



Course Specifications

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

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A. Course Identification

1. Credit hours:	3hs
2. Course type	
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"/>
3. Level/year at which this course is offered:	Level 6 Year 3
4. Pre-requisites for this course (if any):	none
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 LAB	27 30	95%
2	Blended		
3	E-learning	3	5%
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	30
3	Tutorial	
4	Others (specify)	
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

Course Title	Course Number	Contact Hours (CH)		Credit unit (CU)	Year	Level	Pre-requisite
		Lec.	Prac.				
Electrochemistry	CHEM 344	2	1	3	3	6	none

Course Objectives ; They are to identify the following

1. Types of conductor
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: <i>Upon completion of this course, student will be able to</i>	
1.1	<i>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)</i>	K1
1.2	<i>Describe correctly the different phenomena associated with electrochemistry i.e.; type of electrodes, cell presentation (notation), cell reactions, electromotive force (P)</i>	K2
2	Skills : <i>Upon completion of this course, student will be able to</i>	
2.1	<i>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)</i>	S1
2.2	<i>Perform experiments in electrochemistry, record, analyze, interpret the scientific data, and write reports. (P)</i>	S2
2.3	<i>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)</i>	S3
2.4	<i>Write a report/ poster on electrochemistry using communication and online technology in a good verbal and clear scientific language. (P)</i>	S4
3	Values:	
3.1	<i>Working a group leader in cooperation with other colleagues. (P)</i>	VI

C. Course Content

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

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 <i>Upon completion of this course, student will be able to</i>		
1.1	<i>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)</i>	<i>lecture / discussion Seminars /presentation</i>	<i>oral and written examinations laboratory reports</i>
1.2	<i>Describe correctly the different phenomena associated with electrochemistry i.e.; type of electrodes, cell presentation (notation), cell reactions, electromotive force (P)</i>	<i>lecture / discussion / Seminars /Individual presentation</i>	<i>oral and written examinations laboratory reports</i>
2.0	Skills <i>Upon completion of this course, student will be able to</i>		
2.1	<i>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)</i>	<i>lecture / discussion / Seminars /Individual presentation</i>	<i>oral and written examinations laboratory reports</i>
2.2	<i>Perform experiments in electrochemistry, record, analyze, interpret the scientific data, and write reports. (P)</i>	<i>Lab work, group work</i>	<i>lab report/ Lab notebook.</i>
2.3	<i>Knows the proper procedures and regulations for safe handling and use of chemicals and can follow the</i>	<i>lab demonstrations / hands-on student learning activities</i>	<i>Observation of practical skills / Safety exam /</i>

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	<i>proper procedures and regulations for safe handling when using chemicals. (P)</i>		<i>Practical assignments and laboratory reports</i>
2.4	<i>Write a report/ poster on electrochemistry using communication and online technology in a good verbal and clear scientific language. (P)</i>	<i>research activities / project-based learning / Technology-enabled learning</i>	<i>assignments and reports / project / seminar / report</i>
3.0	<i>Values Upon completion of this course, student will be able to</i>		
3.1	<i>Working a group leader in cooperation with other colleagues. (P)</i>	<i>lab demonstrations / whole group and small group discussion</i>	<i>group project reports / Practical assignments and laboratory reports /</i>

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score	
1	<i>Homework assignment</i>	2	2 %	
2	<i>Lecture Quizzes</i>	4	3 %	
3	<i>Mid-term exam</i>	6	15 %	
4	<i>Homework assignment</i>	8	0 %	
5	<i>Group work presentation</i>	12	0	
6	<i>LAB</i>	<i>Quiz in Safety</i>	5	0
7		<i>LAB Sheet</i>	15	10 %
8		<i>Final practical exam</i>	15	15 %
9		<i>Lab report</i>	15	5 %
10	<i>Final Exam</i>	16	50 %	
		<i>Total</i>	<i>100 %</i>	

*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	<ul style="list-style-type: none"> Electrochemistry, 2nd Edition, P.H. Rieger, Springer, 1993 ISBN: 0412043912,9780412043918

	<ul style="list-style-type: none"> Electrochemistry and Corrosion Science, Nestor Perez, 2016, Springer International Publishing, ISBN: 978-3-319-24845-5, 978-3-319-24847-9
Electronic Materials	<i>Some course contents and materials are posted on Black board sites</i>
Other Learning Materials	<ul style="list-style-type: none"> 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.)	<i>1 Lecture room(s) for groups of 50 students 1 Lab room for group of 25 student</i>
Technology Resources (AV, data show, Smart Board, software, etc.)	<i>Smart board, Data show, Black board, Internet</i>
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	<i>Conductivity meter, metal electrodes (i.e. Fe, Cu, Al, Sn, Zn, Mg, Pb ...), Voltameter, Power source, Balance, potentiostate, galvanostate.....</i>

G. Course Quality Evaluation

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

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
Reference No.	42 / 35 /102 112
Date	17 /09 /1442 Corresponding to 28 / 04 /2021

Attachment:

LAB EXPERMENTS

Week	EXPERIMENTAL TITLE	Chemicals and Apparatus used	Remarks
1	Safety and regulations		
2	Determination of cell constant	Acids ,bases ,conductivity cell and conductivity meter	None
3	Determination of equivalent conductance of strong electrolyte	HCl , conductivity cell and conductivity meter	None
4	Determination of equivalent conductance of weak electrolyte	Acetic acid , conductivity cell and conductivity meter	None
5	Conductometric titration of acid –base	HCl ,NaOH ,conductivity cell and conductivity meter	None
6	Conductometric titration of precipitation reaction	KCl, AgNO ₃ ,conductivity cell and conductivity meter	None
7	Conductometric titration of mixtures of acids	HCl , Acetic acid ,conductivity cell and conductivity meter	None
8	Conductometric titration of mixtures of bases	NaOH, NH ₄ OH ,conductivity cell and conductivity meter	None
9	Conductometric titration of mixtures of acid and salt	HCl, NH ₄ Cl ,conductivity cell and conductivity meter	None
10-11	Determination of cell potential for different galvanic cells	Some metals sheets (Cu, Zn, Fe, Ag, Pb), constant current equipment, potentiometer	Metal sheets and equipment are not available
12-13	Determination of corrosion rate of some metals in acidic solution	Some metals sheets (Cu, Zn, Fe, Ag, Pb) and potentiostat/ galvanostat equipment	Metal sheets and equipment are not available
14	Electrodepositing of some metals	Some metals sheets (Cu, Zn, Fe, Ag, Pb), constant current equipment, potentiometer	Metal sheets and equipment are not available
15	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>