Course Specification

(Postgraduate Programs)

Course Title:	**Electroanalytical Chemistry**
Course Code:	**CHM 6135**
Program:	**Master of science in chemistry**
Department:	**Chemistry**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	*Course Specification Version Number*
Last Revision Date:	*Pick Revision Date.*

Table of Contents

A. General information about the course:

1. Course Identification:

1. Credit hours: 3 (3 Lectures, 0 Lab, 0 Tutorials)				
2. Course type				
A.	☐University	☐College	☐Department	☐Track
B.	☐Required		☒Elective	
3. Level/year at which this course is offered: Level 2/Year 1				
4. Course General Description:				
The course is designed to cover an introduction to electrochemistry, electrochemical cells, Nernst equation, electrode potentials, formal potential, and limitations of electrode potentials. The topics include advanced aspects of potentiometry, conductometry, coulometry, polarography, amperometry, voltammetry, and stripping methods.				
5. Pre-requirements for this course (if any)**:**				
Advanced Analytical Chemistry - CHM 6131				
6. Pre-requirements for this course (if any)**:**				
7. Course Main Objective(s):				

- **Recognize the basic and advanced principles of electrochemical method employed in chemical analysis.**
- **Be familiar with the fundamentals of current and potential and their mathematical relations.**
- **Develop awareness of electrochemical techniques for analysis.**
- **Interpret the electrochemical analysis results.**

2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	**45**	**100 %**
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours: (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	**45**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**0**
5.	**Others (specify)……**	**0**
	Total	45

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	**To recall the principles of electroanalytical techniques.**	**K1. Anal.; K2. Anal.; K4. Anal.**	▪ **Five hours/week lectures.** ▪ **Self-study Home-exam.**	▪ **Regular Exams.** ▪ **Assignments** ▪ **Short Quizzes.** ▪ **Oral Discussion.** **Participation.**
1.2	**To describe Oxidation/Reduction Reactions Characterization.**	**K2. Anal.; K4. Anal.**	▪ **Five hours/week lectures.** ▪ **Think to justify The Oxidation/Reduction Reactions, using available references (SDL) online** **Open discussion.**	▪ **Oral Discussion marks** ▪ **Literatures Survey** ▪ **Mini-seminar.** ▪ **Participation.**
1.3	**To outline essential electrochemical concepts.**	**K2. Anal.; K3. Anal.; K4. Anal.**	▪ **Five hours/week lectures.** **Open Discussion with mini-reports to justify electrochemical concepts using available**	▪ **Midterm.** ▪ **Assignments.** ▪ **Group Discussions.** ▪ **Literatures Survey** ▪ **Mini-seminar.** **Participation.**

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
			references (SDL) online.	
1.4	To state Electrochemical Methods of Analysis.	K2. Anal.; K4. Anal.	▪ Five hours/week lectures. Group Discussion using available references (SDL).	▪ Assignments ▪ Open Discussions. ▪ Literatures Survey ▪ Mini-seminar. Participation.
2.0	Skills			
2.1	To explain Voltammetry and Applications of Voltammetry and Stripping Methods.	S1. Anal.; S2. Anal.; S3. Anal.	Lectures activity Self-study. Think, and discuss Applications of Voltammetry deeply.	Questions in Lectures. Short Quizzes and Exams. Open Discussions. Participation Mini -seminar.
2.2	To calculate Concentrations from Potential Measurements.	S2. Anal.; S3. Anal.	Practice some examples for Calculating Concentrations from Potential Measurements. Brainstorming. Self-study.	Questions in Lectures. Participation Oral Discussion Short Quizzes.
2.3	To interpret electrochemical data employing the different methods.	S2. Anal.; S3. Anal.	Lectures Oral Discussions. Brainstorming. Self-study	Questions in Lectures. Short Quizzes and Exams. Oral Discussion. Participation.
2.4	To demonstrate Oral Communication to different electroanalytical techniques and its applications, accompanying writing of mini-Reports, operating electronic mail, and Network in	S1. Anal.; S3. Anal. S4. Anal.	Group Discussion and Assignments Suggest several examples of obtained results from different electroanalytical techniques used used to study which will require reading, writing,	Oral Discussion. Quizzes, and Exams. Giving marks for Oral Discussion in Lectures. Marks given for Assignments.

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	communicating with others.		and oral presentation in groups. Encourage students to use electronic mail to submit Home Exams and Assignments.	
3.0	Values, autonomy, and responsibility			
3.1	To perform a scientific presentation, research, and work independently and integrate with a collaborated group, Using IT to acquire, analyze, and communicate information.	V1. Anal.	Brainstorming. Exercises Group Discussion. Team work.	Oral Discussion. Group Discussion Assignments.
3.2	To appraise effectively the collaboration and inter-professionalism in class discussions or team works, as well as independently.	V1. Anal.; V2. Anal.	Small Group tasks Open discussion at classroom. Office hour guiding. Group Presentation of mini-projects	Participation Homework's Mini-project(s).
…				

C. Course Content:

No	List of Topics	Contact Hours
1.	**Introduction:** Characterizing Oxidation/Reduction Reactions, Balancing Redox Equations, Electrochemical Cells, Electrode Potentials, formal potential, limitations of electrode potentials, and Nernst Equation.	10
2.	**Electrochemical Methods of Analysis:** Potentiometry, conductometry, coulometry, polarography, amperometry, voltammetry.	15
3.	**Potentiometry:** General Principles, Liquid-Junction Potentials, Reference Electrodes, Determination of Concentrations from Potential Measurements.	10

4.	**Voltammetry:** Principles, Voltammetric Instrumentation, Cyclic Voltammetry, Applications of Voltammetry and Stripping Methods.	**10**
5.		
6.		
7.		
8.		
Total		**45**

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Class Activities (Open Discussion, Mini-reports, Oral Presentation, solving questions)**	**weekly**	**30 %**
2.	**Midterm Exams**	**9th and week**	**30 %**
3.	**Final Exam**	**Around 12th–17th week**	**40 %**
4.	**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	***Fundamentals of analytical chemistry*** , Douglas A. Skoog, Donald M. West, F. James Holler, Stanley R. Crouch., 9th Edition. ISBN-13: 978-0-495-55828-6. ***Analytical Chemistry,*** Gary D. Christian, Purnendu K. (Sandy) Dasgupta, Kevin A. Schug. Analytical Chemistry, 7th Edition. ISBN: 978-0-470-88757-8.
Supportive References	**NONE**
Electronic Materials	• Journal of Analytical Chemistry • Saudi Digital Library
Other Learning Materials	• Blackboard. • Multimedia associated with the text book and the relevant websites

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	**Each of the classroom should be equipped with a whiteboard and a projector, with a maximum of 20 students.**

Items	Resources
Technology equipment (Projector, smart board, software)	**The rooms are equipped with data show, Smart Board,** **WI-FI access.**
Other equipment (Depending on the nature of the specialty)	**None**

F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	**Direct:** Questionnaire.
	Course Responsible	**Direct:** Course e-Portfolio. **Indirect:** Second examiner checklist-Course report.
	Peer Reviewer	**Direct:** Questionnaire. **Indirect:** External assessor report.
Effectiveness of students' assessment	Program Leaders	**Direct:** Course e-Portfolio. **Indirect:** Course report.
Quality of learning resources	Students	**Indirect:** Second examiner checklist-Course report.
	Faculty (Academic Advisory-GCC)	**Direct:** course Entrance/Exit. **Indirect:** Observations - Accreditation review.
	Program Leaders	**Direct:** Course e-Portfolio.
	Course Responsible	**Indirect:** Course evaluation survey- Observations- Syllabus review- Accreditation review.
The extent to which CLOs have been achieved	Course Responsible	**Direct:** Exams - Course e-Portfolio. **Indirect:** Second examiner checklist-Course report.
	Program Leaders	**Indirect:** Exams.
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	**Council of Chemistry Department**
REFERENCE NO.	**10 (No. 2/10)**

DATE	21/04/1444- 15/11/2022