COURSE OUTCOME:

- The students will learn spectral properties of complexes, interpretation of spectra,
- Photochemistry of metal complexes, Magnetic behavior of metal complexes,
- Spectral applications of coordination compounds,
- Reactions mechanisms in Transition metal complexes, Electron transfer reactions,

UNIT- I: **[15 Hours]**

Spectral properties of complexes: Term symbols for d^n ions, spectroscopic ground states, selection rules, nature of spectral bands- band shapes, band intensities, band widths, spin-orbit coupling, vibrational structures.

Orgel diagrams, Tanabe-Sugano diagrams, interpretation of spectra of octahedral, distorted octahedral, tetrahedral and square planar complexes, Determination of $_o$ from spectra. Charge transfer bands – origin, types, and characteristics. Photochemistry of metal complexes- photosubstitution and photoredox reactions, ligand photoredox reactions, photoreactions and solar energy conversion.

UNIT- II: **[15 Hours]**

Type of magnetic behaviour, orbital contribution, spin orbit coupling, spin cross-over systems. Measurement of magnetic susceptibility – Gouy and Faraday methods, diamagnetic corrections, ferro- and antiferromagnetic coupling, super paramagnetism. High and low spin equilibria. Magnetic properties of lanthanides and actinides. Infrared spectra of metal complexes, Group frequency concept. Changes in ligand vibrations on coordination- metal ligand vibrations. Spectral applications of coordination compounds - IR spectra of metal carbonyls - ESR spectra-application to copper complexes, Mossbauer spectra- application to iron complexes. NMR spectra - Application to diamagnetic complexes.

UNIT- III: **[15 Hours]**

Reaction Mechanisms in Transition Metal Complexes**:** Energy profile of a reaction, inert and labile complexes, kinetics of octahedral substitution and mechanistic aspects. Acid hydrolysis, factors affecting acid hydrolysis, base hydrolysis, conjugate base mechanism and evidences in its favor. Anation reactions, reactions without M-L bond cleavage. Substitution reactions in square planar complexes, trans effect, mechanisms of substitution. Substitution reactions in tetrahedral complexes. Isomerization and racemization reactions of coordination compounds. Electron transfer reactions- inner sphere and outer sphere reactions, complimentary and non-complimentary reactions.

References:

1. D.N.Satyanarayana:Electronic absorption Spectroscopy and Related Techniques, OUP, 2001.
2. F.Basolo and R.G.Pearson: Inorganic Reaction Mechanisms, Wiley Eastern, 1979.
3. W.W.Porterfield: Inorganic chemistry – A Unified Approach, Elsevier, 2005.
4. R.L.Dutta and A Syamal : Elements of Magnetochemistry, Affiliated east-West, 1993.
5. J.E Huheey, R.L.Keiter and A.L.Keiter: Inorganic Chemistry(4^{th}edn),Addison Wesley, 2000.

AC H 552: Synthetic and Natural Products Chemistry

COURSE OUTCOME:

Enable the students:

- To acquire knowledge on the various reagents employed for oxidation and reduction of various kinds of organic molecules.

- To understand the various methods of halogenations of carbonyl compounds, benzylic and allylic halogenations.

- To get a good understanding of isolation, classification, methods of structure elucidation and synthesis of various types of alkaloids, terpenoids and steroids with suitable examples.
- To understand the chemistry of various types of steroidal hormones, steroidal oral contraceptives and transformations in steroids and steroidal hormones.

UNIT–I: **[15Hours]**

Reduction Reactions: Catalytic hydrogenation-Introduction, catalysts and solvents, mechanismsand stereochemistry of catalytic hydrogenations. Hydrogenolysis and homogeneous catalytic hydrogenation.

Metal hydride reduction: Reduction with $LiAlH_4$and $NaBH_4$, Stereo chemistry of reduction,Reduction with diborane and related reactions.

Dissolving Metal Reductions: Mechanisms of reduction of carbonyl compounds, Bimolecularreductions of esters, Birch reduction, Wolf-Kishner reduction and reduction with diimide. **Oxidation reactions:** Mechanism of oxidation reaction with chromium and manganese salts,Osmium tetroxide, peracids, periodic acid and Lead tetra acetate.

Halogenation: Halogenation of carbonyl compounds. Benzyllic and Allylic halogenations.

UNIT –II: **[15 Hours]**

Alkaloids: Introduction of isolation, classification, general methods of structure illucidation.Structure and synthesis of the following alkaloids: Papaverine, Adrenaline, Ephedrine, Piperine, Morphine, Yohimbine, Reserpine.

Terpenoids: Introduction, classification, isoprene rule, methods of structure determination.Structure and synthesis of Geraniol, Menthol, α-Pinene, Camphor, Farnesol, Zingiberene and α-Santonin.

UNIT- III: **[15 Hours]**

Steroids: Introductionand Nomenclature of steroids, Blanc's rule, Barbier-Wieland degradation,Oppenauer oxidation, Diel's hydrocarbon, Chemistry of Cholestrol, Ergosterol, Vitamin-D & bile acids.

Steroidal Hormones: Chemistry of Oestrone, Oestradiol, Oestriol and their chemicalrelationship. Chemistry of Progesterone, Androsterone and Testosterone. Structure and Synthesis of Cortisone, Cortisol and Aldosterone. Steroidal oral contraceptives. Transformations in steroids and hormones.

References:

1. Modern Organic Reactions- H.O.House.
2. Advanced Organic Chemistry-IV-Ed. Part A &B-F.J.Carrey&R.J.Sundberg(Kluwer) 2001.
3. Modern Methods of Organic Synthesis-N.Carruthers (Cambridge University), 1996.
4. Natural Products Chemistry Vol-I & II. G. R. Chatwal (Himalaya Bombay) 1990.
5. Chemistry of Natural Products – Vol-I & II – O. P. Agarwal(Goel Gorakhpur), 1985.
6. Organic Chemistry-Vol-I & II- I. L. Finar (Longmann ELBS London), 2000.
7. Chemistry of Natural Products: A Unified Approach-N R Krishnaswamy (University Press) 1999.
8. Chemistry of Natural Products-Sujata V. Bhat, B.A. Nagasampagi, MeenakshiSivakumar (Springer-Narosa) 2005.

AC H 553: CHEMISTRY OF SOLID STATE AND NANO MATERIALS

COURSE OUTCOME: