



Course Specification

(Bachelor)

Course Title: **Mechanism of Inorganic Reactions**

Course Code: **CEM 354**

Program: **CHRMISTRY**

Department: **CHRMISTRY**

College: **COLLEGE OF SCIENCE**

Institution: **MAJMAAH UNIVERSITY**

Version: **TP-153**

Last Revision Date: **09/12/2024**



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A. General information about the course:

1. Course Identification

1. Credit hours: (3)

2. Course type

A. University College Department Track Others
 B. Required Elective

3. Level/year at which this course is offered: (6th/3rd year)

4. Course General Description:

This course delves into the mechanisms and dynamics of inorganic chemical reactions, emphasizing the understanding of reaction pathways, kinetics, and the interplay of electronic, steric, and structural factors. Topics include substitution reactions in coordination chemistry, electron transfer processes, redox reactions, and ligand exchange mechanisms. Special focus is given to transition metal complexes, catalysis, and the role of inorganic reaction mechanisms in biological and industrial processes.

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

None

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

CEM 353

7. Course Main Objective(s):

The aim is to teach students basic mechanisms for inorganic reaction types, such as: electron transfer reactions, ligand substitution reactions and migration & insertion reactions, outer -inner shell mechanism, conditions of mechanism reactions. Students must know how to use inorganic reaction mechanisms available in the literature to solve chemical problems.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100%



No	Mode of Instruction	Contact Hours	Percentage
2	E-learning	0	0
3	Hybrid <ul style="list-style-type: none"> • Traditional classroom • E-learning 	0	0
4	Distance learning	0	0

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	45
2.	Laboratory/Studio	0
3.	Field	0
4.	Tutorial	0
5.	Others (specify)	0
Total		45

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Know types of reactions, complexes formation constants and kinetics of reactions.	K1	PowerPoint) and Video related to the topic. - Demonstration of a large number of problems solution in the class - Discussions - E-learning - Self-learning	- Midterms - Quizzes - Homework - Class participation - Encourage students to search the Internet for everything related to - Homework on the blackboard - Final exam - E-exam.
1.3	Explain possible mechanisms of ligand exchange reactions and charge transfer reactions.	K3		
2.0	Skills			



Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
2.2	Communicate effectively orally and written using appropriate presentation methods for different chemical issues with recipients of different types	S2	Cooperative learning -Problem Solving -Interactive teaching - Discussion and dialogue - Active Learning - Peer Learning -Encourage students to work as team in order To raise the spirit of cooperation among students - Lectures for detailed	Self-performance in class. Written presentation of assignments. Direct contact during office hours.
2.4	Solve chemical problems related to reactions types, complexes formation constants and kinetics of reactions and applications of chemistry through critical thinking to develop appropriate rational, explanations and answers.	S4		
3.0	Values, autonomy, and responsibility			
3.3	Self-development, assess own learning and performance and autonomously make decisions regarding self-development and/or tasks based on convincing evidence.	V3	Assignments (individual or group) at regular intervals to solve and submit on time. • Participation of students in classroom discussion and problem solving sessions • Team work reports and presentations (data collection,	- Observing student's participation in group activity. - Checklist of the tasks carried out by the student. Observing student's participation in group discussion.



Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
			internet search, data processing, analysis and reporting)	- Checklist of student's punctuality in submitting work on time.

C. Course Content

No	List of Topics	Contact Hours
1.	Types of reactions, complexes formation constants and Kinetics and thermodynamics of inorganic reactions	6
2.	Substitution reactions in square planer	3
3	Factors affecting on rate of water exchange reactions	6
4	Substitution reactions in octahedral. Trans effect in substitution reaction	6
5	Possible mechanisms of ligand exchange reactions. Charge transfer reactions	6
6	Migration and insertion reactions, outer -Inner shell mechanism, conditions of mechanism	6
7	Reactions of coordinated ligands. Photochemical reactions of complexes	6
8	Catalyzed substitution reactions, addition of protons to metals.	6
Total		45

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework	Continues	5%
2.	Quizzes	End of topic	5%
3.	Presentation	One/semester	10%
4.	First midterm exam	6th	15%
5.	Second midterm exam	9th	15%
6.	E. exam	12th	10%
7.	Final written Exam	End of the semester	40%

*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	<ul style="list-style-type: none"> • Journal of Coordination Chemistry. • Applied Organometallic Chemistry.
Supportive References	<ul style="list-style-type: none"> • Rudi van Eldik and Colin D. Hubbard, "Inorganic Reaction Mechanisms" 1st ed. Elsevier, 2017. • Smiljko Ašperger, "Chemical Kinetics and Inorganic Reaction Mechanisms", 2nd ed., Springer, Boston, MA, 2003.
Electronic Materials	<ul style="list-style-type: none"> • http://onlinelibrary.wiley.com/book/10.1002/3527600825 • http://www.chem.ox.ac.uk/icl/dermot/mechanism1/
Other Learning Materials	<ul style="list-style-type: none"> • Isisdraw and Chemdraw and Chemoffice Software. • http://scholle.oc.uni-kiel.de/herges/modeling/gliederung.html • http://chem-faculty.ucsd.edu/trogler/GroupTheory224/Grouptheory.html • http://phycomp.technion.ac.il/~ira/types.html

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms, E- learning, balckboard
Technology equipment (projector, smart board, software)	<ul style="list-style-type: none"> • Common computer lab containing at least 25 computer sets. • High speed internet access.
Other equipment (depending on the nature of the specialty)	<ul style="list-style-type: none"> • Required programs specific for chemistry students.

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	students	Program/Department Instructor
Effectiveness of Students assessment	Program/Department Instructor	Program/Department Instructor
Quality of learning resources	Program/Department Instructor	Peer review
The extent to which CLOs have been achieved	Peer review	Program/Department Instructor



Assessment Areas/Issues	Assessor	Assessment Methods
Other	None	

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	CHEMISTRY DEPARTMENT COUNCIL
REFERENCE NO.	6
DATE	9-3-1444 H

