

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CHEMISTRY
 SEMESTER-II
CHEMISTRY-II
 (Common to all branches)

Instruction : 2+1 hours per week	Semester End Exam Marks : 60	Subject Reference Code : 18BS220CH
Credits : 2	Continuous Internal Exam Marks : 40	Duration of semester End Exam : 3 Hours

LEARNING OUTCOMES

At the end of the course students should be able to:

1. Describe the construction, functioning and applications of the selected primary, secondary batteries and the fuel cells
2. Categorise the polymers and discuss the synthesis of a few polymers and their applications.
3. Suggest appropriate treatment methods of water to make it fit for domestic and industrial applications.
4. Discuss the properties, synthesis and applications of nano materials and composite materials & properties and applications of liquid crystals.
5. Analyse a few materials by using instrumental methods namely Atomic Absorption Spectroscopy, Flame Photometry, Visible spectroscopy, Thermogravimetry and Differential Scanning Calorimetry.

UNIT-I: BATTERY TECHNOLOGY (8H)

Introduction, basic concepts of battery (power density and energy density), Primary and secondary cells, - Primary batteries: construction and electrochemistry of HgO-Zn battery, Ag₂O-Zn battery and lithium-V₂O₅ battery, secondary batteries: construction and electrochemistry of lead-acid, Ni-Cd and lithium ion battery - advantages and limitations.

Fuel cells: Concept, types of fuel cells and merits-Construction and working of Molten carbonate fuel cell, phosphoric acid fuel cell, electrochemical reactions in these cells and their applications.

UNIT-II: POLYMER CHEMISTRY (8H)

Introduction, Degree of polymerization, Functionality of monomers & its effect on the structure of polymers, Classification of polymers-a) Homo and Co-polymers, b) Homo chain and Hetero chain polymers. c) Plastics, Elastomers, Fibers & Resins d) Thermoplastics & Thermosets. Molecular weight- number average & weight average- numerical- - Glass transition temperature - factors affecting T_g. Types of Polymerization - Addition and Condensation polymerization.

Plastics: Preparation, properties and applications of A) Aramid (Kevlar) B) phenol-formaldehyde (Bakelite)

Elastomers: Natural rubber- Structure - Vulcanization and advantages.

Artificial Rubbers: Preparation, properties and uses of Buna-S, and Silicone rubbers.

Biodegradable polymers: concept, preparation of poly lactic acid-significance

Conducting polymers: Definition- classification- intrinsic and extrinsic, mechanism of conduction in doped polyacetylene -Applications.

UNIT-III: WATER TECHNOLOGY (8H)

Hardness of water- types and its units (PPM, mg/liter). Calculation of degree of hardness of water-numericals. Determination of hardness of water by EDTA method -numericals. Alkalinity of water and its determination-Numericals. Boiler troubles- scales & sludges formation & prevention-Calgon method and phosphate conditioning. Softening of water by ion exchange and Reverse Osmosis. Specifications of potable water. Water treatment for drinking purpose-Coagulation, Sedimentation, Filtration, Sterilization by a) Chlorination b) Ozonolysis. Concept of Break Point Chlorination.

UNIT-IV: ADVANCED ENGINEERING MATERIALS (8H)

A. Liquid Crystals:

Introduction, Classification: Thermotropic and Lyotropic liquid crystals. Chemical constitution & liquid crystalline behavior. Molecular ordering in liquid crystals. Nematic, Smectic and Cholesteric- Applications.

B. Nano Materials:

Introduction and properties (electrical, catalytic, magnetic) of nano materials. Synthesis- top down & bottom up approaches- chemical vapor deposition & sol-gel methods. Applications of nano materials.

C. Composites:

Introduction, characteristics, classification, preparation by hand lay up method and applications.

UNIT-V: MODERN ANALYTICAL /INSTRUMENTATION TECHNIQUES IN CHEMICAL ANALYSIS (8H)

A. Visible Spectroscopy: Beer- Lamberts law- estimation of copper sulphate in the given sample

B. Atomic Absorption: Spectroscopy: Principle-working and applications.

C. Flame Photometer: Principle, working and applications

D. Thermal Analysis Techniques: Introduction, Thermogravimetry (TGA) and Differential Scanning Calorimetry (DSC) principles and applications.

Text Books:

1. PC Jain, M Jain Engineering Chemistry, Dhanapathi Rai &sons (16th edition), New Delhi.
2. Sashi Chawla, Text book of Engineering Chemistry, Dhanapathi Rai &sons, New Delhi.
3. O.G. PALANNA, Engineering Chemistry, TMH Edition.
4. SS Dara, S Chand &sons, Engineering Chemistry, New Delhi.
5. Puri, Sharma and Pathania Principles of physical chemistry, Vishal Publishing Co.
6. PL Soni and op Dharmarha, S Chand &sons, Text book of PhysicalChemistry, New Delhi.
7. University Chemistry, by B.H.Mahan.
8. NPTEL Polymer Chemistry Course, D. Dhara, IIT Kharagpur

Learning resources:

1. Polymer chemistry and Physics of Modern Materials, 2nd edn, J. M. G. Cowie, Stanley Thornes, UK, 1998
2. Introduction to Nano science, by S m Lindsay, Oxford University press.
3. Polymer Chemistry, 2nd edn, P. C. Hiemenz and T. P. Lodge, CRC Press (2007)
4. Principles of Polymer Chemistry, P. J. Flory, Cornell University Press, 1953
5. Wikipedia.