



Lahore University of Management Sciences
CHEM 531 – Advanced Organic Chemistry, Fall 2023

Instructor	Irshad Hussain
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Course URL (if any)	

Course Teaching Methodology (Please mention following details in plain text)
<ul style="list-style-type: none">Teaching Methodology: synchronous or asynchronous or a blend of both SynchronousLecture details: Percentage of recorded and live interaction lectures All lectures will be in-person on campus, unless the course goes online due to any reason

Course Basics				
Credit Hours	03			
Lecture(s)	Nbr of Lec(s) Per Week	02	Duration	75 min each
Recitation (per week)	Nbr of Rec (s) Per Week		Duration	
Lab (if any) per week	Nbr of Session(s) Per Week		Duration	
Tutorial (per week)	Nbr of Tut(s) Per Week		Duration	

Course Distribution	
Core	Graduate students (MS) of Chemistry
Elective	
Open for Student Category	
Closed for Student Category	

COURSE DESCRIPTION

COURSE PREREQUISITE(S)	
<ul style="list-style-type: none">	N/A



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COURSE OBJECTIVES	
•	<ol style="list-style-type: none">1. To give the students a general overview of the structures and reactivity of fairly complex organic molecules based on frontier orbitals interaction.2. To enable the students to understand and interpret patterns of reactivity of fairly complex organic reactions on the basis of frontier orbitals interaction and mechanistic reasoning.3. To enable the students to propose strategies for the syntheses of fairly complex organic molecules not even discussed during the course.

Learning Outcomes	
•	<p>At the end of this course, the students should be able to understand the mechanism and analyze the products of fairly advance organic reactions involving following concepts:</p> <ol style="list-style-type: none">1. Nucleophilic substitution at saturated carbon2. Nucleophilic addition and substitution at the carbonyl group3. Using organometallic reagents to make C-C bonds4. Elimination reactions (E1, E1cb and E2)5. Aromatic substitution reactions6. Stereochemistry of above-mentioned organic reactions.7. Color chemistry, heterocyclic compounds and pericyclic reactions.

Grading Breakup and Policy	
Class participation:	05 %
Assignments:	10 %
Quizzes:	20 %
Mid-term exam:	30 %
Final exam:	35 %
Instructor has the privilege to change the grading scheme which, if availed, will be conveyed to the students well in time. If, for any reason, the course goes online, then grading policy will also change.	

Examination Detail	
Midterm Exam (1)	<p>Yes/No: Yes</p> <p>Combine/Separate: Combine</p> <p>Duration: ~02 h</p> <p>Expected Date: 8th week</p> <p>Exam Specifications: Closed books, course material in any form is not permitted</p>
Final Exam	<p>Yes/No: Yes</p> <p>Combine/Separate: Combine</p> <p>Duration: ~03 h</p> <p>Exam Specifications: Closed books, course material in any form is not permitted</p>



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COURSE OVERVIEW			
	Topics	Recommended Readings	Objectives/ Application
Week 1	Period 2 elements and the building blocks of organic molecules; functional groups & their stereochemistry etc.	Course package plus recommended sections of the textbook (s)	To know the importance of period 02 elements and draw the building blocks of organic molecules; understand functional groups and their stereochemistry.
Week 2	Inductive effect, resonance and linear combination of atomic orbitals (LCAO)	Course package plus recommended sections of the textbook (s)	To enable the students to understand and apply the concept of inductive effect, resonance and to build molecular orbitals from atomic orbitals
Week 3	Molecular orbital theory and frontiers orbital theory	Course package plus recommended sections of the textbook (s)	To enable the students to understand and apply concept of the formation of molecular orbitals and the role of frontiers orbitals in organic chemical reactions.
Week 4	Conformations and cycloalkanes; Structure, reactivity and acid-base equilibrium etc.	Course package plus recommended sections of the textbook (s)	To enable the students to understand and predict the conformations of molecules, especially cycloalkanes, and understand their reactivity based on their energy/stability.
Week 5	Substitution and reactions at SP ³ centers (SN1, SN2 etc.)	Course package plus recommended sections of the textbook (s)	To enable the students to understand SN ₁ and SN ₂ reactions at SP ₃ carbon atoms in detail.
Week 6	Elimination reactions at SP ³ centers (E1, E2, E1cb etc.) with more examples.	Course package plus recommended sections of the textbook (s)	To enable the students to understand E1, E2 and E1cb reactions at SP ₃ carbon atoms in detail.
Week 7	Addition reactions revisited	Course package plus recommended sections of the textbook (s)	To enable the students to understand the addition reactions of unsaturated compounds and their stereochemistry.
Week 8	Addition and substitution reactions of carbonyl compounds and their derivatives	Course package plus recommended sections of the textbook (s)	To enable the students to understand the reactivity and chemistry of carbonyl compounds
Week 9	Electrophilic and nucleophilic Aromatic substitution reactions	Course package plus recommended sections of the textbook (s)	To enable the students to understand the reactivity of aromatic compounds specifically the substitution reactions.
Week 10-11	Color Chemistry and pericyclic reactions	Course package plus recommended sections of the textbook (s)	To enable the students to understand the basis of color chemistry, its applications in nanobiology and the introduction to pericyclic reactions
Week 12-14	Retrosynthesis and Heterocyclic Chemistry	Course package plus recommended sections of the textbook (s)	To enable the students to understand the chemistry of heterocyclic compounds and the concept of retrosynthesis.



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Textbook(s)/Supplementary Readings
<p>Textbooks:</p> <p>Organic Chemistry by Clayden, Greeves, Warren and Wothers (Edition 2009). ISBN 978-0-19-850346-0</p> <p>Others recommended readings:</p> <p>Organic Chemistry as a 2nd Language, Part – II, by David R Klein Organic chemistry by TWG Solomons and CB Fryhle (9th Edition); ISBN 978-0-471-68496-1 Organic Chemistry by L. G. Wade Jr. (6th Edition); ISBN 0-13-147871-0</p>



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Academic Honesty

The principles of truth and honesty are recognized as fundamental to a community of teachers and students. This means that all academic work will be done by the student to whom it is assigned without unauthorized aid of any kind. Plagiarism, cheating and other forms of academic dishonesty are prohibited. Any instances of academic dishonesty in this course (intentional or unintentional) will be dealt with swiftly and severely. Potential penalties include receiving a failing grade on the assignment in question or in the course overall. For further information, students should make themselves familiar with the relevant section of the LUMS student handbook.

Harassment Policy

SSE, LUMS and particularly this class, is a harassment free zone. There is absolutely zero tolerance for any behaviour that is intended, or has the expected result of making anyone uncomfortable and negatively impacts the class environment, or any individual's ability to work to the best of their potential. In case a differently-abled student requires accommodations for fully participating in the course, students are advised to contact the instructor so that they can be facilitated accordingly.

If you think that you may be a victim of harassment, or if you have observed any harassment occurring in the purview of this class, please reach out and speak to me. If you are a victim, I strongly encourage you to reach out to the Office of Accessibility and Inclusion at oai@lums.edu.pk or the sexual harassment inquiry committee at harassment@lums.edu.pk for any queries, clarifications, or advice. You may choose to file an informal or a formal complaint to put an end of offending behavior. You can find more details regarding the LUMS sexual harassment policy [here](#).

To file a complaint, please write to harassment@lums.edu.pk.

SSE Council on Equity and Belonging

In addition to LUMS resources, SSE's **Council on Belonging and Equity** is committed to devising ways to provide a safe, inclusive and respectful learning environment for students, faculty and staff. To seek counsel related to any issues, please feel free to approach either a member of the council or email at cbe.sse@lums.edu.pk

Rights and Code of Conduct for Online Teaching

Not applicable if the course is conducted in-person, as planned.

If, for any reason, it goes online, then misuse of online modes of communication is unacceptable. TAs and Faculty will seek consent before the recording of live online lectures or tutorials. Please ensure if you do not wish to be recorded during a session to inform the faculty member. Please also ensure that you prioritize formal means of communication (email, LMS) over informal means to communicate with course staff..