20CY104 ORGANIC CHEMISTRY - 2

Hours Per Week :

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4	-	-	4

Course Description and Objectives:

This course offers students understand the reaction mechanism of some of the Pericyclic, Photochemical and other organic reactions towards synthesis of heterocyclic compounds. Detailed reaction mechanism will be taught with relevance to regio-, stereo-, and chemoselective outcome for reaction. This also includes understanding the feasibility via frontier molecular orbitals in some of the cycloaddition reactions as well. Photochemical reactions of carbonyl compounds, olefins and aromoatics will be of interest to analyze the phenomenon of photochemical process. By illustrating the mechanism of common oxidizing and reducing agents synthesis of various heterocyclic skeletons will be covered during this course.

Course Outcomes:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes
1	Evaluation of various organic reactions such as an addition, substitution, elimination and rearrangement reactions.
2	Apply the concepts of FMO to explain the mechanism of electrocyclic and cycloaddition reaction.
3	Examine the photochemical process of some of the organic reactions.
4	Apply the knowledge of oxidizing and reducing agents to construct a protocol in organic reactions.
5	Apply the knowledge of oxidations, reductions and rearrangement towards synthesis of heterocyclic compounds.

UNIT - I :

Reaction Mechanism: Heterolytic bond cleavage, homolytic bond cleavage; representation of mechanistic steps using arrow formalism. Detailed reaction mechanisms and effect of different parameters in the regio-, stereo-, chemo-selective and specific reactions, outcome of addition, substitution, elimination, rearrangement including their stereochemical aspects.

UNIT - II :

Pericyclic Reactions: Definition, classification, MO theory, Electronic configuration in ground and first excited states of aliphatic conjugated polyene system (upto 4 double bonds). Electrocyclic Reactions: Mechanism, stereochemistry, PMO, FMO, correlation diagram, Woodward-Hoffman rules. **Cycloaddition Reactions**: FMO and correlation diagram methods (2+2) and (4+2) cycloaddition reactions, stereochemistry. Sigmatropic Rearrangement: classification, Mechanism by FMO method. Cope, Claisen and Aza-Cope rearrangements.

UNIT - III :

Photochemical Reactions: Primary photochemical processes, Jablonskii diagram, photochemical reactions of carbonyl compounds: Norrish type I and II reactions, Di-Pi methane and related rearrangements. Photochemistry of olefins: *cis-trans* isomerism, Paterno-Buchi reaction, photochemistry of aromatics, Organic photochemical reactions.

UNIT - IV :

Oxidations, reductions and rearrangements: Oxidations: Using Molecular oxygen, Lead tetra acetate, Peracids, Oxidation of C=C, perhydroxylation using $KMnO_4$, OsO_4, PCC, PDC, IBX, Swern oxidation and metal oxides

Reduction: Using hydrogenation, hydrogenolysis, hydrides and electrons

Rearrangement reactions: Anionic, Cationic and other rearrangements

UNIT - V :

Heterocycle Synthesis: Synthesis, structure, reactivity, orientation and important reactions of epoxide, azitidine, aziridine, pyridine, furans, pyrroles, thiophenes, indoles, quinolines, isoquinolines and and their derivatives.

Text Books:

1. W. Carruthers, Some Methods of Organic Synthesis, Cambridge University Press. 8. H. O. House, Modern Synthetic Reactions, Benjamin-Cummings Publishing Co. 1972.
2. G. S. Zweifel and M. H. Nantz, Modern Organic Synthesis-An Introduction, W. H. Freeman and Company, 2006.
3. A. Carey and and R. J. Sundberg, Advanced Organic Chemistry, Part A&B, Fifth Edition, 2007.
4. J. Clayden, N. Greeves, S. Warren and P. Wothers, Organic Chemistry, 2nd edition, Oxford University Press, 2012.

Reference Books

1. J. H. Fuhrhop, G. Li, Organic Synthesis: Concepts and Methods, 3rd edition, VCH, 1994.
2. S. Warren and P. Wyatt, Organic Synthesis: The Disconnection Approach, 2nd edition, Wiley, 2008.