هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Molecular Spectroscopy**
Course Code:	**2044205-2**
Program:	**Bachelor in Chemistry**
Department:	**Department of Chemistry**
College:	**College of Sciences**
Institution:	**Taif University**

Table of Contents

A. Course Identification

1. Credit hours:	**2 (Theoretical)**
2. Course type	
a.	University ☐ College ☐ Department √ Others ☐
b.	Required ☐ Elective √
3. Level/year at which this course is offered:	**8th Level / 4th Year**
4. Pre-requisites for this course (if any)**:**	**NA**
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 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**	-
3	**Tutorial**	-
4	**Others** (specify)	-
	Total	**30**

B. Course Objectives and Learning Outcomes

1. Course Description

The purpose of this course is to provide an advanced overview of molecular spectroscopy. Specifically, the underlying principles of spectroscopy using quantum mechanics, where the interaction of light and matter, and group theory as starting points. The focus of this course is the various forms of optical spectroscopy, including rotational, vibrational and electronic spectroscopy, as well as a brief look at photoelectron spectroscopy and lasers.

2. Course Main Objective

Describe the basic concepts of all electromagnetic radiations, laws of light and its applications in real life and chemistry problem.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding:**	
1.1	Recall Basic definitions and terminology in spectroscopy	K1
1.2	Recognize the relationship and interactions among the molecular spectroscopy and the environment	K3
2	**Skills:**	

CLOs		Aligned PLOs
2.1	Explain phenomena, concepts, principles and associated applications related to different subjects of the course	S1
3	**Values:**	
3.1	Participate in the development of the performance of work teams	V1

C. Course Content

No	List of Topics	Contact Hours
1	**Introduction to spectroscopy** A historical overview of light and electromagnetic spectrum	2
2	The photon - Quantization of energy and energy level	2
3	**Quantitative Spectroscopy** Beer-Lambert law, Absorbance and Transmittance, Absorption laws and the nature of radiant energy	4
4	**Molecular orbital theory.**	4
5	**Electronic Spectroscopy** Types of electronic transitions	4
6	The relation between the colour and molecular structure in organic compounds	2
7	Calculations of the maximum wave length (λ_{max}) of dienes and α, β-unsaturated carbonyls	4
8	**Vibrational Spectroscopy:** FT-IR absorption spectroscopy. Types of vibrations in molecules (stretching, bending, etc.)	4
9	**Vibrational Energies:** Vibrational energy levels (Spring model, force constant, effective mass)	2
10	Effect of bond strength on vibrational transitions	2
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	Recall Basic definitions and terminology in spectroscopy.	Lecture	Written exam
1.2	Recognize the relationship and interactions among the molecular spectroscopy and the environment.	Lecture	Written exam
2.0	**Skills**		
2.1	Explain phenomena, concepts, principles and associated applications related to different subjects of the course.	Discussion	Homework assignments
3.0	**Values**		
3.1	Participate in the development of the performance of work teams	Collaborative Learning	Individual presentations

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Homework Assignments (Electronic)	Throughout Semester	15%
2	Individual presentations	Throughout Semester	5%
3	Periodical Exam	7/8	15%
4	Mid Term Exam	11/12	15%
5	Final exam	16	50%

***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	• Fundamentals of Molecular Spectroscopy, C.N. Banwell (1983), McGraw-Hill, London, Latest Edition. ISBN: 0-07-084139-X. • Fundamentals of Molecular Spectroscopy, Walter S. Struve (1989), New York, Chichester, Latest Edition. ISBN:978-0471854241.
Essential References Materials	• Elements of Physical Chemistry, Atkins & de Paula, Latest Edition. Chapter 19 & 20, ISBN: 978-1429218139. • Foundations of Spectroscopy, Duckett & Gilbert, Latest Edition, Chapter 2-3-4. ISBN: 978-0198503354.
Electronic Materials	• Basic UV-Vis Theory, Concepts and Applications. • Rotation and Vibration of Diatomic Molecules
Other Learning Materials	--

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Lecture rooms with max 60 seats (some equipped with data show facility).
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, smart board, Blackboard access.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	--

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