



I Year - I Semester		L	T	P	C
		3	0	0	3
<b>APPLIED CHEMISTRY(BS1106)</b>					

**Pre-requisite Course:** Students should have basic understanding of Chemistry.

**Course Description and Objectives:** Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

**Course Outcomes:**

Upon completion of the course, the student will be able to achieve the following outcomes.

CO	Course Outcomes	POs
1	Outline the properties of polymers and various additives added and different methods of forming plastic materials. Interpret the mechanism of conduction in conducting polymers	4
2	Explain the theory of construction of battery and fuel cells. Categorize the reasons for corrosion and study some methods of corrosion control.	5
3	Understand the importance of materials like nano-materials and fullerenes, Liquid crystals and superconductors and their uses. Understand the preparation of semiconductors.	3
4	Obtain the knowledge of computational chemistry and understand importance molecular machines	3
5	Understand the principles of different analytical instruments & explain the different applications of analytical instruments. Design sources of energy by different natural sources	4

**SYLLABUS:**

**UNIT - I: POLYMER TECHNOLOGY**

**Objective: Importance of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries**

**Polymerisation:-** Introduction-methods of polymerization (emulsion and suspension)-physical and mechanical properties. **Plastics:** Compounding-fabrication (compression, injection, blown film, extrusion) - preparation, properties and applications of PVC, polycarbonates and Bakelite-mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste. **Elastomers:-** Natural rubber-drawbacks-vulcanization-preparation, properties and applications of synthetic rubbers (Buna S, thiokol and polyurethanes). **Composite materials:** Fiber reinforced plastics-conducting polymers-biodegradable polymers-biopolymers-biomedical polymers.



## UNIT-II: ELECTROCHEMICAL CELLS AND CORROSION

**Objective:** Outline the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented

Single electrode potential-Electrochemical series and uses of series-standard hydrogen electrode, calomel electrode-concentration cell-construction of glass electrode-Batteries: Dry cell, Ni- Cd cells, Ni-Metal hydride cells, Li ion battery, zinc air cells-Fuel cells: H<sub>2</sub>-O<sub>2</sub>, CH<sub>3</sub>OH-O<sub>2</sub>, phosphoric acid, molten carbonate.

Corrosion:-Definition-theories of corrosion (chemical and electrochemical)-galvanic corrosion, differential aeration corrosion, stress corrosion, waterline corrosion-passivity of metals-galvanic series-factors influencing rate of corrosion-corrosion control (proper designing, cathodic protection)-Protective coatings: Surface preparation, cathodic and anodic coatings, electroplating, electroless plating (nickel). Paints (constituents, functions, special paints)

## UNIT-III: MATERIAL CHEMISTRY

**Objective:** To express the increase in demand as wide variety of advanced materials are introduced; which have excellent engineering properties

**Part I : Non-elemental semiconducting materials:-** Stoichiometric, controlled valency & chalcogen photo/semiconductors-preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling, epitaxy, diffusion, ion implantation) - Semiconductor devices (p-n junction diode as rectifier, junction transistor).

**Insulators & magnetic materials:** electrical insulators-ferro and ferri magnetism- Hall effect and its applications.

### Part II:

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

**Liquid crystals:-** Introduction-types-applications.

**Super conductors:-**Type -I, Type II-characteristics and applications

## UNIT-IV: ADVANCED CONCEPTS/TOPICS IN CHEMISTRY

**Objective:** Explain the crystal structures, and the preparation of semiconductors. Magnetic properties are also studied

**Computational chemistry:** Introduction, Ab Initio studies

**Molecular switches:** characteristics of molecular motors and machines, Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid-base controlled molecular shuttle, a molecular elevator, an autonomous light-powered molecular motor



## UNIT-V:

**Objective:** Recall the increase in demand for power and hence alternative sources of power are studied due to depleting sources of fossil fuels. Advanced instrumental techniques are introduced.

### Part A: SPECTROSCOPIC TECHNIQUES

Electromagnetic spectrum-UV (laws of absorption, instrumentation, theory of electronic spectroscopy, Frank-condon principle, chromophores and auxochromes, intensity shifts, applications), FT-IR (instrumentation and IR of some organic compounds, applications)-magnetic resonance imaging and CT scan (procedure & applications).

### Part B: NON CONVENTIONAL ENERGY SOURCES

Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, tidal and wave power, ocean thermal energy conversion

## TEXT BOOKS:

1. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publishing Co.

## REFERENCE BOOKS:

1. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2019 edition.