Course Specification
(Bachelor)

Course Title:	Spectroscopy of Organic Compound
Course Code:	334CHEM2
Program:	Bachelor of Science in Chemistry
Department:	Physical Sciences
College:	College of Science
Institution:	Jazan University (JU)
Version:	TP 153 2024
Last Revision Date:	5/5/2024

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (2hs)

2. Course type

A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		

3. Level/year at which this course is offered: (Level 5 / Year 3)

4. Course general Description:

4. Course general Description

Course Title	*Course Number*	*Contact Hours (CH)*		*Credit unit (CU)*	*Year*	*Level*	*Pre-requisite*
		Lec.	*Prac.*				
Spectroscopy of Organic Compounds	*334CHEM2*	*2*	*0*	*2*	*3*	*5*	*232CHEM3*

This course aims to give students the basic knowledge of different regions of electromagnetic radiations and their properties to develop skills in elucidation of the molecular structure of organic compounds

Course objectives: They are to identify the following.

- ***To understand different regions of electromagnetic radiations and their interaction with atoms and molecules.***
- ***To identify the spectra due to the electronic absorption.***
- ***The basic principles of nuclear magnetic resonance spectroscopy*.**

Syllabus: A-Theoretical contents

Empirical, Molecular, Structural formula and Index of hydrogen deficiency. The electromagnetic radiations - interaction with atoms and molecules – the electronic absorption
– Ultra violet and visible spectroscopy (UV) – effect of molecular structure and stereochemistry of compounds on electronic absorption – Infra red spectroscopy (IR) – effect of molecular structure on stretching and bending vibrations (conjugation – induction – hydrogen bonding –stereo positions) – Nuclear magnetic resonance spectroscopy – the magnetic nuclei – effect of external magnetic field on magnetic nuclei – shielding and deshielding effect - spinning protons – splitting of signals– chemically and magnetically equivalent protons – integration – coupling constant – exchangeable protons with deuterium – mass spectrometry – formation of molecular ion – rules of fragmentation of molecular ions – isotopes in nature – molecular ion area – high resolution mass spectrometry.

Syllabus: A-Practical contents

none

5. Pre-requirements for this course (if any)**:**

232CHEM3

6. Co-requisites for this course (if any)**:**

none

7. Course Main Objective(s):

This course aims to give students the basic knowledge of different regions of electromagnetic radiations and their properties to develop skills in elucidation of the molecular structure of organic compounds

2. Teaching mode (mark all that apply)

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

3. Contact Hours (based on the academic semester)

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

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

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**; (Upon completion of the course, student will be able to)			
1.1	***Demonstrate a broad knowledge and understanding in spectroscopy, electromagnetic radiation, chromophore, Auxochrome its applications., etc (P)***	K (1.1)	Lecture group work discussion	Objective Q
1.2	***Describe the essential facts, principles and theories related to spectroscopic chemistry and its uses in identification of simple organic compounds ,etc (P)***	K(1.2)	Lecture group work discussion	Short answer Questions
2.0	**Skills**; (Upon completion of the course, student will be able to)			
2.1	***Use numeracy skills in calculating λmax for identification of organic compounds, Label the components of the instrument to be used for each spectral method and its work, analyze experimental data obtained from different spectroscopy charts… (P)***	S(2.1)	lecture group work discussion	Solving Problems & chart analysis

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.2	*access useful and specialized sites on the internet, in order to search and select specific information about spectroscopic topics (I)*	S((2.4)	project-based learning Technology-enabled learning	Research presentation rubric

C. Course Content

No	List of Topics	Contact Hours
1.	*Empirical, Molecular and Structural formula. Index of hydrogen deficiency*	*2*
2.	*What is light and electromagnetic radiation - Interaction between light and matter.*	*2*
3.	*UV Spectroscopy: Ground and excited states, Lambert-Beers law and types of bands, molar absorptivity, a calculation of λ_{max} to the possible structure. The Woodward-Fieser roles for dienes and Carbonyl compounds, enones.*	*2*
4.	*infrared spectroscopy: Infrared absorption process - Instrumentation – Sample preparation (solid, liquid and gas), types of vibrations, H00k s law and its application.*	*2*
5.	*Characteristic infrared bands of different organic functional groups: hydrocarbons, alcohols and phenols, ethers, Amines, Alkyl and aryl halides. Carbonyl compounds, Factors influence the carbonyl group, aldehydes, ketones, carboxylic acids, esters, amides, acid chlorides, anhydrides. Nitriles, …*	*2*
6.	*Applications of IR in identification of organic compounds.*	*2*
7.	*Nuclear Magnetic Resonance Spectroscopy: Nuclear spin states – Nuclear magnetic moments -Absorption of energy, The mechanism of absorption (Resonance)- NMR spectrometer.*	*3*
8.	*Chemical and magnetic equivalence and non-equivalence. Integrals and integration- Chemical environment and chemical shift- Shielding and deshielding. Local diamagnetic shielding: Electronegativity effect, Hybridization effects, acidic and exchangeable protons, H-bond. Magnetic anisotropy. Spin →Spin coupling and coupling constant.*	*4*
9.	*13C NMR spectroscopy (chemical shift); more complex spin-spin splitting patterns*	*3*
10.	*Mass spectroscopy: Ionization of the compounds and formation of molecular ion*	*2*
11.	*Rules of fragmentation and Some applications.*	*2*
12.	*Spectroscopic identification of Organic compounds: how to use the synergistic information afforded from the combination of mass, UV, IR and NMR spectra to identify the structure of an organic molecule.*	*4*

Total		**30**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	*Homework assignment*	*2-10*	*3*
2.	*Lecture Quizzes (Q1)*	*2-7*	*2*
3.	*Mid-term exams. (MID1.)*	*8-6*	*15*
4.	*Mid-term exams. (MID2.)*	*12-14*	*15*
5.	*Research Presentation*	*9*	*3*
6.	*Ethic Chick*	13	2
7.	*Final Exam*	*12-14*	*60*
...	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	Introduction to spectroscopy, D.L.Pavia, G.M.Lampnon , .S.Kriz,3rd ed.2000, Brooks, Cole Pub.Co
Supportive References	• Spectroscopy of Organic Compounds 6th ed., Kalsi, New Age International (p) Ltd, 2004 • Introduction to Spectroscopy, 5th Edition AUTHORS: Pavia/Lampman/Kriz/Vyvyan - ©2015
Electronic Materials	Some course contents and materials are posted on Black board sites
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	1 Lecture room(s) for groups of 50 students
Technology equipment (projector, smart board, software)	Smart board, Data show, Black board, internet
Other equipment (depending on the nature of the specialty)	none

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Student	Likert-type Survey CES) Indirect

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of Students assessment	Instructor & Course coordinator	Class room evaluation (direct & indirect
Quality of learning resources	Program coordinator	Indirect
The extent to which CLOs have been achieved	Assessment committee	Indirect
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Physical Sciences Department Council
REFERENCE NO.	Psci2415
DATE	28/03/1446 Corresponding to 1 / 10 /2024

H. Attachments

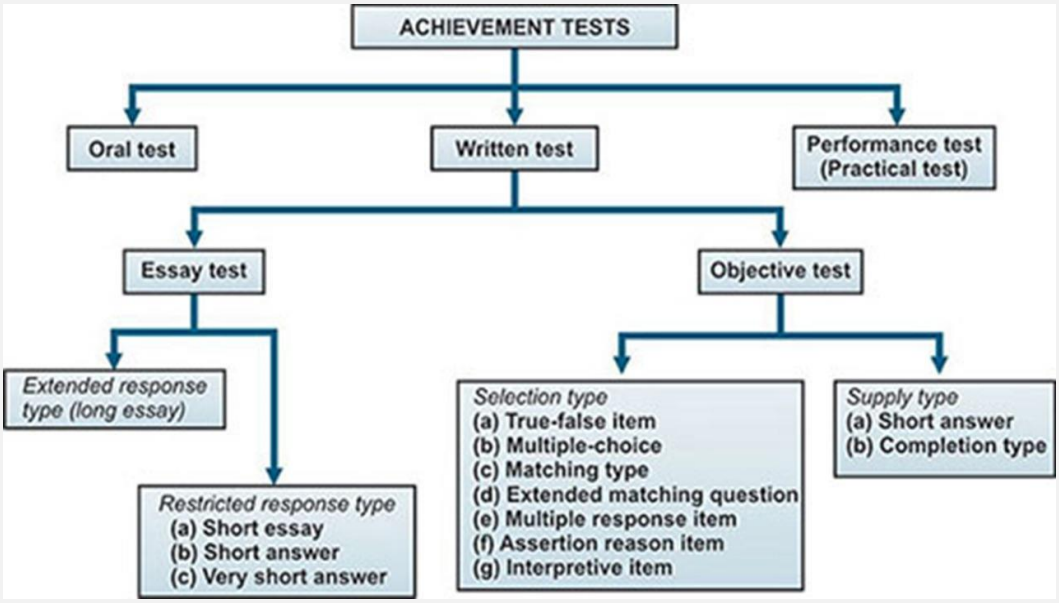
1- Practical Work

none

2- Blue Print

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	--	--	2.4	--	3.2
Marks	16	26	53	--	--	3	--	2

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	1.1 (16 M)	Quiz	Objective Q	3	3	2
			Midterm	Objective Q	4	2	5
			Final Exam	Objective Q	5	10	9
	K2	1.2 (26 M)	HW	Objective Q	8	4	2
			Midterm	Objective Q	5	5	7
			Final Exam	Objective Q	16	16	17
Skills	S1	2.2 (53 M)	Homework	Solving problems	2	1	1
			Midterm	Solving problems and spectral data analysis	6	18	18
			Final Exam	Solving problems and spectral data analysis	7	34	34
	S4	2.4 (3M)	Research Presentation	Combined Spectra	-	-	1
				data analysis	-	--	1
				structural elucidation	-	--	1
Value	V2	3.1 (3 M)	Research ethic check	Plagiarism check	-	--	2
TOTAL		100					100


ACHIEVEMENT TESTS
Oral test
Written test
Performance test (Practical test)
Essay test
Objective test
Extended response type (long essay)
Restricted response type
(a) Short essay
(b) Short answer
(c) Very short answer
Selection type
(a) True-false item
(b) Multiple-choice
(c) Matching type
(d) Extended matching question
(e) Multiple response item
(f) Assertion reason item
(g) Interpretive item
Supply type
(a) Short answer
(b) Completion type