هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Electrochemistry**
Course Code:	**CHEM 344**
Program:	**Bachelor in Chemistry**
Department:	**Chemistry**
College:	**College of Science**
Institution:	**Jazan University (J U)**

Table of Contents

A. Course Identification

1. Credit hours: 3hs
2. Course type **a.** University ☐ College ☐ Department ☑ Others ☐ **b.** Required ☑ Elective ☐
3. Level/year at which this course is offered: Level 8 Year 3
4. Pre-requisites for this course (if any)**:** 241CHEM3
5. Co-requisites for this course (if any)**:** none

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	22	100
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	22
2	Laboratory/Studio	22
3	Tutorial	
4	Others (specify)	
	Total	44

B. Course Objectives and Learning Outcomes

1. Course Description

Course Title	Course Number	Contact Hours		Credit unit (CU)	Year	Level	Pre-requisite
		Lec.	Prac.				
Electrochemistry	CHEM 344	2	1	3	3	8	241CHEM3

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.

2. Course Main Objective

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

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding:** *Upon completion of this 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)*	*K1*
1.2	*Describe correctly the different phenomena associated with electrochemistry i.e.; type of electrodes, cell presentation (notation), cell reactions, electromotive force (P)*	*K2*
2	**Skills :** *Upon completion of this 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)*	*S1*
2.2	*Perform experiments in electrochemistry, record, analyze, interpret the scientific data, and write reports. (P)*	*S2*
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)*	*S3*
3	**Values:**	
3.1	*Working as a group leader in cooperation with other colleagues. (P)*	*V1*

C. Course Content

No	List of Topics	Contact Hours
1	*Electrolytic and Non-electrolytic conductors*	*3*
2	*Oxidation States & Redox Reactions*	*2*
3	*Galvanic (electrochemical) Cells*	*3*
4	*Cell Potential under Standard Conditions*	*3*
5	*Gibbs Energy and Redox Reactions*	*2*
6	*Cell Potential under Nonstandard Conditions and Nernst equation*	*3*
7	*Batteries & fuel cell*	*2*
8	*Corrosion*	*2*
9	*Electrolytic cell*	*2*
10	*Selected experiments related to the course topic*	*22*
	Total	*44*

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 and Understanding** *Upon completion of this 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)*	*lecture / discussion Seminars /presentation*	*MCQ*
1.2	*Describe correctly the different phenomena associated with electrochemistry i.e.; type of electrodes, cell presentation (notation), cell reactions, electromotive force (P)*	*lecture / discussion / Seminars /Individual presentation*	Q&A
2.0	**Skills** *Upon completion of this 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)*	*lecture / discussion / Seminars /Individual presentation*	Solving Problems & chart analysis
2.2	*Perform experiments in electrochemistry, record, analyze, interpret the scientific data, and write reports. (P)*	*Lab work, group work*	*MCQ, Q&A, lab report rubric*
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)*	*lab demonstrations / hands-on student learning activities*	*Safety exam*

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
3.0	***Values*** ***Upon completion of this course, student will be able to***		
3.1	***Working as a group leader in cooperation with other colleagues. (P)***	***lab demonstrations / whole group and small group discussion***	***Practical group work Rubric***

2. Assessment Tasks for Students

#	Assessment task*		Week Due	Percentage of Total Assessment Score
1	*Homework assignment*		*3-8*	*2 %*
2	*Lecture Quizzes*		*5-7*	*3 %*
3	*Mid-term exam*		*6-8*	*15 %*
4	*LAB*	*LAB Sheet*	*15*	*5 %*
5		*Safety Exam*	*11*	*4%*
6		*Final practical exam*	*11*	*7 %*
7		*Lab report*	*2-10*	*10 %*
8		*Group work evaluation*	*2-10*	*4%*
9	*Final Exam*		*12-14*	*50 %*
			Total	*100 %*

***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:

- ***Instructor will be available for academic counseling on daily basis for at 4h/day during office hours.***
- ***The office hours are listed in the instructor time table and delivered to students in the first lecturer in each semester.***
- ***Instructor is available in a WhatsApp group with student.***
- ***E-mail and Telephone number are delivered to student for any help during semesters.***

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Handbook of Electrochemistry, 2007, Cynthia G. Zoski, Elsevier
Essential References Materials	• 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. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	***1 Lecture room(s) for groups of 50 students*** ***1 Lab room for group of 25student***
Technology Resources (AV, data show, Smart Board, software, etc.)	***Smart board, Data show, Black board, Internet***
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	***Conductivity meter, metal electrodes (i.e. Fe, Cu, Al, Sn, Zn, Mg, Pb …), Voltameter, Power source, Balance, potentiostate, galvanostate……***

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of Teaching and Assessment	***Student***	***Likert-type Survey (CES) Indirect***
Extent of achievement of course learning outcomes	***Instructor & Course coordinator***	***Class room evaluation (direct & indirect)***
Quality of learning resources	***Program coordinator***	***Indirect***
Exam Quality assessment	***Assessment committee***	***Indirect***
Effectiveness of Teaching and Assessment	***Student***	***Likert-type Survey (CES) Indirect***

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	Chemistry Department Council CHEMS 2216
Reference No.	CHEMS 221602
Date	27/09/2022 G -- 01/03/1444 H

Attachment:

1- LAB EXPERMENTS

Week	*EXPERMENTAL 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, monochloric 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 cell creating from 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 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 KNO_3, 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	***An Electrolytic Cell: Electrolysis of CuCl2***	0.2 M $CuCl_2$. Power supply or 9V batteries	***None***
10	***An Electrolytic Cell: Electroplating***	1.0 M $CuSO_4$, a copper strip, iron nail, battery or power source,	***None***
11	***Final exam***		

For unavailable equipments, 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

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	MCQ	2	2	1
			Mid term	MCQ	6	6	3
			Final Exam	MCQ	11	11	11
	K2	1.2 (21M)	Quiz	Q&A	2	2	1
			Mid term	Q&A	5	5	5
			Final Exam	Q&A	5	5	15
Skills	S1	2.1 (34M)	H.W	Solving Problems & chart analysis	4	4	2
			Quiz	Solving Problems & chart analysis	1	1	1
			Mid term	Solving Problems & chart analysis	2	2	7
			Final Exam	Solving Problems & chart analysis	6	6	24
	S2	2.2 (22M)	Practical Sheet	MCQ	6	6	3
				Q&A	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	MCQ	8	8	4
Value	V1	3.1 (4)	Continuous assessment	Group evaluation rubric	-	4	4
TOTAL		100					100