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Department of Mathematics and Physical Sciences
East West University

Course Outline: Fall-2024

Course Title : Engineering Chemistry-1
Course Code : CHE 109
Pre- requisite : None
Credit Hours : 04
Course Instructor : Nasima Akter Mukta, PhD
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Objectives: This course aims to give a basic knowledge of atoms and molecules, concept of chemical bonding, structure of molecule, introduces the mole concept and ideas of solution concentrations, acid-base titration, and how structure relates to bonding and bulk properties. The course also treats phases and solution behavior, equilibrium and thermodynamics, electrochemistry and basics of biochemistry.

Course Learning Outcomes:

CLO1	**Acknowledge the fundamentals and application of current chemical theories.**
CLO2	**Apply knowledge in problem solving, critical thinking and analytical reasoning.**
CLO3	**Design and carry out experiments as well as accurately record and analyze the results of such experiments.**

Constructive Alignment

CLOs	**Bloom's Taxonomy**	**Teaching-learning strategies**	**Assessment Method**
CLO1	**Cognitive-** Remember (Level 1) Understand (Level 2)	**Lecture** **Discussion**	**Quizzes, Mid-Term Exam, Final Exam, Course Viva, Lab Viva**
CLO2	**Cognitive-** Understand (Level 2) Apply (Level 3) Analyze (Level 4) Evaluate (Level 5) Create (Level 6)	**Lecture** **Blended Learning** **Brainstorming** **Think-Pair Share (TPS)** **Problem Solving**	**Quizzes, Mid-Term Exam, Final Exam, Course Viva, Lab Viva, Assignment, Presentation**
CLO3	**Cognitive-** Understand (Level 2) Apply (Level 3) Analyze (Level 4)	**Lecture** **Blended Learning** **Problem Solving**	**Lab Classwork, Lab Report, Lab Exam**

Course Content and Course Timeline:

Sl No	Course Content-Theory	Planned number of lectures	CLOs
1	**Chemical Solution of acids and bases:** Types of solutions and ways of expressing concentration, Strong and weak acids/bases, relative strength of acids/base, pH and buffer solutions, neutralization curves, acid base titration, Measurement of pH.	**04**	CLO1 CLO2 CLO3
2	**Atomic structure and properties:** Atomic particles, atomic number, mass number, atomic orbitals, isotopes, electronic configurations of atoms, Pauli exclusion principle, Hund's rule, Aufbau principles atomic models/postulations, periodic table and periodic properties of elements, photoelectric effect, electromagnetic radiation.	**03**	CLO1
3	**Chemical Bonding:** Forces between atoms and molecules, Forces in Solid bindings, ionic bond, covalent bond, metallic bond, hydrogen bond, hybridization, valence bond theory (VBT), VESPER theory, geometry of molecules.	**03**	CLO1
4	**Nuclear Chemistry:** Radioactive elements, properties of alpha, beta and gamma rays, radioactive decay, calculation of half-life period of radioactive isotope, radioactive dating, nuclear reaction.	**02**	CLO1 CLO2
5	**Nanochemistry:** nanomaterials, classification and properties of nanomaterials, synthesis and processing of nanomaterials, Characterization techniques of nanomaterials, nanowires, carbon nanotubes, graphene. Application of nanomaterials in energy storage and environmental issues (air, water, and fuel purification).	**02**	CLO1 CLO2
Mid Exam Date: (08.12.2024, Slot: 8:00 AM-9:15 AM, Room FUB 803)			
6	**Properties of gases**: Gas Laws (Boyles, law, Charles's Law, combined gas law, Gay-Lussac law, ideal gas law, Dalton's law of partial pressure). Mathematical problems.	**02**	CLO1 CLO2
7	**Electrochemistry:** Oxidants and reductants, oxidation number, Electrode, electrolyte, standard hydrogen electrode, electrolysis, Electrochemical cell, electromotive force, electrode reactions, reduction potential, the chemical series, electroplating, product	**04**	CLO1 CLO2

	deposition within the electrodes, Galvanic cell, Daniel cell, dry cell, Hydrogen fuel cell.		CLO3
8	**Environmental Chemistry:** sources and effects of air pollution, acid rain, ozone depletion, water pollutants, soil pollution, greenhouse effect, prevention of environmental pollution. Water and air purification via adsorption.	**02**	CLO1
9	**Basics of organic chemistry:** Introduction of aliphatic and aromatic hydrocarbons, nomenclature of various organic compounds, synthesis of various hydrocarbons (alkane, alkene, alkyne, alcohol, acid, benzene, phenol, etc), important organic reactions such as addition reaction, elimination reaction, substitution reaction, Friedel craft reactions, Selected organic compounds (phenol and its derivatives; alcohols and its derivatives).	**03**	CLO1
10	**Basics of biochemistry:** photosynthesis, carbohydrates (saccharides), protein (amino acids, peptide bond), lipids, fat/oil (saturated/unsaturated), nucleic acids, DNA, RNA.	**02**	CLO1
11	**Basics of chemical hazard and Chemical weapons convention (CWC):** Basics of chemical safety, explosive/hazardous chemicals, storage/handling chemicals, hazard communications, health risks of chemical exposer, personal protective equipment, chemical safety rules and regulations, Chemical weapons and their classification, dual use of chemicals, chemical threat.	**01**	CLO1
	Final Exam (09.02.2025, Sunday)		
	Mid Exam	**01**	
	Review class (04.02.2025)	**01**	
	Total	**30**	
	Books 1. Chemistry by Kenneth A. Goldsby, Raymond Chang 2. Essentials of Physical Chemistry, B.S. Bhal, G.D. Tuli, Arun Bhal 3. General Chemistry Principles and Modern Applications by Ralph H. Petrucci 4. Riam Abu Much, Kurt Winkelmann, Muhamad Hugerat- Nanochemistry for Chemistry Educators, Royal Society of Chemistry 5. Stanley E. Manahan - Environmental Chemistry (2022, CRC Press)		

Course Content-Lab	Hrs	CLOs
1. Determination of the water of crystallization of copper (II) sulphate ($CuSO_4$). 2. Standardization of sodium hydroxide solution with a standard solution of oxalic acid. 3. Standardization of HCL solution with a standard solution of sodium hydroxide (NaOH). 4. Determination of the Molar Mass of an Unknown, Diprotic Acid, H_2A using NaOH. 5. Standardization of sodium thiosulphate ($Na_2S_2O_3$) solution with a standard solution of potassium dichromate ($K_2Cr_2O_7$) 6. Standardization of potassium permanganate ($KMnO_4$) solution with standard sodium oxalate solution. 7. Preparation of a buffer solution. 8. Solubility test for inorganic compounds. 9. Qualitative analysis of inorganic compounds. 10. Estimation of ferrous ions present in a supplied solution of ferrous sulphate by a standard potassium permanganate ($KMnO_4$) solution. 11. Determination of available chlorine in bleaching powder. 12. Qualitative tests for organic functional groups (-OH, -COOH, -CHO, =CO, $-NH_2$, NO_2) 13. Qualitative tests for carbohydrates.		CLO1 CLO2 CLO3

Textbook

1. Chemistry by Kenneth A. Goldsby, Raymond Chang

2. Essentials of Physical Chemistry, B.S. Bhal, G.D. Tuli, Arun Bhal

3. General Chemistry Principles and Modern Applications by Ralph H. Petrucci

4. John Wiley and Son's - Vogel's Textbook of Quantitative Chemical Analysis

5. N. Haque and M. Uddin -Practical Chemistry Introduction.

Evaluation and Grading Policy:

Evaluation (Total marks: 100)

Theory (75)		Lab (25)	
Quiz	10	Lab Report	8
Presentation	5	Lab Performance	5

Assignment	5	Lab Final Assessment	7
		Lab-Viva	5
Class performance	5		
Mid Exam	20		
Term Final Exam	30		

Grading Policy: University Grading Scheme

Range of Marks (%)	Letter Grade	Grade Point
80 – 100	A+	4.00
75 – 79	A	3.75
70 – 74	A-	3.50
65 – 69	B+	3.25
60 – 64	B	3.00
55 – 59	B-	2.75
50 – 54	C+	2.50
45 – 49	C	2.25
40 – 44	D	2.00
Less than 40	F	0.00

Exam Schedule

Mid Exam	Last day of classes	Term Final
Google classroom notice **08.12.2024**	Academic calendar of EWU **04.02.2025**	Academic calendar of EWU **09.02.2025, Sunday**

Special Instructions:

- **Apron is mandatory for Lab class.**
- Students are required to come to the class on time and expected to attend all classes and examinations.
- **No section change is allowed for class or lab.**
- **No make-up lab is allowed without proper reason.**
- All mobile phones MUST be turned to silent mode during class and exam period.
- Plagiarism in assignments will not be allowed.
- Cheating in exam is a punishable offence and strict actions will be taken according to EWU rule.

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