



Course Specification

(Bachelor)

Course Title: Principles of Analytical Chemistry

Course Code: CHEM 253

Program: Bachelor's degree

Department: Botany and microbiology

College: Science

Institution: King Saud university

Version: TP-153

Last Revision Date: 22 October 2023

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A. General information about the course:

1. Course Identification

1. Credit hours: (2 hours (1+0+1))

2. Course type

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

3. Level/year at which this course is offered: (5th level / 3^{ed} year)

4. Course general Description:

This course designed together with the laboratory section to cover the basic principles and general concepts of the analytical chemistry.

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

CHEM 101

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

None

7. Course Main Objective(s):

To learn and understand the basic principles of analytical chemistry, including:

- Gravimetric and volumetric analysis.
- Different concentration expressions and calculations.
- Equilibrium applications for acid-base, precipitation, complexation and redox reactions.
- Solubility and solubility product.
- Cation and anion identification.
- Titration types and applications.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	14	100%
2	E-learning		
3	Hybrid		





No	Mode of Instruction	Contact Hours	Percentage
	- Traditional classroom - E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	14
2.	Laboratory/Studio	28
3.	Field	-
4.	Tutorial	-
5.	Others (specify)	-
Total		42

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			
1.1	Define the basic principles of analytical chemistry	K1	Visualization- Student discussion- Laboratory experiments	- Homework assignments - Midterm and final exams - Practical exams
1.2	Recognize the types of chemical equilibrium, Solubility, titrations processes and their applications	K2	Visualization- Student discussion- Brainstorming- Laboratory experiments	- Homework assignments - Midterm and final exams - Practical exams
...				
2.0	Skills			
2.1	Calculate the concentration and		Collaborative learning-	Quizzes- assignments





Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	pH values of solutions in various sample matrices	S2	Brainstorming- Laboratory experiments	- Midterm and final exams -Laboratory reports -Practical exams
2.2	Demonstrate appropriate safety techniques and proper use of lab materials and equipment	S6	- Lectures - Homeworks - Laboratory experiments	- practical assessment activities -Practical exams
...				
3.0	Values, autonomy, and responsibility			
3.1	Solve chemistry problems in a leadership role or as a member of a team.	V2	Group discussion- Collaborative Learning- Laboratory experiments- f lipped class	- Homework assignments - practical assessment activities - Practical exams
3.2				
...				

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to qualitative and quantitative analysis	2
2.	Solutions, cations and anions	2
3.	Concentration definitions and expressions	3
4.	Solubility product	1
5.	Acid-base, precipitation, complexometric and redox titration	3
6.	Acid-base, precipitation, complexometric and redox equilibria	3
Total		14

Practical Part





No	List of Topics	Contact Hours
1	Laboratory safety and protocol	2
2	Identification of anions in various salt solution	4
3	Identification of cations in various salt solution	4
4	Titration of mixture of sodium carbonate and sodium hydroxide against standard of hydrochloric acid	2
5	Precipitation titration: Mohr's methods	2
6	Precipitation titration: Volhard's methods	4
7	Precipitation titration: Fajan's methods	2
8	Redox titrations: Titration of unknown oxalic acid solution using potassium permanganate	2
9	Redox titrations: Titration of unknown Fe (II) solution using potassium dichromate	2
10	Redox titrations with iodine: Titration of unknown iodine solution using sodium thiosulphate	2
11	Redox titrations with iodine: Titration of unknown potassium dichromate solution using sodium thiosulphate	2
Total		28

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes and lab reports	weekly	30%
2.	Midterm exams	Week 8	20%
3.	Final exam	Week 17	40%
4.	Assignments	----	10%

*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	-Ibrahim Al-Zamil, M.A. AlHajjaji, Saad Al-Tamrah, M. Banah, "Analytical Chemistry, Gravimetric and Volumetric Analysis" 4th Ed., Al-Khrigi Publisher, 1432. -Ibrahim Al-Zamil, "Analytical Chemistry, Instrumental Analysis" 2nd Ed., Al-Khrigi Library, 1998.
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Supportive References	D.A. Skoog, D.M. West, F.J. Holler, S.R. Crouch, "Fundamentals of Analytical Chemistry", 9th Ed., Brooks Cole, Cengage Learning, 2013.
Electronic Materials	https://youtu.be/87SGsU0X5k8?si=iHaNGemSLZNizUdf
Other Learning Materials	-

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	- Classroom - Chemical lab.
Technology equipment (projector, smart board, software)	- Smart board and internet in classrooms
Other equipment (depending on the nature of the specialty)	- The presence of chemicals used in experiments -The presence of related equipment

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Student	Indirect
Effectiveness of Students' assessment	Faculty	Direct
Quality of learning resources	Faculty and Program Leaders	Direct
The extent to which CLOs have been achieved	Faculty and Program Leaders	Direct
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	22 October 2023

