

## B. Tech Engineering Chemistry Syllabus Revision – 2022

### Engineering Chemistry

Subject Code: CH10101A (with effect from August 2022) – 15 % (6/40) modification

Credit: 4

Contact hours: 4 Hrs/week

**Objective:** The course will give students fundamental concepts of electrochemistry, corrosion, fuels, polymers and liquid crystal and their applications in various industries.

#### Course Outcome:

**CO1:** To acquire basic knowledge of electrodes and the electrochemistry involved in working of cells and batteries.

**CO2:** Understand the causes and mechanism of corrosion, its consequences, and methods to minimize corrosion to improve industrial designs.

**CO3:** Understand the types of liquid crystals, characteristics of liquid crystalline materials and their application in display.

**CO4:** To acquire basic knowledge of different types of polymers and their application in conducting polymers.

### Module I

#### Electrochemistry-I

**Electrochemical Changes** – Electrode potential, half reactions, origin of electrode potential – measurement of electrode potential, Nernst equation and its applications, electrochemical series & its applications, electrochemical cell and its classifications (galvanic cell, electrolytic cell), liquid junction potential, salt bridge, types of electrodes (reference electrodes- standard hydrogen electrode, calomel electrode, silver-silver chloride electrode and indicator electrodes- hydrogen electrode, quinhydrone electrode), electromotive force. (12 Hrs)

### Module II

#### Electrochemistry-II

**Cells and Batteries:** Standard cell, determination of EMF (Poggendorff's compensation method), concentration cell, EMF of concentration cell.

Overview on Primary and secondary cell: Dry (Leclanche) Cell, Alkaline Storage Batteries - Nickel Cadmium Alkaline Cells. The lead-acid storage cell, lithium-ion battery, Fuel Cell: H<sub>2</sub>-O<sub>2</sub> fuel cell. (6 Hrs)

### Module III

**Corrosion and its control:** Corrosion – Cause of corrosion, types and mechanism of corrosion - dry corrosion, Pilling Bedworth rule, electrochemical or wet corrosion (mechanism via Hydrogen evolution & Oxygen absorption), types of electrochemical corrosion (galvanic corrosion, concentration cell corrosion, water line corrosion, stress corrosion - caustic embrittlement, passivity, galvanic series, factors influencing corrosion, corrosion control-corrosion inhibitors, cathodic protection - sacrificial anodic and impressed current cathodic protection. (10 Hrs)

### Module IV

**Liquid crystals:** Introduction, classification of liquid crystals-thermotropic & lyotropic liquid crystal, different phases of thermotropic & lyotropic liquid crystal, chemical constitution and liquid crystalline behaviour, liquid crystalline behaviour in homologous series, molecular ordering in different meso phases, applications of liquid crystals in displays- LCD. (6Hrs)

### Module V

**Polymers:** Definition, type of polymerization with example, Copolymerization, natural rubber, Introduction of Ziegler-Natta polymerization, tacticity (atactic, isotactic, syndiotactic), conducting polymers, Low density polythene (LDPE) and high-density polythene (HDPE), Molecular weights of polymers- number average molecular weight  $M_w$  and weight average molecular weight  $M_n$  and Z-average molecular weight,  $M_z$ . Biopolymers: types and examples. (6 Hrs)

#### Texts Books / Reference Books:

- i) A Text book of Engineering Chemistry - Shashi Chawla
- ii) A Text book of Engineering Chemistry - P.C. Jain & Monika Jain
- iii) Engineering Chemistry - O G Palanna
- iv) Chemistry of Engineering Materials - C.V. Aggrawal
- v) An Introduction to Electrochemistry - Samuel. Glasstone