Course Specification
(Bachelor)

Course Title:	Volumetric Analytical Chemistry
Course Code:	211CHEM -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

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (3hr)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (Level 3 // Year 2)					
4. Course general Description:					

Course Title	*Course Number*	*Contact Hours (CH)*		*Credit unit (CU)*	*Year*	*Level*	*Pre-requisite*
		Lec.	*Prac.*				
Volumetric Analytical Chemistry	***211CHEM3***	***2***	***2***	***3***	***2***	***3***	***101CHEM4***

The aim of this course is to study the theoretical and practical principles of the different methods of volumetric analysis

Course objectives: They are to identify the following:

- Basic principles of volumetric analysis
- Different unites to express concentrations
- Different types of titrations and its applications
- Preparation of solutions with different concentrations

A-Theoretical contents
Basic principles and concepts of volumetric analysis. Different units of concentrations. Different types of titrations as neutralization, oxidation reduction, complexometric and precipitation titrations.

B-Practical contents
Selected experiments related to volumetric analysis

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

101CHEM4

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

None

7. Course Main Objective(s):

The aim of this course is to study the theoretical and practical principles of the different methods of volumetric 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 • 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 a broad understanding and critical view of the principles, classification and application of volumetric analysis. (I)	K(1.1)	*lecture / discussion Seminars /presentation*	***Objective questions***
1.2	Describe the essential facts, principles and theories dealing with neutralization, complexities,	K(1.2)	*lecture / discussion / Seminars*	***Objective questions***

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	precipitation and oxidation reduction reactions. (I)		*/Individual presentation*	
...				
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 volumetric analysis topics. (**I**)	S(2.1)	lecture / discussion / Seminars /Individual presentation	**Solving Problems & chart analysis & Essay questions**
2.2	Apply their experimental basics and skills to use laboratory equipment, and classical techniques for carrying out titration experiments and to write a report representing the scientific data (**I**)	S(2.2)	Lab work, group work	**Lab final exam / lab report rubric/ Objective questions**
2.3	Examine lab safety background to follow proper procedures and regulations for safe handling and use of chemicals. (**I**)	S(2.3)	lab demonstrations / hands-on student learning activities	**Safety exam**

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to analytical chemistry, types of chemical analysis, some definitions for titrimetric methods and calculation of number of moles and equivalent weight.	3
2.	Unites for expressing concentration; normality, molarity, molality, percent, w/w, w/v, v/v%, part per million, part per billion and conversion between some concentration unites.	6
3.	Dilution of solutions, solution preparation, titrations based on acid-base reactions	3
4.	Simple titration curves (strong, weak acids versus strong , weak bases) ,complicated titration curves and calculation of pH during titrations	5
5.	Theory of acid-base indicators and titrations based on oxidation reduction reactions	5

6.	Titration curves of oxidation reduction reactions and applications.	4
7.	Titrations based on complexation reactions, applications and titrations based on precipitation reaction.	3
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 assignment**	**3-8**	**2 %**
2.	**Lecture Quizzes**	**4-6**	**3 %**
3.	**Mid-term exam**	**6-8**	**15 %**
4.	**LAB Sheet**	**15**	**7%**
5.	**Quiz in Safety**	**12-15**	**3%**
6.	**Final practical exam**	**15**	**10 %**
7.	**Lab report**	**Through semester**	**10 %**
8.	**Final Exam**	**16-17**	**50 %**
9.	**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	Quantitative Chemical Analysis, Daniel C. Harris, Charles A. Lucy Kate Parker publisher, 9th edition 2015.
Supportive References	Fundamentals of Analytical Chemistry" - by Douglas A. Skoog, Donald M. West, F. James Holler, and Stanley R. Crouch, Mary Finch publisher 9th edition 2013.
Electronic Materials	Some course contents and materials are posted on Black board sites
Other Learning Materials	• https://book4you.org/book/3338575/951c19 • https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Quantifying_Nature/Volumetric_Chemical_Analysis_(Shiundu)/14.2%3A_Learning_Activity • https://chem.libretexts.org/Under_Construction/Purgatory/Book%3A_Analytical_Chemistry_2.0_(Harvey)/09_Titrimetric_Methods/9.4%3A_Redox_Titrations

	• https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Quantifying_Nature/Volumetric_Chemical_Analysis_(Shiundu)/14.4%3A_Complex_ion_Equilibria_and_Complexometric_Titrations • https://chem.libretexts.org/Special:Search?qid=&fpid=230&fpth=&query=volumertric+analysis&type=wiki

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 glassware and equipment such as erlenmeyer flasks watch glass, graduated cylinder, volumetric flask, graduated pipette, volumetric buret and beakers, 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 students assessment	Instructor & Course coordinator	Classroom 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 Data

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

Practical Work

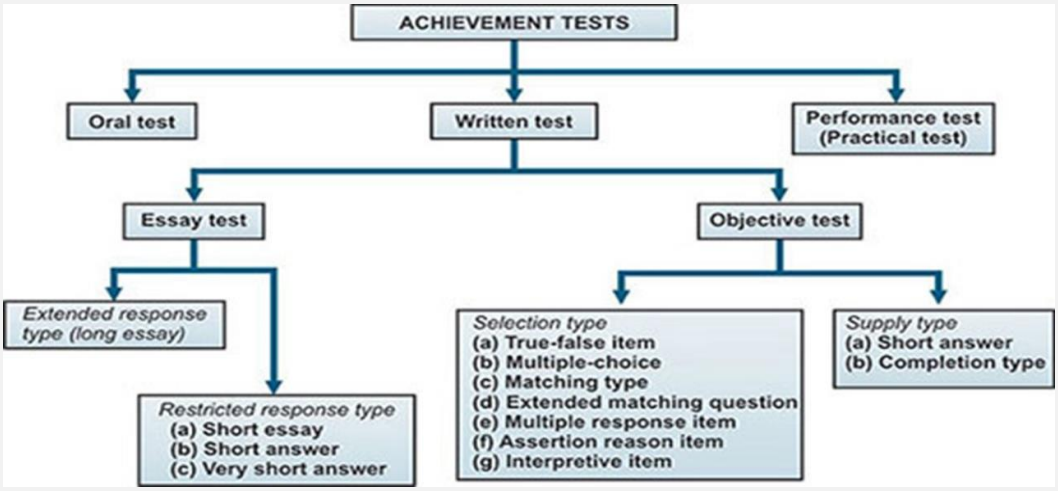
No	Title of Experiment	Tools, Chemicals, and equipment Needed in Experiments	Week
1.	**Laboratory safety**	None	1
2.	**Solution preparation** (Molar and Normal solution)	Sodium carbonate, sodium chloride, Sulphuric Acid and hydrochloric acid	2
3.	**Solution preparation** (Percent w/w,w/v and v/v)	Sodium carbonate, sodium chloride, Sulphuric Acid and hydrochloric acid	3
4.	**Titration Calculations**	-	4
5.	**Determination of normality and strength of unknown sodium hydroxide solution by oxalic acid**	Sodium hydroxide, oxalic acid and phenolphthalein	5
6.	**Determination of normality and strength of unknown hydrochloric acid by solution known Sodium hydroxide**	Sodium hydroxide, hydrochloric acid, phenolphthalein and methyl orange	6
7.	**Revision**	Depending upon the selected experiment	7
8.	**Determination of normality and strength of unknown sodium carbonate solution by standardized Hydrochloric acid solution**	sodium carbonate, Hydrochloric acid, phenolphthalein and methyl orange	8
9.	**Determination of normality and strength of unknown potassium permanganate solution by standard oxalic acid solution**	potassium permanganate, oxalic acid, Sulphuric Acid	9
10.	**Determination of normality and strength of unknown ammonium ferrous sulphate solution by standard potassium dichromate solution**	potassium dichromate solution, ammonium ferrous sulphate, sulphuric acid, phosphoric acid and diphenyl amine	10
11.	**Determination normality and strength of sodium thiosulfate using standard solution of potassium dichromate (iodomeyric titration)**	Sodium thiosulphate, potassium dichromate	11
12.	**Determination normality and strength of magnisum sulphate using standard solution of EDTA (complexmetryl)**	EDTA and magnesium sulphate	12
13.	**Determination of strength and normality of sodium chloride using silver Nitrate standard solution..**	Determination of strength and normality of sodium chloride using silver Nitrate standard solution..	13
14.	Revision		14
15.	FINAL EXAM		15

2- Blue Print

Course Name	Volumetric Analytical Chemistry
Course Code	211CHEM -3

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	2.2	2.3	-	-	-
Marks	30	25	15	27	3	-	-	-

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	1.1 (30M)	Quiz	Objective Questions	2	2	1
			Mid term	Objective Questions	3	7	7
			Final Exam	Objective Questions	5	22	22
	K2	1.2 (25M)	Quiz	Objective & Essay Questions	2	2	1
			Mid term	Objective& Essay Questions	3	6	6
			Final Exam	Objective& Essay Questions	6	18	18
Skills	S1	2.1 (15M)	H.W	Solving Problems & chart analysis & Essay questions	4	2	2
			Quiz	Solving Problems & chart analysis & Essay questions	2	2	1
			Mid term	Solving Problems & chart analysis & Essay questions	2	2	2
			Final Exam	Solving Problems & chart analysis & Essay questions	4	10	10
	S2	2.2 (27M)	Practical Sheet	Objective Questions	2	14	7
			Lab Report	Lab Report Rubric	5	10	10
			Final Lab Exam	I Task experiment	1	10	10
	S3	2.3 (3M)	Safety Quiz	Objective questions	1	6	3
TOTAL		**100**					**100**


ACHIEVEMENT TESTS
Oral test
Written test
Performance test (Practical test)
Essay test
Objective test
Extended response type (long essay)
Restricted response type
(a) Short essay
(b) Short answer
(c) Very short answer
Selection type
(a) True-false item
(b) Multiple-choice
(c) Matching type
(d) Extended matching question
(e) Multiple response item
(f) Assertion reason item
(g) Interpretive item
Supply type
(a) Short answer
(b) Completion type