Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2022
'B^{++}'Grade (CGPA 2.96)

Name of the Faculty: Science &Technology

(As per New Education Policy 2020)

Syllabus: Organic Chemistry

Name of the Course: M.Sc. II (Sem. III &IV)

(Syllabus to be implemented from June 2024)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science & Technology
NEP 2020 Compliant Curriculum
M.Sc.II (Sem–III&IV) ORGANIC CHEMISTRY
Program Preamble

The Master of Science (M.Sc.II(Sem–III&IV) degree program in Organic Chemistry is a modern and broad curriculum that aims to equip students with the practical skills needed to apply their knowledge in a variety of scientific and technological contexts, as well as a thorough understanding of the fundamental concepts of Organic Chemistry.The program, which aligns with the goal of the National Education Policy (NEP) 2020, provides a versatile, interdisciplinary, and learner-centered curriculum that promotes creative thinking, innovation, and holistic development.The one-year MSc-II Organic Chemistry program offers a gradually more complex curriculum that aims to provide a solid foundation in organic chemistry while facilitating specialization and interdisciplinary learning. The curriculum is organized around a few major components:

1. **Discipline Specific Core Courses:** These core courses form the backbone of the program, providing in-depth knowledge and understanding of essential organic chemistry concepts, theories, and methodologies. Students will engage with topics ranging frompericyclic and photochemistry, Advanced Spectroscopic methods, Asymmetric synthesis, Modern organic chemistry ensuring a robust and comprehensive education in the discipline.
2. **Discipline Specific Elective Courses:**The program encourages intellectual exploration beyond the core discipline by offering a wide range of elective courses Advanced organic chemistry, Applied organic chemistry and bioactive heterocycles, Retro synthesis and disconnections. With the help of these electives, students can explore their interests in a variety of disciplines, which promotes creativity, critical thinking, and a well-rounded education.
3. **Field Projects/Internships/Apprenticeships/Community Engagement Projects:** To bridge the gap between theoretical knowledge and real-world applications, the program includes opportunities for field projects, internships, apprenticeships, and community engagement. These experiences provide students with practical insights, problem-solving abilities, and exposure to professional environments, enhancing their readiness for careers in Chemistry and related fields.
4. **Research Methodology and Research Projects:** The MSc Organic Chemistry curriculum places a strong emphasis on research, where students learn about data analysis, scientific inquiry, pharmaceutically significant compounds, research technique, and multi-step organic synthesis. Students are prepared for further education and employment focused on research by being encouraged to solve challenging scientific challenges creatively through individual research projects.

Multiple Entry and Multiple Exit Options

In accordance with the NEP 2020, the MSc organic chemistry program incorporates a Multiple Entry and Multiple Exit framework, offering students the flexibility to enter or exit the program at various stages. This approach ensures that students can tailor their educational journey according to their personal and professional goals, with options to earn certificates, diplomas, or degrees based on the duration of study completed.

- **Year1:**
  Upon completion of the first year, students may exit with a **Certificate in Organic Chemistry**.
- **Year2:**
  After two years, students may choose to exit with a **MSc Degree in Organic Chemistry**

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science & Technology
NEP 2020 Compliant Curriculum
MSc (Organic Chemistry)
Program Outcomes (PO)

Students graduating from the Master of Science in Organic Chemistry program will be able to:

Discipline Specific Core Courses:

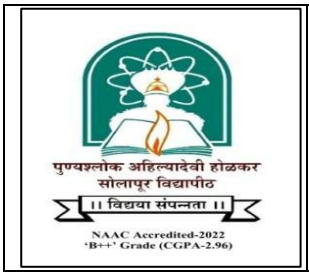
- **PO1**: Exhibit thorough knowledge and comprehension of the fundamental ideas, theories, and procedures in the major subject of choice.
- **PO2**: Utilize subject-specific expertise to solve challenging issues, evaluate information, and reach well-informed conclusions in various fields such as academic and research and industry.
- **PO3**: Learn alternative skills and information from a different or related area to increase your adaptability and awareness across subjects.
- **PO4:** Mastering the basic ideas and concepts of organic chemistry
- **PO5:** Development of abilities to study and understand reaction mechanism, use spectroscopic techniques etc.

Discipline Specific Elective Courses:

- **PO6**: Explore diverse subjects beyond the core discipline, fostering a broad-based education and cultivating critical thinking and creativity.

Research Methodology and Research Project:

- **PO7**: Acquire research skills; including literatue survey, analysis, and interpretation, fostering a scientific approach to problem-solving to develop independent research projects handling capabilities.
- **PO8:** Empowering the students to do independent research of high caliber



Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science & Technology
NEP 2020 Compliant Curriculum
M. Sc. (Organic Chemistry)
Program Specific Outcomes (PSOs)

Students graduating from MSc (Organic Chemistry) will able to :

PSO1: Mastery of Core Organic Chemistry Concepts: demonstrate understanding of basic organic Chemistry concepts, including name reactions, spectroscopy, stereochemistry, pericyclic reactions, photochemistry, Reagents, supramolecular chemistry, reaction mechanism, allowing them to analyze and solve complex organic problems.

PSO2: Experimental and Analytical Skills: demonstrate proficiency in designing and conducting experiments, using modern laboratory equipment, and employing analytical techniques to interpret and present scientific data effectively.

PSO3: Application of organic chemistry knowledge in Technology and Research: apply their knowledge to develop innovative solutions in technology, pharmaceutical industry, chemical industry and applied sciences, contributing to research and development in both academic and industrial settings.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

M.Sc.II Organic Chemistry (w.e.f. 2024-25)

Syllabus Structure and Credit Distribution

Level/ Difficulty	Sem.	Paper Code	Title of the Paper (Course Code)	Semesterexam			L	T	P	Credits
			Mandatory	**Theory**	**IA**	**Total**				
		DSC-5	Advanced Spectroscopic Methods(**2326301**)	60	40	100	4	--	-	4
		DSC-6	Photochemistry and Pericyclic Reactions(**2326302**)	60	40	100	4		-	4
			Elective(Anyone)							
	III	**DSE-3 A**	Advanced Organic Chemistry(**2326306**)	60	40	100	4		-	4
		DSE-3B	Applied Organic Chemistry(**2326307**)	60	40	100	4		-	
			Field Project /RP/ Internship / Apprenticeship/							
		RP	Research Project (**2326303**)	60	40	100	4	-	0	4
			Practical							
		DSC-5P	Spectral Analysis (**2326304**)	30	20	50	-	-	2	6
6.5/400		**DSC-6P**	Organic Synthesis(**2326305**)	30	20	50	-	-	2	
			Elective (Anyone)							
		DSE-3AP	Organic Ternary Mixtures(**2326308**)	30	20	50			2	
		DSE-3BP	Applied Organic Chemistry (**2326309**)	30	20	50			2	
			Total for III semester	**330**	**220**	**550**	**16**	**550**	**6**	**22**
			Mandatory							
		DSC-7	Modern Organic Chemistry (**2326401**)	60	40	100	4	--	-	4
		DSC-8	Chemistry of Bioactive Heterocycles(**2326402**)	60	40	100	4		-	4
			Elective (Anyone)							
		DSE-4A	Retrosynthesis and Disconnection Approach (**2326405**)	60	40	100	4		-	4
	IV	**DSE-4B**	Medicinal Chemistry (**2326406**)	60	40	100	4		-	
			Field Project /RP/ Internship/ Apprenticeship							
		RP	Research Project (**2326403**)	90	60	150	6	-	0	6
			Practical							
		DSC-7P	Organic Chemistry (**2326404**)	30	20	50	-	-	2	4
			Elective (Anyone)							
		DSE-4AP	Synthesis of Heterocycles(**2326407**)	30	20	50			2	
		DSE-4BP	Medicinal Chemistry (**2326408**)	30	20	50			2	
			Total for IV semester	**330**	**220**	**550**	**18**	**550**	**4**	**22**

DSC- Discipline Specific Course,
RM- Research Methodology,
Training RP–Research Project
L– Lecture,T–Tutorial,P– Practical
Credits of Theory =4 Hours of teaching per week 2 Credits of Practical=4 Hours per week

DSE- Discipline Elective course
OJT- On Job

M. Sc.II, Semester-III (Organic Chemistry)

	DSC-5:Advanced Spectroscopic Methods (2326301) **(Credit:04, Theory: 60 Periods, Marks:100)**
	Course Preamble: In advanced spectroscopic method, study of ^{1}H NMR, ^{13}C NMR, 2D NMR spectroscopy and mass spectrometry are described and discussed. Their application for determining structure of molecule such as electronic environment, coupling constant, Mass of the molecule and related spectroscopic problems are introduced and illustrated. This part of the course includes different NMR and mass techniques where a advanced technique is used for structure determination.
	Course Objectives:
•	To know the applications of NMR and mass spectroscopy
•	To understand the different types of NMR techniques and their applications for structural determination
•	To get skill for the confirmation of structure of molecule based on mass spectrometry
•	To analyze organic molecules based on all spectral techniques.
Unit 1:	**Nuclear Magnetic Resonance Spectroscopy: 15 hrs, Weightage = 19 Marks**
	General introduction and definition, criteria required for NMR signal, origin ofNMR, integration of a peak, different solvents used in NMR, chemical shift and factors affecting on chemical shifts in NMR, origin of spin-spin splitting, coupling constant, Nomenclature for coupling constant (*J*), Spin-spin couplingsand n+1 rule, different types of couplings and factors affecting on coupling constants, Karplus equation, Chemical and magnetic equivalence, Nonequivalence within groups, first ordered and second ordered spectra, different spin systems (AB,AX,A_2,AB_2,AX_2,A_2B_2,A_2X_2,AA'XX',AA'BB', ABX, AMX),solvents used in NMR like shift reagents.
Unit 2:	**13C NMR and Mass Spectroscopy 15 hrs, Weightage = 19 Marks**
A]	**^{13}C-NMR Spectroscopy**

	Salient facts about ^{13}C NMR and elementary ideas, instrumental difficulties, FTtechnique advantages and disadvantages, factors affecting on chemical shifts, analogy with ^{1}H NMR, calculations of chemical shift of hydrocarbons, different types of carbons (alkene, alkyne, allene, carbonyl, nitrile, oxime, aromatic carbons etc. and effect of substituent on chemical shifts of carbons, chemical shifts of solvents, proton noise decoupling technique advantages and disadvantages, off-resonance technique. Spectral problems on^{13}C NMR application.
Unit2: B]	**Two-dimensional (2D) NMR spectroscopy: [07]**
	Introduction,Types of 2D NMR, COSY, TOCSY or HOHAHA,2D-INADEQUATE, NOESY ,ROESY ,DEPT and APT, HETCOR (including Interpretation of COSY and HETCOR spectra).
Unit3:	**Mass Spectrometry 15 hrs, Weightage = 19 Marks**
	Introduction, principle of MS, Formation of ions, ion production (EI, CI, FD,MALDI, FAB), ion analysis, ion abundance, factors affecting on fragmentation, Different types of ion peaks like molecular ion peak, base peak, isotopic peaks, metastable peak, Nitrogen rule, fragmentation of different functional groups, Retro-Diels-Alder reaction, McLafferty rearrangement, Ortho-effect.
Unit4:	**Joint problems based application of IR, NMR & Mass spectroscopy 15 hrs, Weightage = 19 Marks**
	Course Outcomes After completion of course students will be able to ➢ Determine the structure from the provided structural data ➢ Apply the theoretical knowledge of spectroscopy to determine the structure of unknown compounds. ➢ The student can determine the structure of drug molecules on the basis of different NMR techniques. ➢ The student can adopt the skill to interpret spectra of drug molecules. ➢ The student is able to analyse and confirm drug molecules by using spectral techniques. ➢ The student is able to apply IR techniques to drug molecules.
	Reference books:

	1. Sharma BK: Instrumental methods of Chemical Analysis, Goel Publishing House 2. Silverstein RM,Bassler GC:Spectrometric Identification of Organic Compounds, JohnWiley 3. Sharma YR: Elementary Organic Spectroscopy, Jalandhar 4. KalsiP S: Spectroscopy of Organic Compounds, New Age International Ltd. 5. D.L.Pavia,G.M.Lampman,G.S.Kriz,3rdEd.Introduction to Spectroscopy, Harcourt College publishers 6. V.M.Parikh:Absorption spectroscopy of organic molecules
	7. D.H.WilliamsandI. Flemming: Spectroscopic methods in organic chemistry, McGrawHill 8. Nuclear Magnetic Resonance–Basic Principles-Atta-Ur-Rehman,Springer-Verlag(1986) 9. Atta-Ur-Rehman:One-and Two-dimensional NMR Spectroscopy-Elsevier (1989) 10. JosephB. Lambert, Shurvell, Lightner:Organic structural spectroscopy-Cooks, Prentice-Hall (1998) 11. Field L.D., Kalman J.R. and SternhellS: Organic structures from spectra-4thEd.John Wiley and sons Ltd. 12. Jackmann and SternhellS: NMR spectroscopy of Organic compounds

	DSC-6:Photochemistry and Pericyclic Reactions (2326302) **(Credit:04, Theory:60 Periods, Marks:100)**
	Course Preamble: In this part, basic and advanced points of pericyclic reactions and photochemistry are included.First unit contains MOT of cyclic and acyclic systems are involved. Various pericyclic reactions such as electrocyclic, cycloaddition, sigma tropic and group transfer are discussed in unit II and III. Unit IV involves photochemical reactions of benzene, carbonyl and alkenes.
	Course Objectives:
•	To understand the basics of MOT.
•	To understand the types of pericyclic reactions with their mechanism.
•	To understand the different types of photochemical reactions with their applications.
•	To understand the applications of MOT, pericyclic reactions and Photochemistry of organic molecules.
Unit1:	**Molecular Orbital Theory** **15 hrs, Weightage = 19 Marks**
	Energies calculation of cyclic and acyclic system orbitals, Determination Energies and stabilities of different systems,Calculation of charge densities, PMO theory and reactivity index
Unit2:	**Pericyclic Reactions-I** **15 hrs, Weightage = 19 Marks**
	Features and classification of pericyclic reactions, Phases, nodes and symmetry properties of molecular orbital in ethylene,1,3-butadiene,1,3,5-hexatriene. allylcation, allyl radical, pentadienyl cation and pentadienyl radical, Thermal and photochemical reactions. Electrocyclic reactions: Con-rotation and dis-rotation,electrocyclic closure and
	Opening in 4n and 4n+2 systems,Woodward-Hoffmann selection rules for electrocyclic reactions. Explanation for the mechanism of electrocyclic reactions by: (i) Symmetry properties of HOMO of open chain partner; (ii) Conservation of orbital symmetry and orbital symmetry correlation diagram and (iii)Huckel-Mobius aromatic and antiaromatic transition state method
Unit3:	**Pericyclic Reactions-II** **15 hrs, Weightage = 19 Marks**

	(a) Cycloaddition reactions: Suprafacial and antara facial interactions. (π2-cycloadditions, Cycloreversions, Stereochemical aspects in supra–supra, antara-supra and antara-antara (π2 and π4 cycloadditions, Diels-Alder reaction,Woodward-Hoffmann selection rules for cycloaddition reactions, Explanation for the mechanism of cycloaddition reactions by 1) Conservation of orbital symmetry and orbital symmetry correlation diagrams 2), Fukui Frontier Molecular Orbital (FMO) theory and (3) Huckel-Mobius aromatic and antiaromatic transition state method. Endo-exo selectivity in Diels-Alder reaction and its explanation by FMO theory, Examples of cycloaddition reactions. (b) Sigmatropic reactions: [1,j] and [i,j] shifts. Suprafacial and antara facial shifts, Selection rules for [i,j] shifts. Cope, degenerate Cope and Claisen rearrangements, Explanation for the mechanism of sigmatropic reactions: 1) symmetry properties of HOMO 2) Huckel-Mobius aromatic and antiaromatic transition state method,chelotropic reactions and explanation of mechanism by FMO theory
Unit 4:	**Photochemistry 15 hrs, Weightage = 19 Marks**
	Free radical reactions: Types of free radical reactions, detection by ESR, freeradical substitution mechanism, mechanism at aromatic substrates, neighboring group assistance. Reactivity for aliphatic and aromatic substitution at a bridge head. Reactivity in attacking radicals. The effect of solvent on reactivity. Allylic hydrogenation (NBS), Oxidation of aldehydes to carboxylicacids, auto-oxidation, coupling of alkynes and arylation of aromatic compounds by diazonium salt, Sandmeyers reaction. Free radical rearrangement, Hunsdiecker reaction. Photochemistry of(π,π∗) transitions: Excited state of alkenes, cis-trans isomerisation, photochemistry state, electrocyclisation and Sigmatropic

	Rearrangements, diπ-methane rearrangement. Intermolecular reactions: photocycloadditions, photodimerasation of sample and conjugated olefins, addition of olefins to α, β unsaturated carbonyl compounds, excimers and exiplexes. Photoaddition reactions. Excited states of aromatic compounds, photodimerisation of benzene, photosubstitution reactions of aromatic compounds and Photo-Fries rearrangement. Photochemistry of (n, π∗) transitions: Excited state of carbonyl compounds, haemolytic cleavage of α-bond-Norrish type I reaction in acyclic, cyclic ketones and strained cycloalkanediones. Intermolecular abstraction of hydrogen: Photoreduction and photooxidation influence of temperature, solvent, nature of hydrogen donors and structure of the substrate. Intramolecular abstraction of hydrogen: Norrish type II reaction in ketones,estersand1,2-diketones. Additionto C-C multiple bonds: Paterno-Buchi reaction, photodecarboxylation, photochemistry of alkyl peroxides, hypohalites and nitriles. Barton reaction. Photochemistry of azo compounds, diazo compounds, azides and diazonium salts. Singlet oxygen-photo oxygenation reactions. Ene reaction, formation of dioxetanes and endoperoxides. Chemiluminescent reactions.Oxidative coupling.
	Course Outcomes:
●	Students will be able to understand basic principle of Photochemistry.
●	Students will understand MOT and its applications.
●	Students will understand different types of photochemical reactions.
●	Students will be able to apply the knowledge of photochemistry and pericyclic reactions.
	Reference books:
	1. Lehar and Merchand:Orbital Symmetry 2. R.B.Woodward and Hoffman:Conservation of Orbital symmetry. 3. Photochemistry and pericyclic reactions by Jagdamba Shingh 4. Cixonand Halton: Organic photochemistry13 5. Arnold: Photochemistry

	6. N.Turro: Modern Molecular Photochemistry 7. Rohatgi- mukherji: Fundamentals of photochemistry. 8. Ginsburg: Nionbenzoid aromatic compound 9. A.Streitfwieser:Molecular orbital theory for organic chemistry. 10. E.Clerk: The aromatic sextet. 11. Lloyd: Carbocyclic non-benzoid aromatic compounds. 12. G.M.Bandger ;The structure and reactions of aromatics compounds 13. W.B.Smith; Molecular orbital methods in Organic Chemist

	DSE-3A:Advanced Organic Chemistry (2326306) **(Credit:04, Theory:60 Periods, Marks:100)**
	Course Preamble: Advanced organic chemistry includes name reactions, rearrangements, enolates study and organoborane reagents which are important parts of organic synthesis. Unit I includes discussion of enolates of various functional groups, its formation and applications. Unit II and III includes advanced name reactions and rearrangements used in organic synthesis. Unit IV has study of various organoboranes and its applications in organic synthesis.
	CourseObjectives:
●	To understand the enolate chemistry in different reactions
●	To study different name reactions, reagents and rearrangements.
●	To know in detail chemistry of organoboranes.
●	To apply knowledge of all types of reactions while designing the organic molecules
Unit1:	**Alkylation of Enolates and Other Carbon Nucleophiles** 15 hrs, Weightage = 19Marks
	Generation and Properties of Enolates and Other Stabilized Carbanions: Generation of Enolates by Deprotonation, Regioselectivity and Stereoselectivity in Enolate Formation from Ketones and Esters, Other Means of Generating Enolates, Solvent Effects on Enolate Structure and Reactivity. Alkylation of Enolates: Alkylation of Highly Stabilized Enolates, Alkylation of Ketone Enolates; Alkylation of Aldehydes, Esters, Carboxylic Acids, Amides, and Nitriles; Generation and Alkylation of Dianions; Intramolecular Alkylation of Enolates; Control of Enantioselectivity in Alkylation Reactions. The Nitrogen Analogs of Enols And Enolates: Enamines and Imine Anions.
Unit2:	**Name reactions** **15 hrs, Weightage = 19 Marks**
	Darzen, Prins, Henry, Bamford-Steven, Baylis-Hillmann, Corey-Fuchs Reaction,Julia Olefination,Mukaiyama aldol,Corey-Winter olefination, Shapiro, Ritter, Stille, Heck, Sonogashira, Suzuki, Negishi, Kumada, Hiyama,
	Tsuji-Trost,Duff,Chugaev,Ring closing metathesis (Grubb'smetathesis),Aldol-Tishchenko reaction (Evans-Tishchenko reaction), Strecker amino acid synthesis, Biginelli reaction,Gewald reaction,Hantzsch pyridine synthesis, Mannich reaction, Ugi reaction, Passerini reaction, Petasis reaction.

Unit3:	**Rearrangements and Reagents** **15 hrs, Weightage = 19 Marks**
	Rearrangements:Payne, Eschenmoser fragmentation, Brook, Wagner-Meerwein,Wolf, Semipinacol, Epoxide rearrangement with lewis acid, Tiffeneau-Demjanov, von Richter, Wittig, Neber, Smiles, Steven, Hofmann, Iodolactonisation, Hoffmann-Loffler Freytag reaction **Reagents**: Lithiumdialkylcuprate(LDC), DCC, DDQ, Organotin reagents, Peterson's synthesis, Trimethylsilyliodide, PPA ,Selenium dioxide.
Unit 4:	**Organoboranes** **15 hrs, Weightage = 19 Marks**
4.1	Preparation and properties of organoborane reagents e.g. RBH_2, R2BH, R_3B, 9-BBN, catechol borane. Thexylborane, cyclohexylborane, $ICPBH_2$,-21-IPC_2BH,Hydrboration mechanism, stereo and regeoselectivity, uses ins ynthesis of primary, secondary tertiary alcohols, aldehydes, ketones, alkenes. Synthesis ofEE, EZ, ZZ dienes and alky enes. Mechanism of addition of IPC_2BH. Allyl boranes- synthesis, mechanism and uses.
	Course Outcomes:
●	The student is able to understand enolate chemistry in different reactions
●	The student study different name reactions, reagents and rearrangements.
●	The student knows in detail chemistry of organoboranes.
●	The student able to apply knowledge all types of reactions while designing the Drug molecules.
	Reference books:
	1. A guidebook to Mechanism in Organic Chemistry (Orient- Longmens)- Peter Sykes 2. Organic Reaction Mechanism (Benjamin)-R.Bresslow 3. Mechanism and Structure in Organic Chemistry (HoltRein hartwinston)-B.S.Gould 4. Organic Chemistry (McGrawHill)- Hendrikson,Cramand Hammond

	5. Basic principles of Organic Chemistry (Benjamin) J.D.Roberts and M.C.Caserio. 6. Reactive intermediates in Organic Chemistry (JojnWiley) N.S.Issacs. 7. Organic reaction mechanism (McGrawHill) R. K.Bansal 8. Advanced organic chemistry, partB: Reaction and synthesis by Francis A.Carey, Richard Y.Sandburg. 9. Organic Chemistry by Clayden, Greeves, Warren and Wothers.

	DSE-3B:Applied Organic Chemistry(2326307) **(Credit:04,Theory: 60Periods, Marks:100)**
	Course Preamble: Applied organic chemistry includes different applicative fields which are major parts of research and industry. Unit I give detailed discussion about green chemistry, basic principles and its applications. Carbohydrate chemistry is discussed in unit II. Unit III is related to discussion of supramolecular chemistry which involves study of non-covalent interactions. Synthesis and chemical properties of polycyclic aromatic compounds are discussed in Unit IV.
	CourseObjectives:
•	To understand basic principles and applications of green chemistry.
•	To understand chemistry of carbohydrates.
•	To understand basics and applications of supramolecular chemistry.
•	To understand basics and applications of Polycyclic aromatic compounds.
Unit1:	**Green Chemistry: 15 hrs, Weightage = 19 Marks**
	Introduction andbasic principles, Ideal synthesis, theoretical and functional details of eco-friendly synthetic protocols with suitable examples and applications: Neat synthesis (solvent free synthesis), Non-volatile organic media and water as green media in organic transformations like ionic liquid, PEG and water, Microwave irradiation as alternative energy source for the chemical transformations, Heterogeneous catalysis/ Immobile catalysis, Ultrasound Assisted synthesis.
Unit 2:	**Carbohydrate Chemistry 15 hrs, Weightage = 19 Marks**

	Introduction, Classification, Monasaccharides, Fisher projection, D and L-configuration, Conversion of Fisher projection to furanose and pyranose form, Haworth Structure, 4C1 and 1C4 Conformations, Conformation of monosaccharides, anomeric effect, Reactions of Monasaccharides, Derivatives of Monosaccharides: Disaccharides ,Polysaccharides, homopoly saccharides, heteroploysccarides. Mucopolysaccharides, Gycoprotiens
Unit3:	**Supramolecular Chemistry 15 hrs, Weightage = 19 Marks**
	Fundamentals of Supramolecular Chemistry: Terminology and definitions in
	Supramolecular chemistry. Intermolecularforces, Solvent and solution properties, solvation and hydrophobic effect. Binding constants; definition anduse.Molecular Recognition: Principle of molecular recognition, host-guest complementarity, preorganisation, chelate effect, cooperativity. Synthesis and applications of supramolecular host (crown ethers,lariat ethers,podands, cryptands, spherands, calix[n]arenes, cyclodextrine) as cation and anion binding receptors and receptors for ion-pair recognition. Supramolecular Reactivity andCatalysis: Organocatalysis mediated throughhy drogenbonding, acid-base catalysis.
Unit 4:	**Polycyclic Aromatic Compounds 15 hrs, Weightage = 19 Marks**
	Introduction,Comparative study of the aromatic character of linear and nonlinear Ortho fused Polynuclear Hydrocarbon. General methods of preparation of polycyclic hydrocarbons: Fittig reaction, Ullmann diaryl synthesis, friedel-Craft reaction, Elbs reaction, Phenanthrene synthesis by Paschorr, Haworth, Stobbe condensation, Bardhan-Sengupta, Bogert-Cook methods, Dehydrogenation of hydroaromatic compounds with sulphur, selenium or palladised charcoal. Naphthacene, Rubrene (pentaceneandhexacene), 2-benzanthracene, 6-benzanthracene, 4-benzpyreneand20-methylcholanthrene, Phenanthrene Derivatives: Chrysene, Picene, Pyrene, Perylene, coronene.
	Course Outcomes:
●	Students will be able to understand basic principles of green chemistry.
●	Students will be able to understand applications of supramolecular chemistry.
●	Students will be able to understand applications Polycyclic Aromatic Compounds.
●	Students will be able to understand chemistry of carbohydrates.

●	**Reference Books**
●	1) Supramolecular Chemistry: from Molecules to Nanomaterials Eds. By P.A. Gale and J.W.Steed(2012). 2) Modern Supramolecular Chemistry by F.Diederich, P.J.Stang, R.T.Tykwinski (2008)..Page 20of 21 3) Core Concepts in Supramolecular Chemistry and Nano chemistry by J.W.Steed, D. R.Turner,K.J.Wallace(2007).
	4) Supramolecular Chemistry by J.W.Steed and J.L.Atwood (2011). 5) Supramolecular Chemistry:Concepts and Perspectives by J.-M.Lehn,Wiley VCH, Weinheim (1995). 6) Supramolecular Chemistry by V.Balzani (Editor), L.DeCola, Kluwer, Dordrecht (1992). 7) Introduction to Supramolecular Chemistry by H.Dodziuk, Kluwer Academic Publishers, The Netherlands (2002). 8) Supramolecular Assemblies Y.Murakami (Editor), Mita Press,Tokyo,(1990). 9) Advances in Supramolecular Chemistry, Vol1 (1990),Vol2 (1992),Vol 3(1993) by G.W. Gokel (Editor), JAI Press, Greenwich. 10) Supramolecular Chemistry– Fundamentals and Applications. Advanced Textbook By T. Kunitake ,KAriga, Berlin: Springer-Verlag Heidelberg,2006.208 p.ISBN978-3-540-01298-6

	RP: Research Project (2326303) **(Credit:04, Marks:100)**
	Course Preamble: The research project for M. Sc. Organic Chemistry is mainly intended to evoke the innovation skill in student. The course will provide an opportunity to apply knowledge and analytical skills learned, to be developed as a prototype or simulation. **Course Objectives:** This course is designed in such a way that students will get an experiential learning. This course will give idea to familiarize with industrial and research work to students. Students can do literature survey, can use various basic software regarding characterization, analysis like mestrenova, chemdraw etc. Also students can get idea how to moniter a new reactions in lab on small scale and large scale.
	Course Outcomes: 1: They should learn independent working on a short research project 2: Students must do a literature review in their subject of interest and choose a project topic in consultation with their supervisor. 3: The students will get idea of A survey of literature, The work schedule, Using Chem Draw program to draw structures,Writing the synopsis.

	➢ There search project for M.Sc. Organic Chemistry is constructed to get familiarize with literature survey important for designing of organic product / new organic molecules / synthetic routes and related applications. ➢ It is expected that project should provide hands on training to the students on various instruments. ➢ They should learn independent working on a short research project ➢ .Students are required to work for a specific project under supervision of concerned faculty member. There will be computer laboratory session for hands on Chemdraw software and literature survey by using Google Scholar/ Science Direct/ Scopus/ Web of Science etc. A student shall be expected to carry out literature survey in the field of interestand to select a topic for his/ her project work in consultation with the supervisor.It shall be expected that a student justifies the gravity and also the relevance of the problem through his /her seminar. Candidates are expected to do the following work at computer laboratory. 1. Literature survey 2. Workplan 3. Handling of Chemdraw software for structure drawing
	4. Chemdraw assignment 5. Synopsis preparation The allotment of the topic will be done in the initial period of third semester.Hence students can start their work in the third semester itself. Each student is supposed to work for at least 60 hours for his / her project.At the last he/she must Submit project report and present the work done at the time of vivavoce.

	DSC-5P:Spectral Analysis (2326304) **(Credit:02, Practical:60 Periods, Marks:50)**
	Course Preamble: To get the practical knowledge of various spectroscopic methods such as IR, NMR, Mass spectroscopy. To impart knowledge in determining structures of organic molecules with the help of various spectra. **Course Objectives:** This course is designed in such a way that students will get an experiential learning. Students should able to determine the structure using basic and advanced spectroscopic technique.
	Course Outcomes: 1: Students can learn to determine the structure of molecules from theoretical data. 2: Students will able to determine the functional group by using using data from UV and spectroscopy

	3: student can determine the structure of molecule from graphical data of ^{1}H and ^{13}C NMR spectroscopy, Mass spectrometry.
	Identification of Organic compounds by the analysis of their spectra. Photocopies of UV, IR, NMR and Mass spectra of standard compounds are to be interpreted to determine the structure of the compound. At the time of practical examination, candidates are expected to submit the Journal.

	DSC-6P:Organic Synthesis (2326305) **(Credit:02, Practical:60Periods, Marks:50)**
	Course preamble: The practical course is designed in such a way that students will learn about various methods for synthesis of pharmaceutically important molecules. Students will get knowledge about reaction set up, different work up methods in the synthesis; follow up of reactions with the help of TLC technique
	Course Objectives: This course is designed in such a way that students will get an experiential idea based on theoretical curriculum. This course contains one and two stage preparation based on name reactions, rearrangements and other basic concept from theory.
	Course Outcomes: 1: Students can get idea of co-relation between theoretical concept and practical work. 2: students will learn One/Two organic preparations starting with 5g or less amount. 3: Students will learn to monitor reaction progress by using TLC chromatography. 4: Students will understand the various methods of recrystallization of the product.
	One/Two organic preparations starting with 5g or less (Anyfive) (TLC,MP/ BP analysis and recrystalization of product is recommended)

	1. Preparation of aromatic aldehydes by Vilsmer Haack reactionor R.T. 2. Preparation of p-chloro nitrobenzene by Sandmeyer reaction 3. Preparation of p-Iodonitrobenzene by Sandmeyer reaction 4. Stork enamine synthesis 5. Mukaiyama Esterification 6. Pechmann Condensation (Coumarin synthesis) 7. Aldol condensation (Chalcone) 8. Benzilic acid rearrangement 9. Fischer indole synthesis 10. Friellander Synthesis 11. Preparation of Benzanilide by Beckmann rearrangement 12. Preparation of Antharanilic acid 13. Preparation of Phthalimide 14. Preparation of N-Bromosuccinamide 15. Preparatin of p-Aminobenzoic acid 16. Pinacol-Pinacolone rearrangement 17. Preparation of Acetophenones by Fries rearrangement
	18. Wittig reaction 19. Preparation of Benzopyrazole 20. Hantzsch pyridine synthesis 21. Ugi Reaction 22. Biginelli reaction 23. Gewald reaction 24. Dess-Martin Oxidation: Oxidation of benzyl alcohol to benzaldehyde 25. Synthesis of benzyl from deoxy benzoin using SeO_2 reagent **(Note:Other suitable experiments may be added)**

	DSE-3AP:Organic Ternary Mixtures (2326308) **(Credit:02, Practical:60 Periods, Marks:50)**
	Course preamble: To get knowledge of physical and chemical methods of separation of given ternary mixture. To use the basic knowledge of theory in identification of compounds separated from ternary mixture. Students will be able to determine physical constant, detect various element in the given compound, identify the functional group of given compound and prepare derivatives of separated compounds. Course Objectives: This course is designed in such a way that students can learn to separate different organic compounds and determine the structure from various basic methods.

	Course outcomes: 1: Students will able to separate acidic, phenolic, basic and neutral compounds from mixture using physical and chemical methods. 2: They will learn method of identification of organic compounds from different chemical tests and synthesizing derivatives.
	Separation, purification and identification of organic compounds (Three components mixtures) by chemical tests, derivatives etc. using microscale technique. IR spectra to be used for functional group identification. Purification Of separated compounds by TLC and Column Chromatography.

	DSE-3BP:Applied Organic Chemistry (2326309) **(Credit:02,Practical:60Periods,Marks:50)**
	Course preamble: The course is designed in such a way that the students will get knowledge about different green methods of organic synthesis. They will be familiarizing with different green techniques to carry out reactions in an environmentally benign way. Course Objectives: This course is designed in such a way that students will get an applicativeidea based on theoretical curriculum. This course contains one and two stage preparation based on name reactions, rearrangements and other basic concept from theory.
	Course Outcomes: 1: Students can get idea of co-relation between theoretical concept and practical work. 2: students will learn One/Two organic preparations starting with 5g or less amount. 3: Students will learn to monitor reaction progress by using TLC chromatography. 4: Students will understand the various methods of recrystallization of the product.
	List of Practicals
1.	Microwave-assisted ammonium format-mediated Knoevenagel reaction
2.	Radical coupling reaction (Preparationof1,1-bis-2-naphthol)by green Synthesis method grinding at room temperature.
3.	Preparation of benzopinacolone
4.	Bromination of acetanilide by using CAN as acatalyst
5.	Pechman condensation (Claycatalyzed solid state synthesis of 7-hydroxy-4-Methyl coumarin)
6.	Benzil Benzilic acid rearrangement
	(Note: Other suitable experiments may be added)

M.Sc.II, Semester-IV (Organic Chemistry)

	DSC-7:Modern Organic Chemistry (2326401) **(Credit:04, Theory:60 Periods, Marks:100)**
	Course Preamble: Modern organic chemistry basic concepts of stereochemistry a stereochemistry of reactions using chiral substrate, chiral auxiliary and chiral reagents. Unit I incl basic concepts and terms involved in stereochemistry. Stereochemistry of fused and bridged ring discussed in detail in unit II. Unit III and IV includes detailed study of asymmetric synthesis us chiral pool, chiral auxiliary, chiral substrate and chiral reagents.
	CourseObjectives:
●	To explain the basic concepts and terms involved in stereochemistry.
●	To learn about stereochemical notations.
●	To describe the stereochemistry of substitution reaction
●	To describe about chiral reagents and catalysts
●	To learn about asymmetric synthesis
Unit1:	**Conformational Analysis and Reactivity 15 hrs, Weightage = 19 Marks**
	Differences in the stability of Diastereomers, Relative reactivity of Diastereomers in ionic elimination, Intramolecular rearrangement, Neighboring Group Participation (NGP), Molecular elimination. Curtin- Hammett principle, Conformational stability and Reactivity of cyclohexane six membered ring system.
Unit2:	**Fused and Bridged rings 15 hrs, Weightage = 19 Marks**
	Introduction, Nomenclature of bicyclic systems, cis- and trans- decalins and nine methyldecalins, perhydroanthracene, perhydraphenanthrene, Bridged rings systems and its reactivity, Bredts rule and stereochemical restrictions
Unit3:	**Asymmetric synthesis-I 15 hrs, Weightage = 19 Marks**
	Introduction to Stereoselective and stereospecific reactions **Chiral Pool**:[α-hydroxy acids and α-amino acids] **Chiral auxiliary**:SAMP/ RAMP, Mayers Oxazolines, Evans Oxazolidinones, L-valine (Schollkopf Bislactim ethers), Seebach Imidazolens from (S)-mandelic acid,Seebachα-hydroxyacids i.e.(*S)*-lacticacids, Cyclichydrazones. **Chiral reagent**: BINAL, BINAP; Hydroboration- Ipc_2BH, $IpcBH_2$, R/S-Alpineborane, DIP-Cl (diisopinocamphylborone chloride), Misamane's Ligand (2,5-dimethylborolane); **Chiral catalyst**:CBS, NADH, baker's yeast. Asymmetric epoxidation: Sharpless epoxidation, Jacobson
Unit4:	**Asymmetric synthesis-II 15 hrs, Weightage = 19 Marks**

	Acyclic Stereocontrol – attack on aldehydes and ketones with α-stereocentres (Crams Model, Felkin-Anh model, Cram-Chelate model); Diastereoselective enolate alkylation, Diastereoselectivity of aldol reactions (Zimmerman-Traxlertransition state model),Diastereoselective enolate alkylation by Evansoxazolidinoneauxiliaries; Diastereoselective allylation reactions of crotylboronates and chiral allyl boron reagents; Proline catalyzed asymmetric aldol reactions, mannich reactions; Diastereoselective Reduction; Diastereoselective reduction (Evans- Saksenaand Evans-Tishenko); Stereocontrol–attackon Alkenes withα-stereocentres in hydroboration and epoxidation reaction.
	Course Outcomes: After completion of course students will be able to
●	Relate the structure and medicinal properties of drugs..
●	Differentiate between different types of stereoisomers, including enantiomers And diastereomers
●	Predict the accurate stereochemistry of products of asymmetric synthesis
	Reference books:
	1) (Topics in Heterocyclic Chemistry 25) Géraldine Masson, LucNeuville (auth.), RomanoV.A.Orru, Eelco Ruijter(eds.)-Synthesis of Heterocycles via Multicomponent Reactions II- Springer-Verlag Berlin 2) Jieping Zhu, QianWang, Meixiang Wang – Multi component Reactions in Organic Synthesis-Wiley-VCH(2015) 3) K.L. AmetaPh.D., Anshu Dandia-Multicomponent Reactions_Synthesis of Bioactive Heterocycles-CRC Press (2017) 4) ZhuJ., Bienhame H.(eds.)-Multicomponent Reactions- Wiley-VCH(2005) 5) Raquel P. Herrera, Eugenia Marqués-L_pez – Multicomponent Reactions_ Concepts and Applications for Design and Synthesis-Wiley (2015) 6) Majid M.Heravi,VahidehZadsirjan-Recent Advances in Applications of Name Reactions in Multicomponent Reactions- Elsevier (2020) 7) Stereochemistry of Organic Compounds (Principle and application): D.Nasipuri 8) Stereochemistry: Conformation and Mechanism: P. S. Kalsi

	9) Stereochemistry of Organic compounds:ErnestL.Eliel / SamuelH.Wilen 10) Advanced Organic Chemistry; PartA and B:F.A.Carey & R.J.Sundberg 11) Organic Chemistry: Clayden, Greeves, Warren and Wothers 12) Organic Synthesis: M.B. Smith 13) Lukehart,Charles M.MacGil livray, Leonard R-Metal-Organic Framework Materials-Wiley (2014) 14) Xian-He Bu, Michael J. Zaworotko, Zhenjie Zhang- Metal-Organic Framework-From Design to Applications-Springer International Publishing_Springer (2020) 15) WeiXia- Fabrication of Metal–Organic Framework Derived Nanomaterials and Their Electrochemical Applications-Springer Singapore (2018)

	DSC-8:Chemistry of Bioactive Heterocycles (2326402) **(Credit:04, Theory:60 Periods, Marks:100)**
	Course Preamble: This course includes synthesis and applications of bioactive heterocycles which very important part of pharmaceuticals industry. This course involves study of 3,4,5,6 membered and benzofused heterocycles rings having mainly N, O, and S, as a heteroatom's with respect to synthesis, chemical properties and bioactive importance.
	Course Objectives: Upon completion of the course student shall be able to
●	To understand chemistry of three and four membered heterocycles.
●	To understand synthesis and reactions of five membered heterocycles.
●	To understand chemistry of six membered heterocycle, their synthesis and applications.
●	To understand synthesis and applications of benzofused heterocycles.
Unit1:	**Three and Four membered heterocycles 15 hrs, Weightage = 19 Marks**
	Baldwin ring closure rules, formation of 3, 4, 5 and 6 membered rings 3-membered rings: Aziridines, Oxiranes, Thiiranes, 4-membered rings:Azetidines,Oxitanes and Thietanes
Unit2:	**Five- membered heterocycles 15 hrs, Weightage = 19 Marks**

	Five-membered rings with one heteroatom: Pyrrollidine, Furan, Pyrrole and Thiophene Five-membered rings with two heteroatoms: Imidazole, Pyrazole, Oxazole,
	Isoxazole, Thiazole, Isothiazole. Five-membered rings with three heteroatoms: Triazoles, Oxadiazole, Thiadiazole, Tetrazole.
Unit3:	**Six-membered heterocycles 15 hrs, Weightage = 19 Marks**
	Six-membered rings with one heteroatom: Pyran, Pyridine Six-membered rings with two heteroatoms: Piperazine, Morphine, Thiomorphine,10 Pyridazines, pyrimidines, pyrazines, Six-membered rings with three heteroatoms: Hexahydro-1,3,5-triazine Six-membered Rings with three heteroatoms: Tetrazine
Unit4:	**Benzofused heterocycles: 15 hrs, Weightage = 19 Marks**
	Benzofused heterocycles: Benzopyrroles,Benzofuran, Indole, Benzothiophene, Benzoxazole, benzthiazole, Benzimidazole, Quinolines, Isoquinoline, Quinazolines, Coumarins and Chromones, Purines and Pteridines
	Course Outcomes:
●	Students will be able to understand synthesis of different heterocycles.
●	Students will be able to understand applications of different heterocycles.
●	Students will be able to understand various chemical reactions of heterocycles.
	Reference books:
	1) R.M. Acheson:An introduction to chemistry of heterocyclic compounds (Interscience) 2) Joule and Smith: Heterocyclic chemistry (Van Nossstrand) 3) R.K. BANSAL: Heterocyclic chemistry(WileyE) 4) L.A.Paquitte: Principals of modern heterocyclic chemistry 5) M.H.Palamer:The structure and reactions of heterocyclic compounds. 6) A.R. Katrtzhy and A.V.Bootton: Advances in Heterocyclic chemistry (A.P.) 7) Finar: Organic chemistry (Vol.1 and 2) 8) Connand Stumf: Outline of Biochemistry 9) Williams, Introduction to the chemistry of enzyme reaction. 10) The Organic Chemistry of Drug Design and Drug Action,R .B. Silverman Academic Press. 11) Stralegies for Organic Drug Synthesis and Design. D.Lednicer, John

	Wiley. 12) Heterocyclic ChemistryVol.1-3, R.R.Gupta, M.Kumar, and V. Gupta, Springer Verlag. 13) The Chemistry of Heterocycles, TEicher and S.Hauptmann, Thieme. 14) Heterocyclic Chemistry, J.A.Joule, K.Mills and G.F.Smith, Chapmanans Hall. 15) Heterocyclic Chemistry, T.L.Gilchrist, Longman Scietific Techinal 16) Contemporary Heterocyclic Chemistry, G.R. Newkome and W.W.Poudler, Wiley. 17) An Introduction t the Heterocyclic Compounds, R.M.Acheson, JohnWiley. 18) Comprehensive Heterocyclic Chemistry, A.R.Katrizky and C.W.Rees, eds, Pergamon Press

	DSE-4A:Retrosynthesis and Disconnection Approach (2326405) **(Credit:04, Theory:60 Periods, Marks:100)**
	Course Preamble: This course includes Protection and deprotections of various functional groups using simple functional group conversion techniques. Retro synthesis and disconnection approach of C-x, C-C band also discussed in details in Unit II, III, and IV.
	Course Objectives:
●	To know the various protecting groups and use of metal complexes.
●	To understand the basic concepts used in retrosynthesis.
●	To get knowledge of C-C disconnection in organic molecules and retrosynthesis.
●	To know rea application of disconnection in organic synthesis.
Unit1:	**Protecting groups and Metal Complexes 15 hrs, Weightage = 19 Marks**

	Part-I Protecting Groups[08] Protection of NH Groups, Protection of OH Croups of Alcohols, Protection of Diols as Acetals, Protection of Carbonyl Groups in Aldehydes and Ketones,Protection of the Carboxyl Group, Protection of Double Bonds, Protection ofTriple Bonds. Part-II Transitional metals complexes in organic synthesis [07]Iron:-Reactions of Iron carbonyls, ferrocenes, Fe-cyclopentadiene complex, protection of dienes, isomerization Mn&Co:-Manganese and Co-carbonyl sinhydroformylation, carboxylations, Synthesis of silane complexes and their applications Pausal-khand reactions and
	Its applications protection of alkynes by Co_2CO_8
Unit2:	**Disconnection Approach-I 15 hrs, Weightage = 19 Marks**
	Introductionto:Grounding of organic chemistry for understanding retrosynthesis; Retrosynthetic analysis and designing of the synthesis; Disconnection approach: An introduction to synthons, synthetic equivalents, disconnection approach, functional group Interconversions, importance of orderof events in organic synthesis, one and two group C-Xdisconnections, selective organic transformations: chemoselectivity,regioselectivity,stereoselectivity, enentioselectivity, Reversal of polarity, cyclization reactions, amine synthesis
Unit 3:	**Disconnection Approach-II: 15 hrs, Weightage = 19 Marks**
	i) One group C-C Disconnections: Alcohols (including stereoslectivity),carbonyls (including regioselectivity), Alkene, Synthesis, use of acetylenes and aliphatic nitrocompounds inorganic synthesis ii) Two group C-C Disconnections: Diels-Alder reactions, 1,3-difunctionalized compoundsand α,β-unsaturated compounds, Control in carbonyl condensations, 1,5-difunctionalized compounds, Michael addition and Robbinson annulation,1-2 Difunctionalised Compounds, Radical Reaction In Synthesis, 1-4 Difunctionalised Compounds, Reconnection, 1-6 Dicarbonyl Compounds, Strategy of Carbonyl Disconnections, Introduction to Synthesis: Saturated heterocycles
Unit 4:	**Disconnection Approach-III 15 hrs, Weightage = 19 Marks**
	Three-membered rings, Rearrangements in Synthesis, Four-membered rings, Photochemistry in synthesis, The use of ketene in synthesis, Five-membered rings, Pericyclic reactions in synthesis: Special methods of five membered rings, six-membered rings, strategy of ring synthesis, Stereoselectivity B, Aromatic heterocycles. Retrosynthes is of reserpine, taxol, strychnine, misoprostol.

	Course Outcomes:
●	The students will be able to apply use of various protecting groups and Organoborane compounds.
●	The student will get basic idea about retrosynthesis.
●	The student will be able to do disconnection of various C-Ccompounds.
●	The student will be able to use various metal complexes in organic synthesis.
	Reference books:
	1) Organic Synthesis: The Disconnection Approach: Stuart Warren 2) Designing Organic Synthesis: Stuart Warren 3) Organic Synthesis: Strategy and Control: Paul Wyatt and Stuart Warren 4) The Logic of Chemical Synthesis: E.J.Corey and Xue-Min Chelg 5) Classics inTotal Synthesis I,II and III: K. C.Nicolaouandothers 6) Organic Synthesis Concepts, Methods, Starting Materials: J.Fuhrhop, G.Penzlin 7) Some Modern Methods of Organic Synthesis: W.Carruthers 8) Organic Synthesis: M.B.Smith 9) Principles of Organic Synthesis: R. Norman and J. M.Coxan 10) Advanced Organic Chemistry: Jerry March 11) Organic Chemistry: Clayden, Greeves, Warren and Wo

	DSE-4B:Medicinal Chemistry (2326406) **(Credit:04, Theory:60 Periods, Marks: 100)**
	Course Preamble: This course includes Definition, classification, SAR, mechanism of action and synthesis of drugs for various classes such as antibiotics, antiviral, antianginal, anaesthetics, anticonvulsants etc.
	Course Objectives:
●	To understand synthetic strategies of different medicines.
●	To understand uses of different drugs.
●	To understand mechanism of action of various drug molecules.
●	To understand structure activity relationship of various drug molecules.
Unit1:	**Definition, Classification, SAR, Mechanism of action and Synthesis* of Drugs for following classes. 15 hrs, Weightage = 19 Marks**

	Sulfonamides: Sulfisoxazole, Sulfapyridine, Sulfacetamide* and Sulfamethoxazole* **Antibiotics**:Penicillin: Ampicillin*, Amoxycillin. Cephalosporin: Cefazolin, Cefadroxil, Cefixime*, Tetracycline, Chloramphenicol*, Aminoglycosides: Streptomycin Antimalerials : Chloroquine*
Unit2:	**Definition, Classification, SAR, Mechanism of action and Synthesis* of Drugs for following classes. 15 hrs, Weightage = 19 Marks**
	Antiviral: Acyclovir, Remdesivir. Antifungal: Clotrimazole, Miconazole, Itraconazole NSAIDs: Aspirin*, Ibuprofen*, Paracetamol*, Diclofenac*, Aceclofenac, Indomethacin, Nimesulide and COX-IIinhibitors
Unit3:	**Definition, Classification, SAR, Mechanism of action and Synthesis*of Drugs for following classes. 15 hrs, Weightage = 19 Marks**
	Antianginal: Nitrates, Nifedipine, Propranolol* Anti-hypertensive Drugs: Verapamil, Captopril*, Atenolol Antidiabetics: Insulin, Tolbutamide, Glipizide, Metformin*, Pioglitazone Antihistamines: Diphenylhydramine*,Chlorpheniramine, Cetrizine
Unit4:	**Definition, Classification, SAR, Mechanism of action and Synthesis*of Drugs for following classes. 15 hrs, Weightage = 19 Marks**
	Anaesthetics:Halothane, Lidocaine and Thiopental* Sedative and hypnotics: Phenobarbital, Diazepam*, Alprazolam **Anticonvulsant**:Phenytoin*,Carbamzepine,Valproic acid Antidepressant: Amitriptiline, Phenelzine* Antineoplastic: Alkylatingagent, Antimetabolites
	Course Outcomes:
●	The students will be able to apply their knowledge about different drug molecules.
●	The students will understand mechanism of action of different drug molecules.
●	The students will be able to correlate structure of drug molecules with their activity.
●	The students will come to know various synthetic routes of different drug molecules.

	Reference books: 1) Medicinal chemistry- Burgers (Vol-I-VI) 2) Principles of medicinal chemistry-William O Foye 3) Textbook of medicinal chemistry- Vol-I&II- Surendra N Pandey 4) Principles of medicinal chemistry- S S Kadam, K R Mahadik and K G Bothara 5) Introductory medicinal chemistry- Kennewell and Taylor 9 6) Wilson and Giswold`s Textbook of Organic medicinal and Pharmaceutical chemistry Jaimes N Delgado and William A Remere 7) Fundamentals of microbiology- Forpischer 8) Genetics of antibiotics producing microorganisms- G Sermouti 9) Organic Chemistry: Clayden, Greeves, Warren and Wo
	10) Organic Synthesis: The Disconnection Approach: Stuart Warren 11) Designing Organic Synthesis: Stuart Warren 12) Comprehensive medicinal chemistry- Corwin and Hansch

	RP: Research Project (2326403) **(Credit:06, Marks:150)**
	Course preamble: The research project for M. Sc. Organic Chemistry is mainly intended to evoke the innovation skill in student. The course will provide an opportunity to apply knowledge and analytical skills learned, to be developed as a prototype or simulation. The course will help students get familiarize with research work to students and apply knowledge of theory to study various aspects of the practical usage.
	Course Objectives: This course is designed in such a way that students will get an experiential learning. This course will give idea to familiarize with industrial and research work to students. Students can do literature survey, can use various basic software regarding characterization, analysis like mestrenova, chemdraw etc. Also students can get idea how to moniter a new reactions in lab on small scale and large scale.
	Course Outcomes: 1: They should learn independent working on a short research project 2: Students must do a literature review in their subject of interest and choose a project topic in consultation with their supervisor. 3: The students will get idea of A survey of literature, The work schedule, Using Chem Draw program to draw structures, Writing the synopsis 4: Project work involving organic synthesis/evaluation of biological studies or in-plant training in any of the pharmaceutical or chemical industry

	Students are expected to work on assigned research project and submit the results at the end of the semester in the form a dissertation. Open defense of the student on his/her dissertation shall be arranged. This defense shall be in front of the panel of examiners.This will be valued for 60 marks. Students are required to work for a specific project under supervision of concerned faculty member. Project work involving organic synthesis / evaluation of biological studies or in-plant training in any of the pharmaceutical or chemical industry for at least 21 days will be considered. Project should be completed under the guidance of a faculty member in the same Department or Industry or research organization. In case of Industry/ research organization one member of that body can also be included as project guide. **Guidelines for Assessment** ➢ Quality of literature survey and novelty in the problem ➢ Clarity of problem definition and feasibility of problem solution ➢ Clarity of objective and scope ➢ Quality of work attempted ➢ Presentation skills

	DSC-7P:Organic Chemistry (2326404) **(Credit:02, Practical: 60 Periods, Marks: 50)**
	Course preamble: The course is designed in such a way that students will get knowledge of isolation of different constituents such as lycopene, limenonene, eugenol, piperine etc. from natural sources using different techniques. **Course objectives:** ➢ To use different techniques of isolation of constituents from natural sources. ➢ To know about methods of recovery of isolated constituent. **Course outcomes**: After completion of the course students will be able to ➢ Use different methods to isolate constituents from natural sources.
	List of Practicals:
	Isolation of following constituents from the natural sources: (Any five)

	1) Isolation of lycopene from tomato fruits 2) Isolation of limonene from citrus rinds 3) Isolation of β-carotene from carrots 4) Isolation of Eugenol from cloves 5) Isolation of Piperine from black pepper

	6) Isolation of Nicotine from tobacco 7) Isolation of Curcumin from turmeric 8) Isolation of capsaicinoids from peppers by Soxhlet extraction **(Note: Other suitable experiments may be added)**

	DSE-4AP: Synthesis of Heterocycles (2326407) **(Credit:02, Practical: 60 Periods, Marks: 50)**
	Course Objectives: • To study different methods of synthesizing heterocyclic compounds. • To use TLC for following reaction progress. • To get information about work up procedure for different synthesis methods. • To know about various recrystalisation methods.
	Course Outcomes: After completion of the course student will be able to • Synthesise heterocyclic compounds. • To use TLC as a tool for studying progress of reaction. • To recrystalise synthesized heterocyclic compound.
	List of Practicals
1.	Organic synthesis / Molecular modeling: Synthesis of medicinally important compounds: (TLC Analysisis recommended) **(Anyfive)** 1. Benzocain 2. Coumarins 3. Benzimidazole 4. Paracetamol 5. Iodoform 6. Phenylazo-2naphthol 7. 2-Phenylquinoline-4-carboxylic acid from benzaldehyde. **(Note: Other suitable experiments may be added)**

	DSE-4BP:Medicinal Chemistry (2326408) **(Credit: 02, Practical: 60 Periods, Marks: 50)**

	Course preamble: This course is designed to study assay of different pharmaceutical drugs such as Paracetamol, Chloramphenicol, Aspirin, and Vitamin-C. To draw plant layout of tablet unit. To understand procedures for preparation of different types of suspensions, emulsion, and syrup. Course objectives: ➢ To study Assay of different pharmaceutical drugs. ➢ To study different methods of Preparation and evaluation of tablet. ➢ To draw Plant layout of tablet unit. ➢ To draw process flow chart of parenteral formulation. ➢ Preparation of weak Iodine solution, Paracetamol suspension, Castor Oil emulsion, simple syrup IP, lemon syrup etc. Course Outcomes: After completion of the course students will be able to ➢ Assay of different pharmaceutical drugs. ➢ Use different methods of Preparation and evaluation of tablet. ➢ To draw Plant layout of tablet unit ➢ To draw process flow chart of parenteral formulation. ➢ Prepare different solution, suspension, emulsion, and simple syrup IP
	List of Practicals
1.	Assay of Paracetamol Tablet
2.	Assay of Chloramphenicol Capsule
3.	Assay of AspirinTablet
4.	Assay of Vitamin-C
5.	Preparation and Evaluation of Tablet
6.	Draw Plant Layout of Tablet Unit
7.	Draw Process Flowchart of parenteral formulation
8.	Validation of UV-Visible spectroscopic analytical method
9.	Performance Qualification of IR
10.	Evaluation of Packaging Material(Glass/Plastic)
11.	Preparation of weak Iodine solution
12.	Preparation of Paracetamol Suspension

13.	Preparation of Castor Oil Emulsion
14.	Preparation of Simple Syrup IP
15.	Preparation of Lemon Syrup
16.	Preparation of Sodium chloride eye lotion
17.	Preparation of Methyl salicylate Ointment **(Note: Other suitable experiments may be added)**

Reference books for Practicals (Sem-III & IV):

1. A Textbook of Practical Organic Chemistry-A.I.Vogel.
2. Practical Organic Chemistry-Mann &Saunders.
3. A Handbook of Quantitative & Qualitative Analysis- H.T.Clarke.
4. Organic Synthesis Collective Volumes by Blat.
5. Reagents in Organic Synthesis by Fieser and Fieser.
6. Organic Practicals by Ahluwalia.
7. Systematic Lab Experiments in Organic Chemistry by Arun Sethi.(New Age).
8. Advanced Practical Medicinal Chemistry by Ashutosh Kar
9. Practical Pharmaceutical Chemistry –parttwo by A.H. Beckett and J.B. Stenlake.
10. Practical Pharmaceutical Analysis by Dr.G. Devala Rao.
11. Laboratory Handbook of Instrumental Drug Analysis by B.G. Nagavi.
12. Spectrometric Identification of Organic compounds-Robert M Silverstein, Sixth edition, John Wiley & Sons,2004.
13. Principles of Instrumental Analysis- Doglas A Skoog,F. James Holler, Timothy A.Nieman,5th edition, Eastern press,Bangalore,1998.
14. Instrumental methods of analysis– Willards, 7th edition,CBS publishers.
15. Organic Spectroscopy- William Kemp, 3rd edition, ELBS,1991.
16. Quantitative analysis of pharmaceutical formulations by HPTLC- PD Sethi, CBS Publishers, New Delhi.
17. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3 rdEdition,CBSPublishers,New Delhi,1997.
18. Pharmaceutical Analysis- Modern methods – Part B - J W Munson, Volume 11, Marcel Dekker Series.
19. Indian pharmacacopoeia.
20. ICH guidelines-(Q2) Analytical method validation.

Nature of question paper (M. Sc. II, Organic Chemistry):

Time: 2 ½ hours Maximum Marks: 60

Instructions

1. All questions are compulsory
2. All questions carry equal marks.
3. Figures to the right indicate full marks.
4. Use of log tables and calculators is allowed.

Q 1. A) Choose correct alternative **Marks 8 (1 x 8)**

Sub-questions (i) to (viii)

B) Fill in the blanks / True or False **Marks 4 (1 x 4)**

Sub questions (i) to (iv)

Q 2. Answer the following (any six) **Marks 12 (2 x 6)**

Sub-questions (a) to (h)

Q 3. Answer the following (any three) **Marks 12 (3 x 4)**

Sub-questions (a) to (d)

Q 4. Answer the following (any two) **Marks 12 (6 x 2)**

Sub-questions (a) to (c)

Q 5. Answer the following (any two) **Marks 12 (6 x 2)**

Sub-questions (a) to (c)

At least 25 % questions should be problem oriented, where-ever possible, in view to train students for the SET/NET/GATE and other competitive examinations. These questions should test the understanding of candidate rather than the memory. The question paper should cover all the Units included in the syllabus of the respective paper and the weightage of the questions should correspond to the number of lectures allotted to the respective Units / Topics.