ENGINEERING CHEMISTRY-1

(Common to all branches)

I B.Tech – I/II Semester (Code: 20CY01)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)	:	70		

PREREQUISITES: None

COURSE OBJECTIVES:

The student should be conversant:

- With the principles of water characterization and treatment of water for industrial purposes and methods of producing water for potable purposes.
- To understand the thermodynamic concepts, energy changes, concept of corrosion & its control.
- With the conventional energy sources, solid, liquid and gaseous Fuels & knowledge of knocking and anti-knocking characteristics.
- With aim to gain good knowledge of organic reactions, plastics, conducting polymers & biodegradable polymers.

COURSE OUTCOME:

After studying this course, students will be able to:

CO-1: Identify the problems associated with the impurities.
CO-2: Apply the knowledge in converting different energies systems and protection of different metals from corrosion.
CO-3: Relate the need of fuels as a source of energy.
CO-4: Classify the organic reaction mechanisms. Understand the types and nature of polymers and their advantages and applications.

UNIT I: Water Chemistry **15hrs**

Introduction: water quality parameters

Characteristics: Alkalinity, Hardness **-**Estimation& simple numerical problems,

Boiler Troubles - Sludges, Scales, Caustic embrittlement, boiler corrosion, Priming and foaming;

Internal conditioning- phosphate, calgon and carbonate methods.

External conditioning - Ion exchange process& Zeolite process

WHO Guidelines, Potable water, Sedimentation, Coagulation, Filtration. Disinfection methods: Chlorination, ozonization and UV treatment.

Salinity – Treatment of Brackish water by Reverse Osmosis and Electrodialysis.

UNIT II **15hrs**

Thermodynamic functions: Energy, Entropy and Free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications.

Corrosion: Types of corrosion - Chemical or dry corrosion, Electrochemical or wet corrosion; Galvanic, stress, pitting and differential aeration corrosion; Factors effecting corrosion, **Corrosion control** – Cathodic protection, and electro plating (Au) & electoless Ni plating.

UNIT III: Fuels **15hrs**

Classification of fuels; Calorific value of fuels (lower, higher)
Solid fuels: Determination of calorific value (Bomb Calorimeter) & related problems, Coal ranking,
Liquid Fuels: Petroleum refining and fractions, composition and uses. Knocking and anti- knocking Agents, Octane number and Cetane number; Bio fuels- Biodiesel, general methods of preparation and advantages
Gaseous fuels: Green hydrogen as an energy carrier, CNG and LPG,
Orsat apparatus -Flue gas analysis.

UNIT IV: **15hrs**

Organic reactions and synthesis of drug molecules.
Introduction to reactions involving substitution (SN^1, SN^2), addition (Markownikoff's and anti-Markwnikoff's rules), elimination (E_1& E_2), Synthesis of a commonly used drug molecule.(Aspirin and Paracetamol).

Polymers: Classification of polymers, Plastics: Thermoplasts and thermosetting plastics, Conducting polymers, Intrinsic and Extrinsic conducting polymers and their applications**.** Bakelite and PVC. Bio degradable polymers: types, examples - Polyhydroxybuterate (PHB), Polyhydroxybuterate-co-β-hydroxyvalerate (PHBV), applications.

TEXT BOOKS:

1. P.C. Jain and Monica Jain, "Engineering Chemistry" DhanpatRai Pub, Co., New Delhi 17th edition (2017).
2. SeshiChawla, "Engineering Chemistry" DhanpatRai Pub, Co LTD, New Delhi 13 th edition, 2013.

REFERENCES:

1 Essential Of Physical Chemistry by ArunBahl, B.S. Bahl, G.D.Tuli, by ArunBahl, B.S. Bahl, G.D.Tuli, Published by S Chand Publishers, 12th Edition, 2012.

2 Text Book of Engineering Chemistry by C.P. Murthy, C.V. Agarwal, A. Naidu B.S. Publications, Hyderabad (2006).

3 Engineering Chemistry by K. Maheswaramma, Pearson publishers 2015.

ENGINEERINGCHEMISTRY LABORATORY

(Common to all branches)

I B.Tech – I/II Semester (Code: 20CYL01)

Lectures	0	Tutorial	0	Practical	3	Credits	1.5
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)	:	70		

LIST OF EXPERIMENTS

1. **Introduction to Chemistry Lab** (the teachers are expected to teach fundamentals likeCalibration of Volumetric Apparatus, Primary, Secondary Solutions, Normality, Molarity, Molality etc. and error, accuracy, precision, theory of indicators, use of volumetric titrations).

2. **Volumetric Analysis:**
   a. Estimation of Washing Soda.
   b. Estimation of Active Chlorine Content in Bleaching Powder
   c. Estimation of Mohr's salt by permanganometry.
   d. Estimation of given salt by using Ion-exchange resin using Dowex-50.
3. **Analysis of Water:**
   a. Determination of Alkalinity of Tap water.
   b. Determination of Total Hardness of ground water sample by EDTA method
   c. Determination of Salinity of water sample
4. **Estimation of properties of oil**:
   a. Estimation of Acid Value
   b. Estimation of Saponification value
5. **Preparations:**
   a. Preparation of Soap
   b. Preparation of Urea-formaldehyde resin
   c. Preparation of Phenyl benzoate
6. **Demonstration Experiments (Any two of the following):**
   a. Determination of p^H of given sample.
   b. Determination of conductivity of given sample by conductometer.
   c. Potentiometric Determination of Iron.

TEXT BOOKS (for Chemistry 1 and 2):

1. Practical Engineering Chemistry by K. Mukkanti, Etal, B.S. Publications, Hyderabad, 2009.
2. Inorganic quantitative analysis, Vogel, 5^{th} edition, Longman group Ltd. London, 1979.

REFERENCE BOOKS:

1. Text Book of engineering chemistry by R.n. Goyal and Harrmendra Goel.
2. A text book on experiments and calculations- Engineering Chemistry. S.S. Dara.
3. Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications.