



## Course Specifications

<b>Course Title:</b>	<b>Group Theory</b>
<b>Course Code:</b>	<b>2043204-2</b>
<b>Program:</b>	<b>Bachelor in Chemistry</b>
<b>Department:</b>	<b>Department of Chemistry</b>
<b>College:</b>	<b>College of Sciences</b>
<b>Institution:</b>	<b>Taif University</b>

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## A. Course Identification

<b>1. Credit hours:</b> 2 (Theoretical)
<b>2. Course type</b>
a. University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/>
b. Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
<b>3. Level/year at which this course is offered:</b> 6 <sup>th</sup> Level/ 2 <sup>nd</sup> Year
<b>4. Pre-requisites for this course (if any):</b> Quantum Chemistry (2042101-2)
<b>5. Co-requisites for this course (if any):</b> 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)	-
	<b>Total</b>	<b>30</b>

## B. Course Objectives and Learning Outcomes

### 1. Course Description

This course deals with the basic principles of group theory, Symmetry elements and symmetry operations, Some general rules for multiplications of symmetry operations, Axis of symmetry, Plane of symmetry, Reflection process, Rotation process, Centre of symmetry, Symmetry elements and Practical Examples, Point groups of many different inorganic molecules, Classified of inorganic compounds and find their point group, Character tables for each point groups, Analyses the infrared and Raman spectra for different inorganic compounds, Elective law for infrared and Raman spectra and Practical examples.

### 2. Course Main Objective

The course aims to investigate the symmetry elements, symmetry operations, chemical bonding, visualizing molecular orbitals, and the vibrational motions of the molecule and deduction of the point group.

### 3. Course Learning Outcomes

CLOs		Aligned PLOs
<b>1</b>	<b>Knowledge and Understanding:</b>	
1.1	Describe the fundamental principles in inorganic chemistry, bonding, reactivity and spectroscopy of inorganic compounds.	K1
1.2	Recognize the symmetry elements and symmetry operations, point groups and character tables for water ( $C_{2v}$ ) and ammonia ( $C_{3v}$ )	K2
<b>2</b>	<b>Skills:</b>	
2.1	Investigate the vibrational motions of molecules.	S1
2.2	Deduce the point group of a given molecule.	S2
<b>3</b>	<b>Values:</b>	
3.1	Participate in the development of the performance of work teams	V1

### C. Course Content

No	List of Topics	Contact Hours
1	Symmetry elements and symmetry operations	2
2	Some general rules for multiplications of symmetry operations	4
3	Axis of symmetry, Plane of symmetry	2
4	Reflection process Rotation process	2
5	Centre of symmetry and Practical Examples	4
6	Point groups of many different inorganic molecules	2
7	Classified of inorganic compounds and find their point group	4
8	Character tables for each point groups	2
9	Analyses the infrared and Raman spectra for different inorganic compounds and practical examples	4
10	Elective law for infrared and Raman spectra and practical examples	4
<b>Total</b>		<b>30</b>

### D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
<b>1.0</b>	<b>Knowledge and Understanding</b>		
1.1	Describe the fundamental principles in inorganic chemistry, bonding, reactivity and spectroscopy of inorganic compounds.	Lecture	Written Exam
1.2	Recognize the symmetry elements and symmetry operations, point groups and character tables for water ( $C_{2v}$ ) and ammonia ( $C_{3v}$ )	Lecture	Written Exam
<b>2.0</b>	<b>Skills</b>		
2.1	Investigate the vibrational motions of molecules	Discussion	Homework Assignments
2.2	Deduce the point group of a given molecule	Discussion	Homework Assignments

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
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	<ul style="list-style-type: none"> <li><a href="#">Chemical Applications of Group Theory</a>, F.A.Cotton (1990). Wiley-Interscience publication (USA), Latest Edition. ISBN: 9780471510949.</li> <li><a href="#">Introduction to Advanced Inorganic Chemistry</a>, P. J. Durrant, B. Durrant (1970). Wiley (USA), Latest Edition. ISBN: 9780582442139.</li> </ul>
Essential References Materials	<ul style="list-style-type: none"> <li><a href="#">Group Theory for Chemists: Fundamental Theory and Applications</a>, Kieran C Molloy (2010). Horwood Publishing in materials (Elsevier), Latest Edition. ISBN: 9780857092410.</li> </ul>
Electronic Materials	<ul style="list-style-type: none"> <li><a href="#">Saudi Digital Library (SDL)</a></li> </ul>
Other Learning Materials	<ul style="list-style-type: none"> <li><a href="#">Learning Management System (Blackboard)</a></li> </ul>

### 2. Facilities Required

Item	Resources
<b>Accommodation</b> (Classrooms, laboratories, demonstration rooms/labs, etc.)	<ul style="list-style-type: none"> <li>Lecture hall with 100 seats.</li> </ul>

Item	Resources
<b>Technology Resources</b> (AV, data show, Smart Board, software, etc.)	<ul style="list-style-type: none"> <li>Computer with smart board.</li> </ul>
<b>Other Resources</b> (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

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

