EC/CM/EE112	CHEMISTRY FOR ENGINEERS	L	T	P	C	Int	Ext
		3	-	-	3.0	30	70

Semester I [First Year]

COURSE OBJECTIVES:

1. To familiarize chemistry and its engineering applications
2. To train the students on the principles and applications of electrochemistry and polymers
3. To introduce instrumental methods and advanced engineering materials

COURSE OUTCOMES:

At the end of the course, the students are able to:

1. understand the Quality of water for domestic and industrial purpose, structural aspects of molecules and apply them in analyzing the behavior of modern engineering materials.
2. compare the materials of construction for battery and electrochemical sensors.
3. explain the preparation, properties, and applications of thermoplastics, thermosetting, elastomers and conducting polymers.
4. summarize the concepts of Instrumental methods.

UNIT I *Text Book - 1,2* [CO:1] **(12)**

Water Technology, Molecular orbital theory and Bonding Models:

Water Technology: Soft and hard water, Temporary hardness and Permanent hardness- Impurities of water-Boiler Troubles, WHO Standards, Municipal Treatment for domestic purpose, Desalination of Brackish water, Electro dialysis and Reverse Osmosis.

Molecular orbital theory -bonding in homo- and hetero nuclear diatomic molecules - energy level diagrams of O and CO - pi -molecular orbitals of butadiene and benzene, calculation of bond order.

UNIT II *Text Book - 1,2* [CO:2] **(12)**

Electrochemistry and its Applications:

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems. Electrochemical sensors - potentiometric sensors with examples, amperometric sensors with examples.

Primary cells- Zinc-air battery, Secondary cells -Lithium-ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen fuel cell- working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).

UNIT III *Text Book - 1* [CO:3] **(12)**

Polymer Chemistry:

Introduction to polymers, Functionality, Degree of polymerization, Tacticity, Types of polymerization, with specific examples and mechanism-Free radical polymerization

Plastics -Thermo and Thermosetting plastics, Preparation, properties and applications of - PVC, Teflon, Bakelite, Nylon-6,6 and Carbon fibers.

Elastomers-Buna-S, Buna-N-preparation, properties and applications.

Conducting polymers - polyacetylene, polyaniline, - mechanism of conduction and applications.

Bio-Degradable polymers - Poly Glycolic Acid (PGA), Poly Lactic Acid (PLA).

UNIT IV *Text Book - 1* [CO:4] **(12)**

Instrumental Methods :

Electromagnetic spectrum. Absorption of radiation : Beer-Lambert's law. UV-Visible Spectroscopy, electronic transition, Chromophore, Auxochrome and various types of shifts, Instrumentation and general applications.

IR spectroscopy-Basic Principles, Application to H O & CO , Instrumentation. Chromatography-Basic Principle, Classification-HPLC: Principle, Instrumentation and general applications.

LEARNING RESOURCES:

TEXT BOOK(s):

1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

REFERENCE BOOK(s):

1. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
2. J.D. Lee, Concise Inorganic Chemistry, 5th Edition, Wiley Publications, Feb.2008
3. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition.