

16HS107 ENGINEERING CHEMISTRY

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P	WA/RA	SSH/HS	CS	SA	S	BS
45	-	-	20	45	-	10	-	-

Course Description and Objectives:

This course aims to develop fundamental knowledge on new engineering materials and their significance in science and engineering applications. In addition, characterization of materials using basic and advanced experimental techniques is also offered. Besides, analysis of water sample and treatment method for domestic, commercial and industrial applications are also covered.

Course Outcomes:

The student will be able to:

- understand the limitations of using hard water for domestic and industrial purposes.
- choose and apply suitable methods to soften the hard water for industrial and domestic applications.
- understand electrochemistry and its importance for applications such as fuel cells, modern lithium ion batteries etc.
- understand the types of corrosion and their implications followed by their control and prevention methods.
- familiarize the preparation, properties and applications of various polymers.

SKILLS:

- ✓ Analyse the total hardness of water sample.
- ✓ Understand the basic principles involved in various batteries.
- ✓ Understand the mechanisms of corrosion and various controlling methods.
- ✓ Synthesize various polymers.
- ✓ Identify the functional groups present in chemical compounds using Infrared and Ultraviolet instruments.

UNIT - 1**L-9**

WATER TECHNOLOGY: Introduction, WHO, BIS standards of water, Hardness of water, Determination of hardness by EDTA (Numerical Problems), Disadvantages of hard water, Scales and sludges, Caustic embrittlement, Boiler corrosion, Priming and foaming, Softening methods - Zeolite process, Ion Exchange process; Desalination of brackish water - Reverse osmosis, Electrodialysis.

UNIT - 2**L-9**

ELECTRO CHEMISTRY: Electrode potential, Electrochemical series, Nernst equation, Reference electrodes, Calomel and standard hydrogen electrode, Ion selective electrode, Glass electrode, Determination of pH using glass electrode; Primary cell, Secondary cell - Lead-acid storage cell, Lithium ion battery; Fuel cells - Hydrogen oxygen, Methanol oxygen.

UNIT - 3**L-9**

SCIENCE OF CORROSION: Introduction, Dry corrosion, Wet corrosion, Mechanisms of wet corrosion, Bimetallic corrosion, Concentration cell corrosion, Factors influencing the rate of corrosion; Corrosion control methods - Cathodic protection, Electroplating, Electrolessplating, Corrosion inhibitors.

UNIT - 4**L-9**

POLYMERS: Introduction, Types of polymerization - Preparation, Properties and applications of polyethylene, PVC, Teflon, Bakelite, Urea formaldehyde, Silicones; Rubber, Vulcanization, Synthetic rubbers - Buna-S, Buna-N, Neoprene; Introduction to conducting polymers; Poly thiophene.

UNIT - 5**L-9**

INSTRUMENTAL TECHNIQUES: Interaction of radiation with matter, UV-Visible spectroscopy - Beer, Lambert's law, Qualitative and quantitative analysis, Block diagram of UV-Visible spectrophotometer, IR spectroscopy - Types of vibrations, Block diagram of IR spectrophotometer.

TEXT BOOKS:

1. P.C Jain and Monica Jain, "Engineering Chemistry", 17th edition, Dhanpat Rai Publications, 2010.
2. Shashi Chavala, "A Text book of Engineering Chemistry Engineering Materials and Applications", 3rd edition, Dhanpat Rai Publications, 2015.

REFERENCE BOOKS:

1. K.S. Maheswaramma and Mridula chugh, "Engineering Chemistry", 1st edition, Pearson publication, 2015.
2. M.R. Senapati, "Advanced Engineering Chemistry", 2nd edition, Lakshmi Publications, 2006.
3. H. W. Wilard and Demerit, "Instrumental methods of Analysis", 7th edition, CBS Publications, 1986.
4. Gurudeep Raj and Chatwal Anand, "Instrumental Methods of Analysis", 5th edition, Himalaya Publications, 2007.

ACTIVITIES:

- Collect water samples from different villages near VFSTR University and determine the total hardness, and total alkalinity.
- Present the water analysis report to the villagers and suggest proper measures to be taken.
- Measure the rate of corrosion of iron objects by weight loss method.
- Identify some of the functional groups like carboxylic acid, aldehyde and ketones by I.R. Spectroscopy.
- Collect water sample from different villages and estimate the fluoride present in the raw water and suggest some steps for the removal of fluoride.