



Course Specification

(Bachelor)

Course Title: **Electrochemical Analysis Methods**

Course Code: **314 CHEM-3**

Program: **Bachelor of Science in Chemistry**

Department: **Physical Sciences**

College: **College of Science**

Institution: **Jazan University (JU)**

Version: **TP-153 2024**

Last Revision Date: **5/5/2024**

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A. General information about the course:

1. Course Identification

1. Credit hours: (3hrs)

2. Course type

A. ☐ University ☐ College ☒ Department ☐ Track ☐ Others
B. ☒ Required ☐ Elective

3. Level/year at which this course is offered: (level 6 – year3)

4. Course general Description:

Course Title	Course Number	Contact Hours (CH)		Credit unit (CU)	Year	Level	Pre-requisite
		Lec.	Prac.				
Electrochemical Analysis Methods	314CHEM-3	2	2	3	3	6	344CHEM-3

Course objectives: They are to identify the following: -

- Basic principles of analytical electrochemistry and electro-analytical methods
- Using some electro-analytical techniques in chemical analysis
- Experimental applications of some electro-analytical methods.

Syllabus: A-Theoretical contents.

Basic principles, concepts, instrumentation and applications of some electro-analytical methods such as potentiometry including ion selective electrodes, electrogravimetry, coulometry, conductometry, voltammetry including polarography and amperometric titrations.

Syllabus: B-Practical contents.

Selected experiments related to electro-analytical methods.

5. Pre-requirements for this course (if any):

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6. Co-requisites for this course (if any):

None

7. Course Main Objective(s):

The course is designed to study the basic principles and experimental applications of some electro-analytical methods and their usage in chemical analysis.



2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	60	100%
2.	E-learning		
3.	Hybrid <ul style="list-style-type: none"> Traditional classroom E-learning 		
4.	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	30
3.	Field	
4.	Tutorial	
5.	Others (specify)	
Total		60

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

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding; (Upon completion of the course, student will be able to)			
1.1	Demonstrate broad understanding and critical view of the principles, classification and application of electro-analytical methods. (P)	K(1.1)	lecture / discussion	Objective Q & Essay Q
1.2	Describe correctly the essential facts, principles dealing with electro-analytical methods. (P)	K(1.2)	lecture / discussion	Objective Q & Essay Q
2.0	Skills; (Upon completion of the course, student will be able to)			
2.1	Demonstrate ability in critical thinking, numeracy, analytical reasoning, use graphs, charts for solving problems related to electro-analytical methods. (P)	S(2.1)	lecture / discussion	Solving Problems & chart analysis Objective Q & Essay Q



Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.2	Apply their experimental basics and skills to use laboratory equipment, modern instrumentation, and classical techniques for carrying out experiments in various fields of electro-analytical methods and to write a report representing the scientific data. (P)	S(2.2)	Lab Work/ group Work	Objective Q & Essay Q, lab report rubric
2.3	Examine lab safety background to follow proper procedures and regulations for safe handling and use of chemicals. (P)	S(2.3)	lab demonstrations / hands-on student learning activities	Safety exam & Objective Q &
3.0	Values, autonomy, and responsibility; (Upon completion of the course, student will be able to)			
3.1	Working as group leader in cooperation with other colleagues. (P)	V(3.1)	Lab demonstrations / whole group and small group discussion	Practical group work Rubric

C. Course Content

No	List of Topics	Contact Hours
1.	Basic principles and terminology of electrochemical cells	5
2.	Ion selective electrodes, principles, fabrication, and uses	6
3.	potentiometry and potentiometric titration	4
4.	Electrogravimetry and coulometry	4
5.	Conductometry and conductometric titration	3
6.	Voltammetry, polarography	5
7.	Amperometric titration	2
8.	Revision	1
9.	Selected Experiments related to course topics	30
Total		60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework	3-8	2%
2.	Quiz	4-6	3%
3.	Midterm Exam	6-9	15%
4.	Lab Sheet	11	5%





No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
5.	Lab Report	Through semester	10%
6.	Final Practical Exam	11	7%
7.	Quiz in Safety	9-11	4%
8.	Group Work Evaluation	2-10	4%
9.	Final Exam	16-17	50%
10	Total		100%

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Undergraduate Instrumental Analysis, James W. Robinson, Eileen M. Skelly Frame and George M. Frame II, Taylor & Francis Group publisher, 7th edition (2014)
Supportive References	Analytical Electrochemistry , by Joseph Wang, John Wiley & Sons. Publisher, 2 nd edition (2006)
Electronic Materials	<ul style="list-style-type: none"> • https://chem.libretexts.org/Courses/British Columbia Institute of Technology/Chem 2305/03%3A Electrochemistry/3.01%3A An Introduction to Electroanalytical Chemistry • https://chem.libretexts.org/Under Construction/Purgatory/Principles of Instrumental Analysis (Skoog et al.) - Under Construction/23%3A Potentiometry • https://chem.libretexts.org/Under Construction/Purgatory/Principles of Instrumental Analysis (Skoog et al.) - Under Construction/25%3A Voltammetry • https://chem.libretexts.org/Under Construction/Purgatory/Principles of Instrumental Analysis (Skoog et al.) - Under Construction/25%3A Voltammetry • https://chem.libretexts.org/Bookshelves/Analytical Chemistry/Supplemental Modules (Analytical Chemistry)/Analytical Sciences Digital Library/In Class Activities/Electrochemical Methods of Analysis/02 Text/7%3A Electrochemical Analytical Methods/7.4%3A Titrimetric Methods of Analysis
Other Learning Materials	Tutorial videos and pictures. Some course contents and materials are posted on Black board sites





2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	1 Lecture room(s) for groups of 50 students 1 Lab room(s) for groups of 25 students
Technology equipment (projector, smart board, software)	Smart board, Data show, Black board, internet
Other equipment (depending on the nature of the specialty)	Laboratory equipment such as pH-Meter, Conductometer, Ion selective electrodes, polarography apparatus. In addition to glassware, water bath, magnetic stirrer, Electronic balance and hot plate

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Student	Likert-type Survey (CES) Indirect
Effectiveness of student's assessment	Instructor & Course coordinator	Class room evaluation (direct & indirect)
Quality of learning resources	Program coordinator	Indirect
The extent to which CLOs have been achieved	Assessment committee	Indirect
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Physical Sciences Department Council
REFERENCE NO.	Psci2415
DATE	28/03/1446 Corresponding to 1 / 10 /2024



H. Attachments

1- Practical Work

No.	Experiment Title	Required Chemicals	Required Glass Wear & equipment	Week
1	Safety and regulations	-	-	1
2	Introduction to Potentiometric titration +Calculation used in Potentiometric titration+ types of calibration curves	-	-	2
3	Glass pH electrode calibration	Buffer pH7 Buffer pH4	Beakers 100ml	3
4	Potentiometric titration of a strong acid using a strong base	HCl, NaOH and distilled water	Glass burette, beaker 100 mL and pH-meter	4
5	Potentiometric titration of a strong acid using a strong base (1 st and 2 nd derivatization)	-	-	5
6	Potentiometric titration of a strong base using a strong acid	HCl, NaOH and distilled water	Glass burette, beaker 100 mL and pH-meter	6
7	Potentiometric titration of a strong base using a strong acid base (1 st and 2 nd derivatization)	-	-	7
8	Potentiometric titration of a weak acid using a strong base	Acetic acid, NaOH and distilled water	Glass burette, beaker 100 mL and pH-meter	8
9	Potentiometric titration of a weak acid using a strong base(1 st and 2 nd derivatization)	-	-	9
10	Potentiometric titration of a strong base using a weak acid	Acetic acid, NaOH and distilled water	Glass burette, beaker 100 mL and pH-meter	10
11	Potentiometric titration of a strong base using a weak acid (1 st and 2 nd derivatization)	HCl, NaOH and distilled water	Glass burette, beaker 100 mL and pH-meter	11
12	Conductometric titration of HCl using NaOH	HCl, NaOH	Glass burette, beaker 100 mL and conductometer	12
13	Conductometric titration of a mixture of strong acid and weak acid using a strong base	HCl, Acetic acid, NaOH and distilled water	Glass burette, beaker 100 mL and pH-meter	13
14	Revision	-	-	14
15	Practical Sheet and Final Lab. Exam	-	-	15





2- Blue Print

Course Name	Electrochemical Analysis Methods
Course Code	314CHEM-3

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	Objective Q & Essay Q		1	2	1
			Mid term	Objective Q & Essay Q		2	3	3
			Final Exam	Objective Q & Essay Q		2	11	11
	K2	1.2 (21M)	Quiz	Essay Q		2	2	1
			Mid term	Essay Q		2	5	5
			Final Exam	Essay Q		3	15	15
Skills	S1	2.1 (34M)	H.W	Solving Problems & chart analysis & Essay Q		8	8	2
			Quiz	Solving Problems & chart analysis & Essay Q		2	2	1
			Mid term	Solving Problems & chart analysis & Essay Q		5	5	7
			Final Exam	Solving Problems & chart analysis & Essay Q		5	24	24
	S2	2.2 (22M)	Practical Sheet	Objective Q		6	3	3
				Essay Q		2	2	2
			Lab Report	Lab Report Rubric		10	10	10
			Final Lab Exam	I Task experiment		1	7	7
	S3	2.3 (4M)	Safety Quiz	Objective Q		8	4	4
	Value	V1	3.1 (4M)	Continuous assessment	Group evaluation rubric		-	4
TOTAL		100						100

