

Course Description Form

1. Course Name: Analytical Chemistry	
2. Course Code: HECM3103	
3. Semester / Annual : Annual	
4. Description Preparation Date: 2026\3\30	
5. Available Attendance Forms: Regularity	
6. Number of Credit Hours (Total) / Number of Units (Total): Theory 90+ Practical 90\ 9	
7. Course administrator's name (mention all, if more than one name)	
Name: Assistant Professor Dr. Ahmed Jasim Muhammad	
Email: ahmed_j_twaij@hilla-unc.edu.iq	
8. Course Objectives	
Course Objectives	<ul style="list-style-type: none"> -Enabling the student to understand the fundamentals and concepts of analytical chemistry -Training students on the basic principles using laboratory equipment and various tools . -How to perform analytical calculations based on theoretical foundations . -Teaching the student practical applications and developing thinking and analytical skills to enable solving emerging problems . - Enabling the student to represent laboratory results practically and perform statistical operations on them.
9. Teaching and Learning Strategies	
Strategy	<ol style="list-style-type: none"> 1 .Knowing and understanding the basics of analytical chemistry 2 .Distinguishing between qualitative and quantitative analysis 3 .Analyzing models qualitatively and quantitatively 4. Linking the relationship between analytical chemistry and other sciences in various fields

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3 theoretical 3 practical	Introduction to Analytical Chemistry, Analytical Chemistry and its importance, Types of scales in chemical analysis, hazard in analytical chemistry	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests
2	3 theoretical 3 practical	Methods of quantitative analysis, Classical method of analysis,	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests
3	3 theoretical 3 practical	Some Basic Concepts, Electrolytes and Non-electrolytes, Solutions, Types of solutions	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests
4	3 theoretical 3 practical	Acids, Bases and Salts, Arrhenius definitions of acids and bases, Definitions of acids and bases according to Brønsted-Lowry theory, Definitions of acids and bases according to Lewis	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests
5	3 theoretical 3 practical	Salts with <u>exam</u>	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests
6	3 theoretical 3 practical	Methods of Expressing Concentration of Solutions, Mass units mass and weight, Chemical formulas, Gram Formula weight	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests
7	3 theoretical 3 practical	Formula concentration (Formality), F, Molar concentration (olarity), M, Normal concentration (Normality), N	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests
8	3 theoretical 3 practical	The relation between molarity (M) and normality Molal concentration (Molality), m	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests
9	3 theoretical 3 practical	Mole fraction, Percentage concentration, Titer expression of concentration	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests
10	3 theoretical 3 practical	Part per million (ppm) and Part per billion (ppb), Density and specific gravity	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests

11	3 theoretical 3 practical	Chemical equilibrium, Law of mass action, Le Chatelier's Principle, Factors affecting the chemical equilibrium	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests
12	3 theoretical 3 practical	Application of law of mass action to equilibrium systems, Dissociation of water, Equilibrium involving slightly soluble ionic solids	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests
13	3 theoretical 3 practical	Ionization of weak acids and weak bases	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests
14	3 theoretical 3 practical	Buffer solution, Types of buffer solution, Buffer capacity	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests
15	3 theoretical 3 practical	Methods of Preparation Solutions and Chemical Calculations in Volumetric Titration Reactions	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests
16	3 theoretical 3 practical	Standard and Standardized Solutions, Characteristics of standard solution	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests
17		Half-year Break			
18	3 theoretical 3 practical	Primary standard materials, Chemical Calculations of Volumetric Titrations, Indicators, Indicator types	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests
19	3 theoretical 3 practical	Calculations of acid-base titrations or neutralization titrations	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests
20	3 theoretical 3 practical	Ionic product constant of water, Hydrogen-Ion Exponent (pH), Calculations of pH of acidic and basic solutions	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests
21	3 theoretical 3 practical	Calculation of pHs of salts solutions, Calculations of pH of buffer solutions	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests
22	3 theoretical 3 practical	Acid-Base Titration Curves with <u>exam</u> Titration of strong acid with strong base Titration of strong base with strong acid Titration of weak acid with strong base Titration of weak acid with weak base	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests
23	3 theoretical 3 practical	Method of using adsorption indicator (Fajan's method) Titration curves for precipitation reactions	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests

24	3 theoretical 3 practical	Complex-Formation Titrations (Complexometry) Complex Compounds (Complexes), Coordination number, Ligand dentate	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests
25	3 theoretical 3 practical	Titration processes employing EDTA	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests
26	3 theoretical 3 practical	Complex formation titration curves of metal ions with EDTA only and not complex formation with the used solutions like Ca²⁺ and Mg²⁺ metal ions. ,Derivation of EDTA Titration curves with exam	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests
27	3 theoretical 3 practical	Oxidation-Reduction Titrations ,Some definitions Oxidation number	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests
28	3 theoretical 3 practical	Balancing of oxidation-reduction equations ,Electrochemical cells ,Types of electrochemical cells	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests
29	3 theoretical 3 practical	Anode and cathode, Electrode potential and Nernst equation,	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests
30	3 theoretical 3 practical	The Standard Hydrogen Electrode (SHE) Measurements of electrode potentials ,Equivalence point potential	Analytical Chemistry	Lectures Theoretical and Practical	Oral and written tests

11.Course Evaluation

Distribution of the grade out of 100 according to the tasks assigned to the student: monthly exams + weekly oral exams + scientific activities

12.Learning and Teaching Resources

Required textbooks (curricular books, if any)	<i>Fundamental of analytical chemistry by skoog and west</i>
Main references (sources)	<i>Fundamental of analytical chemistry by skoog and west Analytical chemistry of Gary</i>
Recommended books and references (scientific journals, reports...)	Any book of fundamental of analytical chemistry
Electronic References, Websites	