Gokaraju Rangaraju Institute of Engineering and Technology
(Autonomous)

ENGINEERING CHEMISTRY

Sub code: GR14A1008	**L T P C**
I Year II sem	**2 1 0 3**

Pre Requisites: Fundamentals in Engineering Chemistry Theory

Course Objectives: This Engineering Chemistry Theory is common to first year branches of UG Engineering. At the end of the course the student is expected to

- Know the fundamental principles of Engineering Chemistry required to solve engineering problems.
- Practical implementation of fundamental theory concepts.
- Introducing new techniques and latest information that motivates the students to bring out his or her views and work effectively.
- To enable the students understand the role of engineering materials such as polymers, energy production, electrical field basic concepts of material behavior and study the environmental applications in the field of engineering and technology.

Course Outcomes: At the end of the course the student is expected to

- Students are able to describe impurities present in water, boiler troubles, removal of impurities.
- Ability to apply corrosion technology methods that are useful to know about the protection of metals from corrosion by various technologies.
- Ability to select lubricants for various purposes.
- Ability to describe electronic materials and their applications in the industry.
- Ability to describe advanced polymer materials and their industrial applications.
- Ability to apply role of chemistry in different environments and energy production.

UNIT-I Water Technology: Sources of natural water, impurities, hardness: causes, types, expression, units, estimation of hardness of water using complexometric titration metod, problems on hardness, Boiler feed water, boiler troubles(scale, sludge, carry over, Caustic Embrittlement, Boiler Corrosion). Internal reatment methods(carbonate, phosphate, calgon), Softening of water – Lime Soda, Ion-Exchange process. Alkalinity of water and its determination, Potable water- its characteristics and steps involved in Municipal Water Treatment, Chlorination-Break Point Chlorination, sterilization by ozonation. Desalination of Brackish water - Reverse Osmosis. Waste water-types of effluents, domestic and industrial effluents(on over view)

UNIT-II Electrochemistry & Corrosion: Concept of Conductances-specific, equivalent, molar conductances and their inter relation ships applications of conductance-conductometric titrations-(Strong acid Vs Strong Base and Weak Acid Vs Strong Base). EMF of a cell, Electrode- Single Electrode Potential, Standard Electrode potential, Electro chemical series and its applications, Electrochemical Cells-types, Galvanic cell: cell representation, Cell reactions, Cell EMF, Electrolytic cells, Concentration cell. Batteries-types Lithium Cell, Secondary cells: Pb-PbO_2 cell, Fuel cells: H_2-O_2 fuel cells and their applications.

Causes and effects of corrosion-types of corrosion- chemical (Dry) corrosion-types and their mechanism, Electrochemical (Wet) corrosion and its mechanism, factors affecting the rate of corrosion – nature of metal and nature of environment. Corrosion Control Methods-Cathodic Protection: Sacrificial Anodic, Impressed Current Cathodic protection. Metallic Coatings –Anodic and Cathodic coatings, Methods of application of metallic coatings- Hot Dipping method(Galvanisation), Cementation(Sheradising), Electroplating(Cu coating), Organic Coatings: Paints – its constituents and their functions.

UNIT-III Engineering Materials I: Cement-types-portland cement –composition, Setting & Hardening of Portland cement.
Ceramics-types-ceramic products - white wares, Stone ware, properties and applications of ceramics.
Refractories-classification, properties(refractoriness,RUL,thermal spalling, thermal conductivity) and their application.

Lubricants: Classification with examples, mechanisms of lubrication (thick film, thin film, extreme pressure), properties of lubricants- viscosity, flash point, fire point, cloud point, pour point.

UNIT-IV Engineering Materials : Electronic materials: Semi conductors, Preparation of Pure Ge and Si by Zone Refining, Czochralski Crystal Pulling, Doping Techniques-Epitaxy, Diffusion & ion implantation.

Polymer Materials: monomer, polymer, types of polymerization-addition and condensation, Plastics-Thermoplastic resins, Thermo set resins. Compounding & fabrication of plastics (compression & Injection moulding), Preparation, Properties, Engineering applications of Hi Density Poly Ethylene(HDPE), Poly Vinyl Chloride(PVC), Bakelite & Nylon 6,6. Liquid Crystal Polymers and their applications, Organic Light Emmiting Diodes (an Over View). Biodegradable polymers-their advantages and their applications. Elastomers – preparation, properties and applications of Butyl rubber, Thiokol rubber, Styrene-Butadiene Rubber. Conducting Polymers-classification with examples-mechanism of conduction in trans poly acetylene and their applications.

UNIT-V Energy sources: Fossil Fuels: Coal –types, analysis of coal- proximate and ultimate analysis and their significance, Calorific value of fuel – HCV, LCV, Determination of Calorific Value using BOMB calorimeter, Theoretical calculation of Calorific Value by Dulong's formula, Numerical Problems. Petroleum-its composition-synthetic petrol – Bergius and Fischer Tropsch's process method , cracking and its significance, knocking and its mechanism in Internal Combustion engines, Octane Rating of Gasoline, Composition, and applications of natural gas, LPG, CNG. Bio-fuels: preparation of Bio-diesel by transesterification method, advantages of Bio-fuel.

Teaching Methodologies:
White Board with marker, OHP & Power Point Presentation
Conducting quizzes,
Conducting Experiments
Assignment uploaded in website.

Prescribed books:
A text book of engineering chemistry by PC Jain and Monica Jain, Dhanpat Rai publishing company.

Reference books:
A text book of engineering chemistry by SS Dara and SS Umre, S Chand publications.
A text book of engineering chemistry by Dr Y Bharathi kumari and Dr Ch Jyothsna, VGS publications.
A text book of engineering chemistry by R.P.Mani, K.N.Mishra, B.Rama Devi, V.R.Reddy, cengage learning publications