



Lahore University of Management Sciences

CHEM 533 - Organic Spectroscopy

Spring 2024

Instructor	Dr. Muhammad Saeed
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Office Hours	
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Secretary/TA	
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Course URL (if any)	lms.lums.edu.pk

Course Teaching Instructions Mode (Please mention following details in plain text)

- Instructions Mode: In-person
- Lecture details: Use of PowerPoint Slides and black/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

Spectroscopic techniques have attained important role the modern-day chemistry in determining the structure of the organic compounds. This course is designed to introduce the theory of these spectroscopic techniques and then focus on the application of these techniques in solving the problems related to structure elucidation of the organic compounds.

COURSE PREREQUISITE(S)

	Chem-531
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COURSE OBJECTIVES

	To develop fundamental understanding of spectroscopic techniques - their origin from the interaction of radiation with matter. Principles and instrumentation of major spectroscopic techniques. Application of each spectroscopic technique for chemical structure characterization.
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Learning Outcomes	
	Develop an ability to rationally exploit a variety of spectroscopic techniques for future research or industrial assignments. It is expected that at the end of this course students will be able to decipher the structure of reasonably complex molecules using spectroscopic techniques.
Grading break up: Component Details and weightages	
Assignment(s):	15% (4 to 5)
Home Work:	
Quiz(s):	20% (5 to 8)
Class Participation:	
Attendance:	
Midterm Examination:	30%
Project:	
Final Examination:	35%
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: 75 min Preferred Date: Exam Specifications:
Final Exam	Yes/No: Yes Combine Separate: Combine Duration: 180 min 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, oai@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			
Week/ Lecture/ Module	Topics	Recommended Readings	Objectives/ Application
•	IR Spectroscopy	Course package plus recommended sections of the text book (s)	These lectures will present the introduction to infrared absorption process, modes of stretching and bending, interpretation of IR-spectra for different functional groups.
•	Proton NMR spectroscopy	Course package plus recommended sections of the text book (s)	This part will focus on the introduction to basic concepts like nuclear spin state, mechanism of absorption, chemical shift, chemical equivalence, shielding, spin-spin splitting, coupling constants and survey of typical ^1H NMR shifts and use of NMR software(s) to extract the required data.
•	Carbon-13 NMR spectroscopy	Course package plus recommended sections of the text book (s)	This part will present the introduction to ^{13}C NMR, survey of typical chemical shifts in ^{13}C NMR, proton-coupled and decoupled ^{13}C NMR and an introduction to 2D techniques like DEPT and use of NMR software(s) to extract the required data.
•	Mass Spectrometry	Course package plus recommended sections of the text book (s)	Introduction to mass spectrometry, ionization methods, fragmentation patterns of different organic compounds.
•	UV/Vis Spectroscopy	Course package plus recommended sections of the textbook (s)	These lectures will present the origin of UV band structure, principles of absorption spectroscopy, introduction to chromophore, effect of conjugation and Woodward-Fieser rules

Textbook(s)/Supplementary Readings

- 1) Introduction to spectroscopy 3rd edition, D. L. Pavia, G. M. Lampman, G. S. Kriz, Publ. Thomos Learning.
- 2) Spectrometric identification of organic compounds 7th edition by Robert Solvstein, Francis X. Webster and David J. Kiemle, John Wiley & Sons, Inc.
- 3) Structure determination of organic compounds 4th edition, Erno Pretsch, Philippe Buhlmann and Martin Badertscher, Springer
- 4) A Handbook of Spectroscopic Data Chemistry 2009 Edition by B. D. Mistry, Oxford Book Company
- 5) Practical guide and spectral atlas for interpretive near infrared spectroscopy 2nd edition by Jerry Workman Jr. and Lois Weyer, CRC Press
- 6) A complete Introduction to Modern NMR Spectroscopy by Roger S. Macomber, A Wiley-Interscience Publication