

## Approval: 1<sup>st</sup> convocation adhoc Meeting

<b>Course Name:</b>	Chemistry
<b>Course Code:</b>	CY-101
<b>Credit:</b>	3-1-2-5
<b>Category:</b>	Core
<b>Prerequisites:</b>	Nil

### **Course content:**

**Quantum Mechanics:** Postulates, Schrödinger wave equation, Interpretation of wave function, particle in a box, implication of the concepts, H atom, radial and angular wave functions, and shapes of orbital;

**Thermodynamics:** Statistical concept of entropy, free energy, and chemical equilibria, chemical potential;

**Kinetics and Catalysis:** Theories of chemical reactions, homogeneous and heterogeneous catalysis;

**Electrochemical Cells:** Electrochemical corrosion and fuel cells;

**Stereoisomerism:** Overview of concepts, configuration, Fischer and Newman projections. Optical isomerism of simple cyclic systems and of compounds without asymmetric carbon atom (allenes, spirocompounds, etc.); chirality involving atoms other than carbon;

**Reaction Mechanism and Stereochemistry in Organic Synthesis:**(a) Addition of  $\text{KMnO}_4$ ,  $\text{OsO}_4$ , and peracids to cis- and trans alkenes (b) Diels-Alder reaction: (4+2) cyclo addition MO treatment (c) Aromatic Nucleophilic substitution mechanism ( $\text{S}_{\text{N}}\text{Ar}$ ,  $\text{S}_{\text{N}}1$ , Arynes) reactivity and reactions;

**Novel Polymers:** Stereochemical control of synthesis, Ziegler-Natta catalyst, Polyurethanes, conducting polymers;

**Spectroscopic Techniques:** Introductory ideas of molecular spectroscopy and applications of UV-visible and IR to simple compounds/coordination complexes;

**Coordination Compounds:** Crystal field theory of octahedral and tetrahedral complexes, colour and magnetic properties, Jahn-Teller distortion with specific reference to  $d^9$  case;

**Organometallics:** (i) Metal carbonyls: synthesis, structure and bonding (ii) Metal alkene complexes: bonding in metal alkene complexes, role of metal alkene complexes in hydrogenation and hydroformylation;

**Metal ions in Biological Systems:** Role of trace metals in biological systems with special reference to transition metals (Cu, Fe, Zn), toxic effects of Cd and Hg.

### **Experiments:**

1. Determination of iron in iron ore using potassium dichromate (Internal indicator method);
2. Determination of sodium carbonate in baking/washing soda;
3. Determination of hardness of water by EDTA-complexometry titrations;

4. Heat of neutralization of a strong base by a strong acid;
5. Equivalent weight of an acid;
6. Viscosity of mixtures of liquids;
7. Surface excess of 1-butanol in aqueous solution;
8. Order of reaction;
9. Percentage of ammonia in an ammonium salt;
10. Identification of functional groups in organic compounds;
11. Blue Printing
12. pH metry / potentiometry titrations; a) Strong acid – strong base; b) Strong acid – weak base; c) Weak acid – strong base; d) Redox titration:  $\text{Fe}^{2+}$  or  $\text{Mn}^{2+}$ ;
13. Spectro photometry: Determination of Fe(III) by colorimetry;
14. Determination of water of crystallization by microwave irradiation;
15. Preparation of acetanilide or aspirin and determination of melting point, and matching with known sample;
16. Determination of chloride of As or Cr in Water.

**References:**

1. Lee J.D., "Concise Inorganic Chemistry", 5th Ed., Chapman & Hall.
2. Malik T. and Madan, "Selected Topics in Inorganic Chemistry", 5<sup>th</sup> Ed., S. Chand & Company.
3. Peter S., "A Guidebook to Mechanism in Organic Chemistry", 6<sup>th</sup> Ed., Orient Longman.
4. Morrison R.T. and Boyd R.N., "Organic Chemistry", Sixth Ed., Prentice Hall of India.
5. Mahan B.H., "University Chemistry", 3<sup>rd</sup> Ed., Narosa Publishing House, New Delhi.
6. Atkins P.W., "Physical Chemistry", Vth Ed. ELBS, Oxford Univ. Press, Oxford.