**ENGINEERING CHEMISTRY**

***(New Regulations w.e.f. 2019-2020)***

**I B.Tech. – I Semester**

**(MECH and CIVIL)**

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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:** | 40  60  100 |

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| **Course Objectives** | * To familiarize engineering chemistry and its applications * To impart the concept of soft and hard waters, softening methods of hard water * To train the students on the principles and applications of electrochemistry, polymers, surface chemistry, and cement | |
| **Course Outcomes** | On successful completion of this course student will be able to: | |
| **CO1** | Explainthe principles of reverse osmosis and electro dialysis |
| **CO2** | Apply Nernst equation for calculating electrode and cell potentials |
| **CO3** | Differentiate between thermoplastics and thermosetting plastics |
| **CO4** | Explaincalorific values, octane number, refining of petroleum and cracking of oils |
| **CO5** | Explainthe setting and hardening of cement and concrete phase |
| **CO6** | Explainthe synthesis of colloids with examples |
| **Course content** | **UNIT – I**  **WATER TECHNOLOGY:** Introduction –Hardness of 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.  **UNIT – II**  **ELECTROCHEMISTRY AND CORROSION:** Electrodes – concepts, reference electrodes (Calomel electrode and glass electrode) electrochemical cell, Nernst equation, cell potential calculations, numerical problems.  Primary cells – Zinc-air battery, Fuel cells, hydrogen-oxygen– working of the cells.  Secondary cells – lead acid and lithium ion batteries- working of the batteries including cell reactions.  Corrosion: Introduction to corrosion, types of corrosion, theories of corrosion, Factors affecting the corrosion, prevention methods of corrosion- Metallic coatings(electroplating) and Cathodic protection  **UNIT-III**  **POLYMERS:** Introduction to polymers, Polymerisation and Types of 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 N, Thiokol and Silicon rubber  **UNIT – IV**  **FUEL TECHNOLOGY:** Introduction **–** Chemical fuels, classification, characteristics of good fuel, calorific value, determination of calorific value (Bomb and Boy’s gas calorimeters), numerical problems based on calorific value, Analysis of coal.  **Liquid Fuels -**Refining of petroleum, knocking and anti-knock agents, Octane and Cetane values.  **Gaseous Fuels-**Flue gas analysis by Orsat’s apparatus.  **UNIT – V**  **ADVANCED ENGINEERING MATERIALS:**  Refractories- Classification, Properties, Factors affecting the refractory materials and Applications  Lubricants- Classification, Functions of lubricants, Mechanism, Properties of lubricating oils and Applications  Building materials- Portland Cement, constituents, phases and reactivity of clinker, Setting and Hardening of cement.  **UNIT-VI**  **SURFACE CHEMISTRY AND APPLICATIONS:** Introduction to surface chemistry, colloids, synthesis of colloids (any two methods with examples), Properties of colloids, stabilization of colloids, coagulation of colloids, adsorption isotherm, BET equation (no derivation) applications of colloids. | |
| **Text Books & References** | **TEXT BOOKS:**   1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013. 2. Peter Atkins, Julio de Paula and James Keeler, Atkins’ Physical Chemistry, 10/e, Oxford University Press, 2010.   **REFERENCE BOOKS:**   1. K N Jayaveera, G V Subba Reddy and C Rama Chandraiah, Engineering Chemistry 1/e 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 SeshaMaheswaramma and MridulaChugh, Engineering Chemistry Pearson India Education Services Pvt. Ltd 4. D. J. Shaw, Introduction to Colloids and Surface Chemistry, Butterworth-Heineman, 1992 | |