Course Specification
(Bachelor)

Course Title:	Group Theory
Course Code:	425CHEM-2
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 8 / Year 4

4. Course general Description:

1. Course Description

Course Title	*Course Number*	*Contact Hours (CH)*		*Credit unit (CU)*	*Year*	*Level*	*Pre-requisite*
		Lec.	*Prac.*				
Group theory	*425CHEM-2*	*2*	*0*	*2*	*4*	*8*	*322CHEM4*

Course objectives: They are to identify the following.

1- Recognizing the elements of symmetry and point groups.
2- Recognizing the reducible and irreducible representations.
3- Recognizing the vibrational spectroscopy.
4- Recognizing the infrared absorption bands and Raman lines.

Syllabus: A-Theoretical contents

Elements of symmetry and point groups – Reducible and irreducible representations – Character tables – Vibrational spectroscopy – Infrared absorption bands and Raman lines – Bonding in transition elements complexes – Spectra of octahedral, tetrahedral and square planar complexes.

Syllabus: B-Practical contents

Non

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

322CHEM-4

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

Non

7. Course Main Objective(s):

The course of Group theory designed to give the students some information about the principles of symmetry and group theory, laws, and their applications in chemistry.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	2*15=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		22

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 in the symmetry element and recognize symmetry operations, resonance, molecular vibrations. (M)	K (1.1)	Lecture group work discussion	Objective Q
1.2	Describe the essential facts, principles and theories in group theory and its application in chemistry. (M)	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	Demonstrate the knowledge and skills in the aspects of group theory, to analyze the obtained from symmetry. (M)	S(2.1)	lecture group work discussion	Solving Problems

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.2	Make effective use of communication, and online technology about chemistry topics in order to improve their basic knowledge in writing (report and paper/ poster) with a good verbal and clear scientific language. (M)	S((2.4)	project-based learning Technology-enabled learning	Research presentation rubric
3.0	**Values, autonomy, and responsibility**; (Upon completion of the course, student will be able to)			
3.1	***Act with integrity and good ethics in chemistry profession and their obligation to society*** (M)	V(3.2)	Research activities	Ethic check rubric

C. Course Content

No	List of Topics	Contact Hours
1.	Symmetry Elements and Operations	***6***
2.	Point Groups - Groups of Low and High Symmetry Other Groups	***6***
3.	Properties and Representations of Groups - Matrices - Representations of Point Groups Character Tables	***4***
4.	Examples and Applications of Symmetry - Polarity & Chirality Molecular Vibrations	***4***
5.	Resonance spectrum and reduced spectrum. - Infra-red spectroscopy Raman spectroscopy	***4***
6.	Octahedral, tetrahedral and square planer complexes	***6***
	Total	30

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	***HW***	***4-9***	***3***
2.	***Mid-term Exams1***	***6-8***	***15***
3.	***Mid-term Exams2***	***12-14***	***15***
4.	***Presentation Session***	***15***	***4***
4	***Ethic check***	***15***	***3***
5	***Final EXAM***	***16-17***	***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	Inorganic Chemistry, 5th Edition by Gary L. Miessler, Paul J. Fischer, Donald A. Tarr, (2013)
Supportive References	Molecular Symmetry and Group Theory: A Programmed Introduction to Chemical Applications, 2nd Edition by Alan Vincent (2001)
Electronic Materials	***Some course contents and materials are posted on Black board sites***
Other Learning Materials	• http://symmetry.otterbein.edu/gallery/index.html • 3D sym op android program

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
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

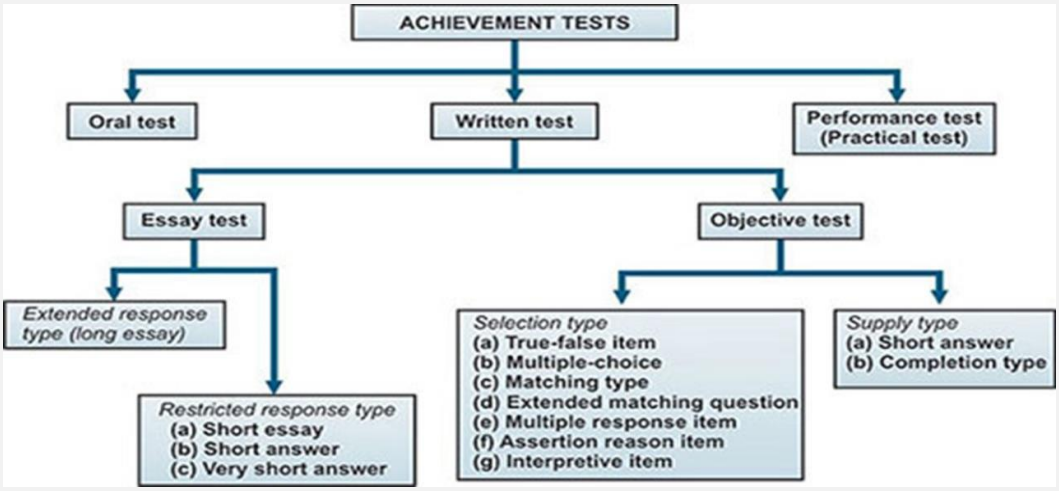
none

2- Blue Print

Course Name	Group Theory
Course Code	425CHEM-2

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1			2.2		3.1
Marks	12	22	59	---	---	4	---	3

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	1.1 (12M)	HW	Objective Q	2	2	1
			Mid-term	Objective Q	4	2	4
			Final Exam	Objective Q	14	7	7
	K2	1.2 (22M)	HW	Short answer Questions	1	1	1
			Mid-term	Short answer Questions	6	6	8
			Final Exam	Short answer Questions	7	13	13
Skills	S1	2.1 (59M)	HW	Solving Problems & chart analysis	3	3	1
			Mid-term	Solving Problems & chart analysis	7	17	18
			Final Exam	Solving Problems & chart analysis	8	40	40
	S4	2.2 (4M)	Research presentation	Research rubric			4
				PPT design			
				Oral discussion			
Value	V2	3.1 (3)	Research ethic check	ethic check rubric	-	3	3
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