

Subject Code: 02CY0453**Subject Name: Organic Chemistry-II****M.Sc. Sem - II****Objectives:**

- To understand reaction mechanism in organic synthesis.
- To learn theories and principles related to organic chemistry.
- To learn various nucleophilic, substitution and electrophilic reactions in organic chemistry.
- To create an interest of students to learn organic chemistry.

Credits Earned: 6 Credits**Course Outcomes:** After completion of this course, student will be able to

- Organic reaction and mechanism pathways.
- Nucleophilic and electrophilic reaction mechanisms, catalyst and rearrangements reactions.
- Recognise and comment on different synthetic strategies and methods for stereocontrol when faced with a synthetic scheme.
- Able to draw mechanisms for reactions involving heterocycles as starting materials, intermediates and products, and to propose syntheses of heterocycles from the major classes.

Pre-requisite of course: NA.**Teaching and Examination Scheme**

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	Mid Sem (M)	Internal (I)	Viva (V)	Term work (TW)	
4	0	3	6	50	30	20	25	25	150

Contents:

Unit	Topics	Contact Hours
1	Reaction path way and Reaction Intermediates: Homolytic bond fission, Heterolytic bond fission, Nucleophiles and electrophiles, Introduction, stability, generation, reactions and applications of carbocations, carbanions, free radicals, carbenes, nitrenes, benzyne, ylides and enamines.	12
2	Organic Reactions, mechanisms and their applications: Aldol condensation, Appel reaction, Barbier-Wieland, Birch reaction, Bouveault reaction, ChiChiBabin reaction, Chan-Lam coupling, Clemmensen reduction, Elbs-persulphate reaction, Hydroboration, Knoevenagel reaction, Kumada coupling, Leukart reaction, Michael addition reaction, Mitsunobu reaction, Mukaiyama reaction, Negishi coupling, Passerini reaction, Perkin reaction, Prins reaction, Reformatsky reaction, Robinson annulation reaction Rosenmund reaction, Vilsmeier- Haack reaction, Wilgerodt, Wolff Kishner, Sharpless-asymmetric epoxidation, Sonogashira coupling, Suzuki coupling, Ugi reaction.	20
3	Organic Rearrangements and their mechanisms: Bayer villiger oxidation, Beckmann rearrangement, Benzil benzoic acid rearrangement, Favorskii rearrangement, Fries Rearrangement, Lossen rearrangement, Neber Rearrangement, Pinacol-pinacolone rearrangement, Schmidt rearrangement, Sommelet Hauser rearrangement	18
4	Application of Selective Reagents: Lithium diisopropylamide, Crown ethers, Dicyclohexylcarbodiimide, DDQ, Wilkinson's catalyst, Lithium Aluminium Hydride, Selenium dioxide.	10
	Total Hours	60

References:

1. Reaction Mechanism and Problems in Organic Chemistry – P. Chattopadhyay, Asian Book Pvt Ltd, New Delhi (2003).
2. A Text Book of Organic Chemistry – R.K.Bansal, New Age International (P) Ltd. 4th edition (2003).
3. Advanced Organic Chemistry, Part B – F. A. Carey & R. J. Sundberg, Plenum Press (2007).
4. Organic Chemistry by G. Marc. Loudon, Oxford University Press (2002).
5. Organic Reaction Mechanism (II edition) – V.K. Ahluwalia, R.K. Parasar.
6. Reaction Mechanism and Reagents in Organic Chemistry – Gurdeep R. Chatwal.
7. Organic Chemistry by Morrison and Boyd, prentice hall of India pvt ltd (6th edition), (2003)

8. Organic Chemistry – I.L.Finar 6th edition (low price), Pearson Education (2003).
9. Advanced Organic Chemistry (IV edition) – Jerry March.
10. Reactive Intermediates in Organic Chemistry – J.P. Trivedi, University granthNirman Board.
11. Organic Chemistry by T.W. Graham solimn, Craig B. Fryble, low price 8th edition, John Wiley & Sons, inc.
12. Organic Chemistry by V. K. Ahluwalia, Madhuri Goyal, Narosa Publishing House, (2000).
13. Organic Synthesis (2nd edition) by M.B. Smith, Mcgraw-Hill, Inc. (2001).
14. Some Modern Methods of Organic synthesis (4th edition), W.Carruthers, Cambridge University Press (2004).
15. Organic Cehmsitry – Structure and Reactivity by Seyhan Ege, A.I.T.B.S. Publishers and Distributors. 3rd edition (1998).
16. Organic Chemistry by J. Mcmurry, Asian Books Pvt. Ltd., 5th edition (2001). Organic Synthesis – Strategy and Control by Paul Wyatt & Stuart Warren, John Wiley & Sons, (2007).
17. Principles of Organic Synthesis by R.O.C Norman, J.M. Coxon, CRC Press, (3rd edition) (2009).
18. Organic Chemistry by J. Clayden, N. Greeves, S. Warren, P. Wothers, Oxford University Press (2000).
19. Comprehensive Organic Synthesis, Vols 1-9, B.M. Frost & I Fleming. Pergamon (1991).

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per 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	Understand	Apply	Analyze	Evaluate	Create
20%	25%	20%	15%	10%	10%

Suggested List of Experiments:**Multistep Synthesis:**

1. To prepare 2, 3- diphenyl thiazolidone from benzaldehyde.
2. To prepare benzanilide from benzophenone.
3. To prepare anthraquinone from phthalic anhydride.
4. To prepare 4-benzylidene 2-phenyl oxazole 5-one from glycine.
5. To prepare 2-phenyl indole from acetophenone.

Any four synthesis must be performed.

Organic Qualitative Analysis of mixture of organic compounds (mixture of 2 and 3 organic compounds):

Identification of single solid organic compounds by chemical tests and preparation of a suitable solid derivative after consulting literature.

Tests include-

- a) Determination of m.p. of solid sample
- b) Detection of special Elements (Nitrogen, Halogens, Sulphur)
- c) Solubility in solvents at room temperature and classification
- d) Preliminary tests
- e) Test for functional group/s [aromatic 1°, 2°, 3° amino, anilido-, nitro-, amido-, phenolic-OH, carboxylic acid, carbonyl (keto, aldehyde), ester-, unsaturation, and hydrocarbon].
- f) Literature survey
- g) Preparation of at least one solid derivative including recrystallisation.
- h) Determination of m.p. of derivative.

At least FOUR unknown samples to be performed during lab session.

❖ Reference Books:

1. An Introduction to Experimental Organic Chemistry- Robert, Gilbert, Rodewald & Wingrove.
2. Systematic Qualitative Organic Analysis-H. Middleton.
3. Hand Book of Organic Analysis- H. T. Clarke.
4. Text Book of Practical Organic Chemistry-A.I. Vogel.

Instructional Method:

- a. 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.
- b. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- c. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- d. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.

- e. Use of hazardous/toxic chemicals should be avoided as far as possible in laboratory.
- f. All students in the laboratory must wear safety goggles and lab coats during lab session.

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