



Lahore University of Management Sciences

CHEM 334 – ADVANCE ORGANIC CHEMISTRY

Spring 2024

Instructor	Dr. Muhammad Saeed			
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Office Hours				
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Secretary/TA				
TA Office Hours				
Course URL (if any)				
Course Teaching Instructions Mode (Please mention following details in plain text)				
<ul style="list-style-type: none">Instructions Mode: In-personLecture details: Use of PowerPoint Slides and whiteboard in the class				
Course Basics				
Credit Hours	3			
Lecture(s)	Nbr of Lec(s) Per Week	2	Duration	75min
Recitation/Lab (per week)	Nbr of Lec(s) Per Week		Duration	
Tutorial (per week)	Nbr of Lec(s) Per Week		Duration	
Course Distribution				
Core	For chemistry majors			
Elective	For others			
Open for Student Category				
Close for Student Category				
COURSE DESCRIPTION				
<p>This course is designed to present the advanced concepts of the organic chemistry to understand more about the synthesis and reactivity of various classes of organic compounds. We will discuss the chemoselectivity, retrosynthetic analysis, rearrangement, asymmetric synthesis and synthesis and reactions of the classes of organic compounds like aromatic rings, aromatic heterocycles, electrophilic alkenes, organic compounds containing sulfur, boron, silicon and tin in more detail. The synthesis of natural products such as alkaloids, fatty acids, aromatic polyketides and terpenes may also be discussed.</p>				
COURSE PREREQUISITE(S)				
	Chem-332			
COURSE OBJECTIVES				
	<ul style="list-style-type: none">To obtain the general overview of how reactions can be carried out chemoselectively.To be able to design the synthesis of organic molecules with moderate complexity by applying the retrosynthetic approach.To be able to interpret the pattern of reactivity, mechanism and the ability to analyze the products of organic reactions involving following concepts: Rearrangements, electrophilic aromatic substitution, electrophilic alkenes, aromatic heterocycles, asymmetric synthesis.The course will also provide the opportunity to learn about the reactivity of the compounds containing sulfur, boron, silicon and tin and the natural products.			



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Learning Outcomes	
	<ul style="list-style-type: none"> This course will enable the students to develop the understanding of how the difference in reactivity of various functional groups can be used to carry out reactions chemoselectively. The students will be able to analyze the mechanism and the products of organic reactions involving following concepts: Rearrangements, electrophilic aromatic substitution, electrophilic alkenes, aromatic heterocycles, asymmetric synthesis, The students will be able to carry out the retrosynthetic analysis of molecules of moderate complexity. The course will also provide the opportunity to learn about the reactivity of the compounds containing sulfur, boron, silicon and tin.
Grading break up: Component Details and weightages	
Assignment(s):	15%
Quiz(s):	15%
Midterm Examination:	30%
Final Examination:	40%
Instructor has the privilege to change the grading scheme which, if availed, will be conveyed to the students well in time.	
Examination Detail	
Midterm Exam	Yes/No: Yes Combine Separate: Combine Duration: TBA Preferred Date: Exam Specifications:
Final Exam	Yes/No: Yes Combine Separate: Combine Duration: TBA Exam Specifications:
Harassment Policy	
<p>Harassment of any kind is unacceptable, whether it be sexual harassment, online harassment, bullying, coercion, stalking, verbal or physical abuse of any kind. Harassment is a very broad term; it includes both direct and indirect behaviour, it may be physical or psychological in nature, it may be perpetrated online or offline, on campus and off campus. It may be one offense, or it may comprise of several incidents which together amount to sexual harassment. It may include overt requests for sexual favours but can also constitute verbal or written communication of a loaded nature. Further details of what may constitute harassment may be found in the LUMS Sexual Harassment Policy, which is available as part of the university code of conduct.</p> <p>LUMS has a Sexual Harassment Policy and a Sexual Harassment Inquiry Committee (SHIC). Any member of the LUMS community can file a formal or informal complaint with the SHIC. If you are unsure about the process of filing a complaint, wish to discuss your options or have any questions, concerns, or complaints, please write to the Office of Accessibility and Inclusion (OAI, oi@lums.edu.pk) and SHIC (shic@lums.edu.pk) —both of them exist to help and support you and they will do their best to assist you in whatever way they can.</p> <p>To file a complaint, please write to harassment@lums.edu.pk.</p>	
SSE Council of Equity and Belonging	
<p>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</p>	



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COURSE OVERVIEW				
Lectures	Topics	Recommended Readings	Activity	Objectives/ Application
1	Chemoselectivity: Selective reactions and protections	Chapter 24, 25		These lectures will introduce the concept of carrying out the reactions selectively at one functional group, in the presence of other groups. The ideas of selective reductions, hydrogenation, oxidations and use of protecting groups will be introduced.
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3				
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5	Retrosynthetic analysis in designing the organic synthesis	Chapter 30	QUIZ1	These lectures will aim to introduce the idea of thinking backwards from the target molecule and choosing different disconnection techniques to design the synthesis of a molecule.
6				
7			Assignment 1: Students will be asked to enhance their presentation skills and review retrosynthesis, by working on examples given in the text-book and related books	
8			Assignments2 announcement: students will be assigned a/some molecules and will be required to come up with a synthetic plan.	
9			Assignment 1 presentation	
10	Rearrangements	Chapter 37		These lectures will introduce the understanding of rearrangement in the organic reactions including Payne rearrangement, Wagner-Meerwein rearrangement, pinacol rearrangement, dienone-phenol rearrangement, benzilic acid rearrangement, Favorskii rearrangement, Baeyer-Villiger reaction, Beckmann rearrangement,
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12				
13	Electrophilic aromatic substitution	Chapter 22	QUIZ2	These lectures will discuss the electrophilic nature of aromatic compounds and the reactions including bromination, nitration, sulfonation, Friedel-Craft reaction. The directing effect of substituents will also be discussed.
14			Assignment2: Write up due date	
15			Assignment2 presentation	
16	Electrophilic alkenes	Chapter 23		These lectures will present the mechanism and product of reactions of alkenes acting as electrophiles. These will include conjugate additions and conjugate substitutions of electrophilic alkenes, nucleophilic aromatic substitution and nucleophilic attack on allylic compounds.
17			Assignment3 announcement: Named reactions	
18	Asymmetric synthesis	Chapter 45	QUIZ3	The lectures will focus to develop the understanding the common methods of asymmetric synthesis and introduction to
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				asymmetric hydrogenation, epoxidation and dihydroxylation.
21	Organo-main-group chemistry 1: Sulfur	Chapter 46		These lectures will present the chemistry of sulfur containing compounds including thioacetals, allylic sulfides, sulfonium ylides and sulfoxides.
22				
23				
24	Aromatic heterocycles: Synthesis and reactivity	Chapter 43 and 44		Understanding the aromaticity and reactivity of 5- and 6-membered heterocycles containing N- O- or S-atoms, and description of classical named reactions for the synthesis including Paal-Knorr synthesis of pyrrole, thiophene and furan, Hantzsch pyridine synthesis, Fischer Indole synthesis and Reissert indole synthesis, Skraup reaction.
25			Assignment 3: Named reaction presentations	
26				

Textbook(s)/Supplementary Readings

Textbook:

Organic Chemistry by Clayden, Greeves, Warren and Wothers (Edition 2009).

ISBN 978-0-19-850346-0

Others recommended:

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