



Course Specifications

Course Title:	Electrochemistry	
Course Code:	4022143-3	
Program:	Chemistry - 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: 3
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: 4 th level/second year
4. Pre-requisites for this course (if any): Chemical Kinetics – Thermodynamics.
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	24 ✓	75%
2	Blended	--	--
3	E-learning	8 ✓	25%
4	Distance learning	--	--
5	Other	--	--

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	22
2	Laboratory/Studio	30
3	Tutorial	--
4	Others (E-learning + Exams + office hours)	15
	Total	67

B. Course Objectives and Learning Outcomes

1. Course Description

This course covers the basic theory and application of electrochemical science: General electrochemical concepts, Introduction to electrochemistry, thermodynamics, electrode potentials, galvanic and electrolytic cells, basic concepts in Corrosion, types of corrossions and corrosion protection, Mixed potentials, Corrosion rates, Polarization curves.

Experimental work illustrating selected parts of the theoretical content.

2. Course Main Objective

- List types of electrodes and types of electrochemical cells.
- Types of standard electrodes and compare them.
- Write Nernst equation and solve related problems.
- List Faraday's laws and solve relevant problems.
- Compare forms of Corrosion.
- List types of fuel cells.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge and Understanding	
1.1	Demonstrate broad knowledge and understanding of the underlying theories, principles, and concepts in electrochemistry.	K1
1.2	Identify the processes, practices, and/or chemical terminology in electrochemistry.	K2
2	Skills :	
2.1	Apply the theories, principles, and concepts in various contexts in electrochemistry.	S1
2.2	Solve complex problems related to electrochemistry.	S2
2.3	use and adapt electrochemical practical experiments	S3
2.4	Collect a data using computers and internet to find all information related to electrochemistry and their applications	S5
3	Values:	
3.1	Work individually and in a team to perform a specific experiment or preparing a report on the electrochemistry.	V3

C. Course Content

No	List of Topics	Contact Hours
1	Introduction to electrochemistry-Types of electrochemical series Standard redox potentials	4
2	Cell potential	2
3	Electrode potential and Nernst equation.	4
4	Electrochemical series	2
5	Standard electrode potentials- Hydrogen and oxygen electrodes	2
6	Mid-Term exam	2
7	Types of Electrodes	2
8	Concentration cells	2
9	Applications on cell potential	2+2E=4
10	Batteries and Fuel cells	2E
11	Forms of corrosion	4E
12	Corrosion Inhibition	2
Total		30

Laboratory Part:

No	List of Topics	Contact Hours
1	Daniell Cell	3
2	Concentration cells	3
3	Electrodeposition at electrodes	3
4	Measurements of cell potential	3
5	Determination of solubility of sparingly soluble salt	3

6	Electroplating	3
7	Measurements of some electrochemical parameters from Tafel Plots	3
8	Determination of the corrosion inhibition efficiency of some inhibitors using Tafel plots	3
9	Determination of corrosion rates using weight loss method	3
10	Determination of the corrosion inhibition efficiency of some inhibitors using weight loss method	3
11	Determination of corrosion rates using thermometric method	3
12	Determination of the corrosion inhibition efficiency of some inhibitors using thermometric method	3
13	Revision	3
14	Final exam	3
Total		32

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		
1.1	Demonstrate broad knowledge and understanding of the underlying theories, principles, and concepts in electrochemistry.	Lectures	Quiz
1.2	Identify the processes, practices, and/or chemical terminology in electrochemistry.	Lectures	Quiz
2.0	Skills		
2.1	Apply the theories, principles, and concepts in various contexts in electrochemistry.	Lectures	Mind map
2.2	Solve complex problems related to electrochemistry.	Lectures	Quiz
2.3	use and adapt electrochemical practical experiments	Lectures	Quiz
2.4	Collect a data using computers and internet to find all information related to electrochemistry and their applications	Self-Directed private Study	Assignments and activities on blackboard
3.0	Values		
3.1	Work individually and in a team to perform a specific experiment or preparing a report on the electrochemistry.	Lab work	Practical Lab report and Exam

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	E-learning	All weeks	5%
2	Assignments and activities	All weeks	5%
3	Mid-term Exam	6	20%
4	Practical Lab Work (Reports and Exams)	11	30%
5	Final Exam.(2 hours exam)	12	40%

*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 for Faculty member

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Electrochemistry Principles, Methods and Applications, Christopher M. A. Brett, Maria Oliveira Brett, Oxford University Press, 2005.
Essential References Materials	<p>1- A.J. Bard ,L.R. Faulkner, Electrochemical Methods , Fundamental and Applications,2010 John Wiley & Sons</p> <p>2- Handbook of Electrochemistry, Cynthia Zosk, Elsevier, 2011.</p> <p>3- Handbook of Corrosion Engineering (Chinese), Pierre R. Roberge, McGraw-Hill, 2005.</p> <p>Corrosion Basics: An Introduction, Pierre R. Roberge, NACE International, 2006</p>
Electronic Materials	Power point lectures, Videos.
Other Learning Materials	Web sites.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms, laboratories and Labs.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, Smart Board and software.
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	Program Leaders	Direct
Extent of achievement of course learning outcomes	Faculty	Indirect
Quality of learning resources	Faculty	Direct

Evaluation Areas/Issues	Evaluators	Evaluation Methods

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 counsel
Reference No.	1 st meeting
Date	2022

Head of Chemistry Department

Dr Moataz Morad

