

Discipline: Civil, Elect., EEE and Mech. Engg.	Semester: 2nd	Name of the Teaching Faculty: BIPIN BIHARI MOHANTY
Subject: Applied Chemistry	No. of Days/per week class allotted: 04	Semester From Date: 04.02.2025 To Date: 17.05.2025 No. of Weeks : 15
Week	Class Day	Theory Topics
1 st	1 st	Unit 1: Atomic Structure, Chemical Bonding and Solutions Rutherford model of atom, Bohr's theory (expression of energy and radius to be omitted).
	2 nd	Hydrogen spectrum explanation based on Bohr's model of atom.
	3 rd	Heisenberg uncertainty principle, Quantum numbers - orbital concept.
	4 th	Shapes of s, p and d orbitals, Pauli's exclusion principle, Hund's rule of maximum multiplicity, Aufbau rule and electronic configuration.
2 nd	1 st	Concept of chemical bonding – cause of chemical bonding, types of bonds: ionic bonding (NaCl as example).
	2 nd	Covalent bonding (H ₂ , F ₂ , HF), hybridization in BeCl ₂ , BF ₃ , CH ₄ , NH ₃ , H ₂ O).
	3 rd	Coordination bonding. Coordination bond in NH ₄ ⁺ .
	4 th	Anomalous properties of NH ₃ , H ₂ O due to hydrogen bonding.
3 rd	1 st	Metallic bonding
	2 nd	Solution - idea of solute, solvent and solution.
	3 rd	Methods to express the concentration of solution molarity (<i>M</i> = mole per liter).
	4 th	ppm, mass percentage, volume percentage, mole fraction.
4 th	1 st	Unit 2: Water Graphical presentation of water distribution on Earth (pie or bar diagram).
	2 nd	Classification of soft and hard water based on soap test.
	3 rd	Salts causing water hardness.
	4 th	Unit of hardness and simple numerical on water hardness.
5 th	1 st	Cause of poor lathering of soap in hard water, problems caused by the use of hard water in boiler (scale and sludge, foaming and priming, corrosion etc.)
	2 nd	Quantitative measurement of water hardness by ETDA method.
	3 rd	Total dissolved solids (TDS), alkalinity estimation.
	4 th	Water softening techniques - soda lime process.
6 th	1 st	Water softening techniques zeolite process.
	2 nd	Water softening techniques ion-exchange process.
	3 rd	Municipal water treatment (in brief only) - sedimentation, coagulation, filtration & sterilization.
	4 th	Water for human consumption for drinking and cooking purposes from any water sources and enlist Indian standard specification of drinking water (collect data and understand standards).

7 th	1 st	Unit 3: Engineering Materials Natural occurrence of metals - minerals, ores of iron, aluminum and copper, gangue (matrix), flux, slag, metallurgy - brief account of general principles of metallurgy.
	2 nd	Extraction of iron from hematite ore using blast furnace.
	3 rd	Extraction of aluminum from bauxite along with reactions.
	4 th	Alloys - definition, purposes of alloying, ferrous alloys and non-ferrous with suitable examples, properties and applications.
8 th	1 st	General chemical composition, composition based applications (elementary idea only, details omitted) of Portland cement and hardening materials.
	2 nd	General chemical composition, composition based applications (elementary idea only, details omitted) of Glasses, Refractory and Composite materials.
	3 rd	Polymers - monomer, homo and copolymers.
	4 th	Degree of polymerization, simple reactions involved in preparation and their application of thermoplastics and thermosetting plastics.
9 th	1 st	Thermoplastics and thermosetting plastics.
	2 nd	Preparation and application of PVC, PS, PTFE.
	3 rd	Preparation and application of nylon - 6, nylon-6, 6 and Bakelite.
	4 th	Rubber and vulcanization of rubber.
10 th	1 st	Unit 4: Chemistry of Fuels and Lubricants Definition of fuel and combustion of fuel, classification of fuels, calorific values (HCV and LCV).
	2 nd	Calculation of HCV and LCV using Dulong's formula.
	3 rd	Proximate analysis of coal (solid fuel).
	4 th	Petrol and diesel - fuel rating (octane and cetane numbers).
11 th	1 st	Chemical composition, calorific values and applications of LPG and CNG.
	2 nd	Chemical composition, calorific values and applications of water gas and coal gas.
	3 rd	Chemical composition, calorific values and applications of producer gas and biogas.
	4 th	Lubrication – function and characteristic properties of good lubricant.
12 th	1 st	Classification with examples, lubrication mechanism - hydrodynamic and boundary lubrication.
	2 nd	Physical properties of fuels: viscosity and viscosity index, oiliness.
	3 rd	Physical properties of fuels: flash point, fire point and pour point.
	4 th	Chemical properties total acid number saponification value) of lubricants
13 th	1 st	Unit 5: Electro Chemistry Electronic concept of oxidation, reduction and redox reactions.
	2 nd	Definition of terms: electrolytes, non-electrolytes with suitable examples, Faradays laws of Electrolysis and simple numerical problems.

	3 rd	Industrial Application of Electrolysis - a. Electrometallurgy b. Electroplating c. Electrolytic refining
	4 th	Application of redox reactions in electrochemical cells: Primary cells - dry cell
14 th	1 st	Application of redox reactions in electrochemical cells: Secondary cell - commercially used lead storage battery
	2 nd	Application of redox reactions in electrochemical cells: Fuel cell
	3 rd	Application of redox reactions in electrochemical cells: Solar cells
	4 th	Introduction to Corrosion of metals - definition, types of corrosion (chemical and electrochemical).
15 th	1 st	H ₂ liberation and O ₂ absorption mechanism of electrochemical corrosion.
	2 nd	Factors affecting rate of corrosion.
	3 rd	Internal corrosion preventive measures - Purification, alloying and heat treatment.
	4 th	External corrosion preventive measures - a. metal (anodic, cathodic) coatings, b. organic inhibitors.