



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

COURSE TITLE: NATURAL PRODUCTS AND SPECTROSCOPY-I
SEMESTER-III
W.E.F. 2024-2025

**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	:	Natural products and Spectroscopy
Course Code	:	S603CHT
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.- I

Course Title: Natural products and Spectroscopy

No. of Credits: 04

Type of Vertical: Compulsory Major

COURSE CODE: S603CHT

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	describe the different types of alkaloids, natural pigments and insect pheromones, prostaglandins, lipids and their chemistry and medicinal important.
CLO-02	Understand	explain structural features, biological importance and structural elucidation of compound of natural product. NMR spectroscopy and advance NMR techniques.
CLO-03	Apply	predict spin system notations and structure of organic compounds using UV, IR, $^1\text{H-NMR}$ and $^{13}\text{C-NMR}$ and Mass spectroscopy. .
CLO-04	Analyse	outline the multistep synthesis and stereochemistry of natural products.

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SEMESTER-III

Paper No.- I

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COURSE CONTENT			
Module No.	Content	Credits	No. of Hours
1	<p>UNIT-I: Natural products-I</p> <ul style="list-style-type: none">○ Carbohydrates: Introduction to naturally occurring sugars: Deoxysugars, aminosugars, branched sugars. Structure elucidation of lactose and D-glucosamine (synthesis not expected). Structural features and applications of inositol, starch, cellulose, chitin and heparin.○ Natural pigments: General structural features, occurrence, biological importance and applications of: carotenoids, anthocyanins, quinones, flavones, pterins and porphyrins (chlorophyll). Structure elucidation of β-carotene and Cyanin (with synthesis). Synthesis of ubiquinone from 3, 4, 5-trimethoxyacetophenone.○ Insect pheromones: General structural features and importance. Types of pheromones (aggregation, alarm, releaser, primer, territorial, trail, sex pheromones etc.), advantage of pheromones over conventional pesticides. Synthesis of bombykol from acetylene, disparlure from 6-methylhept-1-ene, grandisol from 2-methyl-1, 3-butadiene.○ Alkaloids: Occurrence and physiological importance of morphine and atropine. Structure elucidation, spectral data and synthesis of coniine.	01	15

2	<p>UNIT-II: Natural products-II</p> <ul style="list-style-type: none"> ○ Multi-step synthesis of natural products: Synthesis of the following natural products with special reference to reagents used, stereochemistry and functional group transformations: <ul style="list-style-type: none"> a) Woodward synthesis of Reserpine from benzoquinone. b) Corey synthesis of Longifoline from resorcinol. c) Gilbert-Stork synthesis of Griseofulvin from phloroglucinol. d) Corey's Synthesis of Caryophyllene from 2-Cyclohexenone and Isobutylene. e) Synthesis of Juvabione from Limonene. f) Synthesis of Taxol. ○ Prostaglandins: Classification, general structure and biological importance. Structure elucidation of PGE₁. ○ Lipids: Classification, role of lipids, Fatty acids and glycerol derived from oils and fats. ○ Insect growth regulators: General idea, structures of JH₂ and JH₃. ○ Plant growth regulators: Structural features and applications of arylacetic acids, gibberellic acids and triacontanol. Synthesis of triacontanol (synthesis of stearyl magnesium bromide and 12-bromo-1 tetrahydropyranyloxydodecane expected). 	01	15
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3	<p>Unit-IV: Advanced spectroscopic techniques-I</p> <ul style="list-style-type: none"> ○ Proton NMR spectroscopy: Recapitulation, chemical and magnetic equivalence of protons, First order, second order, Spin system notations (A₂, AB, AX, AB₂, AX₂, AMX and A₂B₂-A₂X₂ spin systems with suitable examples). Long range coupling (Allylic coupling, 'W' coupling and coupling in aromatic and heteroaromatic systems), Temperature effects, Simplification of complex spectra, nuclear magnetic double resonance, chemical shift reagents. ○ ¹³C –NMR spectroscopy: Recapitulation, equivalent and non-equivalent carbons (examples of aliphatic and aromatic compounds), ¹³C- chemical shifts, calculation of ¹³C-chemical shifts of aromatic carbons, heteronuclear coupling of carbon to ¹⁹F and ³¹P. ○ Spectral problems: Based on UV, IR, ¹H-NMR and ¹³C-NMR and Mass spectroscopy. 	01	15
4	<p>Unit-IV: Advanced spectroscopic techniques-II</p> <ul style="list-style-type: none"> ○ Advanced NMR techniques: DEPT experiment, determining number of attached hydrogens (Methyl/methylene/methine and quaternary carbons), two dimensional spectroscopic techniques, COSY and HETCOR spectra, NOE and NOESY techniques. ○ Spectral problems: Based on UV, IR, ¹H-NMR, ¹³C-NMR (Including 2D technique) and Mass spectroscopy. 	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.

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

References:

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9. Introduction to Flavonoids, B.A. Bohm, Harwood Academic Publishers, 1998.
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