هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Spectroscopy of Organic Compounds**
Course Code:	**CHEM 334**
Program:	**Bachelor in Chemistry**
Department:	**Chemistry**
College:	**College of Science**
Institution:	**Jazan University (JU)**

Table of Contents

A. Course Identification **3**

6. Mode of Instruction (mark all that apply) 3

B. Course Objectives and Learning Outcomes **3**

1. Course Description 4

2. Course Main Objective 4

3. Course Learning Outcomes 4

C. Course Content **5**

D. Teaching and Assessment **5**

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods 5

2. Assessment Tasks for Students 6

E. Student Academic Counseling and Support **6**

F. Learning Resources and Facilities **6**

1.Learning Resources 6

2. Facilities Required 6

G. Course Quality Evaluation **7**

H. Specification Approval Data **7**

A. Course Identification

1. Credit hours: 2 Hr
2. Course type **a.** University ☐ College ☐ Department ☑ Others ☐ **b.** Required ☑ Elective ☐
3. Level/year at which this course is offered: Level 8 / Year 4
4. Pre-requisites for this course (if any)**:** **none**
5. Co-requisites for this course (if any)**:** **none**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	27	90%
2	**Blended**		
3	**E-learning**	3	10%
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (specify)	
	Total	30

B. Course Objectives and Learning Outcomes

1. Course Description

Course Title	Course Number	Contact Hours (CH)		Credit unit (CU)	Year	Level	Pre-requisite
		Lect.	Practical				
Spectroscopy of Organic Compounds	CHEM 334	2	0	2	Third Year	sixth Level	*none*

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.

*See attachment

2. Course Main Objective

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

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding:** ***Upon completion of this course, students will be able to***	
1.1	***Demonstrate a broad knowledge and understanding in spectroscopy, electromagnetic radiation, chromophore, Auxochrome its applications., etc . (P)***	***K. 1***
1.2	***Describe the essential facts, principles and theories related to spectroscopic chemistry and its uses in identification of simple organic compounds, …etc (P)***	***K. 2***
2	***Skills:*** ***Upon completion of this course, students 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***
2.2	***access useful and specialized sites on the internet, in order to search and select specific information about spectroscopic topics . (I)***	***S.4***

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 λmax 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.*	*4*
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.*	*4*
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.*	*2*
9	*13C NMR spectroscopy (chemical shift); more complex spin-spin splitting patterns*	*2*
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. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	*Demonstrate a broad knowledge and understanding in spectroscopy, electromagnetic radiation, chromophore, auxochrome, and its applications., etc. (P)*	*Lectures, group discussion and assignments*	*Examinations, tests, quizzes, and assignments*
1.2	*Describe the essential facts, principles and theories related to spectroscopic chemistry and its uses in identification of simple organic compounds, …etc. (P)*	*Lectures, group discussion and assignments*	*Examinations, tests, quizzes, and assignments*
2.0	**Skills**		
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)*	*Lectures, group discussion, Examination and assignments*	*Examinations, tests, quizzes, and assignments*
2.2	*Access useful and specialized sites on the internet, in order to search and select specific information about spectroscopic topics (I)*	*individual assignment and individual*	*Reports, poster and seminar presentation*

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		research projects, oral presentation	

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	*Homework assignment (H.W. 1)*	*2*	*2*
2	*Lecture Quizzes (Q1)*	*5*	*2*
3	*Mid-term exam. (MID. 1)*	*8*	*15*
4	*Homework assignment (H.W. 2)*	*10*	*3*
5	*Lecture Quizzes (Q2)*	*12*	*3*
6	*Mid-term exam (MID. 2)*	*14*	*15*
7	*Final Exam*	*17*	*60*
Total			*100*

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

- ***Instructor will be available for academic counseling on daily basis for at 4h/day during office hours.***
- ***The office hours are listed in the instructor time table and delivered to students in the first lecturer in each semester.***
- ***Instructor is available in a WhatsApp group with student.***
- ***E-mail and Telephone number are delivered to student for any help during semesters.***

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Introduction to spectroscopy, D.L.Pavia, G.M.Lampnon , .S.Kriz,3rd ed.2000, Brooks, Cole Pub.Co
Essential References Materials	• 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	• www.wikipedia.org/ • http://chem.ch.huji.ac.il/nmr/ • https://chem.libretexts.org/Special:Search?qid=&fpid=230&fpth=&query=organic+chemistry+spectroscopy&type=wiki

2. Facilities Required

Item	Resources
Accommodation	***1 Lecture room(s) for groups of 50 students.***

Item	Resources
(Classrooms, laboratories, demonstration rooms/labs, etc.)	
Technology Resources (AV, data show, Smart Board, software, etc.)	***Smart board, Data show, Black board, internet***
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	none

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of Teaching and Assessment	***Student***	***Likert-type Survey (CES)*** ***Indirect***
Extent of achievement of course learning outcomes	***Instructor & Course coordinator***	***Class room evaluation (direct & indirect)***
Quality of learning resources	***Program coordinator***	***Indirect***
Exam Quality assessment	***Assessment committee***	***Indirect***

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	**Chemistry Department Council**
Reference No.	42 / 35 /102 112
Date	17 /09 /1442 Corresponding to 28 / 04 /2021