



Course description:

This course covers both fundamental and practical aspects of chemical analysis, it covers the following topics: basic chemical concepts, statistics and data analysis, application of chemical equilibrium systems in quantitative analysis, gravimetric analysis, and titrimetric method of analysis.

Aims of the course:

Upon completion of this course students should be able to

- A. Provide the student with knowledge of principles and techniques of Analytical Chemistry.
- B. Develop the student's ability to identify, formulate and solve mathematical problems as related to chemical analysis.
- C. Develop the student's awareness of the role of data evaluation and statistics in generating meaningful figures.
- D. Understand chemical models and theories that can rationalize what happens in the analytical laboratory.
- E. Acquire an understanding of professional ethics

Intended Learning Outcomes: (ILOs)

A. Knowledge and Understanding

- A1. **Concepts and Theories:** students should be able to demonstrate knowledge of concepts of analytical chemistry.
- A2. **Contemporary Trends, Problems and Research:** Students should be able to apply the theoretical information and lab techniques studied to carry out experiments
- A3. **Professional Responsibility:** serve the public interest and welfare further knowledge of principles and techniques of Analytical Chemistry. Students majoring in health related sciences should also actively be concerned with the health and welfare of co-workers, consumers, and the community.

B. Subject-specific skills

- B1. **Problem solving skills:** use the techniques they studied to solve different equilibrium and preparation buffer and titrimetry problems.
- B2. **Modeling and Design:** Not applicable
- B3. **Application of Methods and Tools:** Students should be able to report their measured data to the correct number of significant figures. They also should be able to use the techniques studied to solve gravimetric and titrimetry problems.

C. Critical-Thinking Skills



C1.Analytic skills: employ their knowledge of the **Statistical Evaluation Data** and calculation skills to identify, and solve chemical analysis problems.

C2.Strategic Thinking: when solving problems, student should care to apply statistical rule, and answer questions about main topic in analytical an effective way to professional chemists.

C3.Creative thinking and innovation: by applying their knowledge of solve different types of problem that relate statistics and data analysis, for instance, chemical equilibrium systems in quantitative analysis, gravimetric analysis, and titrimetric method of analysis

General and Transferable Skills (other skills relevant to employability and personal development)

D1.Communication: ability to extract information from a variety of sources in a clear and organized manner. Students are trained to express their ideas about a topic by participating in class discussions.

D2.Teamwork and Leadership: students will work in groups in the laboratory, as a result they will be trained to work together as well as having the skill to divide the laboratory tasks such as titration skills. It's a major technique in analytical lab.

Course structures:

Lecture	Credit Hours	ILOs	Topics	Teaching Procedure	Assessment methods
10	2	A1, A2, A3, B3	Introduction and Basic Concepts Chapter 1: Role of analytical chemistry, classification of methods.... Chapter 3: Units of measurements, the mol concept, concentration units..... Chapter 4: Chemical equilibrium, acids and bases, solubility and solubility product...	Power point presentation/ white board/ practice exercises	Work sheet exercises/test I, final exam
3		A1,B1,B2	Errors & Statistical Evaluation Data Definitions of terms, types of, types of errors, The confidence limits and confidence	Power point presentation/ white board/ practice exercises periodic table	Practice exercises/test I and final exam
3		A1, B1, C1, C2, C3, B3, D1, B2,	Gravimetric Analysis Properties of precipitates, precipitating agents, relative supersaturation concept, nucleation/crystal growth pathways	Power point presentation/ white board/ practice exercises	Practice exercises/test II, and final exam
2		A1, A1, B1, C1, C2, C3,	Electrolytic Effect Effect of electrolytes on chemical equilibrium, activity coefficient.	Power point presentation/ white board/ practice	Practice exercises/test II and final exam



		B3, D1		exercises	
7		A1, B1, C1, C2, C3, B3, B2, D1	<p>Titration</p> <p>Some general aspects of volumetric titrimetry, standard solutions, volumetric calculations, titration curves.</p> <p>Principles of Neutralization</p> <p>Titration</p> <p>What solutions and indicators are used, calculating the pH in titrations of strong acids and strong bases, buffer solutions, calculating pH in weak acid titrations, calculating pH in weak base titrations, titrating poly functional acids and bases.</p>	Power point presentation/ white board/ practice exercises	Practice exercises/test II and final exam
4		A1, B1, C1, C2, C3, B3, B2, D1	<p>Complexation and Precipitation</p> <p>Titration Forming complexes, titration with inorganic complexing agents, precipitation titrations, titrations with aminocarboxylic acids.</p> <p>Redox Titrations :</p> <p>Redox reactions, electrode potential, the thermodynamic potential of electrochemical cell, calculation of redox equilibrium, indicator for redox titrations.</p>	Power point presentation/ white board/ practice exercises periodic table	Practice exercises/Final exam

Practical component					
1			Calibration of burets	Explain the theory first then the experimental procedure.	Lab report, evaluation of students' lab work. quiz
2			Determination of sampling errors		
2			Gravimetric determination of chloride		
			Gravimetric determination sulfate		
			Acid-base titrations		
			Precipitation titration		
			Complexometric titration		
			Redox titration		

References:

- A. Main Textbook:** Analytical Chemistry: An Introduction, Skoog, West Holler and Crouch
- B. Supplementary Textbook(s):** Day & Underwood, Quantitative Analysis, 6th edition, Prentice Hall, New Jersey, 1991
- C.** Power point presentations uploaded on moodle.

Assessment Methods:

Assessment Methods:

Methods	Grade	Date
Test I	15%	
Test II	15%	
Lab exam	15%	
Homework and activity	5%	
Final Exam	10% practical, 40% theoretical	
Total	100%	

