

**COURSE OBJECTIVES:**

- (1) To understand the basics of molecular interactions.
- (2) Introductory idea about organometallics and their catalytic applications.
- (3) Basics of fuels and corrosion chemistry.

**Module I:**

Quantum Chemistry and Spectroscopy: Basic concepts and postulates of quantum mechanics. Introduction to Schrodinger Wave Equation. Particle in a box: Energy levels, quantum numbers and selection rule.

Spectroscopy: Lambert Beer's Law, Principles and applications of UV-Visible Molecular Absorption Spectroscopy; Chromophores, applications to colorimetry. Effect of conjugation on chromophores, Absorption by aromatic systems, Introductory idea on Rotational and Vibrational Spectroscopy-Principles and application to diatomic molecules.

[7 Classes]

The phase rule: Statement of Gibb's phase rule and explanation of the terms involved, Phase diagram of one component system - water and sulfur system, Condensed phase rule, Phase diagram of two component system - Eutectic Bi-Cd system.

[3 Classes]

**Module II:**

Organometallics: Introduction to organometallics, EAN rule; classification, nomenclature and characteristics of organometallic compounds. Applications of organometallic compounds and catalyst in alkene isomerization hydrogenation and hydroformylation (detail mechanisms are to be excluded). [10 Classes]

**Module III:**

Fuels: Classification of fuels, calorific value. (Determination by Dulong's formula), G.C.V. and Liquid fuels: Classification of petroleum, Refining of petroleum, Cracking, Knocking and anti knocking, cetane and octane numbers. Unleaded petrol, synthetic petrol, power alcohol. Gaseous Fuel: Producer gas, Water gas, LPG, CNG, Kerosene gas, Combustion calculation.

[10 Classes]

**Module-IV**

(6classes)

Corrosion: Electrochemical theory of corrosion, galvanic series, Types of corrosion; Differential metal corrosion, Differential aeration corrosion (Pitting and water line corrosion), Stress corrosion (caustic embrittlement in boilers), Factors affecting, Metal coatings - Galvanizing and Tinning, Corrosion inhibitors, cathodic protection.

**Text Books:**

1. Text Book in Applied Chemistry by A. N. Acharya and B. Samantaray, Pearson India.
2. Introductory to Quantum Chemistry by A. K. Chandra. , 4<sup>th</sup> Edition, Mcgraw Hill Education.
3. Fundamentals of Molecular & Spectroscopy by Banwell, Tata McGraw Hill Education.
4. Physical Chemistry by Gordon M. Barrow, McGraw-Hill
5. Engineering Chemistry, 12<sup>th</sup> Edition, Author: Wiley India Editorial Team Publishers Wiley.
6. Engineering Chemistry: Fundamentals and Applications. Shikha Agarwal. Cambridge University Press.
7. Engineering Chemistry, Jain and Jain, Dhanpat Rai Publiation.

**Reference Books:**

1. Inorganic Chemistry by Donald A. Tarr, Gary Miessler, Pearson India, Third Edition.
2. Quantum Chemistry by Ira N. Levine, Pearson 7<sup>th</sup> Edition.
3. Molecular Spectroscopy, Ira N. Levine, John Wiley and Sons
4. Modern Spectroscopy - A Molecular Approach, by Donald McQuarrie and John Simon, published by University Science Books.
5. Inorganic Chemistry by W. Overton, Rounk and Armstrong, Oxford Univesity Press, 6<sup>th</sup> edition.