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

Synthetic Design: Carbon skeleton frame work, Classification of carbon-carbon single bond and double bond forming reaction and their use in carbon skeleton ring formation. Ring forming and ring cleaving reactions, use of Thorpe condensation, Carbene insertion reaction, Friedel-Crafts reaction, 1,3-dipolar addition and Ene reaction in ring formation, Oxidative cleavage of rings and Retro Diel's-Alder reactions.

Planning of Organic Synthesis: Selection of starting materials and key intermediates during the synthesis. Synthesis of Cubane and Iswarane. Use of Robinson annulation, Dieckmann cyclisation, Arndt-Eistert synthesis, Diel's- Alder reaction in organic synthesis.

Functionality: Synthesis of 6- and 7- methoxy tetralones, biotin and penicillin-V with special reference to the introduction of functional groups. Stereo chemical consideration and stereo selectivity during organic synthesis.

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

General introduction to disconnection approach. Basic principles and technologies used in disconnection approach. Synthons and synthetic equivalents. Interconversion of functional groups. One group C-X and two group C-X disconnections. Use of C-C one group and C-C two group disconnections in the synthesis of 1,2; 1,3; 1,4; 1,5 and 1,6-difunctionalised compounds. **Protecting groups:** Principle of protection of hydroxyl, amino, carboxylic and carbonyl groups.

Retrosynthetic analysis: Analysis of alcohols, carbonyl compounds cyclic and acyclic alkanes, benzocaine, p-methoxyacetophenone, acetonecyanohydrin, 2-methyl-6-methoxy-indole-3-acetic acid, 6-methylquinoline & 1-phenyl-4-p-methoxyphenyl-1,3-butadiene. Illustrative synthesis of Limonene, Danishefsky's pentalenolactone, Benziodarone, Nitrofurazone, Warfarin, Juvabione, Longifolene, Prelog-Djerassi lactone and Taxol.Solid phase synthesis of oligonucleotides.

REFERENCES:

1. Modern Organic Reactions- H.O.House.
2. Organic Synthesis- R. E. Ireland (Prentice Hall India), 1969.
3. Art in Organic Synthesis- Anand, Bindra & Ranganath-(Wiley New Delhi), 1970.
4. Organic Synthesis a Disconnection Approach- Stuart Warren
5. Advanced Organic Chemistry-IV-Ed. Part A &B-F.J.Carrey & R.J.Sundberg (Kluwer) 2001.
6. Modern Methods of Organic Synthesis-N.Carruthers (Cambridge University), 1996.
7. Selected Organic Synthesis-Ian Fleming (John Wiley & Sons) 1973.

CH H 553: ELECTROCHEMISTRY AND REACTION DYNAMICS

COURSE OUTCOME:

- It is an advanced course on two different topics, electrochemical processes and theoretical aspects of chemical kinetics. The first part deals with concept and applications of electrocatalysis and processes taking place at the electrode and the solution interface.
- This course content trains students on alternate methods of synthesis using electrochemical concepts.
- Introduces the student to theoretical basis of understanding the rates of complex reactions,
- Arriving at the mechanism of various inorganic and organic reactions and knowledge of advanced techniques with the use of lasers in characterizing intermediates complex chemical reactions.

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

Electrocatalysis -Introduction. Electrocatalysis in reactions involving adsorbed species, concept and process of electrogrowth on electrodes. deposition to crystallization, mechanism of electrogrowth. special features of electrocatalysis. Hydrogen evolution and reactions. Electronation of oxygen and their mechanisms. 6hrs.

Photocatalysis: History of photocatalysis, principles and developments in photoelectrochemistry. Semiconductor-electrolyte solution interface. Effect of light at semiconductor interface. Capacity of space charge - Mott-Schottky plot. Photo cells-PEC cells and Phtogalvanic cells, surface effects in photoelectrochemistry. 5hrs

Ionic liquids - Introduction, characteristics of ionic liquids, models of simple ionic liquids,mixtures of simple ionic liquids. Hole model for liquid electrolytes. Transport phenomena in liquid electrolytes. Electronic conductance of alkali metals dissolved in alkali halides. 4hrs.

UNIT – II **[15 hours]**

Electrode Processes: Charge transfer across the interface and its implications. Basic electrodicreactions: Butler - Volmer equation. Current potential laws at charged interface. Quantum aspects of charge transfer reactions. Concepts of over voltage, Theory of hydrogen and oxygen overvoltage. Mechanism of cathodic and anodic reactions, Dependence of current density on overvoltage: Tafel equation. Applications of electrode processes-(voltammetry, electrosynthesis, electroctalysis, source of energy) 6 hrs.

The Electrified Interface: Electrification of an interfaces, experimental techniques used instudying interface (Low energy electron diffraction, X-ray photoelectron spectroscopy). The potential difference across Electrified interface. The accumulation and depletion of substances at an interface. Thermodynamics of electrified interface. Brief introduction to the structure of electrified interfaces(models) . 6hrs.

Kinetics of Composite Reactions: Inorganic reaction mechanism (decomposition of N_2O_5, and phosgene). Organic reaction mechanism- decomposition of acetaldehyde. Goldfinger-Letort- Niclause rules, combustion of hydrocarbon. 3hrs

UNIT – II **[15 hours]**

Reaction Dynamics: A Review of Chemical Kinetics, and activation parameters. Statistical treatment of rates – Transition state theory and its applications to reactions in solution. Concept of tunneling. Conventional transition state theory (CTST) - equilibrium hypothesis, Applications of CTST to reaction between atoms, derivation of rate expression, thermodynamic formulation of conventional transition – state theory, limitations of CTST. Extension of TST. 7hrs.

Potential energy surfaces – Features & construction of them. Theoretical calculation of Ea. Features ofpotential energy surfaces (attractive and repulsive surfaces for exothermic reaction). A brief account on concept of stripping and rebound mechanisms. State-to-state kinetics and spectroscopy of transient species. 4hrs

Dynamics of unimolecular reactions - Lindemann, Hinshelwood, RRK & RRKM theories. 4 hrs.

REFERENCES:

1. Modern Electrochemistry, 2nd Ed. Vol.1, 2A &2B, J O M Bockris and A K N Reddy, (Plenum, New York) 1998.
2. Chemical and Electrochemical Energy Systems, Narayan & Viswanathan (Univ. Press, Hyderabad) 1998.
3. Fundamentals of Electrochemistry, Fulkner and A. J. Bard, Wiley India, 2006.
4. Ions in solution-Basic principles of chemical interactions, J. Burgeess (Chichester) 1999.
5. Electrochemistry-Principles, Methods and Applications, Brett and Brett, Oxford Science1993.