Approval: 10th Senate Meeting

Course Number: CY-502
Course Name: Photochemistry and pericyclic reactions
Credits: 3-1-0-4
Prerequisites: Organic Chemistry I
Intended for: M.Sc
Distribution: Core
Semester: Odd/Even

Preamble: Students are expected to learn, predicting the reaction/stereochemical outcome under a given set of conditions by using PMO, FMO, Woodward Hoffmann and Correlation Diagram approaches.

Course Modules:

Unit 1 : Pericyclic Reactions: Molecular orbitals and their symmetry

Molecular orbitals and their symmetry properties, Frontier orbitals of ethylene, 1,3-butadiene, 1,3,5-hexatriene and allyl systems. **(5 lectures).**

Unit 2: Woodward-Hoffmann:

Frontier Molecular Orbital method and Orbital symmetry correlation method. **(5 lectures).**

Unit 3 : Various type of pericyclic reactions:

Electrocyclic reaction; conrotatory and disrotatory motions 4n, 4n+2 and allyl systems. Cycloaddition; antrafacial and suprafacial addition, 4n and 4n+2 systems, 2+2 addition of ketenes, Diels-Alder reaction, stereochemical aspects and synthetic applications. 1,3 dipolar cycloadditions and cheleotropic reactions. Sigmatropic Rearrangements; suprafacial and antrafacial shifts of H, sigmatropic shifts involving carbon moieties, 3,3- and 5,5- sigmatropic rearrangements, Claisen, Cope and Aza-Cope rearrangements. Ene reaction. **(15 lecture).**

Unit 4 : Photochemistry:

Quantum yields, intersystem crossing, photosensitization and energy transfer reactions. Photochemistry of olefins and carbonyl compounds, photo oxygenation and photo fragmentation, Photochemistry of aromatic compounds: isomerisation, additions and substitutions. Singlet molecular oxygen reactions. Patterno-Buchi reaction, Di-pi-methane rearrangement, Bartons reaction and Photo-Fries rearrangement.

(17 lecture).

Text Books:

1. Molecular Reactions and Photochemistry by Charles H. DePuy, Orville Lamar Chapman
2. Frontier Orbital and Organic Chemical Reactions by I. Fleming, John Wiley, 1976.
3. Some modern Methods of Organic Synthesis by W. Carruthers, Cambridge University Press, 1990.
4. Protective Groups in Organic Synthesis by T.W. Greene, Wiley-VCH, 1999.

Reference:

1. Organic Reactions and Orbital Symmetry by T. L. Gilchrist and R. C. Storr, 2nd Ed., CUP
2. Modern Heterocyclic Chemistry by L. A. Paquette, W.A. Benjamin, Inc.,1968.
3. Pericylic reactions by Ian Fleming, Oxford University Press, 1999
4. Pericyclic Reactions A Textbook S. Sankararaman Wiley-VCH, 2005
5. Modern Molecular photochemistry of organic molecules N. J. Turro, V. Ramamurthy, J. C. Scaiano, University Science books, 2010