Course Specifications

Course Title:	Chemistry of Transition Elements
Course Code:	4023552-2
Program:	Chemistry and Industrial Chemistry
Department:	Department of Chemistry
College:	Faculty of Applied Science
Institution:	Umm Al-qura University

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A. Course Identification

1. Credit hours: 2 (theoretical)
2. Course type **a.** University ☐ College ☐ Department ■ Others ☐ **b.** Required ■ Elective ☐
3. Level/year at which this course is offered: 5th level/3th year
4. Pre-requisites for this course (if any)**: Chemistry of the Main Group Elements**
5. Co-requisites for this course (if any)**: --**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	√	100%
2	**Blended**	--	--
3	**E-learning**	--	--
4	**Correspondence**	--	--
5	**Other**	--	--

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	30
2	**Laboratory/Studio**	--
3	**Tutorial**	--
4	**Others** (specify)	--
	Total	30
Other Learning Hours*		
1	**Study**	30
2	**Assignments**	10
3	**Library**	3
4	**Projects/Research Essays/Theses**	3
5	**Others** (quizzes and exams preparation)	20
	Total	66

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

The course introduces chemistry of the transition elements specially the d-block elements involving their general and chemical properties with comparative study of elements in their groups. Brief introduction of lanthanides and actinides chemistry.

2. Course Main Objective

By the end of this course student should be familiar with:

a. The properties of the transition elements especially d-block.

b. The chemical behavior of the inner transition elements depending on the periodic properties in the periodic table in addition to a comparative studies of the elements in their groups.

c. The spectroscopic and magnetic properties of the transition elements.

d. Brief description of the general and chemical properties of lanthanides and actinides

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge:**	
1.1	Describe the site of transition elements in the periodic table.	K3
1.2	Know the f-block elements by its two series; lanthanides (4f) and actinides (5f).	K3
1.3	Describe the characteristic properties of first transition series.	K1
1.4	explain the magnetic properties from crystal field theory.	K5
1.5	Recognize the electronic distribution of electrons in d orbitals on octahedral complexes.	K4
1.6	Recognize the transition elements in their groups.	K3
1.7	List lanthanides and actinides (f-block elements) in comparison with scandium group (abundance, electronic configuration, oxidation states and lanthanides contraction).	K4
1.8	Recognize the spectroscopic and magnetic properties of the d- and f-block elements	K5
2	**Skills :**	
2.1	Explain the site of transition elements in the periodic table.	S4
2.2	Compare between d-block and f-block elements.	S4
2.3	Differentiate between d-block elements with s & p block elements.	S1
2.4	Clarify the characteristic properties of first transition series.	
2.5	Compare between the properties of first transition series (3d) with the second transition series (4d) and third transition series (5d).	S4
2.6	Subdivide the f-block elements into lanthanides and actinides and compare them with scandium group (abundance, electronic configuration, oxidation states and lanthanides contraction).	S2
2.7	Predict the spectroscopic and magnetic properties of the d- and f-block elements.	S2
3	**Competence:**	
3.1	Use information and communication technology.	C3
3.2	Apply IT and communication technology in gathering and interpreting information and ideas concerning the course topics.	C3
3.3	Develop the student's ability in self-dependence and self-study.	C2
3.4	Encourage students to use on-line libraries for searching and interpreting up to dated aspects relating to the applications and uses of transition elements	C3

C. Course Content

No	List of Topics	Contact Hours
1	The site transition elements in the periodic table.	2
2	d-block elements, first transition series (3d), second transition series (4d) and third transition series (5d).	4
3	f-block elements: lanthanides series (4f) and actinides series (5f).	2
4	Differences between d-block and f-block elements.	2
5	Comparisons between 4d and s, p block elements.	2
6	Characteristic properties of first transition series.	2
7	Magnetic properties from crystal field theory.	4
8	Electronic distribution of electrons in d orbitals on octahedral complexes.	2
9	Comparison between the properties of first transition series (3d) with the second transition series (4d) and third transition series (5d).	2
10	Comparative studies of transition elements in their groups; scandium group, titanium group, vanadium group, chromium group, manganese group, iron, cobalt & nickel groups, copper group, and zinc group.	4
11	f-block elements: studies of lanthanides and actinides in comparison with scandium group in terms of abundance, electronic configuration, oxidation states and lanthanides contraction.	2
12	Spectroscopic and magnetic properties – difference between 4f and 5f and its effect on chemical behavior.	2
Total		30

D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
1.1	Describe the site of transition elements in the periodic table.	lecture	quiz
1.2	Know the f-block elements by its two series; lanthanides (4f) and actinides (5f).	discussion	quiz
1.3	Describe the characteristic properties of first transition series.	lecture	quiz
1.4	explain the magnetic properties from crystal field theory.	lecture	exam
1.5	Recognize the electronic distribution of electrons in d orbitals on octahedral complexes.	Lecture and web based study	exam and report
1.6	Recognize the transition elements in their groups.	Lecture and web based study	exam and report
1.7	List lanthanides and actinides (f-block elements) in comparison with scandium group (abundance, electronic configuration, oxidation states and lanthanides contraction).	Lecture and web based study	Quiz and report

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.8	Recognize the spectroscopic and magnetic properties of the d- and f-block elements	discussion and lecture	quiz
2.0	**Skills**		
2.1	Explain the site of transition elements in the periodic table.	lecture	quiz
2.2	Compare between d-block and f-block elements.	lecture and discussion	quiz
2.3	Differentiate between d-block elements with s & p block elements.	lecture	quiz
2.4	Clarify the characteristic properties of first transition series.	Lecture and web based study	exam and report
2.5	Compare between the properties of first transition series (3d) with the second transition series (4d) and third transition series (5d).	lecture and discussion	exam
2.6	Subdivide the f-block elements into lanthanides and actinides and compare them with scandium group (abundance, electronic configuration, oxidation states and lanthanides contraction)	lecture and web based study	quiz and report
2.7	Predict the spectroscopic and magnetic properties of the d- and f-block elements	lecture and discussion	quiz
3.0	**Competence**		
3.1	Encourage the ability to communicate results of work to classmates. Ability to work in a team to perform a specific task.	Scientific discussion and web-based study	web-based student performance systems.
3.2	Apply IT and communication technology in gathering and interpreting information and ideas concerning the course topics.	web-based study	web-based student performance systems
3.3	Develop the student's ability in self-dependence and self-study.	Scientific discussion	individual and group presentations
3.4	Encourage students to use on-line libraries for searching and interpreting up to dated aspects relating to the applications and uses of transition elements	Library visits and web-based study	web-based student performance systems

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Homework or activities.	**--**	**10 %**
2	First Periodic Exam.	**6**	**20 %**

#	Assessment task*	Week Due	Percentage of Total Assessment Score
3	Second Periodic Exam.	12	20 %
4	Final Exam.(2 hours 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 :

- 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

Required Textbooks	- R. Gopalan " *Textbook of Inorganic Chemistry 1st Edition"* **2011,** *CRC Press*.
Essential References Materials	- Eleanor Crabb, Elaine Moore, Lesley Smart "*Concepts in Transition Metal Chemistry" 2010, Royal Society of Chemistry".* - Kazuo Nakamoto "Infrared and Raman Spectra of Inorganic and Coordination Compounds" **2009,** John Wiley &Sons.
Electronic Materials	- http://www.chemweb.com - http://www.sciencedirect.com - http://www.rsc.org
Other Learning Materials	- None

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Well provided Classrooms with capacity of (30) students
Technology Resources (AV, data show, Smart Board, software, etc.)	Rooms equipped with computers and data show
Other Resources (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 of Student 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	
Reference No.	
Date	

Received by: Dr. Ismail Althagafi **Department Head**

Signature:  **Date: 20/12/2019**