Course Title: Organic Synthesis

Course Code: CH-811

Credit Hours: 3-0

Prerequisites: Nil

Course Outcomes:

To understand different methods of bond formation.

Student's must understand and be able to design a synthetic strategy for any complex molecule starting from simpler molecules.

To be able to apply various reactions considering the stereochemical outcomes of the known reactions.

Course Contents

Introduction: Retrosynthetic Analysis, Reversal *of the* Carbonyl Group Polarity *(Umpolung)*

Steps in Planning a Synthesis, Choice of Synthetic Method, etc.

Formation of C-C single bonds via enolates: 1,3-Dicarbonyl and Related Compounds, Direct Alkylation of Simple Enolates, Cyclization Reactions-Baldwin's Rules for Ring Closure, Stereochemistry of Cyclic Ketone Alkylation, lmine and HydrazoneAnions, Enamines, The Aldol Reaction, Condensation Reactions of Enols and Enolates, RobinsonAnnulation.

Formation of C-C single bonds organometallic reagents: Organolithium Reagents, Organomagnesium Reagents, Organotitanium Reagents, Organocerium Reagents, Organocopper Reagents, Organochromium Reagents, Organozinc Reagents, Organoboron Reagents, Organosilicon Reagents, Palladium-Catalyzed Coupling Reactions.

Formation of carbon-carbon multiple-bonds: Formation of Double and Triple Bonds.

Protecting Groups: Protectionof NH Groups, Protection of OH Groups of Alcohols, Protection of Diols as Acetals, Protection of Carbonyl Groups in Aldehydes and Ketones, Protectionof the Carboxyl Group, Protectionof Double Bonds, Protectionof Triple Bonds.

Functional Group Transformations: Oxidation of Alcohols to Aldehydes and Ketones, Reagents and Procedures for Alcohol Oxidation, Chemoselective Agents for Oxidizing Alcohols, Oxidation of Acyloins, Oxidation of Tertiary Allylic Alcohols,Oxidative Procedures to Carboxylic Acids, Allylic Oxidation of Alkenes

Terminology for Reduction of Carbonyl Compounds, Nucleophilic ReducingAgents ElectrophilicReducingAgents, Regio- and Chemoselective Reductions, Diastereoselective Reductions of Cyclic Ketones, Inversion of Secondary Alcohol Stereochemistry, DiastereofacialSelectivity in Acyclic Systems, Enantioselective Reductions.

Retrosynthesis: Practice exercises of various classes of compounds

Recommended Books

1. G. S. Zweifel, *et. al*. Modern Organic Synthesis.
2. F. A. Carey, *et. al*. Advanced Organic Chemistry. Part B: Reactions and Synthesis.
3. S. Warren, *et. al*. Organic Synthesis: The Disconnection Approach.
4. G.W. Ewing, Principles and Applications of Asymmetric Synthesis.