# EC/CE/EE/ CS/IT/ME-109

#### CHEMISTRY OF ENGINEERING MATERIALS

LTPC

#### **COURSE OBJECTIVES:**

- 1. To acquire knowledge on formation of polymers and conditions to act as conducting polymers.
- 2. To gain knowledge on the chemistry of some important plastics and rubbers commonly used.
- 3. To understand parameters related to efficiency of various fuels
- 4. To gain knowledge on the characteristics of refractories and lubricants.
- 5. To understand the requirements and chemistry of explosives and utility of liquid crystals

### **COURSE OUTCOMES:**

#### After successful completion of the course, the students

- 1. demonstrate formation of polymers and the utility of conducting polymers in electronics, electrical and other fields.
- 2. illustrate usage of plastics and elastomers in day to day life and in fields like automobile, electronics, etc.
- 3. Classify fuels based on calorific values.
- Select appropriate lubricant for a given system, and explain the characteristics and utility of refractories.
- 5. Analyze the characteristics of liquid crystals and explosives.

UNIT I Text Book-1 & 2 (12)

**Polymers:** Monomer functionality, degree of polymerization, Tacticity, classification of polymerization - addition, condensation and co-polymerization, mechanism of free radical polymerization.

**Conducting polymers:** Introduction, examples and applications, Polyacetylene - mechanism of conduction.

UNIT II Text Book-1 (12)

**Plastics -** Thermoplastic and thermosetting resins, preparation, properties and uses of Bakelite, polyesters, Teflon and PVC. Compounding of plastics.

**Rubber -** Processing of latex, Drawbacks of natural rubber - Vulcanization, Chemistry of Synthetic rubbers- Buna-S and Buna-N, polyurethane rubber and silicone rubber, epoxy resin (adhesive)

UNIT III Text Book-1 (12)

**Fuels:** Classification of fuels, calorific value - LCV and HCV-units and determination by Bomb calorimeter, Coal- Ranking, proximate and ultimate analysis, carbonization of coal-types (using Beehive oven), Metallurgical coke-properties and uses.

**Petroleum based:** Fractional distillation, cracking-fixed bed, reforming, octane number and cetane number of liquid fuels, composition and uses of petrol, diesel, CNG and LPG.

UNIT IV Text Book-1 & 2 (12)

**Refractories:** Characteristics, classification, properties and their significance-refractoriness, strength of refractoriness under load, dimensional stability, thermal spalling, thermal expansion, thermal conductivity, porosity Common refractory bricks- silica, fire clay and carborundum.

**Lubricants:** Classification, functions, properties of lubricants - Viscosity, Viscosity index, Flash point, Fire point, Cloud point, Pour point, Oilyness. Solid lubricants - Graphite and Molybdenum sulphide, Additives, determination of viscosity by Red wood viscometer.

UNIT V Text Book-1 (12)

Liquid crystals: Structure of liquid crystal forming compounds, Classification and applications.

**Explosives:** Characteristics, terms related to explosives, classification-primary, low and high explosives. Manufacture of gun powder, lead azide, nitroglycerine and RDX

#### **LEARNING RESOURCES:**

## TEXT BOOK(s):

- 1. Engineering Chemistry, P.C. Jain and Monika Jain, 15th Edition, 2008, Dhanpat Rai Publishing Company, New Delhi.
- 2. A Text Book of Engineering Chemistry, Shashi Chawla, 3rd Edition, 2009, Dhanpat Rai and Co.(P) Ltd., New Delhi.

#### **REFERENCE BOOK(s):**

- 1. A Text Book of Engineering Chemistry, S.S. Dara and S.S. Umare, 12th Edition, 2010, S.Chand and Co.Ltd.
- 2. Principles of Polymer Science, P.Bahadur and N.V. Sastry, Narora Publishing House

## **WEB RESOURCES:**

- 1. http://www.chem1.com/acad/webtext/states/polymers.html
- 2. http://www.nptel.ac.in/courses/104105039/
- 3. http://freevideolectures.com/Course/3070/Science-and-Technology-of-Polymers