



# DETAILED TEACHING SCHEME

SCHOOL OF SCIENCE

PROGRAM: M.Sc. – ORGANIC CHEMISTRY

ACADEMIC YEAR – 2023-24

SEMESTER – I (Batch - 2023-25)

DEFINITION OF CREDIT: **1. Lecture (L):** 1 hour/week/semester, **2. Practical (P):** 2 hours/week/semester, **3. Tutorial(T):** 2 hours/week/semester.

TEACHING SCHEME												
Course Code	Course Name	Teaching Hours per week				SSH	Credits	Max. Marks of TSEE	CIE	PSEE	TCIE - I Assessment Method	Remarks any
		TH	TU	PR								
MGC101	Spectroscopy	4	0	0	3	4	100	Y	N	Assignment		
MGC112	Organic Chemistry-I	4	0	0	3	4	100	Y	N	Assignment	Revised	
MGC113	Analytical Chemistry-I	4	0	0	2	4	100	Y	N	Assignment	Revised	
MGC211	Separation Techniques	4	0	0	2	4	100	Y	N	Assignment	Revised	
MGC105	General Chemistry Experiments	0	0	8	0	4	---	Y	Y	Assignment	New course	
	<b>TOTAL</b>	<b>16</b>	<b>0</b>	<b>8</b>	<b>10</b>	<b>20</b>						
	<b>Total Teaching Hours 24</b>											

Signature of HOD

Signature of Director



# DETAILED TEACHING SCHEME

SCHOOL OF SCIENCE

PROGRAM: M.Sc. – ORGANIC CHEMISTRY

ACADEMIC YEAR – 2023-24

SEMESTER – II (Batch - 2023-25)

DEFINITION OF CREDIT: **1. Lecture (L):** 1 hour/week/semester, **2. Practical (P):** 2 hours/week/semester, **3. Tutorial(T):** 2 hours/week/semester.

## TEACHING SCHEME

Course Code	Course Name	Teaching Hours per week				SSH	Credits	Max. Marks of TSEE	CIE	PSEE	TCIE - I Assessment Method	Remarks any
		TH	TU	PR								
MOC313	Heterocyclic Chemistry	4	0	0	3	4	100	Y	N	Assignment	Revised	
MOC203	Medicinal Chemistry	4	0	0	3	4	100	Y	N	Assignment	New course	
MOC204	Advance Organic Chemistry	4	0	0	2	4	100	Y	N	Assignment	New course	
MOC314	Chemistry of Natural Products	4	0	0	2	4	100	Y	N	Assignment	Revised	
MOC205	Organic Chemistry Experiments	0	0	8	0	4	---	Y	Y		New course	
	<b>TOTAL</b>	<b>16</b>	<b>0</b>	<b>8</b>	<b>10</b>	<b>20</b>						
	<b>Total Teaching Hours 24</b>											

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# DETAILED TEACHING SCHEME

SCHOOL OF SCIENCE

PROGRAM: M.Sc. – ORGANIC CHEMISTRY

ACADEMIC YEAR – 2023-24

SEMESTER – III (Batch - 2022-24)

DEFINITION OF CREDIT: **1. Lecture (L):** 1 hour/week/semester, **2. Practical (P):** 2 hours/week/semester, **3. Tutorial(T):** 2 hours/week/semester

TEACHING SCHEME											
Course Code	Course Name	Teaching Hours per week			SSH	Credits	Max. Marks of TSEE	CIE	PSEE	TCIE - I Assessment Method	Remarks any
		TH	TU	PR							
MOC301	Stereochemistry	4	0	0	3	4	100	Y	N	Assignment	
MOC302	Chemistry of Synthetic Drugs	4	0	3	3	7	100	Y	Y	Assignment	
MOC303	Heterocyclic Chemistry	4	0	3	3	7	100	Y	Y	Assignment	
MOC304	Chemistry of Natural Products	4	0	3	2	7	100	Y	Y	Assignment	
	<b>TOTAL</b>	<b>16</b>	<b>0</b>	<b>9</b>	<b>11</b>	<b>25</b>					
	<b>Total Teaching Hours 25</b>										

Signature of HOD

Signature of Director



## DETAILED TEACHING SCHEM

\* Students are required to undergo training for 15 hours. of Field Work/Training/Workshop throughout the semester.

1. CIE – Continuous internal evaluation (TCIE &/OR PCIE)
2. SSH - Self-study hours
3. PSEE – Practical semester end examination including ITD, Dissertation, Industrial project, Industrial training etc..
4. (@) Audit Course / Non- Gradual Course
5. TSEE – Theory Semester End Examinations
6. Y – Yes    I    N- No
7. TH – Theory | PR – Practical | TU - Tutorial
8. Any other abbreviation

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# SYLLABUS

<b>Course Title</b>	Stereochemistry
<b>Course Code</b>	MOC301
<b>Course Credit</b>	Lecture :4
	Practical :0
	Tutorial :0
	Total :4

## Course Learning Outcomes:

After Successful completion of the above course, students will be able to:

- **Understand** types of isomers.
- **Apply** different reactions from stereoscopic aspect.
- **Remember** the idea of enantiomers, diastereomers, racemic mixture and resolution.
- **Understand** different conformations for acyclic as well as cyclic systems.
- **Explain** stereochemistry of organic compounds.
- **Analyze** conformational analysis including substituted cyclohexane, cyclohexanone, cyclohexenes etc.
- **Differentiate** stereo specific and stereoselective reactions, Drawing of diastereomers, substituted cyclohexanes etc.
- **Analyze** diastereoselectivity in detail.

## Detailed Syllabus:

Sr. No	Name of chapter & Details	Session Allotted
<b>SECTION-I</b>		
1	<b>Fundamental stereochemistry:</b> Enantiomers and chirality, Planes of symmetry and chirality, Isomerisation (stereo isomer and constitutional isomer), configuration and conformation, Racemic modification and resolution method, optical activity due to molecular dissymmetry, R and S nomenclature, Fischer projection, Mesodiastereomers, Determination of stereochemistry compounds. Resolution (separating enantiomers), natural chirality, chiral drugs and others.	15
2	<b>Conformational analysis:</b> Confirmation and configuration, ring strain, cyclohexane (drawing, substituted	15

	cyclohexane), Locking groups(t-butyl groups, decalins and steroids), reactivity of axially and equatorially substituted rings, conformation of ring containing sp <sup>2</sup> hybridized carbon atom, conformation of multi rings (cyclohexanone and cyclohexene) and others.	
<b>SECTION-II</b>		
<b>3</b>	<b>Diastereoselectivity:</b> Stereo specific and stereo selective reactions, prochirality, nomenclature of prochiral faces/groups using R/S type system. Drawing diastereo isomers of acyclic molecules. Lowest energy conformation of carbonyl compounds. Cram's rule, Newman projection and Felkin-Anh model. Chelation, stereoselective reaction of acyclic alkenes. The Hovek model. Diastereoselectivity in aldol reaction and others.	<b>15</b>
<b>4</b>	<b>Determination of stereochemistry by spectroscopic methods:</b> Stereochemistry of fused rings, coupling in furans, determination of homolytic groups, enantiotopic groups, diastereotopic groups, germinal coupling in six membered rings, the nuclear over house effect and others. 3J values vary with H-C-C-H dihedral angle, stereochemistry of Fused Rings, coupling in furans. Determination of homolytic groups, enantiotopic groups, diastereotopic groups, germinal coupling in six membered rings, the nuclear over house effect and others.	<b>15</b>
<b>Instructional Method and Pedagogy:</b>		
<ul style="list-style-type: none"> <li>▪ Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.</li> <li>▪ Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.</li> <li>▪ Surprise tests/Quizzes/Tutorials will be conducted.</li> </ul>		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. Stereochemistry of organic compounds - P.S. Kalsi.</li> <li>2. Stereochemistry - D. Nasipuri</li> <li>3. Organic chemistry - I.L. Finar</li> <li>4. Stereochemistry - J.P. Trivedi</li> <li>5. Stereo selective synthesis: A practical approach - M. Nogradi, VCH</li> </ol>		



# SYLLABUS

<b>Course Title</b>	Chemistry of Synthetic Drugs	
<b>Course Code</b>	MOC302	
<b>Course Credit</b>	Lecture	: 04
	Practical	: 03
	Tutorial	: 00
	Total	: 07
<b>Course Learning Outcomes:</b>		
After Successful completion of the above course, students will be able to:		
<ul style="list-style-type: none"> <li>▪ <b>Remember</b> history of drug classification, synthesis and basic concepts of medicinal chemistry</li> <li>▪ <b>Understand</b> the utilization of different drugs.</li> <li>▪ <b>Apply</b> the knowledge for industrial purposes as well as civilization.</li> </ul>		
<b>Detailed Syllabus:</b>		
<b>Sr. No</b>	<b>Name of chapter &amp; Details</b>	<b>Session Allotted</b>
<b>SECTION-I</b>		
<b>1</b>	<b>History, classification, synthesis and usage:</b> History of medicinal chemistry, Various types of classifications, synthesis and usage of synthetic and natural product drugs.	<b>12</b>
<b>2</b>	<b>Synthesis and usage central nervous system:</b> Anesthetic (local and general), Analgesics, Antipyretics, Sedatives, Hypnotics, Tranquilizers, Antiepileptic, Anticonvulsants and Antimaniacs, antidepressant, drugs used in antiemetics CNS stimulants and activators. <b>Musculoskeletal Disorder Drugs:</b> NSAIDS, anti-arthritis, neuromuscular, muscle relaxants, topical analgesics. <b>Cardiovascular Drugs:</b> Anti-arrhythmic agents, antihypertensive, antianginal, vasodilators, coagulants, anticoagulants, antithrombotic and antiplatelet drugs. <b>Respiratory System Drugs:</b> Antitussives, expectorants, mucolytic, respiratory stimulants and anti-asthmatic drugs.	<b>18</b>

## SECTION-II

<b>3</b>	<p><b>Gastrointestinal Tract Drugs:</b> Anta acids, anti-ulcer and antisecretory, anti-spasmodic, anti-diarrheals, laxatives and lubricants.</p> <p><b>Genitourinary System Drugs:</b> Urinary infectives, diuretics and anti-diuretics, analgesics, spermicidal, contraceptives.</p> <p><b>Drugs on Skin Diseases:</b> Topical steroidal, topical antifungals, drugs for acne vulgaris, psoriasis and seborrheic dermatitis, topical infectives.</p> <p><b>Anti-Infections anti- Infestations</b></p>	<b>20</b>
	<p><b>Anticancer introduction to Chemotherapeutic Agents:</b> Anti-malarial, anti-protozoals, anti-leprosy, anti-tubercular, antifungal, anti-anaerobics, anthelmintic, anti-infective and antiviral drugs.</p> <p><b>Antibiotics and Antibacterial:</b> Penicillins, cophelosphorins, fluroquinolones, aminoglycosides, marcolides, antibiotics, chloramphenicol, tetracyclines, oxazolidinediones and sulphonamides.</p>	
<b>4</b>	<p><b>Miscellaneous:</b> Organometallic drugs, diagnostic agents.</p> <p><b>Recently Introduced Drugs</b></p>	<b>10</b>
<b>Instructional Method and Pedagogy:</b>		
<ul style="list-style-type: none"> <li>▪ Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.</li> <li>▪ Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.</li> <li>▪ Surprise tests/Quizzes/Tutorials will be conducted. Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.</li> <li>▪ Minimum ten experiments shall be there in the laboratory related to course contents.</li> </ul>		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. Wilson and Gisvold's Textbook of Organic Medicinal &amp; Pharmaceutical Chemistry, Ed. Robert F.dorge.</li> <li>2. The Organic Chemistry of drug design and drug action, R. B. Silverman.</li> <li>3. Strategies for organic drug synthesis &amp; design, D. Lednicer John Wiley.</li> <li>4. Principles of Medicinal Chemistry, William O. Foye, Lippincott, William and Wilkins.</li> <li>5. Total synthesis of Natural products, Apsimon (Series).</li> <li>6. Pharmaceutical substances by A. Kaleemann&amp; Engle.</li> <li>7. Medicinal Chemistry by D. Sriram and P. Yogeewari, (Pearson education).</li> <li>8. Principles of medicinal chemistry volume-1 by Dr. S SKadam, Dr. K. R. Mahadik, Dr. K.G. bothara.</li> </ol>		



# SYLLABUS

<b>Course Title</b>	Heterocyclic Chemistry
<b>Course Code</b>	MOC303
<b>Course Credit</b>	Lecture : 04
	Tutorial : 00
	Practical : 03
	Total : 07

## Course Learning Outcomes:

After successful completion of the above course, students will be able to:

- **Understand** various basic fundamentals of heterocycles.
- **Explain** the class of heterocycles.
- **Recognize** reactions of heterocycles and their utilization in synthesis of new compounds.
- **Apply** knowledge of three, four, five, six and seven membered heterocyclic compounds in synthesis.
- **Identify** organic solid and liquid mixtures.
- **Analyze** different synthesis mechanism.

## Detailed Syllabus:

Sr. No	Name of chapter & Details	Session Allotted
<b>SECTION-I</b>		
1	<p><b>Fundamentals of Heterocyclic Compounds:</b>  <b>Nomenclature of Heterocyclic compounds:</b>            Introduction, trivial name of common ring systems, Hantzsch-Widman nomenclature for monocyclic, fused and bridged heterocycles. Replacement of Hantzsch-Widman nomenclature by IUPAC nomenclature.</p> <p><b>Three membered heterocyclic compounds with one &amp; Two heteroatoms:</b>            Preparation and properties (chemical and physical) of important compounds.</p> <p><b>Four membered heterocyclic compounds:</b>            Preparation and properties (chemical and physical) of azetines, azetidines, oxetanes and thietanes.</p>	10
2	<p><b>Five membered and some other Bicyclic System:</b>  <b>Five membered heterocyclic compound with one heteroatom:</b>            Preparation and properties (chemical and physical) of pyrroles, furans and thiophenes.</p>	10

	<p><b>Five membered heterocyclic compound with two heteroatom:</b> Preparation and properties (chemical and physical) of pyrazoles, imidazoles, isoxazoles, oxazoles, isothiazoles and thiazoles and their substitution reactions.</p>	
3	<p><b>Five membered heterocyclic compound with three/four hetero atom:</b> Preparation and properties (chemical and physical) of triazole and tetrazoles. Bicyclic ring system of five membered heterocyclic compounds: Preparation and properties (chemical and physical) of indoles, isoindols, indolizines, benzofuran, isobenzofuran, benzothiophene and isobenzothiophene and their substitution reactions</p>	10
<b>SECTION-II</b>		
4	<p><b>Six membered and several bi and tricyclic system:</b> <b>Six membered heterocyclic compounds with one heteroatom:</b> Preparation and properties (chemical and physical) of pyridines and pyrans. Preparation and properties (chemical and physical) of 2-pyrones and 4-pyrones. <b>Six membered heterocyclic compounds with two heteroatoms:</b> Preparation of pyridazine, pyrimidine, pyrazine, oxazine, thiazine and dioxane, and their substitution reactions. <b>Bi/tri-cyclic ring system of six membered heterocyclic compounds:</b> Preparation and properties (chemical and physical) of quinolines, isoquinolines, quinazolines, quinolizines, acridines and phenothiazines and their substitution reactions.</p>	20
5	<p><b>Seven and eight membered ring systems:</b> <b>Seven membered heterocyclic compounds:</b> Preparation and properties (chemical and physical) of azepines, oxepines, thiepinines, diazepines and benzodiazepines. <b>Eight membered heterocyclic compounds:</b> Preparation and properties (chemical and physical) of azocane, oxecane and thiocane.</p>	10
<b>Instructional Method and Pedagogy:</b>		
<ul style="list-style-type: none"> <li>▪ Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.</li> <li>▪ Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.</li> <li>▪ Surprise tests/Quizzes/Tutorials will be conducted.</li> <li>▪ The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.</li> <li>▪ Minimum ten experiments shall be there in the laboratory related to course contents.</li> </ul>		
<b>Reference Books:</b>		
1. Heterocyclic chemistry. Thomas L. Gilchrist, Prentice Hall.		

2. An introduction to the chemistry of Heterocyclic compounds. R. H. Acheson, John Wiley & Sons.
3. The chemistry of Heterocycles. TheophilEicher, Siegfried, Hauptmann and Andreas Speicher. John Wiley & Sons.
4. Comprehensive Heterocyclic chemistry. A. R. Katritzky and C. W. Rees. Pergamon Press.
5. Vogel's Text Book of Practical Organic Chemistry. Brain. S. Furniss, Antony. J. Hannaford, Peter. W. G. Smith and Austin R. Tatchell. Pearson.



# SYLLABUS

<b>Course Title</b>	Chemistry of Natural Products
<b>Course Code</b>	MOC304
<b>Course Credit</b>	Lecture :04
	Practical :03
	Tutorial :00
	Total :07

## Course Learning Outcomes:

After successful completion of the above course, students will be able to:

- **Design** synthesis different vitamins, Alkaloids, cholesterol and terpenoids.
- **Remember** biogenesis of natural products.
- **Apply** the knowledge of natural product compounds in isolation with use of different chromatography techniques.
- **Understand** the quantitative analysis of natural product compounds.

## Detailed Syllabus:

Sr. No	Name of chapter & Details	Session Allotted
<b>SECTION-I</b>		
<b>1</b>	<b>Introduction of natural products:</b> Introduction, Classification, source, Primary and secondary metabolite, Extraction and isolation methods of metabolite, General methods for the structure determination of natural products.	<b>12</b>
<b>2</b>	<b>Biogenesis and bioactivity of natural products:</b> Biogenesis of Terpenoid and Steroids – mevalonic acid pathway, Shikimate pathway. Activity guided Isolation, Biological activity and bioassay.	<b>08</b>
<b>3</b>	<b>Alkaloids:</b> Introduction of Opium alkaloids, Structure and synthesis of Morphine, rearrangement in opium alkaloids, structure and synthesis of Sceletium alkaloid A4, structure and synthesis of Mahanimbine, synthesis of Reserpine and Tylophorine.	<b>10</b>

## SECTION-II

4	<b>Terpenoids and Carotenoids:</b> Structure and synthesis of bicyclic sesquiterpenoids Eudesmol and Cadinene, structure and synthesis of Carotene, synthesis of Caryophyllene and (-) Khusimone, molecular rearrangement of Caryophyllene and Logifolene. Importance of vitamin C analogs.	10
5	<b>Steroids:</b> Structure and synthesis of Cholesterol, synthesis of Cortisone, Androgens and Oestrogens, Chemistry of bile acids.	10
6	<b>Vitamins:</b> General isolation method, Structure and synthesis of Vitamin A1, Vitamin B1 (Thiamine), Vitamin B6 (Pyridoxine) and Biotin (Vitamin H). Synthesis of Vitamin C	10

### Instructional Method and Pedagogy:

- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.
- Surprise tests/Quizzes/Tutorials will be conducted. Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.
- Surprise tests/Quizzes/Tutorials will be conducted.
- Minimum ten experiments shall be there in the laboratory related to course contents.

### Reference Books:

1. Chemistry of Natural products by V.K. Ahluwalia, Lalita S. Kumar, Sanjiv Kumar.
2. Organic Chemistry of Natural products by Ayodhya Singh & Seema Singh, campus Publishers (2008).
3. Chemistry of Natural products by S.V. Bhatt, B.A. Nagasampagi, S. Minakshi, Springer- Berlin Heidelberg (2005).
4. Natural Products Chemistry, Vol. I & II, K. Nakanishi et al., Academic press publication (1974)
5. Phytochemical Methods, A guide to modern techniques of plant analysis by J.B. Harbone
6. Thin layer Chromatography by Stahl



# DETAILED TEACHING SCHEME

SCHOOL OF SCIENCE

PROGRAM: M.Sc. - ORGANIC CHEMISTRY

ACADEMIC YEAR – 2023-24

SEMESTER – IV (Batch - 2022-24)

DEFINITION OF CREDIT: **1. Lecture (L):** 1 hour/week/semester, **2. Practical (P):** 2 hours/week/semester **3. Tutorial(T):** 2 hours/week/semester

## TEACHING SCHEME

Course Code	Course Name	Teaching Hours per week				SSH	Credits	Max. Marks of TSEE	CIE	PSEE	TCIE - I Assessment Method	Remarks any
		TH	TU	PR								
	Elective	-	-	-	10	25	-	Y	Y			
	<b>TOTAL</b>	-	-	-	10	25						

## University Elective – I (Anyone Offered)

Course Code	Course Name	Teaching Hours				SSH	Credits	Max. Marks of TSEE	CIE	PSEE	TCIE - I Assessment Method	Remarks any
		TH	TU	PR								
MOC401	Project (Dissertation)	-	-	-	10	25	-	Y	Y			
MOC402	Internship	-	-	-	10	25	-	Y	Y			

Signature of HOD

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