# 19SH1203 - ENGINEERING CHEMISTRY

**(Common to** **EEE, ECE, CSE & IT)**

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| Course Category: | Basic science | Credits: | 3 |
| Course Type: | Theory | Lecture-Tutorial-Practical: | 2-1-0 |
| Prerequisite: | Fundamental concepts of Chemistry | Sessional Evaluation:  Univ. Exam Evaluation:  Total Marks: | 40  60  100 |
| Objectives: | Students undergoing this course are expected:   1. To familiarize engineering chemistry and its applications 2. To train the students on the principles and applications of electrochemistry and polymers 3. To impart the concept of soft and hard waters, softening methods of hard water | | |

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| Course Outcomes | Upon successful completion of the course, the students will be able to: | |
| CO1 | Illustrate the molecular orbital energy level diagram of different molecular species |
| CO2 | Apply Nernst equation for calculating electrode and cell potentials |
| CO3 | Demonstrate the corrosion prevention methods and factors affecting corrosion |
| CO4 | Explain the different types of polymers and their applications |
| CO5 | Explain the principles of reverse osmosis and electro dialysis |
| CO6 | Explain calorific values and refining of petroleum |
| Course Content | UNIT – I  **STRUCTURE AND BONDING MODELS:** Planck's quantum theory, dual nature of matter, Schrodinger equation, significance of Ψ and Ψ2, molecular orbital theory – bonding in homo and heteronuclear diatomic molecules – energy level diagrams of O2 and CO. π-molecular orbitals of butadiene and benzene, calculation of bond order, crystal field theory – salient features – splitting in octahedral and tetrahedral geometry.  UNIT – II  **WATER TREATMENT:** 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-III  **ELECTROCHEMISTRY AND APPLICATIONS:** 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. Potentiometry – potentiometric titration (strong acid *vs* strong base). Conductometry – conductometric titrations (strong acid *vs* strong base & weak acid *vs* strong base)  UNIT-IV  **CORROSION:** Introduction to corrosion, electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion, metal oxide formation by dry electrochemical corrosion, Pilling Bedworth ratios and uses, Factors affecting the corrosion, prevention methods of corrosion- Metallic coatings(electroplating) and Cathodic protection.  UNIT – V  **POLYMER CHEMISTRY:** 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 Silicone rubber  UNIT-VI  **FUEL TECHNOLOGY:** Chemical fuels – Introduction, classification, characteristics of a good fuel, calorific value, determination of calorific value (Bomb calorimeter and Boy’s gas calorimeter), numerical problems based on calorific value.  **Solid Fuels -** 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. | |
| Text Books &  References  Books | **TEXT BOOKS**   1. Jain and Jain, Engineering Chemistry, 16 Ed., Dhanpat Rai Publishers, 2013. 2. Peter Atkins, Julio de Paula and James Keeler, Atkins’ Physical Chemistry, 10 Ed., Oxford University Press, 2010.   **REFERENCE BOOKS**   1. K N Jayaveera, G V Subba Reddy and C Rama Chandraiah, Engineering Chemistry 1 Ed. Mc Graw Hill Education (India) Pvt Ltd, New Delhi 2016 2. J. D. Lee, Concise Inorganic Chemistry, 5 Ed., Oxford University Press, 2008. 3. Dr. S.S. Dara and Dr S.S Umare, A Text book of Engineering Chemistry, 1 4. Ed., Chand & Company Ltd., 2000. 5. K Sesha Maheswaramma and Mridula Chugh, Engineering Chemistry, 1 Ed., Pearson India Education Services Pvt. Ltd, 2016. | |