**20SH1101**-**ENGINEERING CHEMISTRY**

(Common to CE and ME)

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| **Course Category:** | Basic Science | **Credits** | 3 |
| **Course Type:** | Theory | **Lecture-Tutorial-Practical:** | 3-0-0 |
| **Pre-requisite:** | Fundamental concepts of Chemistry | **Sessional Evaluation:****External Exam Evaluation:****Total Marks:** | 4060100 |

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| **Course Objectives** | 1. To familiarize engineering chemistry and its applications
2. To impart the concept of soft and hard waters, softening methods of hard water
3. To train the students on the principles and applications of electrochemistry, polymers, surface chemistry, and cement
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| **Course Outcomes** | CO1 | Explainthe principles of reverse osmosis and electro dialysis |
| CO2 | Apply Nernst equation for calculating electrode and cell potentials |
| CO3 | Demonstrate the factors affecting corrosion and corrosion prevention methods  |
| CO4 | Differentiate between thermoplastics and thermosetting plastics |
| CO5 | Solve the numerical problems based on Calorific value |
| CO6 | Enumeratethe reactions at setting and hardening of cement  |
| **Course content** | **UNIT I****WATER TECHNOLOGY****Introduction:**Hardness of water,types of hardness,units of hardness,disadvantages of hard water, Estimation of hardness of water by EDTA Method - Boiler troubles **-** scale and sludge, Priming and foaming, caustic embrittlement, Boiler corrosion, Industrial water treatment –Lime-soda, zeolite and ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electro dialysis.**UNITII****ELECTROCHEMISTRY AND APPLICATIONS****Electrodes:** concepts, Electrode potential, Nernst equation, reference electrodes (Calomel electrode and glass electrode) electrochemical cell, cellpotential calculations, numerical problems.**Primary cells**: Zinc-air battery.**Secondary cells**: lead acid and lithium ion batteries-working of the batteries including cell reactions.**Fuel cells**: hydrogen-oxygen fuel cell– working of the cells.**Potentiometry:** potentiometric titration (strong acid vs. strong base). **Conductometry**:Conductometric titrations (strong acid vs. strong base & weak acid vs. strong base).**UNITIII****CORROSION**Introduction to corrosion,definition,types of corrosion,Mechanism of corrosion- metal oxide formation by dry corrosion, Pilling Bed worth ratios and uses and electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion, Factors affecting the corrosion, prevention methods of corrosion- Cathodic protection (Sacrificial anodic protection and Impressed current cathodic protection) and Metallic coatings (Electroplating).**UNIT IV****POLYMER CHEMISTRY**Introduction to polymers, Polymerization and Types of polymerisation (addition, condensation and co-polymerisation).**Plastomers**: Thermoplastics and Thermo setting plastics,Preparation, properties and applications of PVC, Bakelite, Urea-Formaldehyde and Nylons.**Elastomers:**Preparation,properties and applications of Buna S, Buna N and Thiokol.**UNIT V** **FUEL TECHNOLOGY****Chemical fuels**: Introduction, classification, characteristics of a good fuel, calorific value, determination of calorific value (Bomb and Boy’s gas calorimeters),numerical problems based on calorific value.**Solid Fuels-**Analysis of coal (Proximate and Ultimate analysis).**Liquid Fuels -**Refining of petroleum, knocking and anti-knock agents, Octane and Cetane values.**Gaseous Fuels-**Flue gas analysis by Orsat’s apparatus.**UNIT VI****ADVANCED ENGINEERING MATERIALS****Refractories:** Classification, properties, criteria for a good Refractory material and Applications**Lubricants:** Classification, Functions of lubricants, Mechanism, Properties of lubricants-Viscosity, viscosity index, Flash and Fire points, Cloud and Pour points and ApplicationsBuilding materials- Cement – classification, Portland Cement **-** constituents, Setting and Hardening of Portland Cement. |
| **Textbooks & Reference books** | **TEXTBOOKS:**1. Jain and Jain, *“Engineering Chemistry”*, Dhanpat Rai Publishers, 16th edition, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, *“Atkins’ Physical Chemistry”*, 10th edition, Oxford University Press, 2010.

**REFERENCE BOOKS:**1. K N Jayaveera, G V Subba Reddy and C Rama Chandraiah, *“Engineering Chemistry”* 1stedition,McGraw Hill Education (India) Pvt. Ltd, New Delhi 2016.
2. Dr. S.S. Dara and Dr. S.S Umare, *“A Text book of Engineering Chemistry”*, 1st edition, Chand & Company Ltd., 2000.
3. K Sesha Maheswaramma and MridulaChugh, *“Engineering Chemistry”*1stedition, Pearson India Education Services Pvt. Ltd, 2016.
4. D. J. Shaw, *“Introduction to Colloids and Surface Chemistry”,*4thedition, Butterworth Heineman, 2013.
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