**20SH1203-APPLIED CHEMISTRY**

(Common to EEE, CSE, IT and AI&DS )

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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 make the student learn about | |
| 1.To familiarize engineering chemistry and its applications  2.To train the students on the principles and applications of electrochemistry and polymers  3.To introduce modern engineering materials, semiconductors and nanomaterials | |
| **Course Outcomes:** | On successful completion of this course student will be able to: | |
| **CO1** | Explain the calculation of bond order of O2 and CO molecules |
| **CO2** | Illustrate the band theory of solids for conductors, semiconductors and insulators |
| **CO3** | Apply Nernst equation for calculating electrode and cell potentials |
| **CO4** | Demonstrate the factors affecting corrosion and corrosion prevention methods |
| **CO5** | Discuss the different types of polymers and their applications |
| **CO6** | Understand the types of calorific value |
| **Course content:** | **UNIT I: STRUCTURE AND BONDING MODELS:**  Planck's quantum theory, dual nature of matter, Schrodinger equation, significance of Ψ and Ψ2, applications to hydrogen, molecular orbital theory – bonding in homo- and hetero nuclear diatomic molecules – energy level diagrams of N2, O2, CO and NO, π-molecular orbitals of butadiene and benzene, calculation of bond order.  **UNIT II: MODERN ENGINEERING MATERIALS**  i). Understanding of materials: Crystal field theory – salient features – splitting in octahedral, tetrahedral and square planar geometry. Properties of coordination compounds- oxidation state, coordination number, magnetic properties and colour.  ii). Semiconductor materials, superconductors- basic concept, band diagrams for conductors, semiconductors and insulators, effect of doping on band structures.  iii). Nanochemistry: Introduction, classification of nanometerials, properties and applications of fullerenes, carbon nanotubes and graphene nano-particles.  **UNIT III: ELECTRO CHEMISTRY AND APPLICATIONS**  Introduction to Electro chemistry, Electrode potential, Nernst equation, reference electrodes (Calomel electrode and glass electrode), electrochemical cell, cell potential calculations and numerical problems .Batteries-  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 cell.  Potentiometry – potentiometric titration (redox reaction).  Conductometry – concept of conductivity- Specific, equivalent & molar conductance and cell constant, conductivity cell, conductometric titrations (acid-base titrations).  PHmetry-Basic concepts and applications.    **UNIT IV: SCIENCE OF CORROSION**  Introduction to corrosion, definition, types of corrosion, Mechanism of corrosion- metal oxide formation by dry corrosion, Pilling Bedworth 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 and electro less plating.  **UNIT V: POLYMER SCIENCE AND TECHNOLOGY**  Introduction to polymers, Polymerisation and Types of polymerisation (addition, condensation and co-polymerisation), Poly dispersibity index-Measurement of average molecular weight of polymer.  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 VI:FUEL TECHONOLOGY**  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–** Types, ranking of coal and Analysis of coal (Proximate and Ultimate analysis ).  **Liquid Fuels -**Refining of petroleum, knocking and anti-knock agents, Octane and Cetane numbers.  **Gaseous Fuels-**L.P.G, Water gas, producer gas and Flue gas analysis by Orsat’s apparatus. | |
| **Text Books & References** | **TEXT BOOKS:**   1. Jain and Jain, Engineering Chemistry, 16 Ed., DhanpatRai 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. McGraw 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 Ed., Chand & Company Ltd., 2000. 4. K Sesha Maheswaramma and Mridula Chugh, Engineering Chemistry, 1 Ed., Pearson India Education Services Pvt. Ltd, 2016. | |