NATIONAL INSTITUTE OF TECHNOLOGY SILCHAR
DEPARTMENT OF CHEMISTRY

Subject Code: CY11001	**CHEMISTRY**	**L-T-P-C**
Semester: 1st / Year: 1st	**Pre-Requisite - None**	**3-0-0-3**

Syllabus for EE, ECE and EIE

Polymer & Composite materials: Classification of polymers, methods of polymerization, thermosetting and thermoplastic polymers, conducting and biodegradable polymers, synthesis, properties and applications of polyethylene, chloropolyvinyl chloride (CPVC), Composite materials: Classification and basic requirement of composite materials, applications.

Nanomaterials & Fuels: Nanomaterials: Introduction; synthesis, characterization and applications of nanomaterials. Fuel: Introduction, classification of fuel, calorific value (HCV and LCV), determination of calorific value by bomb calorimetry, bio-fuels.

Chemical Thermodynamics: Introduction to chemical thermodynamics; second law of thermodynamics, Gibbs free energy, reaction spontaneity and equilibrium, fundamental equations, Maxwell's relations, Gibbs-Helmoltz equation, chemical potential.

Electrochemistry & Corrosion: Electrode potentials and its relevance to oxidation and reduction, types of electrodes, galvanic cell, measurement of EMF and application of EMF, types of reference electrodes (hydrogen, glass, quinhydrone electrodes), determination of pH. Dry Cells, lead acid cell and Fuel Cells: Construction, reaction, advantages and applications. Corrosion: Types of corrosion, factors affecting corrosion and corrosion control.

Water & Its Treatment: Sources of impurities in water; hardness in water and its disadvantages; boiler scale and its prevention; caustic embrittlement; boiler corrosion: treatment of water at industrial and domestic level; biological oxygen demand (BOD) and chemical oxygen demand (COD) and their significance.

Spectroscopy: Basics of spectroscopy, electromagnetic spectrum, Basic principles of IR, UV-Visible and NMR spectroscopy, Application of IR, UV-Visible and NMR spectroscopy in structure elucidation and material characterization.

Text Books:

1. Engineering Chemistry by Jain and Jain (Dhanpat Rai)
2. Engineering Chemistry by S Chawla (Dhanpat Rai)
3. Physical Chemistry by S Glasstone (McMillan India)
4. Environmental Chemistry by A K Dey (New Age International)
5. Chemistry of Nanomaterials by C N R Rao et al (Wiley-VCH)

Course Objectives: The course aims to provide foundational knowledge of polymers, composite materials, nanomaterials, and fuels with their engineering applications. It introduces the principles of chemical thermodynamics and electrochemistry essential for understanding energy systems and material behaviour. The course also covers corrosion mechanisms and prevention methods, along with water treatment techniques for industrial purpose. The course also covers basic spectroscopic tools for material analysis.

Course Outcomes: After completion of the course, the students will be able to

CO-1: Understand the synthesis, properties, and applications of polymers, composites, and nanomaterials for engineering and industrial use.

CO-2: Apply the principles of chemical thermodynamics and electrochemistry to solve engineering problems related to energy, fuel and electrochemical systems.

CO-3: Identify different types of corrosion and propose appropriate control and prevention strategies for materials.

CO-4: Evaluate water quality and treatment methods, and interpret spectroscopic data for material analysis.

NATIONAL INSTITUTE OF TECHNOLOGY SILCHAR
DEPARTMENT OF CHEMISTRY

Subject Code: CY11002	**CHEMISTRY**	**L-T-P-C**
Semester: 2nd / Year: 1st	**Pre-Requisite - None**	**3-0-0-3**

Syllabus for ME, CE and CSE

Polymer & Composite materials: Classification of polymers, methods of polymerization, thermosetting and thermoplastic polymers, conducting and biodegradable polymers, synthesis, properties and applications of polyethylene, chloropolyvinyl chloride (CPVC), Composite materials: Classification and basic requirement of composite materials, applications.

Fuel & Petroleum: Fuel: Introduction, classification of fuel, calorific value (HCV and LCV), determination of calorific value by bomb calorimetry, bio-fuels. Petroleum, knocking, octane number and cetane number, petrochemical.

Nanomaterials & Green Chemistry: Nanomaterials: Introduction; synthesis, characterization and applications of nanomaterials. Principles and application of Green Chemistry.

Electrochemistry & Corrosion: Electrode potentials and its relevance to oxidation and reduction, types of electrodes, galvanic cell, measurement of EMF and application of EMF, types of reference electrodes, determination of pH. Dry Cells, lead acid cell and Fuel Cells: Construction, reaction, advantages and applications. Corrosion: Types of corrosion, factors affecting corrosion and corrosion control.

Water & its treatment: Sources of impurities in water; hardness in water and its disadvantages; boiler scale and its prevention; caustic embrittlement; boiler corrosion: treatment of water at industrial and domestic level; biological oxygen demand (BOD) and chemical oxygen demand (COD) and their significance.

Spectroscopy: Basics of spectroscopy, electromagnetic spectrum, Basic principles of IR, UV-Visible and NMR spectroscopy, Application of IR, UV-Visible and NMR spectroscopy in structure elucidation and material characterization.

Text Books:

1. Engineering Chemistry by Jain and Jain (Dhanpat Rai)
2. Engineering Chemistry by S Chawla (Dhanpat Rai)
3. Physical Chemistry by S Glasstone (McMillan India)
4. Environmental Chemistry by A K Dey (New Age international)
5. Chemistry of Nanomaterials by C N R Rao et al (Wiley-VCH)

Course Objectives: The course aims to provide foundational knowledge of polymers, composite materials, nanomaterials, and fuels with their engineering applications. It introduces the principles of chemical thermodynamics and electrochemistry essential for understanding energy systems and material behaviour. The course also covers corrosion mechanisms and prevention methods, along with water treatment techniques for industrial purpose. The course also covers basic spectroscopic tools for material analysis.

Course Outcomes: After completion of the course, the students will be able to

CO1: Explain the properties and applications of polymers, composites, petroleum-based fuels for engineering and industrial use.

CO2: Apply the concepts of nanomaterials and green chemistry in the development of sustainable engineering solutions.

CO3: Analyze electrochemical processes and corrosion mechanisms to propose suitable mitigation techniques.

CO4: Assess water quality and treatment methods, and interpret spectroscopic data for material analysis.