



Course Specification

(Bachelor)

Course Title: **Chemistry of Transition metals**

Course Code: **CEM 251**

Program: **Chemistry**

Department: **Chemistry**

College: **College Of Science**

Institution: **Majmaah University**

Version: **TP-153**

Last Revision Date: **11 December 2024**



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A. General information about the course:

1. Course Identification

1. Credit hours: (2)

2. Course type

A. University College Department Track Others

B. Required Elective

3. Level/year at which this course is offered: (level 4/ year 2)

4. Course General Description:

This course provides an in-depth study of the chemistry of transition metals and inner transition metals (lanthanides and actinides). The course covers their electronic configurations, oxidation states, general characteristics, Magnetic properties, Physical and chemical properties for these elements and their role in biological and industrial processes.

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

CHM 241

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

None

7. Course Main Objective(s):

- 1- Introduce students to the basic concepts, properties and chemistry of transition elements.
- 2- Identify the relationship between the electronic structure and physical and chemical properties of the transition elements.
- 3- List the role of transition elements in biological systems and in oxidation-reduction reactions of biochemistry.
- 4- Understand the properties and behaviors of transition metals and inner transition metals.
- 5- Analyze the electronic structures and oxidation states of these metals.



6- Investigate the roles of these metals in biological systems and industrial applications.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom		
2	E-learning		
3	Hybrid <ul style="list-style-type: none"> Traditional classroom E-learning 	15 15	50% 50%
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		30

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	define the periodic trends and concepts related to transition elements and their compounds.	K1	-Lectures -Discussion -questions during class	-Final exam - Midterm exam - Short tests -Quizzes. - Homework
1.2	Recall symbols, formulas			



Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	and chemical equations for reactions of transition elements and their compounds.			- Class exercises - Evaluation of research
2.0	Skills			
2.1	Communicate effectively orally and written using appropriate presentation formats for different issues with recipients of different types	S2	-Lectures -Active learning - E-learning -Self-learning -Cooperative Education -Examinations	- Final exam - Midterm exam - Short tests -Quizzes. - Homework - Class exercises - Evaluation of research
2.2	Demonstrate the ability to use modern technology and statistical applications that are used in the various fields of chemistry	S3		
...				
3.0	Values, autonomy, and responsibility			
3.1	Apply standards of integrity, transparency and ethical behavior in various Academic and professional fields	V1	-Simulation programs -Cooperative work	- Research papers





C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to transition elements, classification of transition elements, electronic structures & oxidation states, general characteristics of transition elements. Trends in properties across the transition series.	4
2.	Chemistry of Period 4 d-block elements and their compounds: physical and chemical properties, important halides of the elements, Important oxides of the elements.	6
3.	Comparative chemistry of period 5 and 6 d-block elements and their compounds: Introduction, some physical properties of the elements, important halides and oxides of the elements.	6
4.	Role of transition elements in biological systems. The role of the transition elements in bio oxidation-reduction reactions	2
5.	Introduction to chemistry of Lanthanides and Actinides (Inner Transition Metals) (f-block elements) - General properties of lanthanides and actinides. - Electronic configurations and oxidation states. - Lanthanide contraction and its consequences. - Brief comparative chemical behavior of lanthanides and actinides.	6
6.	- Applications of Transition and Inner Transition Metals - Biological importance: metalloenzymes, metalloproteins. - Medical applications: contrast agents, radiopharmaceuticals. - Industrial applications: catalysts, superconductors, phosphors. - Environmental aspects: role in pollution control, radioactive waste management	6
Total		30

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework, exercises, periodic tests , Essays, laboratory reports, Presentation ,project	During the semester	20%
2.	Mid term 1	6 th week	15%
3.	Mid term 2	11 th week	15%
4.	Electronic exam	12 th week	10%
5.	Final exam	End of semester	40%
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	-Transition Metal Compounds, Daniel KhomskiiDaniel, Cambridge University Press,2024. -Lanthanides and Ac-nides, S. CoVon, MacMillan Educa-on
Supportive References	- Inorganic chemistry by Shriver & Atkins, 5th Edition: W. H. Feeman and Company - Inorganic Chemistry, Principles of structure and reactivity, 4th edition. J.E. Huheey and others.
Electronic Materials	
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms
Technology equipment (projector, smart board, software)	projector, smart board, software, The electronic platform, Smart Board
Other equipment (depending on the nature of the specialty)	Virtual laboratories Research laboratory Library

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Student evaluation (electronically questionnaire) organized by the University
Effectiveness of Students assessment	Department	Analysis of electronically questionnaire. the Make decision through department Council
Quality of learning resources	Department / staff members	Analysis of course report by



Assessment Areas/Issues	Assessor	Assessment Methods
		Chemistry Department Council
The extent to which CLOs have been achieved	Department Faculty	CLO Analysis Report
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	CHEMISTRY DEPARTMENT COUNCIL
REFERENCE NO.	
DATE	

