

# CHEMISTRY-I

## Course Objectives:

- (1) To understand the basics of quantum mechanical concepts and spectroscopy.
- (2) To predict the bulk properties and processes using thermodynamic considerations.
- (3) To learn an introductory idea about new materials.
- (4) To understand the fundamental concepts on fuels and corrosion chemistry.

## Module I: [10Classes]

Quantum Chemistry and Spectroscopy: Basic concepts and postulates of quantum mechanics. Introduction to Schrodinger Wave Equation (without derivation), Particle in a box: Energy levels, quantum numbers and selection rule.

Spectroscopy: Lambert Beer's Law, Principles and applications of UV-Visible Molecular Absorption Spectroscopy; Chromophores, applications on quantitative analysis. Effect of conjugation on chromophores, Absorption by aromatic systems, introductory idea on rotational and vibrational Spectroscopy Principles and application to diatomic molecules.

## Module II: [8 Classes]

The phase rule: Statement of Gibb's phase rule and explanation of the terms involved, Phase diagram of one component system – water and sulfur system, Condensed phase rule, Phase diagram of two component system – Eutectic Bi-Cd, Pb-Tin system & Isomorphous System.

## Module III: [ 10 Classes]

Fuels: Classification of fuels, calorific value. (Determination by Dulong's formula), G.C.V. and N.C.V., Solid fuels, Analysis of coal. Liquid fuels: Classification of petroleum, Refining of petroleum, Cracking, Knocking and anti knocking, cetane and octane numbers. Unleaded petrol, synthetic petrol, power alcohol. Gaseous Fuel: Producer gas, Water gas, LPG, CNG, Kerosene gas, Combustion calculation.

## Module IV: [ 08 Classes]

Corrosion: Electrochemical theory of corrosion, galvanic series, Types of corrosion; Differential metal corrosion, Differential aeration corrosion (Pitting and water line corrosion), Stress corrosion (caustic embrittlement in boilers), Factors affecting, metal coatings – Galvanizing and Timing, Corrosion inhibitors, cathodic protection.

## Module-V: [10 Classes]

New Materials: Introduction to nanomaterials, classification (0D, 1D, 2D) with examples, size dependent properties, Top-down and Bottom-up approaches of nanomaterial synthesis. Introductory idea on synthesis of nanomaterials via green synthetic route. Application of nanomaterials in environmental fields and electronic devices.

## Text Books:

1. Engineering Chemistry (NPTEL web-book) by B. L. Tembe, Kamaluddin and M. S. Krishan.
2. Text Book in Applied Chemistry by A. N. Acharya and B. Samantaray, Pearson India.