

### **Module – I**

(To develop basic concepts of quantum mechanics and its applications in bonding)

Structure & Bonding: Dual nature of matter, Schrodinger equation (need not be derived), interpretation of wave functions, molecular orbital theory of diatomic molecules, metallic bonding.

(No. of Lectures = 7)

*Phase rule:* Phase diagram of one & two component systems, H<sub>2</sub>O, S, Cd-Bi and Fe-C systems.

(No. of Lectures = 5)

*Solid State:* Crystal systems, Bravais lattices, closed packed structures, ionic solids, and crystal defects including Schottky and Frenkel defects.

(No. of Lectures=4)

### **Module – II**

(To develop basic concepts about the rates of reactions and catalysis)

1. Reaction Kinetics & Catalysis:

Rate law, Order & Molecularity, Determination of order of reaction, Kinetics of Zero, 1<sup>st</sup> and 2<sup>nd</sup> order reactions, Collision theory, theory of absolute reaction rates, Energy of activation, Homogeneous & Heterogeneous catalysis (a general idea)

(No. of Lectures= 7 )

2. Electrochemistry: Electrochemical cells, EMF, Measurement of EMF, Relation between EMF & free energy change of cell reactions, Electrode potentials and measurements with reference to standard hydrogen electrode, calomel electrodes, determination of pH, dry cells, storage cells and fuel cells.

(No. of Lectures= 7)

### **Module – III**

(Applications of thermodynamic principles to chemical systems)

1. Chemical thermodynamics: Thermo chemistry, Thermo-chemical calculations based on Hess's law and Born-Haber cycle, second law of thermodynamics, Entropy.
2. The free energy concepts, applications to gases, Gibbs Helmholtz equation, free energy change and criterion of spontaneity and equilibrium of chemical reactions, chemical equilibrium, Maxwell's relations.

(No of Lectures= 9)

#### **Text Books:**

1. Physical Chemistry by G.M. Barrow, 6<sup>th</sup> edition, Tata McGraw Hill, New Delhi.
2. Physical Chemistry by P.W. Atkins, 5<sup>th</sup> / 6<sup>th</sup> edition Oxford.

#### **Reference Books:**

1. Principles of Physical Chemistry by Puri, Sharma and Pathania.

2. Physical Chemistry by Bahl and Tuli.
3. Engineering Chemistry by Jain and Jain (15th edition).
4. Physical Chemistry-Thomas Engel, Philip Reid by Pearson Education.