COURSE CONTENT- CHEMISTRY

1st B. Tech (Common)

Course Philosophy:

- The Engineering undergraduate students should develop conceptual understanding of reactions, kinetics and thermodynamics, which will be useful for most of the branches of engineering.
- Need to develop an understanding of the relationship between structure and function of organic and inorganic materials they may work with

Learning Outcome:

- Understanding the physical principles that governs the chemical reactions, thermodynamics and kinetics that are backbone of physical chemistry
- Understanding of the chemistry behind red-ox reactions
- Develop understanding of the structure and property relation ship of aromatic and aliphatic compounds
- Understand the role of chirality in deciding property of molecules
- Understand the chemistry behind thermal and photochemical transformations
- Develop understanding of the role of polymeric materials, lipids, proteins etc and their interaction with drugs
- Understand the origin of colour, electronic and magnetic properties of substances
- Develop ability to reason the choice of enzymes and catalysts used in Industry

UNIT –I

Thermodynamics:
Second law of thermodynamics, entropy change accompanying various processes, Third law of thermodynamics, Spontaneity of a chemical reaction and Gibbs energy, Gibbs Helmohltz equation, Chemical potential

Phase Equilibria:
Phase, components, degree of freedom, Phase rule, Phase diagram of single component and two component systems, eutectic point, Lever rule.

Electrochemistry:
Different type of electrode, Electromotive force, Nernst equation, Relationship between thermodynamic properties and EMF of a cell, Battery, fuel cell, Corrosion, corrosion control.

Chemical Kinetics:
Parallel, opposing and consecutive reaction, Unimolecular reaction, Lindemann-Hinshelwood approach, Adsorption Isotherms.

UNIT –II

Aromaticity
Aromatic, non-aromatic and anti-aromatic compounds

Stereochemistry

Concept of chirality, Axial chirality, enantiomers and diastereomers, specific rotation, optical purity, Racemic modification and resolution, R/S, D/L and E/Z nomenclature

Pericyclic reactions

Definitions, Classifications, photochemical [2+2] and thermal [4+2] cycloaddition, Sigmatropic rearrangement

Macromolecules

Introduction to peptides and proteins. Basics of Polymer Chemistry, Polymerization techniques, natural and synthetic polymer

UNIT –III

Coordination chemistry

Crystal Field Theory; d-orbital splitting in Octahedral and tetrahedral ligand field; Jahn-Teller distortion; factors influencing magnitude of crystal field splitting; Spectrochemical Series, CFSE, Limitations and Consequence of CFT, Introduction to LFT

Spectroscopy

FT-IR spectroscopy vibration modes, Hooke's Law,

UV-Visible spectroscopy Instrumentation: Source, Dispersion devices, sample area, detectors; types of electronic transitions, selection rules, ground state term symbol, chromophores; effect of conjugation, substituent effects

Organometallic Chemistry

18 and 16 electron rule, M-M bonding, bonding modes of CO, activation of metal carbonyls, Catalysis by organometallic compounds: hydroformylation, Ziegler-Natta catalysis,

Solid state Chemistry

Miller indices; Miller Indices for Planes, interplanar spacing; defects; semiconducting and superconducting materials.

Reference Books:

1. **Advanced Physical Chemistry** by B. R. Puri, L. R. Sharma & M. S. Pathani, Milestone Publishers
2. **Atkins' Physical Chemistry, P. Atkins and J. de Paula, 8th edition, Oxford University Press, 2006.**
3. **Organic Chemistry,** J. CLayden, N. Greeves, S. Warren, P. Wother, Oxford University Press, 2000.
4. **Principles of polymerization**, George G. Odian, 4th Edn, John Wiley & Sons, Inc., Publication, 2004.
5. **Shriver Atkin's Inorganic Chemistry by** P. Atkins, T. Overton, J. Rourke, M. Weller, M. Armstrong, 5th Edn, Oxford University Press, 2009
6. **Inorganic Chemistry** by C.E. Housecroft, A. G. Sharpe, 4th Edn, Pearson Education, 2017