllabus, Fall 2024