هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

Course Specifications

Course Title:	**Organic Spectroscopy**
Course Code:	**2044101-3**
Program:	**Bachelor in Chemistry**
Department:	**Department of Chemistry**
College:	**College of Sciences**
Institution:	**Taif University**

Table of Contents

A. Course Identification

1. Credit hours:	**3 (2 Theoretical, 1 Lab)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**7th Level / 4th Year**
4. Pre-requisites for this course (if any)**:**	**Organic Chemistry 2 (2042203-3)**
5. Co-requisites for this course (if any)**:**	**NA**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	2 Theoretical and 3 Practical hours/ Week	100 %
2	**Blended**	-	-
3	**E-learning**	-	-
4	**Distance learning**	-	-
5	**Other**	-	-

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	45
3	**Tutorial**	
4	**Others** (specify)	
	Total	**75**

B. Course Objectives and Learning Outcomes

1. Course Description

This course describes the principles spectroscopic techniques and instrumentation including; Infra-Red (IR), Ultraviolet (UV), Mass spectrometry (MS) and Nuclear magnetic resonance spectroscopy (NMR).

2. Course Main Objective

The course aims to elucidate the organic compounds' structures using combined spectral data (i.e. Infra-red, Ultra-violet, Mass and Nuclear magnetic resonance spectra).

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding:**	
1.1	Identify the different types of spectra	K1
1.2	Describe how to use different spectra in the identifications of organic compounds	K2
2	**Skills:**	

CLOs		Aligned PLOs
2.1	Apply the rules for organic compounds' structures identification	S1
2.2	Solve problems using organic spectroscopic criteria	S2
3	**Values:**	
3.1	Work effectively in groups	V1

C. Course Content

No	List of Topics	Contact Hours
1	Introduction to infra-red spectroscopy and vibration in organic molecules.	2
2	Characteristic IR spectral features of hydrocarbons.	4
3	Characteristic IR spectral features of oxygen and nitrogen containing compounds.	2
4	Color, absorption of the ultraviolet light, electronic excitation and factors in relation. Calculation of the absorption maximum in unsaturated natural products	4
5	Basic principles of the technique, natural abundance of isotopes, ionization and structure elucidation of hydrocarbons. Fragmentation mode of hydrocarbons.	4
6	Fragmentation mode and structure elucidation of oxygen-containing compounds. Fragmentation mode and structure elucidation of nitrogen and sulfur containing compounds.	4
7	Spinning of nuclei in a magnetic field, absorption, emission of radio frequency .and the NMR spectrum	4
8	Spin coupling and chemical shift in ^{1}H NMR spectroscopy, ^{1}H NMR structure elucidation of hydrocarbons	2
9	^{1}H NMR structure elucidation of functionalized hydrocarbons.	2
10	^{13}C NMR based structure elucidation of organic compounds.	2
Total		**30**

Lab Content

No	List of Topics	Contact Hours
1	Introduction of Organic spectroscopy (How solved the problems generally of IR, UV, Mass, ^{1}HNMR, and ^{13} C NMR	3
2	IR problems to identify the function groups of Aliphatic hydrocarbon (alkane); Alicyclic; Alkenes; Alkynes.	6
3	IR interpretation for Mono substituted aromatic hydrocarbon; Di-substituted aromatic (Meta-substituted) hydrocarbon; Di-substituted aromatic (Para-substituted) hydrocarbon.	3
4	IR interpretation for aliphatic ether; aromatic ether; Aldehyde; Ketones; Carboxylic acids	3
5	IR interpretation for ester; acid anhydride; acid chloride; primary, secondary and tertiary amines	3
6	IR problems for unknown compounds	6
7	UV- problems for unknown compounds and calculation of the maximum wave length.	6

8	^{1}H NMR- problems for unknown compounds and calculation of the number of hydrogen atoms.	6
9	^{13}H NMR- problems for unknown compounds and calculation of the number of carbon atoms.	3
10	Mass spectrum- problems for unknown compounds and recognition of both base and molecular ion peaks.	6
Total		**45**

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	Identify the different types of spectra	Lecture	Written exam
1.2	Describe how to use different spectra in the identifications of organic compounds	Lecture	Written exam
2.0	**Skills**		
2.1	Apply the rules for organic compounds' structures identification.	Discussion	Homework Assignments
2.2	Solve problems using organic spectroscopic criteria	Problem-Solving	Practical tasks and Exam
3.0	**Values**		
3.1	Work effectively in groups	Collaborative Learning	Individual presentations

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Homework Assignments	Throughout Semester	5%
2	Individual presentations	Throughout Semester	5%
3	Periodical Exam	7/8	20%
4	Mid Term Exam	11/12	10%
5	Practical tasks	Throughout Semester	15%
6	Final practical Exam	15	5%
7	Final exam	16	40%

***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 :

Commitment to the rules of the Academic Advising Department at the university in accordance with the academic guidance manual approved by the university and the attached forms, there are different arrangements made by teaching staff to support student consultations including;
- Office hours: 8 hours per a week for each academic member.
- Academic guidance: an academic member has a number of students to guide them throughout degree journey.

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	• Organic Spectroscopy, L. D. S. Yadav Kluwer (2005), Latest Edition. Springer Netherlands. ISBN: 978-94-017-2508-8.
Essential References Materials	• Spectroscopic Identification of Organic Compounds, Robert M. Silverstein, Francis X. Webster, David J. Kiemle, David L. Bryce (2014), Latest Edition. Wiley (USA). ISBN: 978-0-470-61637-6.
Electronic Materials	• Saudi Digital Library (SDL)
Other Learning Materials	• Learning Management System (Blackboard) • Computer programs for graphing organic compounds and chemical reactions (Chem draw , Chem sketch)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	A classroom with movable tables and chairs conducive to group discussion and teamwork.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, smart board
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	• NMR spectrometer. • UV Spectrometer.

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of Teaching and assessment	Students	Survey (indirect method)
Extent of achievement of course learning outcomes	Program leader	Reports (Direct method)
Quality of learning resources	Peer referees Students	Reports (Direct method) Survey (indirect method)

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	**Department Council/ Quality assurance committee**
Reference No.	7-3-1445
Date	27/2/1445 HJ 12/09/2023 G