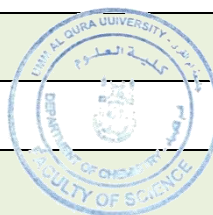


# Course Specifications

<b>Course Title:</b>	Volumetric and Gravimetric Analytical Chemistry
<b>Course Code:</b>	4022133-3
<b>Program:</b>	Chemistry
<b>Department:</b>	chemistry
<b>College:</b>	Faculty of Applied Science
<b>Institution:</b>	Umm Al-qura University



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## A. Course Identification

<b>1. Credit hours:</b> 2hours			
<b>2. Course type</b>			
a.	University <input type="checkbox"/>	College <input type="checkbox"/>	Department <input checked="" type="checkbox"/>
b.	Required <input checked="" type="checkbox"/>	Elective <input type="checkbox"/>	Others <input type="checkbox"/>
<b>3. Level/year at which this course is offered:</b> 3 <sup>rd</sup> level / 2 <sup>nd</sup> year			
<b>4. Pre-requisites for this course (if any):</b> General chemistry1			
<b>5. Co-requisites for this course (if any):</b> ---			

## 6. Mode of Instruction (mark all that apply)

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

## 7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
<b>Contact Hours</b>		
1	Lecture	30
2	Laboratory/Studio	42
3	Tutorial	
4	Others (specify)	
	<b>Total</b>	72
<b>Other Learning Hours*</b>		
1	Study	40
2	Assignments	5
3	Library	
4	Projects/Research Essays/Theses	
5	Others (specify)	20
	<b>Total</b>	65

\* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

## B. Course Objectives and Learning Outcomes

<b>1. Course Description</b> Volumetric and Gravimetric Analytical Chemistry course provide students with the necessary background of quantitative analysis of different compounds using different tools of analysis and its application.
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## 2. Course Main Objective

By the end of this course student will be able to :

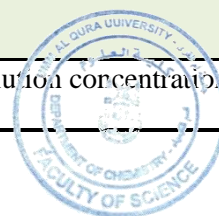
- 1.1. describe the theoretical principles of volumetric and gravimetric analysis.
- 1.2. Familiar with statistical methods and solution concentration parameters in chemical measurements
- 1.3. apply the procedures required for gravimetric analysis and factors which effect the precipitation process
- 1.4. be further prepared for the necessarily rigorous sequence in chemistry courses need the volumetric and gravimetric analysis.

## 3. Course Learning Outcomes

CLOs		Aligned PLOs
1	<b>Knowledge:</b>	
1.1	Recognize the principles of volumetric and gravimetric analysis in analytical chemistry.	K5
1.2	Identify the classification of volumetric methods of analysis.	K1
1.3	Identify the suitable condition of gravimetric analysis, precipitants types and its applications in removal of contamination.	K5
1.4	Outline the difference between nucleation, precipitate growth and define the concentration parameters.	K5
1.5	Recognize different statistical methods in analytical chemistry.	K2
1.6	Describe neutralization, precipitation, reduction-oxidation, compleximetric titrations.	K5
1.7	list the importance of gravimetric analysis and its application.	K5
2	<b>Skills :</b>	
2.1	Apply the suitable methods to refer to concentration parameters.	S2
2.2	Compare the different types of volumetric analysis and predict the suitable method for analysis.	S4
2.3	Explain principles of gravimetric analysis and its classification contamination, Choose the suitable method to purify the precipitate.	S2
2.4	Analyze different solutions and calculate solution pH.	S7
2.5	Appraise the volumetric and gravimetric methods in analytical chemistry.	S1
2.6	predict the type of precipitant and procedure for gravimetric analysis.	S1
3	<b>Competence:</b>	
3.1	Manage resources, time and collaborate with members of the group.	C1
3.2	Work effectively both in a team, and independently on solving chemistry problems.	C2
3.3	Communicate effectively with his lecturer and colleagues	C1
3.4	Use IT and web search engines for collecting information.	C3

## C. Course Content

No	List of Topics	Contact Hours
1	Classification and applications of quantitative analysis and solution concentration parameters.	2



2	The principles of volumetric analysis and statistical methods – neutralization titrations theory- pH measurements.	2
3	Buffer solutions, their working theory and their applications- Indicators in neutralization titrations and the applications of neutralization titrations in manufacture, pharmaceutical and biochemistry fields	2
4	Precipitation theory, adsorption indicators, applications of precipitation titrations and titrations which include complexes formation.	2
5	Compleximetry titrations and their applications in water analysis and manufacture and reduction – oxidation (Redox) titrations and their applications.	2
6	Principles and requirements of gravimetric analysis.	2
7	Theoretical principles of precipitation and stages of saturated, supersaturated and solubility product, precipitation formation ( nucleation, precipitate growth)	2
8	Mid Term exam	2
9	Factors affecting the solubility of precipitate, precipitation from homogeneous solution and contamination of precipitates ,types of contaminants (co-precipitation, post precipitation, surface adsorption)	2
10	The methods of contaminants removing or minimizing	2
11	Organic precipitants, requirements and its application Inorganic precipitants, requirements and its application	4
12	Calculations of gravimetric analysis	2
13	Revisions and final exam	2
<b>Total</b>		<b>30</b>

#### Laboratory Part:

- Standardization of hydrochloric acid using 0.1N sodium carbonate.
- Determination of sodium hydroxide and sodium carbonate in mixture using hydrochloric acid
- Determination of ammonia in ammonium solution using hydrochloric acid
- Standardization of potassium permanganate using oxalic acid
- Iodometry and Iodimetry using sodium thiosulphate
- Silver nitrate titrations by Volhard and Mohr methods
- Standardization of EDTA using zinc sulphate
- Determination of water crystallization in barium chloride salt.
- Determination of barium ion as barium sulphate.
- Determination of aluminum in alum.
- Determination of calcium using ammonium oxalate
- Determination of lead as lead chromate
- Determination of nickel using dimethylglyoxime

## 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		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.1	Recognize the principles of volumetric and gravimetric analysis in analytical chemistry	• Lectures	• Exams • long and short essays posters lab manuals
1.2	Identify the classification of volumetric methods of analysis	• Lectures	• Exams
1.3	Identify the suitable condition of gravimetric analysis, precipitants types, and its applications in removal of contamination	• Lectures Scientific discussion	• Exams • long and short essays posters lab manuals
1.4	Outline the difference between nucleation, precipitate growth and define the concentration parameters	• Lectures	• Exams • web-based student performance systems
1.5	Recognize different statistical methods in analytical chemistry	• Lectures • Scientific discussion	• Exams • Home work assignment containing problem thinking activities
1.6	Describe neutralization, precipitation, reduction-oxidation, compleximetric titrations	• Lectures	• Exams • home work
1.7	list the importance of gravimetric analysis and its application	• Lectures • Web based study	• Exams • long and short essays posters lab manuals
<b>2.0</b>	<b>Skills</b>		
2.1	Apply the suitable methods to refer to concentration parameters	• Lectures	• Exams
2.2	Compare the different types of volumetric analysis and predict the suitable method for analysis	• Lectures • Web-based study	• Exams • Group discussion
2.3	Explain principles of gravimetric analysis and its classification contamination, Choose the suitable method to purify the precipitate.	• Lectures	• Exams
2.4	Analyze different solutions and calculate solution pH	• Lectures	• Exams • Home work
2.5	Appraise the volumetric and gravimetric methods in analytical chemistry	• Lectures • Web-based study	• posters demonstrations
2.6	predict the type of precipitant and procedure for gravimetric analysis	• Lectures	Quiz
<b>3</b>	<b>Competences</b>		
3.1	Manage resources, time and collaborate with members of the group.	presentation	Observation of group's team work performance
3.2	Use university library and web search engines for collecting information and search about different topics.	project	Write a report
3.3	Work effectively both in a team, and	group discussion	Observation of

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	independently on solving chemistry problems.		group's team work performance
3.4	Communicate effectively with his lecturer and colleagues	group discussion	Observation by the instructor
3.5	Use IT and web search engines for collecting information.	presentation	Observation by the instructor

## 2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Homework or activities.	--	10 %
2	Midterm Exam.	8	20 %
3	Practical Exam.	14	30 %
4	Final Exam. (2 hours exam)	16	40 %
5	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 :**

- We have faculty members to provide counseling and advice.
- Office hours: During the working hours weekly.
- Academic Advising for students

## F. Learning Resources and Facilities

### 1. Learning Resources

<b>Required Textbooks</b>	<ul style="list-style-type: none"> <li>• Douglas A. Skoog, Donald M. West, James F. Holler and Stanley R. Crouch, Analytical Chemistry, 7th edition, Springer (2014)</li> <li>• Gary D. Christian, Purnendu K. Dasgupta and Kevin A. Schug, Analytical Chemistry, 7th edition, WILEY (2014)</li> </ul>
<b>Essential References Materials</b>	Lecture Hand outs available on the coordinator website
<b>Electronic Materials</b>	<ul style="list-style-type: none"> <li>• <a href="http://www.chemweb.com">http://www.chemweb.com</a></li> <li>• <a href="http://www.sciencedirect.com">http://www.sciencedirect.com</a></li> <li>• <a href="http://www.rsc.org">http://www.rsc.org</a></li> </ul>
<b>Other Learning Materials</b>	

### 2. Facilities Required

Item	Resources
<b>Accommodation</b> (Classrooms, laboratories, demonstration rooms/labs, etc.)	<ul style="list-style-type: none"> <li>-Classrooms capacity (30) students.</li> <li>-Providing hall of teaching aids including computers</li> </ul>

Item	Resources
	and projector.
<b>Technology Resources</b> (AV, data show, Smart Board, software, etc.)	Room equipped with computer and projector and TV.
<b>Other Resources</b> (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	No other requirements.

### G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Students	questionnaire (indirect )
Extent of achievement of course learning outcomes	Program Leader	results data analysis (direct) and questionnaire (indirect )
Quality of learning resources	Course instructor	Questionnaire (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	
Reference No.	
Date	

Received by: Dr. Ismail Althagafi

Department Head

Signature:



Date: 20/12/2019

