

**Module I**

**Disconnection Approach:** An introduction to synthons and synthetic equivalents, disconnection approach, functional group inter conversions, the importance of the order of events in organic synthesis, one group C-X and two group C-X disconnections, chemoselectivity, umplong approach, cyclisation reactions, amine synthesis.

**Protecting Groups:**

Principle of protection and deprotection of alcohol, amine, carbonyl and carboxyl groups and their application in organic synthesis.

**Module II****One Group C-C Disconnection:**

Alcohols and carbonyl compounds, regioselectivity, alkene synthesis, use of acetylenes and aliphatic nitro compounds in organic synthesis.

**Two Group C-C Disconnections:**

Diels-Alder reaction, 1,3-difunctionalised compounds,  $\alpha,\beta$ -unsaturated carbonyl compounds, control in carbonyl condensations, 1,5-difunctionalised compounds. Micheal addition and Robinson annulation.

**Ring Synthesis:**

Saturated heterocycles, synthesis of 3, 4, 5 and 6 membered rings, aromatic heterocycles in organic synthesis.

**Synthesis of Some Complex Molecules:**

Application of the above protocols in the synthesis of following compounds. Camphor, Vitamin D and Cortisone.

**Module III****Pericyclic Reactions:**

Molecular orbital symmetry, Frontier orbitals of ethylene, 1,3-butadiene, 1,3,5-hexatriene and allyl system, classification of pericyclic reactions, Woodward-Hoffmann correlation diagrams, FMO and PMO approach. Electrocyclic reactions: Conrotatory and disrotatory motion,  $4n$ ,  $4n+2$  and allyl systems.

Cycloadditions: Antarafacial and suprafacial additions,  $4n$  and  $4n+2$  systems, 2+2 addition of ketenes, 1,3 dipolar cycloadditions and cheletropic reactions.

Sigmatropic rearrangements: Suprafacial and antarafacial shifts of H, Sigmatropic shifts involving carbon carbon moieties, [3,3] and [5,5] Sigmatropic rearrangements, Claisen, Cope and aza-Cope rearrangements, fluxional tautomerism, ene reaction.

**Selected Text/Reference Books:**

1. Designing Organic Synthesis, A Programmed Introduction to Synthon Approach, S. Warren, Second Edition, Wiley, 1978.
2. Organic Synthesis: Concepts, Methods and Starting Materials, J. Fuhrhop and G. Penzlin, VCH, Weinheim, Germany, 2<sup>nd</sup> edn., 1993.
3. Some Modern Methods of Organic Synthesis, W. Carruthers, Cambridge Univ. Press, 4<sup>th</sup> edn, 2004.
4. Modern Synthetic Reactions, H. O. House, W. A. Benjamin, 2<sup>nd</sup> edn., 1972.
5. March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure, Michael B. Smith, 7<sup>th</sup> Edition, Wiley, 2013.
5. Principles of Organic synthesis, R.O.C. Norman, J. M. Coxon, CRC Press, Third Edition, 1993.
6. Advanced Organic Chemistry Part B: Structure and Mechanism, Francis A. Carey, Richard J. Sundberg, Fifth Edition, Springer, 2008.
7. Organic Synthesis: The Disconnection Approach, S. Warren and P. Wyatt, Wiley India Pvt.Ltd, 2<sup>nd</sup> edn, 2008.
8. Photochemistry and Pericyclic Reactions, J. Singh and J. Singh, Third Edition, New Age International (P) Ltd, 2012.