EC/CE/CS/ EE/IT/ME-103	APPLIED CHEMISTRY	L	T	P	C
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COURSE OBJECTIVES:

1. To know the softening methods and quality parameters of water used in industries.
2. To know the requirements and purification methods of drinking water.
3. To understand the construction and functioning of electrochemical energy systems.
4. To study the mechanisms, types, factors influencing corrosion and protection methods of corrosion.
5. To acquire knowledge on latest analytical techniques.

COURSE OUTCOMES:

After successful completion of the course, the students will be able to

1. demonstrate knowledge in Quality and utility of water in industries.
2. desribe the water treatment methods for purification.
3. analyze the functioning of electrochemical energy systems.
4. relate corrosion and environment and suggest methods to prevent corrosion.
5. analyze substances using techniques like spectrophotometry, colorimetry, conductometry and potentiometry.

UNIT I *Text Book - 1* **(12)**

Water technology: Types of Hardness - units and determination by EDTA method (simple problems), Water technology for industrial purpose: Boiler troubles- scales, sludges, caustic Embrittlement, boiler corrosion, priming and foaming - causes and prevention.

Internal conditioning - phosphate, calgon and carbonate treatment. External conditioning-lime soda process (simple problems), softening by ion exchange process. Desalination of brackish water by electro dialysis and reverse osmosis.

UNIT II *Text Book - 1* **(12)**

Water treatment for drinking purpose - WHO guidelines, sedimentation, coagulation, filtration (slow sand filter), various methods of chlorination, breakpoint chlorination.

Phase Rule: Statement and explanation of the terms involved, one component water system, condensed phase rule - construction of phase diagram by thermal analysis, simple eutectic system (Pb-Ag system only), applications eutectic compounds.

UNIT III *Text Book - 1* **(12)**

Electrochemistry: Electrode potential, electrochemical series and its significance, Nernst equation - derivation - related problems, Reference electrodes (SHE and Calomel electrode) Ion-selective electrode - glass electrode and measurement of pH.

Electrochemical Energy Systems: Types of electrochemical energy systems, electrochemistry of primary batteries (Lachlanche or dry cell), Secondary cells (Lead Acid cell, Ni-Cd cell), Lithium batteries (Li-MnO_2 Lithium organic electrolyte) and their advantages. Fuel cells (Oxygen-Hydrogen).

UNIT IV *Text Book - 1* **(12)**

Corrosion and its control: Introduction, dry corrosion, electrochemical theory of corrosion, Types of corrosion- differential aeration, galvanic (galvanic series) and Stress corrosion Factors affecting corrosion-design, pH, over voltage and temperature.

Protection methods: Cathodic protection, (Impressed current and sacrificial anode) corrosion inhibitors - types and mechanism of inhibition, metallic coatings - Galvanization, Tinning, Electroplating (Cu) and electro less plating (Ni)

UNIT V *Text Book - 1,2* **(12)**

Analytical Techniques: Spectroscopy- Beer-Lambert's law, UV-electronic transitions - chromophores - auxochromes - shifts, and IR- modes of vibrations, ex.H_2O, CO_2 Instrumentation of UV and IR.

Colorimetry - estimation of Iron, Conductometric (HCl vs NaOH) and potentiometric titrations (Fe(II) vs $K_2Cr_2O_7$).

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):

A Text Book of Engineering Chemistry, S.S. Dara and S.S. Umare, 12th Edition, 2010, S.Chand and Co.Ltd.

WEB RESOURCES:

1. http://www.powerstream.com/BatteryFAQ.html#lec
2. http://freevideolectures.com/Course/3029/Modern-Instrumental-Methods-of-Analysis
3. http://www.cdeep.iitb.ac.in/webpage_data/nptel/Core%20Science/Engineering%20Chemistry%201/