INSTITUTE	**FACULTY OF SCIENCE**
PROGRAM	**MASTER OF SCIENCE (CHEMISTRY)**
SEMESTER	**2**
COURSE TITLE	**ORGANIC CHEMISTRY-ESSENTIAL CONCEPTS**
COURSE CODE	**02CY0456**
COURSE CREDITS	**6**

Objective:

1 The aim of learning this course is to make learners able to understand the heteocyclic compounds and understand organic reaction, rearrangements, cross-coupling reactions with their mechanism and applications in organic chemistry.

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

1 Understand the concept of heterocyclic compounds.
2 Knowledge of reduction reactions and application of reducing agents with mechanisms.
3 Knowledge of oxidation reactions and applications of oxidizing agents with mechanisms.
4 Understand cross coupling reactions and importance of multi component reactions.

Pre-requisite of course: To Understand the concepts of heterocyclic chemistry and organic name reactions and reagents

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
5	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Heterocyclic Chemistry** Nomenclature of heterocycles, monocyclic, fused and bridged heterocycles, synthesis and reactions of pyrrole, thiophene, furan, pyrazole, imidazole, oxazole,, Thiazole, pyrimidine, benzofurans, indole, benzothiophenes pyridine, quinoline, isoquinoline, six membered rings containing two heteroatoms.	10

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Contents : Unit	Topics	Contact Hours
2	**Reduction reactions, mechanism and its applications** Reduction reactions: (a) Catalytic hydrogenation (Heterogeneous: palladium/platinum/rhodium/nickel etc; Homogeneous: Wilkinson). Noyori asymmetric hydrogenation. , (b) Metal based reductions using Li/Na/Ca in liquid ammonia, sodium, magnesium, zinc, titanium and samarium (Birch reduction, Pinacol formation, McMurry, acyloin formation, dehalogenation and deoxygenation), (c) Hydride transfer reagents from Group III and Group IV in reductions. (i) NaBH4, triacetoxyborohydride, L-selectride, K-selectride, Luche reduction; LiAlH4, DIBAL-H, and Red-Al, trialkylsilanes and trialkylstannane, Meerwein-Pondorff-Verley reduction) (ii) Stereo/enantioselective reductions (chiral boranes, Corey-Bakshi-Shibata reduction), Clemmenson and Wolff-Kishner reduction, Rosenmund and Bouveaulant Blanc reaction	16
3	**Oxidation reactions, mechanism and its applications** Metal-based and non-metal based oxidations of (a) alcohols to carbonyls (chromium, manganese, aluminium, silver, ruthenium, DMSO, hypervalent iodine and TEMPO based reagents) (b) phenols (Fremy's salt, silver carbonate) (c) alkenes to epoxides (peroxides/per acids based), Sharpless asymmetric epoxidation, Jacobsen epoxidation, Shi epoxidation, (d) alkenes to diols (manganese, osmium based), Sharpless asymmetric dihydroxylation, Prevost reaction and Woodward modification, (e) alkenes to carbonyls with bond cleavage (manganese, osmium, ruthenium and lead based, ozonolysis), (f) alkenes to alcohols/carbonyls without bond cleavage (hydroboration-oxidation, Wacker oxidation, selenium, chromium based allylic oxidation) (g) ketones to ester/lactones (Baeyer-Villiger) Corey-Kim oxidation, Dess-Martin oxidation, Swern oxidation, Wacker oxidation.	16
4	**Transition Metal Catalyzed Cross-Coupling reactions and Multicomponent reactions** Murahasi, Suzuki, Sonogashira, Kumada, Heck, Stille, Negishi, Hiyama, Buchwald-Hartwig and Ullman coupling reactions with mechanism, Multicomponent reactions with mechanism and applications.	18
Total Hours		**60**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Experiment** Experiment 1, Experiment 2, Experiment 3, Experiment 4, Experiment 5, Experiment 6, Experiment 7, Experiment 8	45
Total Hours		**45**

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Textbook :

1 A Text Book of Organic Chemistry, R.K.Bansal, New Age International (P) ltd. 4th edition, 2003

2 Reaction Mechanism and Problems in Organic Chemistry, P. Chattopadhyay, Asian Book Pvt Ltd, 2003

References:

1 Advanced Organic Chemistry, Part B , Advanced Organic Chemistry, Part B , F. A. Carey & R. J. Sundberg, Plenum Press, 2007

2 Organic Chemistry , Organic Chemistry , Morrison and Boyd, Prentice Hall of India Pvt Ltd, 2003

3 Organic Chemistry, Organic Chemistry, I. L. Finar, Pearson Education, 2003

4 Organic Chemistry, Organic Chemistry, V. K. Ahluwalia, Narosa Publishing House, 2003

5 Some Modern Methods of Organic synthesis, Some Modern Methods of Organic synthesis, W.Carruthers, Cambridge University Press, 2004

6 Organic Chemistry, Organic Chemistry, J. Clayden, N. Greeves, S. Warren, P. Wothers, Oxford University Press, 2000

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**
10.00	20.00	25.00	25.00	10.00	10.00

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

4 All students in the laboratory must wear safety goggles and lab coats during lab session.

5 Use of hazardous/toxic chemicals should be avoided as far as possible in laboratory

6 Practical examination will be conducted at the end of semester for evaluation of performance of students in 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

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Supplementary Resources:

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

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