



# Course Specifications

<b>Course Title:</b>	Fundamentals of Analytical Chemistry
<b>Course Code:</b>	CHEM 252
<b>Program:</b>	BSc. Program
<b>Department:</b>	Chemistry
<b>College:</b>	Science
<b>Institution:</b>	King Saud University

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## A. Course Identification

<b>1. Credit hours:</b>	3 Credit hours; (2 Lecture + 1 Practical)
<b>2. Course type:</b>	
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"/>
<b>3. Level/year at which this course is offered:</b>	3ed or 4th level / 2nd year
<b>4. Pre-requisites for this course (if any):</b>	General Chemistry, CHEM101
<b>5. Co-requisites for this course (if any):</b>	Non

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

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	2 / week	70%
2	Blended		
3	E-learning		
4	Correspondence		
5	Other (practical in laboratory)	2 / week	30%

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

No	Activity	Learning Hours
<b>Contact Hours</b>		
1	Lecture	30
2	Laboratory/Studio	28
3	Tutorial	
4	Others (specify)	
	<b>Total</b>	58
<b>Other Learning Hours*</b>		
1	Study	
2	Assignments	
3	Library	
4	Projects/Research Essays/Theses	
5	Others(specify)	
	<b>Total</b>	

\*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> This course conducting together with the laboratory experiments to cover the basic principles and general concepts of the traditional analytical chemistry.
<b>2. Course Main Objective</b> To learn and understand the basic principles of analytical chemistry, including but not limited to: <ul style="list-style-type: none"><li>- Introduction to qualitative and quantitative analysis</li><li>- Chemicals, apparatus and unit operations of analytical chemistry.</li><li>- Concentration expressions and calculations.</li><li>- Chemical equilibria.</li><li>- Gravimetric methods of analysis.</li><li>- Aqueous solution, solubility and solubility product.</li><li>- Effect of electrolytes; cation and anion identification.</li><li>- Titrations in analytical chemistry.</li><li>- Neutralization titrations and acid base systems.</li><li>- Precipitation, complexation and redox reactions and titrations.</li></ul>

## 3. Course Learning Outcomes

CLOs		Aligned PLOs
<b>1</b>	<b>Knowledge:</b>	
1.1	Define the basic principles of analytical chemistry	K2
1.2	Outline the most important concentration expressions and units in various sample matrices	K1
1.3	Memorize and describe the differences between all types of chemical equilibria	K3
1.4	Recognize the relation between basic analytical concepts and life	K2
<b>2</b>	<b>Skills:</b>	
2.1	Explain different titration processes	S1
2.2	Evaluate and interpret experimental data	S2
2.3	Prepare and calculate solutions concentration	S1
2.4	Calculate different types of equilibrium constants	S2
<b>3</b>	<b>Competence:</b>	
3.1	Work independently and as a part of a team; discuss and solve the problems individually and with group	C1
3.2	Demonstrate good and safe handling of chemicals and lab wares and following lab instructions	C1

## C. Course Content

No	List of Topics	Contact Hours
1	An overview on analytical chemistry, introduction to qualitative and quantitative analysis	2
2	Chemicals, apparatus and unit operations of analytical chemistry	2
3	Concentration expressions and calculations	4

4	Gravimetric methods of analysis	4
5	Chemical equilibria	2
6	Aqueous solution, solubility and solubility product	2
7	Effect of electrolytes; cation and anion identification	2
8	Titrations in analytical chemistry	2
9	Neutralization titrations and acid base systems	4
10	Precipitation, complexation and redox reactions and titrations	6
<b>Total</b>		<b>30</b>

No	List of Topics (Laboratory)	Contact Hours
1	Separation and identification of ions (two experiments)	4
2	Gravimetric analysis (two experiments)	4
3	Acid-base titration (two experiments)	4
4	Practical exam 1	2
5	Precipitation titration (two experiments)	4
6	EDTA titration (two experiments)	4
7	Redox titration (two experiments)	4
8	Practical exam 2	2
<b>Total</b>		<b>28</b>

## D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
<b>1.0</b>	<b>Knowledge</b>		
1.1	Define the basic principles of analytical chemistry	-Lectures -Lab experiments	-1st, 2nd and final exams
1.2	Outline the most important concentration expressions and units in various sample matrices	-Homework's	-Lab reports assessment -Practical exams assessment
1.3	Memorize and describe the differences between all types of chemical equilibria		-Homework's assessment
1.4	Recognize the relation between basic analytical concepts and life		
<b>2.0</b>	<b>Skills</b>		
2.1	Explain different titration processes	-Lectures -Lab experiments	-1st, 2nd and final exams
2.2	Evaluate and interpret experimental data		-Lab reports -Practical exams assessment
2.3	Prepare and calculate solutions concentration		
2.4	Calculate different types of equilibrium constants		
<b>3.0</b>	<b>Competence</b>		
3.1	Work independently and as a part of	-Lectures	-Lab reports

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	a team; discuss and solve the problems individually and with group	-Lab experiments -Homework's	-Practical exams assessment
3.2	Demonstrate good and safe handling of chemicals and lab wares and following lab instructions	-Direct contact during office hour -Performance in problem solving and assignments	-Self-performance in lab -Homework's and direct contact assessments

## 2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Midterm exam	6-8	20%
2	Assignment, discussion, and homework's	Weekly	10%
3	Laboratory reports	Weekly	10%
4	Quizzes and practical exams	7 & 14	20%
5	Final exam	16-17	40%
6			

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

## E. Student Academic Counseling and Support

<p><b>Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:</b></p> <ul style="list-style-type: none"> <li>-Office hours: 6 h/week</li> <li>-Laboratory assistance</li> <li>-Previous exams and their answers</li> </ul>
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## F. Learning Resources and Facilities

### 1. Learning Resources

<b>Required Textbooks</b>	-Douglas A. Skoog, Donald M. West, F. James Holler, Stanley R. Crouch, "Fundamentals of Analytical Chemistry", 9th Ed., Brooks Cole Cengage Learning, 2014.
<b>Essential References Materials</b>	-Gary D. Christian, Purnendu K. Dasgupta, Kevin A. Schug, "Analytical Chemistry", 7th Ed., John Wiley & Sons, 2014. -Ibrahim Al-Zamil, "Analytical Chemistry, Instrumental Analysis" 5th Ed., Al-Khrigi Publisher, 2015.
<b>Electronic Materials</b>	-All lectures are available on the web site ( <a href="https://fac.ksu.edu.sa/aifseisi">https://fac.ksu.edu.sa/aifseisi</a> ) -Several videos and animations are available on the web site
<b>Other Learning Materials</b>	-Microsoft Excel -Handouts and Power Point Presentations

## 2. Facilities Required

Item	Resources
<b>Accommodation</b> (Classrooms, laboratories, demonstration rooms/labs, etc.)	-Classroom for 30 students equipped with modern teaching technology -Laboratory in accordance with the rules of safety and equipped with the required instruments and chemicals
<b>Technology Resources</b> (AV, data show, Smart Board, software, etc.)	-The presence of computer, E-podium, projector, smart board and internet in classrooms
<b>Other Resources</b> (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	-The presence of chemicals and standards used in analytical -The presence of related analytical equipment and tools, e.g. pH meters, analytical balances, water baths and glassware. -The presence of the first aid and safety equipment

## G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	-Postgraduate students -Course evaluation by students -Student faculty meeting	Student questionnaires and students meeting
Extent of achievement of course learning outcomes	-Peer Reviewer -Program Leaders	-Peer consultation on teaching -Departmental council meetings
Effectiveness of teaching and assessment	-Consult teachers with long experience -Postgraduate students	Student questionnaires

**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

<b>Council / Committee</b>	
<b>Reference No.</b>	
<b>Date</b>	