

<b>B. TECH 1<sup>st</sup> SEMESTER</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>
<b>19BS1T02: ENGINEERING CHEMISTRY</b>				

### **COURSE OUTCOMES**

**At the end of semester, the students will be able to**

**CO1:** Explain the impurities present in raw water, problems associated and how to avoid them (K2)

**CO2:** Explain the advantages of Polymers in daily life (K2)

**CO3:** Explain the theory of construction of battery and fuel cells and theories of corrosion and prevention methods. (K2)

**CO4:** Differentiate conventional and non-conventional energy sources and their advantages and disadvantages. (K2)

**CO5:** Identify the usage of advanced materials in day to day life (K2)

### **UNIT I: WATER TECHNOLOGY**

Hardness of water-types of hardness-disadvantages of hard water-determination of hardness by EDTA complexometric method. Portable water and its specifications-steps involved in purification of water-chlorination, break point of chlorination. Boiler troubles: Scale and sludge-priming and foaming-boiler corrosion-caustic embrittlement.

Industrial Water Treatment: Softening methods: zeolite process-ion exchange process.

Brackish water treatment (desalination methods): Reverse osmosis - electro dialysis.

**Learning Outcomes: At the end of this unit, the students will be able to Explain**

The impurities present in raw water, problems associated with them and how to avoid them

### **UNIT-II: POLYMERS AND COMPOSITE MATERIALS**

**Polymers**-Introduction-Types of polymers-degree of polymerization-functionality-preparation properties and applications of individual polymers-Bakelite-PVC-Poly styrene.

**Plastics:** Types (thermosetting and thermoplastic)-compounding of plastics-moulding Process (Any Four) - recycling of e-waste.

**Rubbers and elastomers:** Introduction-natural rubber-vulcanization of rubber-synthetic rubbers-Buna-N, Buna-S.

**Composite materials:** Fiber reinforced plastics-biodegradable polymers-biomedical polymers-conducting polymers

**Learning Outcomes: At the end of this unit, the students will be able to**

- **Outline** the properties of polymers and various additives added and different methods of forming plastic materials.
- **Explain** the preparation, properties and applications of some plastic materials.
- **Discuss** natural and synthetic rubbers and their applications.

### UNIT III: ELECTRO CHEMICAL CELLS AND CORROSION

#### Electrochemical Cells

Introduction-single electrode potential-electrochemical cell-electrochemical series and applications. Reference electrodes-standard hydrogen electrode and calomel electrode-construction of glass electrode.

Batteries: Construction, working and cell reaction of primary (dry cell) and Secondary (Pb acid, Ni-Cd, Zinc-Air and Li-ion) battery. Fuel cells ( $H_2-O_2$ , Methanol-Air cells).

#### Corrosion

Defination-theories of corrosion (Chemical and Electrochemical corrosion)-types of corrosion (Galvanic, Differential aeration (waterline and pitting corrosion), stress Corrosion). Factors influencing rate of corrosion-nature of metal-nature of corrosive atmosphere.

Corrosion Prevention methods: Cathodic protection-Sacrificial anodic method-Impressed voltage method. Metallic coatings: Galvanization-Tinning-Electro plating-Electro less plating.

#### Learning Outcomes: At the end of this unit, the students will be able to

- **Explain** the theory of construction of battery and fuel cells.
- **Categorize** the reasons for corrosion and study some methods of corrosion control.

### UNIT IV: CONVENTIONAL AND NONCONVENTIONAL ENERGY RESOURCES

#### Conventional energy sources

Introduction to fuels-classification and characteristics of fuels-solid, Liquid and gaseous fuels-advantages and disadvantages-calorific value-higher and lower calorific values-construction and working of bomb calorimeter-analysis of coal-proximate and ultimate analysis-numerical problems related to bomb calorimeter, Dulong's formula and coal analysis-petroleum refining-cracking-petrol and diesel knocking-octane number and cetane number-gaseous fuels-Natural gas-CNG-LPG

#### Non-conventional energy sources

Solar energy: Advantages-disadvantages of solar cells-construction and working of photo voltaic cell-Introduction to hydro power-geo thermal power-tidal and wave power.

#### Learning Outcomes: At the end of this unit, the students will be able to

- **Differentiate** conventional and non conventional energy sources and their advantages and disadvantages.
- **Explains** energy production by different natural sources

### UNIT V: CHEMISTRY OF MATERIALS

Nano materials: Introduction-sol-gel method-characterization by BET, SEM and TEM methods-carbon nanotubes and fullerenes: Types, preparation and applications

Semiconductors:Preparation (Distillation, Zone refining, Czochralski crystal pulling epitaxy, diffusion, ion implantation)-semiconductor devices (P-N junction diode as rectifier, junction transistor)

Cement: Constituents of cement-setting and Hardening of cement, Decay of Cement.

Refractories: Definition of refractory-classification and properties of refractoriness-applications of refractories.

#### Learning Outcomes: At the end of this unit, the students will be able to

- **Outline** the awareness of materials like nanomaterials and fullerenes and their uses.
- **Explain** the techniques that detect and measure the surface properties of materials.
- **Illustrate** the commonly used industrial materials.

**Text Books:**

- T1.** A Text Book of Engineering Chemistry - N. Y. S. Murthy, V. Anuradha & K. Ramana Rao, Maruthi Publications. (2018)
- T2.** A Text Book of Engineering Chemistry - K. Sesa Maheswaramma, Mridula Chugh, Pearson Publications (2018).

**Reference Books:**

- R1.** Engineering Chemistry – Jain & Jain, Dhanpat Rai Publishing Company (2017)
- R2.** Text Book of Engineering Chemistry - Shashi Chawla, Dhanpat Rai & Co. (P) Limited (2017)
- R3.** Chemistry –Prasanta Rath, Subhendu Chakroborthy, Cengage publications (2018)

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