

## APPLIED CHEMISTRY (UCB001)

L	T	P	Cr
3	1	2	4.5

**Course objective:** The course aims at elucidating principles of applied chemistry in industrial systems, water treatment, engineering materials and analytical techniques.

### **Water Treatment and Analysis**

Standards for drinking water, Water Quality parameters, Determination of alkalinity of water, Hardness of water: Units and determination. Demineralization of water, Softening of water: Lime-soda Process, Ion exchange process, Zeolite process. Internal and external conditioning: Carbonate conditioning, Phosphate conditioning, Colloidal conditioning, Calgon conditioning, Desalination of brackish water.

### **Corrosion**

Corrosion and its economical aspects, Types of corrosion: Galvanic, Erosion, Crevice, Pitting, Waterline, Soil, Microbiological. Theories of corrosion: Acid, Direct Chemical attack, Electrochemical. Corrosion prevention by metallic, organic/inorganic coatings and corrosion inhibitors.

### **Electrochemistry**

Migration of ions, Transference number, Determination of Transference number by Hittorf's method, Conductometric titrations, Types of electrode: Calomel and glass electrode, Liquid junction potential, Potentiometric Titrations.

### **Fuels and Battery**

Classification of fuels, Calorific value, Cetane number, Octane number, fuel quality, Comparison of solid liquid and gaseous fuel, properties of fuel, alternative fuels: biofuels, Power alcohol and synthetic petrol, Battery, Photovoltaic cell, Metal-air battery, Lithium and nickel battery.

### **Spectroscopic Techniques**

Beer-Lambert's law, Introduction to atomic and molecular spectroscopy, Principle, instrumentation and applications of atomic absorption, atomic emission, UV-Vis and IR spectroscopy.

### **Phase Rule**

Introduction to Phase, Component and Degree of freedom, Derivation of phase rule, One component and two component systems.

### **Chemistry of Polymers**

Overview of polymers, Types of polymerization, Molecular weight determination, Industrial applications of polymers in fiber, paints and coatings, Conducting polymers. Biodegradable Polymers, Polymers in automotive industry.

### **Green Chemistry and Nanochemistry**

Principles of Green Chemistry, Atom economy in rearrangement, addition, substitution and elimination reactions, Green Ibuprofen synthesis, Zeolites, Nanomaterials: synthesis, properties and application.

### **Laboratory Work**

Experiments involving use of pH meter, conductivity meter, potentiometer, colorimeter, UV-Vis spectrophotometer and melting point apparatus. Determination of hardness, alkalinity, chloride, chromium, iron and copper in aqueous medium, and properties of fuel.

**Course outcome:** The students will acquire knowledge of

1. Different types of polymers, engineering and nanomaterials and their applications

2. Approach to demonstrate the working of electrodes, working and uses of classical batteries.
3. Differentiate various types of corrosion, and gain knowledge on control measures associated with corrosion
4. Principles underlying various methods of water and instrumental analysis.

#### ***Text Books***

1. Ramesh, S. and Vairam S. *Engineering Chemistry*, Wiley India (2012) 1<sup>st</sup> ed.
2. Jain, P.C. and Jain, M. *Engineering Chemistry*, Dhanpat Rai Publishing Co. (2005) 15<sup>th</sup> ed.
3. Puri, B.R., Sharma and L.R., Pathania, M.S. *Principles of Physical Chemistry*, Vishal Publishing Co. (2008).

#### ***Reference Books***

1. Sivasankar, B., *Engineering Chemistry*, Tata McGraw-Hill Pub. Co. Ltd, New Delhi (2008).
2. Shulz, M.J. *Engineering Chemistry*, Cengage Learnings, (2007) 1<sup>st</sup> ed.
3. Chanda, M. and Roy, S. K., *Industrial Polymer, Specialty Polymer and their application*, CRC Press (2008) 4<sup>th</sup> ed.