Course Specification
(Bachelor)

Course Title:	Electrochemistry
Course Code:	CHM242
Program:	Chemistry
Department:	Chemistry
College:	College of Sciences Al Zulfi
Institution:	Majmaah University
Version:	TP-153
Last Revision Date:	12/10/2024

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (.....)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (.....2nd Level/ 1st Year ....)					
4. Course General Description:					
This course is designed to gain students essential knowledge about all kinds of redox reactions and concepts of electrochemistry					
5. Pre-requirements for this course (if any)**:**					
PHYS101					
6. Co-requisites for this course (if any)**:**					
7. Course Main Objective(s):					
Knowledge about the basics of Electrochemistry and its applications					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	3H	70%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		30%
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	28
2.	**Laboratory/Studio**	18
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	
Total		**Total**

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

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Describe the general concepts of electrochemistry and conductance**	K.1	Midterm exams Periodical short quizzes	Lectures Solving problems
1.2	**Outline of the general procedure of laboratory experiments**	K.2	Discussion and team work	Video tutorial Discussion
2.0	**Skills**			
2.1	**Apply the appropriate mathematical formula to solve problems relating to course concept**	**S.1**	Class Participation Presentation Essay Question	Lectures Solving problems Video tutorial Discussion
2.2	**Explain the results of electrochemical from Laboratory experiments.**	**S.2**		
3.0	**Apply the appropriate mathematical formula to solve problems relating to course concept**			
3.1	**Work independently and as part of a team**	**V.1**	procedure Experiments in lab	Write reports and power point presentation Exercises related to specific topics
3.2	**Demonstrate the ability to use the**	**V.3**		

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	library resources and scientific data base to obtain information about topic, chemical, chemical technique or an issue relating to chemistry.			Write reports and power point presentation Exercises related to specific topics
...	**Work independently and as part of a team**	**V.1**	procedure Experiments in lab	Write reports and power point presentation Exercises related to specific topics

C. Course Content

No	List of Topics	Contact Hours
1.	Faraday's Laws, Electrical Conductivity	**2 H**
2.	Activity and activity coefficient, Transport Number and its determination	**2 H**
3.	Application of conductance measurements	**2 H**
4.	Reverse and non-inverse cells, galvanic cells, electrode and cell notation, Standard Reduction Potentials, Electrochemical series	**2 H**
5.	Classification of electrodes - Classification of galvanic cells	**2 H**
6.	Thermodynamics of redox reactions, Nernst equation,	**2 H**
7.	Electrode potential, Reference electrodes	**2 H**
8.	Butler-Volmer equation and Tafel equation The mechanism of the electrode processes	**2 H**
	Applications of Nernst equation in estimating Thermodynamic properties and pH measurements	**2 H**
	The electrolysis ,fuel cells ,polarization and over potential	**2 H**
	Electrochemical energy systems ,Energy storage devices ,batteries and fuel cells ,Electrochemical Super capacitor	**4 H**
	Practical part	
	- Conductometric Determination of Solubility for calcium hydroxide - Conductometric Titrations. - Determination of PH of solutions using Glass electrode. -Electromotive Force Measurements and determination of standard Electrode potential. - Determination of the Oxidation and reduction potential for electrode. - Determination of the solubility constant using e.m.f measurements.	**18 H**

	- Determination the Mean activity of solution using e.m.f measurements. - Cyclic voltammetry and application - Impedance spectroscopy -Revision	
	Faraday's Laws, Electrical Conductivity	**2 H**
	Activity and activity coefficient, Transport Number and its determination	**2 H**
Total		

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	First Midterm	5th	15 %
2.	E-exam	10 th	10%
3.	Second Midterm	6th	15%
4.	Review and oral presentation	8th	10 %
5.	Final practical exam	11th	10%
6.	Final written Examination	14th	40 %

*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	Electrochemistry, Carl H. Hamann and Andrew Hamnett, WILEY-VCH, 2007 -Electrochemical Methods: Fundamentals and Applications, A. J. Bard and L. R. Faulkner, John Wiley & Sons, New York, 2001 -Chemistry, Raymond Chang, McGraw-Hill, 2010 Physical Chemistry 11th ed. Peter Atkins and etc. Oxford University Press. 2018
Supportive References	Saudi Digital Library Science-direct Khan Academy on youtube
Electronic Materials	
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Class rooms are available with smart boards and internet
Technology equipment (projector, smart board, software)	Computers and internet are available for online study and video tutorials.
Other equipment (depending on the nature of the specialty)	The course is only theoretical part.

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	students	DIRECT
Effectiveness of Students assessment	**students**	**INDIRECT**
Quality of learning resources	**students**	**DIRECT**
The extent to which CLOs have been achieved	**Staff members**	**DIRECT**
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**CHEMISTRY DEPARTMENT COUNCIL**
REFERENCE NO.	**16**
DATE	**12/10/2024**