



FIRST-YEAR OF MASTER OF SCIENCE CHEMISTRY REVISED SYLLABUS ACCORDING TO CBCS NEP2020

COURSE TITLE: SYNTHETIC ORGANIC CHEMISTRY-I
SEMESTER-III
W.E.F. 2024-25

**RECOMMENDED BY THE BOARD OF STUDIES IN CHEMISTRY
AND
APPROVED BY THE ACADEMIC COUNCIL**

Devrukh Shikshan Prasarak Mandal's
Nya. Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce, and
Vid. Dadasaheb Pitre Science College (Autonomous), Devrukh.
Tal. Sangameshwar, Dist. Ratnagiri-415804, Maharashtra,
India

Academic Council Item No:

Name of the Implementing Institute	:	Nya. Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce, and Vid. Dadasaheb Pitre Science College (Autonomous), Devrukh. Tal. Sangameshwar, Dist. Ratnagiri-415804,
Name of the Parent University	:	University of Mumbai
Name of the Programme	:	Master of Science
Name of the Department	:	Chemistry
Name of the Class	:	Second Year
Semester	:	Third
No. of Credits	:	04
Title of the Course	:	Synthetic Organic Chemistry-I
Course Code	:	S602CHT
Name of the Vertical in adherence to NEP 2020	:	Compulsory Major
Eligibility for Admission	:	Chemistry Graduate learner seeking Admission to Post Graduate Programme in adherence to Rules and Regulations of the University of Mumbai and Government of Maharashtra
Passing Marks	:	40%
Mode of Assessment	:	Formative and Summative
Level	:	PG
Pattern of Marks Distribution for SEE and CIA	:	60:40
Status	:	NEP-CBCS
To be implemented from Academic Year	:	2024-2025
Ordinances /Regulations (if any)		

Syllabus for Second Year of Master of Science in Chemistry

(With effect from the academic year 2024-2025)

SEMESTER-III

Paper No.- II

Course Title: Synthetic Organic Chemistry-I

No. of Credits: 04

Type of Vertical: Compulsory Major

COURSE CODE: S602CHT

Learning Outcomes Based on BLOOM's Taxonomy:

After completing the course, the learner will be able to...		
Course Learning Outcome No.	Blooms Taxonomy	Course Learning Outcome
CLO-01	Remember	draw mechanisms of organic reactions such as name reaction, reaction related to free radicals, enamine and ylides.
CLO-02	Understand	explain stability, reactivity, structural and stereochemical properties of free radicals, enamines, ylides and organometallic reaction.
CLO-03	Apply	construct mechanism with application of multicomponent reaction.
CLO-04	Analyse	differentiate between enamines and enolates.

Syllabus for Second Year of Master of Science in Chemistry

(With effect from the academic year 2024-2025)

SEMESTER-III

Paper No.- II

Course Title: Synthetic Organic Chemistry-I

No. of Credits: 04

Type of Vertical: Compulsory Major

COURSE CODE: S02CHT

COURSE CONTENT			
Module No.	Content	Credits	No. of Hours
1	UNIT-I: Name reactions with mechanism and application <ul style="list-style-type: none">○ Mukaiyama esterification, Mitsunobu reaction, Darzen's Glycidic Ester synthesis, Ritter reaction, Yamaguchi esterification, Peterson olefination.○ Domino reactions: Characteristics; Nazarov cyclization○ Multicomponent reactions: Strecker Synthesis, Ugi 4CC, Biginelli synthesis, Hantzsch synthesis, Pictet-Spengler synthesis○ Click Reactions: Characteristics; Huisgen 1,3-Dipolar Cycloaddition	01	15
2	UNIT-II: Radicals in organic synthesis <ul style="list-style-type: none">○ Introduction: Generation, stability, reactivity and structural and stereochemical properties of free radicals, Persistent and charged radicals, Electrophilic and nucleophilic radicals.○ Radical Initiators: Azobisisobutyronitrile (AIBN) and Dibenzoyl peroxide.○ Characteristic reactions: Free radical substitution, addition to multiple bonds. Radical chain reactions, Radical halogenation of hydrocarbons (Regioselectivity), radical cyclizations, autoxidations:	01	15

	<p>synthesis of cumene hydroperoxide from cumene.</p> <ul style="list-style-type: none"> ○ Radicals in synthesis: Inter and intra molecular C-C bond formation via mercuric hydride, tin hydride, thiol donors. Cleavage of C-X, C-Sn, C-Co, C-S, O-O bonds. Oxidative coupling, C-C bond formation in aromatics: SRNAr reactions. ○ Hunsdiecker reaction, Pinacol coupling, McMurry coupling, Sandmeyer reaction, Acyloin condensation. 		
3	<p>UNIT-III: Enamines, Ylides and α-C-H functionalization</p> <ul style="list-style-type: none"> ○ Enamines: Generation & application in organic synthesis with mechanistic pathways, Stork enamine reaction. Reactivity, comparison between enamines and enolates. Synthetic reactions of enamines including asymmetric reactions of chiral enamines derived from chiral secondary amines. ○ Phosphorus, Sulfur and Nitrogen Ylides: Preparation and their synthetic applications along with their stereochemical aspects. Wittig reaction, Horner-Wadsworth Emmons Reaction, Barton-Kellogg olefination. ○ α-C-H functionalization: By nitro, sulfoxide, sulfone and phosphonate groups: generation of carbanions by strong bases (LDA/n-butyl lithium) and applications in C-C bond formation. Bamford-Stevens reaction, Julia olefination and its modification, Seyferth-Gilbert homologation, Steven's rearrangement. 	01	15
4	<p>Unit-IV: Metals / Non-metals in organic synthesis</p> <ul style="list-style-type: none"> ○ Mercury in organic synthesis: Mechanism and regiochemistry of oxymercuration and demercuration of alkenes, mercuration of aromatics, transformation of aryl mercurials to aryl halides. Organomercurials as carbene transfer reagents. ○ Organoboron compounds: Mechanism and regiochemistry of hydroboration of alkenes and 		

	<p>alkynes, asymmetric hydroboration using chiral boron reagents, 9-BBN hydroboration, oxazaborolidine (CBS catalyst) and functional group reduction by diborane.</p> <ul style="list-style-type: none"> ○ Organosilicons: Salient features of silicon governing the reactivity of organosilicons, preparation and important bond-forming reactions of alkyl silanes, alkenyl silanes, aryl silanes and allyl silanes. β-silyl cations as intermediates. Iodotrimethylsilane in organic synthesis. ○ Silyl enol ethers: Application: As nucleophiles (Michael reaction, Mukaiyama aldol reaction), in ring contraction reactions. ○ Organotin compounds: Preparation of alkenyl and allyl tin compounds; application in C-C bond formation, in replacement of halogen by H at the same C atom. ○ Selenium in organic synthesis: Preparation of selenols/selenoxide, selenoxide elimination to create unsaturation, selenoxide and seleno acetals as α-C-H activating groups. 	01	15
	Total	04	60

Access to the Course

The course is available for all the students admitted for Second Year of Master of Science.

Methods of Assessment

The assessment pattern would be 60:40, 60% for Semester End Examination (SEE) and 40% for Continuous Internal Assessment (CIA). The structure of the SEE and CIA would be as recommended by the Board of Studies and approved by the Board of Examination and the Academic Council of the college.

References:

1. Advanced Organic Chemistry, Part A and Part B: Reaction and
2. Synthesis, Francis A. Carey, Richard J. Sundberg, 5th Edition, Springer Verlag

Nya. Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce and Vid. Dadasaheb Pitre Science College, Devrukh (An Autonomous College Affiliated with University of Mumbai)

3. Modern Methods of Organic Synthesis, 4th Edition, W. Carruthers and Iain Coldham, Cambridge University Press, 2004.
4. Chem.Rev. 2002, 102, 2227-2302, Rare Earth Metal Triflates in Organic Synthesis, S. Kobayashi, M. Sugiura, H. Kitagawa, and W.W.L. Lam.
5. Organic Chemistry, Clayden Greeves Warren and Wothers, Oxford Press (2001).
6. Modern Organic Synthesis: An Introduction, G.S. Zweifel and M.H. Nantz, W.H. Freeman and Company, (2007).
7. Advanced Organic Chemistry: Reaction Mechanism, R. Bruckner, Academic Press (2002).
8. Principles of Organic Synthesis, R.O.C. Norman & J. M. Coxon, 3rd Edn., Nelson Thornes
9. Organic Chemistry, 7th Edn, R. T. Morrison, R. N. Boyd, & S. K. Bhattacharjee, Pearson
10. Strategic Applications of Name Reactions in Organic Synthesis, L. Kurti & B. Czako (2005), Elsevier Academic Press
11. Advanced Organic Chemistry: Reactions & Mechanisms, 2nd Edn., B. Miller & R. Prasad, Pearson
12. Organic reactions and their mechanisms, 3rd revised edition, P.S. Kalsi, New Age International Publishers
13. Organic Synthesis: The Disconnection Approach, Stuart Warren, John Wiley & Sons, 2004
14. Name Reactions and Reagents in Organic Synthesis, 2nd Edn., Bradford P. Mundy, Michael G. Ellard, and Frank Favoloro, Jr., Wiley-Interscience
15. Name Reactions, Jie Jack Lie, 3rd Edn., Springer
16. Organic Electrochemistry, H. Lund, and M. Baizer, 3rd Edn., Marcel Dekker.