



Course Specifications

Course Title:	Chemistry of Volumetric Analysis
Course Code:	CHEM 211-3
Program:	Bachelor in Chemistry
Department:	Chemistry
College:	College of Science
Institution:	Jazan university (JU)

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A. Course Identification

1. Credit hours:	3hr	Workload:	169	ECTS:	6.0
2. Course type					
a.	University <input type="checkbox"/>	College <input type="checkbox"/>	Department <input checked="" type="checkbox"/>	Others <input type="checkbox"/>	
b.	Required <input checked="" type="checkbox"/>		Elective <input type="checkbox"/>		
3. Level/year at which this course is offered: level 3 / year 2					
4. Pre-requisites for this course (if any):					
None					
5. Co-requisites for this course (if any):					
None					

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom Lab.	30 30	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	30
3	Tutorial	
4	Others (specify)	
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

Course Title	Course Number	Contact Hours (CH)		Credit unit (CU)	Year	Level	Pre-requisite
		Lec.	Prac.				
Chemistry of volumetric analysis	CHEM 211	2	2	3	2	3	-

Course objectives: They are to identify the following:

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

Syllabus: 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.

Syllabus: A-Practical contents

Selected experiments related to volumetric analysis

*See attachment

2. Course Main Objective

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

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge and Understanding	
1.1	Demonstrate a broad understanding and critical view of the principles, classification and application of volumetric analysis. (I)	K1
1.2	Describe the essential facts, principles and theories dealing with neutralization, complexities, precipitation and oxidation reduction reactions. (I)	K2
2	Skills :	
2.1	Demonstrate ability in critical thinking, numeracy, analytical reasoning, use graphs, charts for solving problems related to volumetric analysis topics. (I)	S1
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)	S1

CLOs		Aligned PLOs
2.3	Examine lab safety background to follow proper procedures and regulations for safe handling and use of chemicals. (I)	S3
3	Values:	
3.1	Work as a group leader in cooperation with other colleagues (I)	C1

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.	4
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.	4
3	Dilution of solutions, solution preparation, titrations based on acid-base reactions	4
4	Simple titration curves (strong, weak acids versus strong , weak bases) ,complicated titration curves and calculation of pH during titrations	4
5	Theory of acid-base indicators and titrations based on oxidation reduction reactions	3+1 Exam
6	Titration curves of oxidation reduction reactions and applications.	4
7	Titrations based on complexation reactions, applications and titrations based on precipitation reaction.	4
8	Revision	2
9	Selected Experiments related to course topics.	30
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	Knowledge and Understanding		
1.1	Demonstrate a broad, knowledge in the principle of volumetric analysis and its classification.	Lecture / Group work discussion	Written examinations, HW and quizzes
1.2	Describe the essential facts, principles and theories dealing with neutralization, complexities, precipitation and oxidation reduction reactions.	Lecture / Group work discussion	Written examinations, HW and quizzes
2.0	Skills		
2.1	Demonstrate the knowledge and skills required to solve problems related to calculate pH during titration, concentration of solutions and determining equivalent point. Determine	Lecture / Group work discussion	Problem-solving exercises

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	the suitable indicator for different titrations.		
2.2	Apply experimental basics and skills to use laboratories equipment for carrying out different types of titrations experiments as well as accurately report, record and analyze the obtained results	Lab demonstrations /hands-on student learning activities / whole group and small group discussion	Practical assignments and laboratory reports
2.3	Examine lab safety background to follow proper procedures and regulations for safe handling and use of chemicals.	Lab demonstrations	Safety exam
3.0	Values		
3.1	Work as a group leader in cooperation with other colleagues	lab demonstrations /hands-on student learning activities / whole group and small group discussion	laboratory reports

2. Assessment Tasks for Students

#	Assessment task*		Week Due	Percentage of Total Assessment Score
.1	Homework		5	2%
.2	Quiz		4	3%
.3	Midterm Exam		11	15%
.4	Practical work	Sheet	13	10%
		Lab report	10	2%
		Final Experiment	13	15%
		Activities and participation during Laboratory session	12	3%
.5	Quiz in safety		12	0%
.6	Final Exam		15	50%
.7	Total			100%

*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

Instructor will be available for academic counseling on daily basis for at 2h/day during office hours. The office hours are listed in the instructor time table and delivered to students in the first lectures in each semester. E-Mail is delivered to students for any help.

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Quantitative Chemical Analysis, Daniel C. Harris, Charles A. Lucy Kate Parker publisher, 9 th edition 2015.
Essential References Materials	Fundamentals of Analytical Chemistry” - by Douglas A. Skoog, Donald M. West, F. James Holler, and Stanley R. Crouch, Mary Finch publisher 9 th edition 2013.
Electronic Materials	<ul style="list-style-type: none"> • 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=volumetric+analysis&type=wiki •
Other Learning Materials	Tutorial videos and pictures Some course contents and materials are posted on Black board sites

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	<i>1 Lecture room(s) for groups of 50 students 1 Lab room(s) for groups of 25 students</i>
Technology Resources (AV, data show, Smart Board, software, etc.)	<i>Smart board, Data show, Black board, internet</i>
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	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

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of Teaching and Assessment	Student	Likert-type Survey (CES) <u>Indirect</u>
Extent of achievement of course learning outcomes	Instructor & Course coordinator	<u>Class room evaluation</u> (direct & indirect)

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resources	Program coordinator	Indirect
Exam Quality assessment	Assessment committee	Indirect

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

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

Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Chemistry Department Council
Reference No.	42 / 35 /102 112
Date	17 /09 /1442 Corresponding to 28 / 04 /2021

B-Practical contents

No	Title of Experiment	Tools, Chemicals, and equipment Needed in Experiments	Week
1.	Laboratory safety	None	1
2.	Solution preparation	Sodium carbonate and sodium chloride	2
3.	Solution preparation by serial dilution	Sulphuric Acid, hydrochloric acid	3
4.	Solution preparation by parallel dilution	Glassware, Oven, filtration system, hydrochloric acid, calcium salt, ammonia solution, ammonium oxalate	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 (iodometric titration)	Sodium thiosulphate, potassium dichromate	11
12.	Determination normality and strength of magnesium sulphate using standard solution of EDTA (complexometry)	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	None	14
15.	FINAL EXAM		15