



## Course Specifications

<b>Course Title:</b>	Chemistry of Transition Elements (d &f)
<b>Course Code:</b>	4023552-2
<b>Program:</b>	Chemistry and Industrial Chemistry
<b>Department:</b>	Chemistry
<b>College:</b>	Faculty of Applied Science
<b>Institution:</b>	Umm Al-qura University

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## A. Course Identification

<b>1. Credit hours: 2 (theoretical)</b>
<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: 4<sup>th</sup> level/ 2<sup>ed</sup> year</b>
<b>4. Pre-requisites for this course (if any): Chemistry of the Main Group Elements</b>
<b>5. Co-requisites for this course (if any): nothing</b>

## 6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	22	70%
2	Blended	---	---
3	E-learning	6	20%
4	Distance learning	---	---
5	Other (Exams + office hours)	4	10%

## 7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	22
2	Laboratory/Studio	0
3	Tutorial	0
4	Others (E-learning + Exams + office hours)	10
	Total	32

## B. Course Objectives and Learning Outcomes

<b>1. Course Description</b> The course introduces chemistry of the transition elements of d-block and f-block elements involving their general and chemical properties with comparative study of elements in their groups.
<b>2. Course Main Objective</b> By the end of this course student should be familiar with: a. The properties of the transition elements of d-block and f-block. b. The chemical behavior of the inner transition elements depending on the periodic properties in the periodic table in addition to a comparative study of the elements in their groups. c. The spectroscopic and magnetic properties of the transition elements. d. Comparative study for the chemical properties of transition elements as well as the lanthanides & actinides

### 3. Course Learning Outcomes

CLOs		Aligned PLOs
<b>1</b>	<b>Knowledge and Understanding:</b>	
1.1	Recognize the underlying principles explaining the main characteristics of the transition elements in their groups and in comparison to s-block elements.	<b>K1</b>
1.2	Classify the transition elements and their compounds in their groups.	<b>K2</b>
1.3	Describe the transition elements and their compounds in their groups through studying their general and physical properties, chemical reactions, separation and extraction.	<b>K2</b>
<b>2</b>	<b>Skills:</b>	
2.1	Compare between d-block or f-block elements and the main group elements	<b>S1</b>
2.2	Explain the chemical methods used to solve complex problems concerning extraction the elements from their ores.	<b>S2</b>
2.3	Calculate the oxidation state of transition elements in their compounds	<b>S2</b>
2.4	Summarize the different methods used to purify and extract the different transition elements from their ores.	<b>S1</b>
2.5	Apply IT and communication technology in gathering and interpreting information and ideas concerning transition elements and their compounds	<b>S4</b>
2.6	Communicate effectively using theoretical basis of extraction and purification of transition elements to a variety of audiences	<b>S5</b>
<b>3</b>	<b>Values:</b>	
3.1	Work individually to use the on-line libraries for searching and interpreting the course topics.	<b>V2</b>
3.2	Work collaboratively and constructively for searching and interpreting up to dated aspects relating to the applications and uses of transition elements.	<b>V3</b>

### C. Course Content

No	List of Topics	Contact Hours
1	The site of transition elements in the periodic table.	2
2	General characteristics of the transition elements (d-block) in comparison to s-block elements.	2
3	Study of the transition elements in their groups; scandium group, titanium group, vanadium group, chromium group, manganese group, iron, cobalt & nickel groups, copper group, and zinc group.	10
	Midterm exam	<b>1</b>
4	Characteristics of f-block elements: lanthanide series (4f) and actinide series (5f).	8
5	Studies of lanthanides and actinides in comparison with d-block elements in terms of electronic configuration, abundance, oxidation states and lanthanides contraction.	3E
	Industrial uses of transition elements	3E
	Final exam	<b>2</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	Recognize the underlying principles explaining the main characteristics of the transition elements in their groups and in comparison to s-block elements.	<ul style="list-style-type: none"> <li>• Lectures</li> <li>• scientific discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Quiz</li> <li>• periodic exams.</li> <li>• final exam.</li> </ul>
1.2	Classify the transition elements and their compounds in their groups.	<ul style="list-style-type: none"> <li>• Lectures</li> <li>• scientific discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Quiz</li> <li>• periodic exams.</li> <li>• final exam.</li> </ul>
1.3	Describe the transition elements and their compounds in their groups through studying their general and physical properties, chemical reactions, separation and extraction.	<ul style="list-style-type: none"> <li>• Lectures</li> <li>• scientific discussion</li> <li>• E-learning.</li> </ul>	<ul style="list-style-type: none"> <li>• Quiz</li> <li>• periodic exams.</li> <li>• final exam.</li> <li>• Assignment on blackboard</li> </ul>
<b>2.0</b>	<b>Skills</b>		
2.1	Compare between d-block or f-block elements and the main group elements.	<ul style="list-style-type: none"> <li>• Lectures</li> <li>• scientific discussion</li> <li>• E-learning.</li> </ul>	<ul style="list-style-type: none"> <li>• Quiz</li> <li>• periodic exams.</li> <li>• final exam.</li> <li>• Assignment on blackboard</li> </ul>
2.2	Explain the chemical methods used to solve complex problems concerning extraction the elements from their ores.	<ul style="list-style-type: none"> <li>• Lectures</li> <li>• scientific discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Quiz</li> <li>• periodic exams.</li> <li>final exam.</li> </ul>
2.3	Calculate the oxidation state of transition elements in their compounds	<ul style="list-style-type: none"> <li>• Lectures</li> <li>• scientific discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Quiz</li> <li>• periodic exams.</li> <li>final exam.</li> </ul>
2.4	Summarize the different methods used to purify and extract the different transition elements from their ores.	<ul style="list-style-type: none"> <li>• Lectures</li> <li>• scientific discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Quiz</li> <li>• periodic exams.</li> <li>• final exam.</li> </ul>
2.5	Apply IT and communication technology in gathering and interpreting information and ideas concerning transition elements and their compounds	<ul style="list-style-type: none"> <li>• Web based study.</li> </ul>	<ul style="list-style-type: none"> <li>• Assignments activities</li> </ul>
2.6	Communicate effectively using theoretical basis of extraction and purification of transition elements to a variety of audiences	<ul style="list-style-type: none"> <li>• Lectures.</li> <li>• Web based study.</li> </ul>	<ul style="list-style-type: none"> <li>• Quiz.</li> <li>• Final exam</li> <li>• Assignments activities</li> </ul>
<b>3.0</b>	<b>Values</b>		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
3.1	Work individually to use the on-line libraries for searching and interpreting the course topics.	<ul style="list-style-type: none"> <li>• web based study</li> </ul>	<ul style="list-style-type: none"> <li>• Class discussion.</li> </ul>
3.2	Work collaboratively and constructively for searching and interpreting up to dated aspects relating to the applications and uses of transition elements.	<ul style="list-style-type: none"> <li>• Library visits</li> <li>• Web-based study</li> </ul>	<ul style="list-style-type: none"> <li>• Class discussion activities</li> </ul>

## 2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Assignments and activities	Al weeks	10 %
2	E-learning	Al weeks	10 %
3	Mid-term Exam	6	30 %
4	Final Exam (2 hours exam)	12	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:**

- Office hours: During the working hours weekly.
- Academic Advising for students.

Availability of Staff members to provide counselling and advice

## F. Learning Resources and Facilities

### 1. Learning Resources

<b>Required Textbooks</b>	R. Gopalan " <i>Textbook of Inorganic Chemistry 1st Edition</i> " <b>2011</b> , CRC Press.
<b>Essential References Materials</b>	<ul style="list-style-type: none"> <li>- Eleanor Crabb, Elaine Moore, Lesley Smart" <i>Concepts in Transition Metal Chemistry</i>" 2010, Royal Society of Chemistry".</li> <li>- Kazuo Nakamoto "Infrared and Raman Spectra of Inorganic and Coordination Compounds" <b>2009</b>, John Wiley &amp; Sons.</li> </ul>
<b>Electronic Materials</b>	<ul style="list-style-type: none"> <li>- <a href="http://www.chemweb.com">http://www.chemweb.com</a></li> <li>- <a href="http://www.sciencedirect.com">http://www.sciencedirect.com</a></li> </ul> <a href="http://www.rsc.org">http://www.rsc.org</a>

<b>Other Learning Materials</b>	None
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## 2. Facilities Required

Item	Resources
<b>Accommodation</b> (Classrooms, laboratories, demonstration rooms/labs, etc.)	Well provided Classrooms with capacity of (30) students
<b>Technology Resources</b> (AV, data show, Smart Board, software, etc.)	Rooms equipped with computers, internet connection and data show
<b>Other Resources</b> (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	None

## G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of Teaching and assessment	students	Questionnaire evaluation of the course.
Evaluation of the extent of achievement of course learning outcome	Program/Department Instructor	Annual course report
Verification of Standards Achievement	Peer review	- Check marking of a sample of exam papers, or student work. -Exchange corrected sample of assignments or exam basis with another staff member for the same course in other faculty.

**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	Quality committee and department Council
Reference No.	1 <sup>st</sup> meeting
Date	2021

Head of Chemistry Department



Dr Moataz Morad

