Dr. Joyanta Kumar Saha
Associate Professor
Department of Chemistry
Jagannath University

Course Outline: Spring-2024

Course Title : Engineering Chemistry-1
Course Code : CHE109
Pre- requisite : None
Class Time & Office Hour :

Time & Date	Class		Lab	Office time
	12:15-1:30	3:05-4:20	4:30-6:30	
Sun				
Mon	CHE109 S-12 FUB-603	CHE109 S-13 FUB-603	CHE109 Lab S-12 Room 723	**1:30-3:00** **FUB-9th floor**
Tue				
Wed	CHE109 S-12 FUB-603	CHE109 S-13 FUB-603	CHE109 Lab S-13 Room 723	**1:30-3:00** **FUB-9th floor**
Thu				

Make up Schedule : Make-up classes will be suitably arranged.
Course Instructor : **Dr. Joyanta Kumar Saha**
Contact : **01923616020**
Email : joyanta.saha@ewubd.edu
Office : **FUB-9th floor**

Objectives: Aims to give a basic knowledge of atoms and molecules, the concept of chemical bonding, and the structure of a molecule, introduce 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, nuclear chemistry, nano chemistry and the basics of organic and biochemistry.

Course Learning Outcomes:
CLO1: Understand 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 and accurately record and analyze the results of such experiments.

Course Contents/Description:

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, semiconductor, photoelectric effect, electromagnetic radiation.

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.

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, the geometry of molecules.

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.

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).

Mid Exam

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.

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 deposition within the electrodes, Galvanic cell, Daniel cell, dry cell, Hydrogen fuel cell.

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.

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).

Basics of biochemistry: photosynthesis, carbohydrates (saccharides), protein (amino acids, peptide bond), lipids, fat/oil (saturated/unsaturated), nucleic acids, DNA, RNA.

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.

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. Steven S. Zumdahl, Susan A. Zumdahl, Chemistry 9th ed
5. Riam Abu Much, Kurt Winkelmann, Muhamad Hugerat- Nanochemistry for Chemistry Educators, Royal Society of Chemistry
6. Stanley E. Manahan - Environmental Chemistry (2022, CRC Press)

Evaluation and Grading Policy:

Quizzes	10%
Presentations/Viva	10%
Attendance	5%
Mid Term Exam	25%
Term Final Exam	25%
Lab	25%

Grading Policy:

Numerical Scores	Letter Grade	Grade Point
80% and above	A+	4.00
75% to less than 80%	A	3.75
70% to less than 75%	A-	3.50
65% to less than 70%	B+	3.25
60% to less than 65%	B	3.00
55% to less than 60%	B-	2.75
50% to less than 55%	C+	2.50
45% to less than 50%	C	2.25
40% to less than 45%	D	2.00
Less than 40%	F	0.00

Exam Schedule: Last day of classes 29 May 2024

Exam	**Date**	
MID	Before April 2024	
Final	Wednesday	05 June 2024

Special Instructions:

- **An apron is mandatory for Lab class.**
- Students are required to come to class on time and are 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 periods.
- Plagiarism in assignments will not be allowed.
- Cheating in exams is a punishable offense and strict actions will be taken according to EWU rules.

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