

COURSE TITLE : **ENGINEERING CHEMISTRY - II**
COURSE CODE : **2004**
COURSE CATEGORY : **F**
PERIODS PER WEEK : **3**
PERIODS /SEMESTER : **45**
CREDITS : **3**

TIME SCHEDULE

Module	Topic	Periods
1	Atomic Structure II and Chemical bonding	11
2	Electrochemistry and Corrosion	12
3	Basic Organic Chemistry and Polymers	9
4	Fuels and Environmental Chemistry	9
Theory		41
Test		4
Total		45

COURSE OUTCOME

Student will be able to

- Enable the students to understand the latest concepts of atom model.
- Develop the basic theoretical concepts of orbitals and facts related to it. Develop the skill of writing electronics configuration of atoms.
- Introduce the concept of Chemical bonding and distinguish different types of chemical bond.
- Distinguish and justify different materials based on conductivity in Science and Technology
- Illustrate the mechanism of electrolysis with examples and to solve the problems related to electrolysis. Apply the concept of fuel cell in modern technology.
- Summarise the concept of corrosion and its after effects, solve the practical Problems related to it.
- Distinguish different types of refractories and glasses and apply this in industrial field.
- Compare, differentiate, explain, relate and extend the concept of polymers and polymerisation with examples.
- Understand, list and differentiate the concept of fuels, Identify and relate the impact of environmental pollution in daily life and to point out the remedial steps for it.

SPECIFIC OUTCOME

MODULE - I:

1.1.0 ATOMIC STRUCTURE – II AND CHEMICAL BONDING

1.1.1 Explain Bohr model of atom with merits and demerits

1.1.2 Explain dual nature of atom, deBroglie relation and Uncertainty Principle

- 1.1.3 Introduce the concept of orbit, orbital and quantum numbers with shapes of s and p – orbitals
- 1.1.4 Explain Aufbau principle, Pauli's exclusion principle and Hund's rule of maximum multiplicity
- 1.1.5 Illustrate Electronic configuration of atoms of elements up to atomic number 20
- 1.1.6 Understand the idea of chemical bonding using octet rule
- 1.1.7 Explain different types of chemical bonds – Ionic bond, Covalent bond, Coordinate bond and Hydrogen bonding with examples.

MODULE – II

2.1.0 : ELECTROCHEMISTRY AND CORROSION

- 2.1.1. Distinguish between
 - a) Conductors and Insulators
 - b) Metallic and electrolytic Conductors
 - c) Strong and Weak Electrolytes
- 2.1.2 Illustrate electrolysis taking molten NaCl and aqueous NaCl solution as examples
- 2.1.3 Explain qualitative and quantitative statement of Faradays laws of electrolysis.
- 2.1.4 Explain the applications of electrolysis (electroplating and anodizing)
- 2.1.5 Outline schematic representation of galvanic cell
- 2.1.6 Explain the classification of galvanic cell as primary, secondary and fuel cells
- 2.1.7 Illustrate primary cell with Daniel Cell as example
- 2.1.8 Explain the concept of fuel cell taking H_2-O_2 fuel cell with advantages and applications
- 2.1.9 Introduce the concept of electrode potential and EMF of cell
- 2.1.10 Explain Electrochemical Series with applications
- 2.1.11 Define Corrosion
- 2.1.12 Explain rusting of Iron and mention the conditions of rusting
- 2.1.13 Explain electrochemical theory of corrosion
- 2.1.14 Describe the methods of prevention of corrosion (Barrier Protection, Sacrificial Protection, Cathodic Protection and Antirust Solutions.)

MODULE - III :

3.1.0 CHEMISTRY OF MATERIALS AND POLYMERS

- 3.1.1 Understand the fundamental ideas of Organic Chemistry
- 3.1.2 List the differences between Organic and Inorganic Compounds
- 3.1.3 Describe Uniqueness of Carbon atom
- 3.1.4 Distinguish between Saturated and Unsaturated Compounds and introduce Concept of functional group
- 3.1.5 Understand the reactivities with the classification and properties
- 3.1.6 Explain general properties and types of glasses – soda glass, Borosilicate glass, safety glass and Insulating glass with their Contents and Uses
- 3.1.7 List the uses and advantages of optical fibres
- 3.1.8 Understand the term polymers, and polymerization
- 3.1.9 Explain the Various Classification of polymers
- 3.1.10 Distinguish between Natural and Synthetic rubber
- 3.1.11 Explain Vulcanisation and its merits

3.1..12 Introduce Common polymers- Poly ethene, polypropene, polystyrene, PVC, Neoprene, Teflon, Buna-s, Buna-N, Nylon-6 ,Nylon-66 and Bakelite with their monomers and uses.

MODULE- IV

4.1.0: FUELS AND ENVIRONMENTAL CHEMISTRY

4.1.1 Understand the term fuel

4.1.2 Define Caloric Value

4.1.3 List the qualities of a good fuel

4.1.4 Explain the Classification into solid, liquid, gaseous and nuclear fuels with examples.

4.1.5 Explain preparation and properties of water gas and producer gas

4.1.6 Define cracking and distinguish between thermal and catalytic cracking

4.1.7 Introduce different regions of atmosphere

4.1.8 Recollect the terms Pollutant and Pollution

4.1.9 Understand different types of pollution – Air Pollution, Water Pollution and Soil Pollution

4.1.10 Understand the terms – ozone depletion, green house effect and acid rain

4.1.11 Explain different types of smog

4.1.12 Understand the relevance of Green Chemistry
(Principle and scope in the present scenario)

CONTENT DETAILS

MODULE - I :

Atomic Structure II and Chemical Bonding (11+1=12 hours)

Bohr Model of atom – Postulates, Merits and Demerits - Dual nature of matter – de Broglie relation – Uncertainty Principle – Concept of Orbit and Orbital – Quantum numbers – Sub energy levels (s,p,d,f) - shape of s and p orbitals.

Electronic Configuration of atom – Aufbau principle, Pauli's exclusion principle, Hund's rule of maximum multiplicity – electronic configuration of elements upto atomic number 20.

Chemical bonding – Octet rule – Electro negativity- Types of Chemical bonds - Ionic (Electrovalent) bond – Covalent bond, Coordinate bond and hydrogen bonding – Definition with two examples for each.

MODULE - II:

Electrochemistry and Corrosion (12+1=13 hours)

Classification of materials based on conduction – conductors, Semiconductors and Insulators – Definition with two examples each – Types of Conductors – Metallic and electrolytic conductors – Any four differences.

Electrolytes and Non - electrolytes – Definition with two examples – Strong and Weak Electrolytes – Definition with two examples -

Electrolysis – Definition – Electrolysis of molten NaCl and aqueous NaCl solution using Pt electrodes – Faraday's laws of electrolysis (Qualitative and Quantitative Statements only). Applications of electrolysis – Electroplating and Anodising – Any two differences – Electroplating of Nickel on mild steel – Anode, Cathode, electrolyte and half cell reactions – Electrochemical cell – Daniel cell – Representation of the cell – half cell and over all cell reactions – Primary and Secondary cells – definition and examples only –

fuel cell – H₂-O₂ fuel cell – Cell reactions, advantages and applications – Electrode potential – standard electrode potential – EMF of cell – Electrochemical Series and its applications.

Corrosion – Definition and examples – rusting of iron Factors affecting rusting - conditions of rusting – Mechanism of rusting – Electrochemical theory – Types of Corrosion – Chemical and Electro chemical Corrosion – Prevention of Corrosion – Barrier Protection, Sacrificial Protection, Cathodic protection and Anti rust solutions.

MODULE - III:

Chemistry of Materials and Polymers (9+1=10 hours)

Introduction to organic chemistry – Differences between organic and inorganic compounds – Uniqueness of Carbon – Saturated and Unsaturated hydrocarbons –concept of functional group.

Refractories – Classification and properties – Glasses – General properties and types of glasses – Soda glass, Borosilicate glass, Safety glass and Insulating glass – Content and uses – Uses and advantages of Optical Fibres.

Polymers – definition – Classification of Polymers based on nature of monomers origin(source), structure, mode of synthesis and magnitude of intermolecular forces with two examples each – Natural rubber – Vulcanisation – Properties and merits – Common Polymers - monomers and uses – Polythene, Polypropene, Polystyrene, PVC, Neoprene, Teflon, Buna – S, Buna – N, Nylon-6, Nylon-66 and Bakelite.

MODULE - IV:

Fuels and Environmental Chemistry (9+1=10 hour)

Fuel - Definition – Calorific value – Qualities of a good fuel – classification of fuels – solid, Liquid, gaseous and nuclear fuels with three examples each – water gas and Producer gas – Preparation and Properties – Cracking – Thermal and Catalytic Cracking.

Environmental Chemistry - Regions of atmosphere – Pollutant and Pollution – Definition – Types of pollution – Air pollution, water pollution and Soil Pollution – Mention only major pollutants – Impact of Air Pollution – Ozone depletion, green house effect, acid rain and smog – Types of smog – Elementary ideas of green Chemistry.

REFERENCE :

Jain and Jain	Engineering Chemistry	Dhanpat Rai and Sons
S. S. Dara	Engineering Chemistry	S. Chand Publication
B. K Sharma	Industrial Chemistry	Geol Publication
S. S. Dara	Environmental Chemistry and Pollution Control	S. Chand Publication
	Wiley “All in One”	Wiley India Pvt. Ltd 2012 Editon.