# 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:** | 2-1-0 |
| **Prerequisite:** | Fundamental concepts of Chemistry | **Sessional Evaluation:****Univ. Exam Evaluation:****Total Marks:** | 4060100 |
| **Objectives** | * To familiarize engineering chemistry and its applications.
* To train the students on the principles and applications of electrochemistry and polymers.
* To introduce modern engineering materials, semiconductors and nanomaterials.
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| **Course Outcomes** | Upon successful completion of this course students will be able to: |
| CO1 | Explainthe 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 - ISTRUCTURE AND BONDING MODELSPlanck's quantum theory, dual nature of matter, Schrodinger equation, significance of Ψ and Ψ2, applications to hydrogen, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of N2, O2, CO and NO, π-molecular orbitals of butadiene and benzene, calculation of bond order. UNIT - IIMODERN ENGINEERING MATERIALS1. 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.
2. Semiconductor materials, superconductors- basic concept, band diagrams for conductors, semiconductors and insulators, effect of doping on band structures.

 1. Nano chemistry: Introduction, classification of nano materials, properties and applications of fullerenes, carbon nanotubes and graphene nanoparticles.

UNIT - IIIELECTRO CHEMISTRY AND APPLICATIONSIntroduction 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).PH metry-Basic concepts and applications.UNIT - IVSCIENCE OF CORROSIONIntroduction 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 - VPOLYMER SCIENCE AND TECHNOLOGYIntroduction 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 - VIFUEL TECHNOLOGYChemical 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 and References** | 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.
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| 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 Ed., Chand & Company Ltd., 2000.
4. K Sesha Maheswaramma and Mridula Chugh, Engineering Chemistry, 1 Ed., Pearson India Education Services Pvt. Ltd, 2016.
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