هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission
اعتماد
NCAAA
2024
TP-153

Course Specification
(Bachelor)

Course Title	**Identification Methods of Organic Compounds**
Course Code:	**CHM 1325**
Program:	**Bachelor of Science in Chemical Laboratories**
Department:	**Chemistry**
College:	**Science**
Institution:	**Imam Mohammed Ibn Saud Islamic University**
Version:	**2024- -1**
Last Revision Date:	**15 September 2024**

Table of Contents

A. General information about the course:

-1. Course Identification

1. Credit hours: 2 (2, 0, 0)					
2 (2 Lectures, 0 Lab, 0 Tutorials)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: Level 6/ Third year					
4. Course general Description:					
This course will discuss the application of several spectroscopic methods available to chemical laboratories students, including Ultraviolet Spectroscopy (UV), mass spectrometry (MS), infrared (IR), 1H, and 13C NMR and their importance in structural elucidation as well techniques will be highlighted. Practical aspects of each method will be emphasized, and students will learn how to operate instruments. The classes teach theory and problem-solving approaches to interpreting data to elucidate the structure of complex organic molecules.					
5. Pre-requirements for this course (if any):					
Organic Chemistry, CHM 1225					
6. Co-requisites for this course (if any):					
None					
7. Course Main Objective(s):					
At the end of this course, the student will be able to: ✓ **To recognize the basic spectroscopy of Organic Compounds** ✓ **To describe the spectroscopic data of Organic Compounds by determination of the Functional Group and number of protons and carbons.** ✓ **To outline scientific methods for identifying and elucidating organic compounds.** ✓ **To interpret the structure of organic compounds from spectroscopic data.** ✓ **To define factors that influence the chemical structure**					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	**30**	**100%**
2	E-learning	**0**	**0**
3	Hybrid • Traditional classroom • E-learning	**0**	**0**
4	Distance learning	**0**	**0**

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	**30**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**0**
5.	**Others (specify)**	**0**
Total		30

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**To recognize the basic spectroscopy of organic compounds.**	**K1, K2**	▪ **Three hours weekly containing lectures A Private study including home exam.**	**Direct:** ✓ **Quizzes** ✓ **Assignments** ✓ **Discussions. Participation**
1.2	**To describe the spectroscopic data of organic compounds by determination of the functional group and number of protons and carbons.**	**K2, K4**	**Three hours are weekly containing lectures and group discussion**	**Direct:** ✓ **Quizzes** ✓ **Assignments.** ✓ **Oral Discussion marks**
1.3	**To interpret the structure of Organic Compounds from spectroscopic data with defining factors that influence the chemical structure**	**K2, K4**	• **Three hours are weekly for lectures Think and talk about elucidating organic compounds spectroscopically.**	**Direct:** ✓ **Midterms.** ✓ **Assignments** ✓ **Oral Discussions.** ✓ **Quizzes.**
2.0	**Skills**			

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
2.1	To analyze information related to applied organic chemistry.	S1, S3	• Lectures activity Think and talk about structures and functional groups of organic compounds	Direct: ✓Questions in Lecture ✓Short Quizzes and Exams. ✓Participation ✓Oral Discussion, Home Exam.
2.2	To interpret data and results through analytical, logical thinking.	S3,S4	Encourage students to communicate their logic and chemical thinking cooperatively with their peers	Direct: ✓Questions in Lectures ✓Participation ✓Oral Discussion Short Quizzes and Exams.
2.3	To Summarize concepts of elucidation of chemical structures leading to logical thinking, followed by evaluation of gained information.	S1, S3	• Lectures and Oral Discussions. Brainstorming Exercises	Direct: ✓ Questions in Lecture Short Quizzes and Exams.
1.4	To demonstrate oral communication and carry out structure elucidation sequence orally and mentally, with technical writing skills, and communicate results electronically.	S3, S4	• Brain Storms Exercises Group Discussion	Direct: ✓Oral Discussion. ✓Group Discussion ✓Assignments
3.0	**Values, autonomy, and responsibility**			
3.1	Appraise teamwork and create awareness to maintain scientific integrity during assessments, projects, and mini-projects.	V2	• Group discussion, assignments, and homework	Direct ✓Oral tests, ✓Sheets Marks ✓Assignments and homework marks Mini projects
3.2	Show personal values and attributes such as	V1, V2	• Teamwork and class discussions	Direct ✓ lab reports Mini projects

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
	honesty, empathy and respect for others			

C. Course Content

No	List of Topics	Contact Hours
1.	**MOLECULAR FORMULAS AND WHAT CAN BE LEARNED FROM THEM**: Elemental analysis and calculations, Molecular Formula, Index of Hydrogen Deficiency	4
2.	**INFRARED SPECTROSCOPY**: Uses of the Infrared Spectrum, The Modes of Stretching and Bending, Bond Properties and Absorption Trends, Preparation of Sample for IR spectroscopy, What to Look for When Examining IR Spectra, Functional Groups Position on IR Chart	4
3.	**ULTRAVIOLET SPECTROSCOPY:** The Nature of Electronic Excitation, Principles of Absorption Spectroscopy, What is a Chromophore, Effect of Conjugation, Woodward Rules for Calculation of γ_{max} for Dienes, Enones	4
4.	**MASS SPECTROMETRY:** The Mass Spectrometer, The Mass Spectrum, Determination of Molecular Weight, (Isotope Ratio Data, and Some Fragmentation Patterns of Functional Groups.	4
5.	^{1}H **NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY:** the Nuclear Spin States, The Mechanism of Absorption (Resonance), The Chemical Shift and Shielding, Chemical Equivalence, Integrals, and Integration, Chemical Environment and Chemical shift, Electronegativity Effects, Hybridization Effects, Hydrogen Bond, and Magnetic Anisotropy, (Spin-Spin Splitting (n+1) Rule, Pascal Triangle, Survey of Typical ^{1}H NMR Absorptions by type of Functional group	8
6.	^{13}C **NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY:** The Carbon- 13 Nucleus, Carbon- 13 Chemical Shift, (3) Proton Coupled ^{13}C Spectra (Spin-Spin Splitting) of Carbon- 13 Signals, Proton Decoupled ^{13}C Spectra, Off- Resonance Decoupling A Quick Dip into DEPT, Calculation of ^{13}C Chemical Shift	4
7.	**COMBINED STRUCTURE PROBLEMS**	2
Total		**30**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm 1	Week 6th -7th	20 %
2.	Midterm 2	Week 11th -12th	20 %
3.	Quizzes, homework, class participation	During semester	20 %
4.	Final examination	Week 16th	40 %
5.	Total		100%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Donald L. Pavia, Gary M. Lampman, George S. Kriz, James A. Vyvyan, **Introduction to Spectroscopy,** ASIN : 128546012X, Cengage Learning; 5th edition (January 1, 2014,) ISBN-10: 9781285460123, ISBN-13: 978-1285460123
Supportive References	1. Robert M. Silverstein, Francis X. Webster, David J. Kiemle, **Spectrometric Identification of Organic Compounds**, John Wiley & Sons Inc; 7th edition (January 1, 2005), ISBN-10 : 0471393622, ISBN-13 : 978-0471393627. 2. Atta-ur Rahman, Muhammad Iqbal Choudhary, Atia-tul- Wahab, **Solving Problems with NMR Spectroscopy**, ASIN : 0124115896, Academic Press; 2nd edition (September 18, 2015), ISBN-10 : 9780124115897, ISBN-13 : 978-0124115897 3. PAULA YURKANIS BRUICE, **Organic Chemistry**, PEARSON INDIA (January 1, 2019), ISBN-10 : 9353948452, ISBN-13 : 978-9353948450 4. John E. McMurry , **Organic Chemistry**, Cengage Learning; 9th edition (March 25, 2015), ISBN-10 : 1305080483, ISBN-13 : 978-1305080485
Electronic Materials	
Other Learning Materials	• Blackboard

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• **Each of the class room should be equipped with a whiteboard and a projector, with a maximum of 20 students.**

Items	Resources
Technology equipment (projector, smart board, software)	**The rooms are equipped with data show, Smart Board, WI-FI access.**
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**Students**	**Direct:** Questionnaire.
	Course Responsible	**Direct:** Course e-Portfolio. **Indirect:** Second examiner checklist-Course report.
	Peer Reviewer	**Direct:** Questionnaire. **Indirect:** External assessor report.
Effectiveness of Students assessment	**Program Leaders**	**Direct:** Course e-Portfolio. **Indirect:** Course report.
Quality of learning resources	**Students**	**Indirect:** Second examiner checklist-Course report.
	Faculty (Academic Advisory)	**Direct:** course Entrance/Exit. **Indirect:** Observations - Accreditation review.
	Program Leaders	**Direct:** Course e-Portfolio. **Indirect:** Course evaluation survey- Observations- Syllabus review- Accreditation review.
The extent to which CLOs have been achieved	**Course Responsible**	**Direct:** Exams - Course e-Portfolio. **Indirect:** Second examiner checklist-Course report.
	Program Leaders	**Indirect:** Exams.
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**COUNCIL OF DEPARTMENT OF CHEMISTRY**
REFERENCE NO.	**3 (NO. 1/3)**

DATE	5/3/1446- 8/09/2024