INSTITUTE	**FACULTY OF SCIENCE**
PROGRAM	**MASTER OF SCIENCE (CHEMISTRY)**
SEMESTER	**3**
COURSE TITLE	**ADVANCED ORGANIC CHEMISTRY - I**
COURSE CODE	**02CY1504**
COURSE CREDITS	**4**

Objective:

1 To study some important rearrangements and to study different pericyclic reactions.

2 To create an interest of students to learn advanced concepts in organic chemistry.

Course Outcomes: After completion of this course, student will be able to:

1 Advanced concepts of Pericyclic reactions

2 Molecular rearrangements, mechanism and their applications.

3 Understand the concepts of Retro synthesis of bifunction molecules and Protection and deprotection of common functional groups.

4 Recognize and comment on aromatic concept of organic compounds.

Pre-requisite of course: Students should have knowledge of basic concepts of organic chemistry at UG and PG 1st year level.

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
4	0	0	50	30	20	0	0

Contents : Unit	Topics	Contact Hours
1	**Pericyclic Reaction** Introduction, Types of pericyclic reaction, Aromaticity in context of pericyclic reaction, Woodward-Hoffmann rules and pericyclic reactions, Conservation of molecular orbital symmetry, symmetry characteristics of molecular orbitals, correlation diagram of electrocyclic reaction,, Correlation diagram and FMO method of cycloaddition reaction, orbital symmetry in cycloaddition reaction (Correlation diagram), Frontier molecular orbital method, Cope and Claisen Rearrangement, Examples based on electrocylic, sigmatropic and cycloaddition reactions.	20

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Contents : Unit	Topics	Contact Hours
2	**Molecular Rearrangements** Wagner-Meerwein, pinacol and benzilic acid rearrangements in acyclic and cyclic organic molecules (substituted cyclohexane and decalin), migrating aptitude and their stereochemical outcome, rearrangement involving diazomethane (Wolff and Demjanov rearrangement), Stevens, Sommelet and Wittig rearrangements, Favorskii rearrangement in acyclic and cyclic a-halo ketones, Fries Rearrangement, McLafferty rearrangement, Hoffman, Curtius, Schmidt and Lossen rearrangements and its key reaction intermediates, Beckmann rearrangement and its stereochemistry, Baeyer??Villiger rearrangement in cyclic and acyclic ketones and migratory aptitude of alkyl and aryl groups, Dakin reaction in conversion of benzaldehyde to phenol and salicylaldehyde to catechol	20
3	**Retrosynthetic Analysis** Disconnection approach towards synthesis of bifunctional molecules (both cyclic and acyclic): concepts of synthons, synthetic equivalents (ethyl acetoacetate, ethyl cyano acetate and diethyl malonate as examples). Functional group interconversion (FGI).Protection and deprotection of common functional groups (-OH, carbonyl, -NH2, -CO2H) in synthetic route.	12
4	**Aromaticity** Aromaticity and anti-aromaticity, Hückel??s rule, y-aromaticity, homo-aromaticity, neutral and charged aromatic systems (3, 4, 5, and 7- membered ring systems), annulenes and fused rings systems, heteroannulenes	8
Total Hours		**60**

Textbook :

1 Pericyclic Reactions - A Textbook: Reactions, Applications and Theory, S. Sankararaman, Roald Hoffmann, Wiley-VCH, 2005

2 Reactions, Rearrangements & Reagents, S.N. Sanyal, Bharati Bhawan Publishers & Distributors, 2019

3 Fundamentals of Organic Synthesis the Retrosynthetic Analysis, Ratan Kumar Kar, New Central Book Agency, 2014

4 Aromaticity and Antiaromaticity: Concepts and Applications, Alexander I. Boldyrev, Tadeusz M. Krygowski, Miquel Solà, Gabriel Merino, Michal K. Cyrañski, WILEY,, 2022

References:

1 Organic Synthesis: The Disconnection Approach, 2nd Edition, Organic Synthesis: The Disconnection Approach, 2nd Edition, Stuart Warren, Paul Wyatt, John Wiley & Sons, Inc., 2008

2 An Introduction to the Chemistry of Heterocyclic Compounds, An Introduction to the Chemistry of Heterocyclic Compounds, Acheson, Richard Morrin, John Wiley &. Sons, 1960

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References:

3 Chemistry of Heterocyclic compounds, Chemistry of Heterocyclic compounds, Trivedi J J, Gwynn P., Ellis, 2001

4 Aromaticity Modern Computational Methods and Applications, Aromaticity Modern Computational Methods and Applications, Israel Fernandez, Elsevier, 2021

5 Organic Synthesis: The Disconnection Approach, Organic Synthesis: The Disconnection Approach, Stuart Warren, Paul Wyatt, Wiley,, 2008

6 Molecular Rearrangements in Organic Synthesis, Molecular Rearrangements in Organic Synthesis, CM Rojas, John Wiley &. Sons, 2015

7 Pericyclic Reactions, Pericyclic Reactions, Ian Fleming, oxford university press, 2015

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation

Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
10.00	20.00	30.00	30.00	10.00	0.00

Instructional Method:

1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

3 Students will use supplementary resources such as online videos, NPTEL videos, ecourses, Virtual Laboratory.

Supplementary Resources:

1 http://www.organic-chemistry.org/reactions.htm

2 http://www.organic-chemistry.org/books/

3 https://www.youtube.com/watch?v=Z_GWBW_GVGA

4 https://www.youtube.com/results?search_query=organic+rearrangements

5 http://www.nptel.ac.in/courses/104103069/#

6 http://ocw.mit.edu/courses/chemistry/

7 http://vlab.amrita.edu/index.php?sub=2

8 http://www.vlab.co.in/ba_labs_all.php?id=9 Digitally signed by (Name of HOD) DR.