Course Specification
(Bachelor)

Course Title:	ELECTROCHEMISTRY
Course Code:	344 CHEM -3
Program:	Bachelor of Science in Chemistry
Department:	Physical Sciences
College:	College of Science
Institution:	Jazan University
Version:	TP-153 2024
Last Revision Date:	5/5/2024

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (3hrs)

2. Course type

A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		

3. Level/year at which this course is offered: (level5 /Year3)

4. Course general Description:

Course Title	*Course Number*	*Contact Hours (CH)*		*Credit unit (CU)*	*Year*	*Level*	*Pre-requisite*
		Lec.	*Prac.*				
Electrochemistry	*344CHEM-3*	*2*	*1*	*3*	*3*	*5*	*241CHEM-3*

Course Objectives; ***They are to identify the following***

1. ***Types of conductors***
2. ***Classification of electrolytic cells***
3. ***Measuring EMF***
4. ***Applications of electrochemistry***

Syllabus: A-Theoretical contents

Electrolytic conductors, General electrochemistry concepts, Introduction to electrochemistry: electrode potentials, galvanic and electrolytic cells, Nernst equation, Corrosion and corrosion protection, Overview of applications of electrochemistry

Syllabus: A-Practical contents

Experimental work illustrating selected parts of the theoretical content

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

241CHEM-3

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

none

7. Course Main Objective(s):

This course aims to give students the basic principles of electrochemistry and its applications

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		

No	Mode of Instruction	Contact Hours	Percentage
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	30
2.	**Laboratory/Studio**	30
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	
Total		60

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

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**; (Upon completion of the course, student will be able to)			
1.1	***Demonstrate a broad understanding and critical view on principal of electrochemistry, Concepts and terminology of electrochemistry topics including; electrolyte solution theories, electrochemical (Galvanic) cell, origin of electrode potential theories, Faraday's law of electrolysis, ……etc (P)***	K(1.1)	***lecture / discussion Seminars /presentation***	Objective questions
1.2	***Describe correctly the different phenomena associated with electrochemistry i.e.; type of electrodes, cell presentation (notation), cell reactions, electromotive force (P)***	K(1.2)	***lecture / discussion / Seminars /Individual presentation***	Objective questions + Essay Questions
2.0	**Skills**; (Upon completion of the course, student will be able to)			
2.1	***Demonstrate an ability in critical thinking, numeracy, statistical, analytical reasoning, use graphs, charts and to solving problems related to faraday's law and Nernst equation. (P)***	S(2.1)	***lecture / discussion / Seminars /Individual presentation***	Essay Questions + solve Problems

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.2	***Perform experiments in electrochemistry, record, analyze, interpret the scientific data, and write reports. (P)***	S(2.2)	***Lab work, group work***	Objective questions + Essay Questions
2.3	***Knows the proper procedures and regulations for safe handling and use of chemicals and can follow the proper procedures and regulations for safe handling when using chemicals. (P)***	S(2.3)	***lab demonstrations / hands-on student learning activities***	Objective questions + Essay Questions
3.0	**Values, autonomy, and responsibility**; (Upon completion of the course, student will be able to)			
3.1	***Working as a group leader in cooperation with other colleagues. (P)***	V(3.1)	***lab demonstrations / whole group and small group discussion***	***Practical group work Rubric***

C. Course Content

No	List of Topics	Contact Hours
1.	*Electrolytic and Non-electrolytic conductors*	*4*
2.	*Oxidation States & Redox Reactions*	*3*
3.	*Galvanic (electrochemical) Cells*	*3*
4.	*Cell Potential under Standard Conditions*	*3*
5.	*Gibbs Energy and Redox Reactions*	*3*
6.	*Cell Potential under Nonstandard Conditions and Nernst equation*	*3*
7.	*Batteries & fuel cell*	*3*
8.	*Corrosion*	*4*
9.	*Electrolytic cell*	*4*
10.	*Selected experiments related to the course topic*	*30*
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	*Homework assignment*	*3-8*	*2 %*
2.	*Lecture Quizzes*	*5-10*	*3 %*
3.	*Mid-term exam*	*9-11*	*15 %*
4.	*LAB Sheet*	*15*	*5 %*
5.	*Safety Exam*	*12-15*	*4%*
6.	*Final practical exam*	*15*	*7 %*
7.	*Lab report*	*2-15*	*10 %*
8.	*Group work evaluation*	*2-15*	*4%*
9.	*Final Exam*	*16-17*	*50 %*
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	Handbook of Electrochemistry, 2007, Cynthia G. Zoski, Elsevier
Supportive References	• Electrochemistry, 2nd Edition, P.H. Rieger, Springer, 1993 ISBN: 0412043912,9780412043918 • Electrochemistry and Corrosion Science, Nestor Perez, 2016, Springer International Publishing, • ISBN: 978-3-319-24845-5,978-3-319-24847-9
Electronic Materials	***Some course contents and materials are posted on Black board sites***
Other Learning Materials	• https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Electrochemistry • https://courses.lumenlearning.com/chemistryformajors/chapter/introduction-to-electrochemistry/ • https://pages.uoregon.edu/tgreenbo/electrolysis10.html • https://pages.uoregon.edu/tgreenbo/voltaicCellEMF.html

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	***1 Lecture room(s) for groups of 50 students*** ***1 Lab room for group of 25student***
Technology equipment (projector, smart board, software)	***Smart board, Data show, Black board, Internet***

Items	Resources
Other equipment (depending on the nature of the specialty)	***Conductivity meter, metal electrodes (i.e. Fe, Cu, Al, Sn, Zn, Mg, Pb …), Voltameter, Power source, Balance, potentiostate, galvanostate……***

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	***Student***	***Likert-type Survey (CES) Indirect***
Effectiveness of Students assessment	***Instructor & Course coordinator***	***Class room evaluation (direct & indirect)***
Quality of learning resources	***Program coordinator***	***Indirect***
The extent to which CLOs have been achieved	***Assessment committee***	***Indirect***
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Physical Sciences Department Council
REFERENCE NO.	Psci2415
DATE	28/03/1446 Corresponding to 1 / 10 /2024

H. Attachments

1- Practical Work

1- LAB EXPERIMENTS

Week	EXPERIMENTAL TITLE	Chemicals and Apparatus used	Remarks
1	Safety and regulations		
1	Determination of cell constant	0.1N KCl, conductivity cell	
2	Determination of equivalent conductance	0.1N KCl, MgSO4, monochloride acid, conductivity cell	None
3	Activity Series	0.1 M $Cu(NO_3)_2$, 0.1 M $Mg(NO_3)_2$, 0.1 M HCl, 0.1 M $Zn(NO_3)_2$, 0.1 M $AgNO_3$, Mg, Cu, Zn	None
4	Electrochemical Cells	0.5M $Cu(NO_3)_2$, 0.5M $Zn(NO_3)_2$, 0.5M $Pb(NO_3)_2$, 0.5M KNO_3 rods, DC voltmeter or digital multimeter, copper, zinc, lead.	None
5	Galvanic cells created from the environment	Citric acid, Oxalic acid., sheet of copper , sheet of zinc, distilled water, DC voltmeter or digital multimeter, Lemon, Kiwi,…….	None
6	Simple galvanic cell using a pottery vase or any membrane partition	Zn, Pb, Cu, strips , 0.1M $CuSO_4$, 0.1 M $Zn(NO_3)_2$, 0.1 M $Pb(NO_3)_2$, 0.1 M $FeSO_4$ and 0.1 M KNO3, DC voltmeter or digital multimeter, porous vase	None
7	Investigation of the temperature coefficient Of Galvanic Cell	Copper Sulfate ($CuSO_4$),Zinc Sulfate ($ZnSO_4$), sheet of copper ,sheet of zinc, voltmeter or digital multimeter, thermometer	None
8	Corrosion	Zn Sheets, NaOH, balance	None
9	Corrosion	Cu Sheets, H2SO4, balance	None
10	An Electrolytic Cell: Electrolysis of CuCl2	0.2 M $CuCl_2$. Power supply or 9V batteries	None
11	An Electrolytic Cell: Electrolysis of H2O	H2O. Power supply or 9V batteries	None
12-13	An Electrolytic Cell: Electroplating	1.0 M $CuSO_4$, a copper strip, iron nail, battery or power source,	None
14-15	Final exam		

For unavailable equipment, we use some stimulated experiments through links as:

https://pages.uoregon.edu/tgreenbo/voltaicCellEMF.html

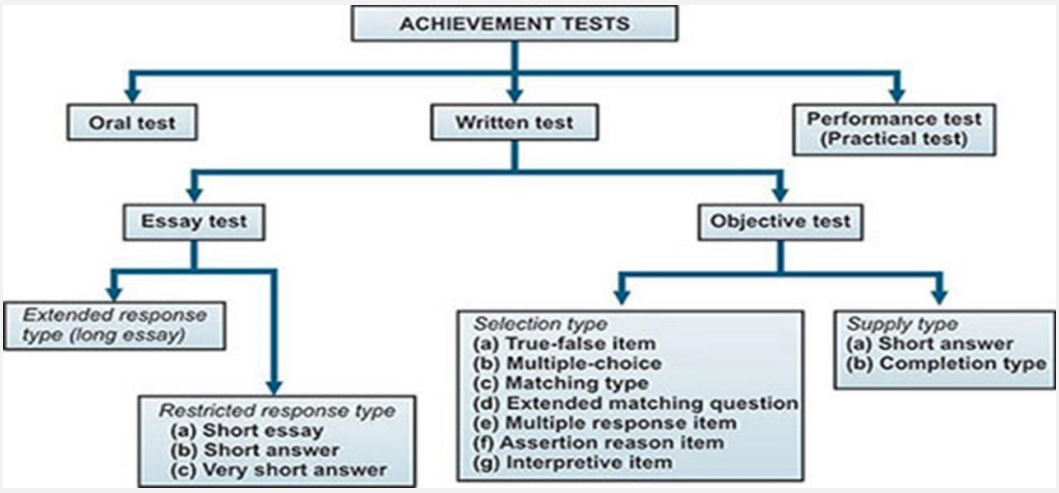
http://introchem.chem.okstate.edu/DCICLA/voltaicCell20.html

2- Blue Print

Course Name	ELECTROCHEMISTRY
Course Code	344 CHEM-3

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	2.2	2.3	2.4	3.1	3.2
Marks	15	21	34	22	4	--	4	---

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	1.1 (15M)	Quiz	Objective Q	2	1	1
			Mid term	Objective Q	6	3	3
			Final Exam	Objective Q	11	11	11
	K2	1.2 (21M)	Quiz	Essay q	2	1	1
			Mid term	Essay q	5	5	5
			Final Exam	Essay q	5	15	15
Skills	S1	2.1 (34M)	H.W	Solving Problems & chart analysis	4	2	2
			Quiz	Solving Problems & Essay Questions + solve Problems	1	1	1
			Mid term	Solving Problems & Essay Questions + solve Problems	2	7	7
			Final Exam	Solving Problems & Essay Questions + solve Problems	6	6	24
	S2	2.2 (22M)	Practical Sheet	Objective Q	6	6	3
				Essay q	2	2	2
			Lab Report	Lab report rubric	10	10	10
			Final Lab Exam	1Task experiment	1	1	7
	S3	2.3 (4M)	Safety Exam	Objective Q + Essay q	8	8	4
Value	V1	3.1 (4)	Continuous assessment	Group evaluation rubric	-	4	4
TOTAL		100					100


ACHIEVEMENT TESTS
Oral test
Written test
Performance test (Practical test)
Essay test
Objective test
Extended response type (long essay)
Restricted response type
(a) Short essay
(b) Short answer
(c) Very short answer
Selection type
(a) True-false item
(b) Multiple-choice
(c) Matching type
(d) Extended matching question
(e) Multiple response item
(f) Assertion reason item
(g) Interpretive item
Supply type
(a) Short answer
(b) Completion type