CHE-251-MJ-T: Organic Chemistry-I

Course Type: Major (Theory) **No. of Credits: 2**

Course Outcomes

1. Recall basic concepts of acidity, basicity, reaction mechanisms, oxidation, reduction, and stereochemistry.
2. Explain the mechanisms of organic reactions involving halides, oxidizing and reducing agents, and stereochemical outcomes in cyclic systems.
3. Apply knowledge of acidity, basicity, nucleophilic substitution, oxidation, reduction, and stereochemical principles to predict the behavior of organic compounds.
4. Analyze reaction mechanisms, reactivity trends of halogenated hydrocarbons, and stability of substituted cyclohexane conformations.
5. Evaluate the choice of reagents and reaction conditions for achieving specific transformations in organic synthesis.
6. Develop synthetic strategies using organic reactions and stereochemical concepts.

Course Contents

Chapter 1 : Structure, Acidity and Basicity **[6 Hours]**

Introduction to acidity and basicity, Lowry-Brønsted and Lewis acids and bases, concept of conjugate acids and bases, pKa, simple and substituted aliphatic acids, phenols, aromatic carboxylic acids, bases, pKb, aliphatic and aromatic bases, Introduction to types of organic reactions, concept of Reaction Mechanisms, energetics of reaction

Chapter 2 : Reactivity and Reactions of halogenated hydrocarbons **[10 Hours]**

Introduction and classification, general methods of preparation, reactivity of alkyl, aryl, allyl and vinyl halides, Nucleophilic substitution reactions: S_N1 and S_N2, Factors affecting S_N1 and SN2 reactions, Elimination reactions: E1 and E2, and comparative study of substitution and elimination reactions of alkyl halides, Nucleophilic aromatic substitution (S_NAr) reactions.

Chapter 3 : Oxidizing and reducing agents **[8 Hours]**

Oxidizing Reagents: Jones oxidation, Potassium permanganate, m-CPBA, Osmium tetroxide, Criegee Oxidation, O_3, Selenium dioxide, Reducing Reagents: Catalytic hydrogenation, LAH, SBH, DIBAL, Reduction of alkynes by Lindlar's catalyst and Na/NH_3, Clemmensen reduction, Wolff-Kishner reduction

Chapter 4 : Stereochemistry of mono and di-substituted cyclohexane [6 Hours]

Stability of chair conformation, ring flipping, Mono and di-substituted cyclohexanes, 1, 3-diaxial and butane-gauche interactions, cis and trans stereochemistry, optical activity, energy profile diagrams and stability.

References

1. A Guidebook to Mechanism in Organic Chemistry by Peter Sykes. 6th ed. Essex, England: Longman Scientific & Technical
2. Organic Chemistry by Morrison and Boyd, 7th Edition, Pearson Education
3. Advanced Organic Chemistry by Jerry March, 7th Edition, Wiley
4. Organic Chemistry by Jonathan Clayden, Nick Greeves, and Stuart Warren, 2nd Edition, Oxford University Press
5. Stereochemistry of Organic Compounds by D. Nasipuri, 3rd Edition, New Age International.
6. The Art of Writing Reasonable Organic Reaction Mechanisms" by Robert B. Grossman, 1st Edition, Springer
7. Reaction Mechanisms in Organic Chemistry" by S. M. Mukherjee and S. P. Singh, 1st Edition, New Age International
8. W. Carruthers and I. Coldham Search Results, Modern Methods of Organic Synthesis, Cambridge University Press, 2004
9. Francis A. Carey and Richard J. Sundberg, Advanced Organic Chemistry, Part B: Reactions and Synthesis, Springer, 2007
10. Richard O.C. Norman, James M. Coxon, Principles of Organic Synthesis, CRC Press, 1993