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| **Course code** | **Course Title** | **Core/ Elective** |
| BS206HS | Chemistry | Core |
| L | T | P/D | Credits | CIE | SEE |
| 3 | 1 | 0 | 4 | 40 | 60 |
| **Prerequisite:** Electrochemistry &Batteries, Water & Corrosion, Polymers, Energy Sources, Inorganic Engineering Materials**Course Objectives:** The objective of this course is to make the student* Apply the principals of electrochemistry in storage of electrical energy in batteries.
* Rationalize bulk properties and processes using thermodynamic considerations.
* Gains knowledge in causes of corrosion and its prevention. Attains knowledge about the disadvantages of hard water and treatment of water for drinking purpose.
* Explain the influence of chemical structure on properties of materials and their choice in engineering applications.
* Exposed to qualitative and quantitative parameters of chemical fuels.

**Course Outcomes:** After completion of the course, the student will be able to* **CO203.1**. Apply concept of electrode potential in identifying feasibility of electrochemical reaction; illustrate electro analytical techniques and working of batteries
* **CO203.2.** Identify the mechanism of corrosion of materials on basis of electrochemical approach and devise corrosion control methods. Estimate the physical & chemical parameters of quality of water and explain the process of water treatment.
* **CO203.3** Explain the influence of chemical structure on properties of materials and their choice in engineering applications.
* **CO203.4** Classify chemical fuels and grade them through qualitative analysis.
* **CO203. 5** Relate the concept of green chemistry to modify engineering processes and materials. Understand the function of drugs.
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| **Unit-I: (10 Hrs) Electrochemistry and Batteries :**Electrochemistry: Electrochemical cells, Electrolytic and Galvanic cells- notation, cell notation, cell reaction and cell potentials. Electrodes: Electrode potential and Standard Electrode Potential (SEP). Construction and function of Calomel Quinhydrone and Glass electrodes. Determination of pH of a solution by using Quinhydrone electrode. Thermodynamics of emf , Nernst equation and its derivation. Applications of Nernst equation to electrode potential and emf of cells. Numerical problems.Batteries: Primary batteries: Zn - Carbon battery. Secondary batteries: Pb- |

Acid cell & battery and Li-Ion cell battery, Applications. Flow batteries (Fuel cells): Hydrogen-Oxygen fuel cells& functioning. Applications of batteries.

## Unit-II: (10 Hrs)

**Water Chemistry--its treatment and corrosion:**

Water Chemistry: Hardness of Water-Types and units of hardness, estimation of temporary and permanent hardness of water by EDTA method. Alkalinity of water and its determination. Water softening by Ion exchange process and desalination of water by reverse osmosis method. Numerical problems. Specifications of potable water--Steps involved in treatment of water – Sterilization by Chlorination -Disinfection of water by chlorination and ozonization. Break Point Chlorination – advantages.

Corrosion: Causes and effects of corrosion. Types of Corrosion-Dry corrosion – its types or Chemical corrosion and Wet or Electrochemical corrosion and their mechanism.

Concentration cell corrosion. Waterline, Pitting and galvanic corrosion. Factors effecting rate of corrosion.

## Unit-III: (10 Hrs)

Polymers: Basics of terms polymers: Monomer functionality, degree of polymerization. Types of Polymerization (i) Addition--Mechanism of free radical polymerization (ii) Condensation (iii) Co-Polymerization with examples.

Classification of polymers - Thermoplastics & Thermosetting resins. Plastics, Fibres and Elastomers and their characteristics. Preparation, Properties & Uses of the following polymers: Plastics - PVC and Bakelite, Fibres - Nylon 6:6, and Dacron. Elastomers - Buna-S, Butyl Rubbers.

Conducting polymers: Concept, Classification and Mechanism of conduction in Trans Poly-acetylene, Doped Conducting Polymers. Applications of conducting polymers.

Biodegradable polymers: Concept. preparation, properties and applications of polylactic acid

## Unit-IV: (10 Hrs)

Chemical Fuels: Concept, definition and classification of fuels- Primary and secondary fuels. Solid, liquid and gaseous fuels. Characteristics of a good fuel. Calorific Value – High Calorific Value(HCV) and Low Calorific Value (LCV). Numerical problems.

Solid Fuels: Coal and its types. Analysis of coal - Proximate and Ultimate analysis. Numerical Problems.

Liquid Fuels: Petroleum. Composition of Gasoline, Diesel and Kerosene. Cracking & its Significance- Catalytic cracking by moving bed method,

# Knocking. Fuel rating – Octane and Cetane numbers.

Gaseous Fuels: LPG, CNG –Composition, characteristics and applications.

**Unit-V: (10 Hrs)**

# Green Chemistry, Green Engineering Principles: Concept, Principles of green chemistry –.

Principles of Green Engineering.

# Biodiesel: Sources, Concept of Trans esterification. Properties and significance

#### Text Books:

T1. PC Jain, M Jain Engineering Chemistry, Dhanpat Rai &sons, 16th edition, 2015, New Delhi. (Unit: 1,4,5)

T2. B.R. Puri, L.R. Sharma and M.S. Pathania, ―Principles of Physical

Chemistry‖, S. S. Chand & Company Ltd., Revised edition (2013). (Unit 2)

T3. Sashi Chawla,―Engineering Chemistry, Dhanpat Rai & Sons, New Delhi,

2017 (1St January 2017) (Unit 3 )

T4. O G Palanna, ―Engineering Chemistry‖, Tata Mc Graw Hill, New Delhi,

First Edition 2009.(Unit 2&4)

#### Reference Books :

R1. J D Lee, Concise inorganic chemistry, Blackwell science ltd, USA, Fifth edition

R2. P.W. Atkins,Physical Chemistry .

R3. T.W. Graham Solomons, C.B. Fryhle and S.A. Snyder, ―Organic Chemistry‖,

Wiley, 12th edition (2017).