VANITA VISHRAM WOMEN'S UNIVERSITY

(Managed By: Vanita Vishram, Surat)

1st Women's University of Gujarat

SCHOOL OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF CHEMISTRY

M.Sc. Organic Chemistry

SYLLABUS

As per NEP-2020

w.e.f 2024-25

INDEX

1 PREAMBLE – VVWU

Vanita Vishram Women's University (VVWU) is the First-ever Women's University of Gujarat approved by the Government of Gujarat under the provisions of the Gujarat Private Universities Act, 2009. It is a University committed to achieve Women's Empowerment through Quality Education, Skill Development, and by providing employment opportunities to its girl students through its model curriculum, integration of technology in pedagogy and best-in-class infrastructure. The focus is on prioritizing practical component and experiential learning supported through academia-industry linkages, functional MoUs, skill development training, internships etc. It aims at providing opportunities to the girl students for holistic development and self-reliance.

VISION

Empowerment of women through quality education and skill development, so as to make them strong pillars of stability in the society.

MISSION

To provide Education & Professional Training to all women for their all-round development, so as to enable them to become economically independent and socially empowered citizens.

2 SALIENT FEATURES

- Based on NEP-2020 & CBCS
- Interdisciplinary as well as multidisciplinary.
- Practical-oriented, skill-based & vocation-based.
- Based on experiential learning.
- Greater exposure to internship, hands-on training, project work, field work, presentation etc.
- Mode of teaching shall be Offline.
- Qualified & Competent Faculty Members for effective teaching-learning
- Employment-Generating

3 INTRODUCTION OF THE PROGRAM

The M.Sc. Chemistry course is an advanced postgraduate program designed to provide students with a comprehensive and in-depth understanding of complex chemical principles and their practical applications. Delving into various specialized areas, such as organic, physical and analytical, the program equips students with specialized knowledge and expertise.

A significant emphasis is placed on hands-on research, experimentation, and laboratory work, enabling students to develop advanced skills in chemical analysis, compound synthesis, and data interpretation. Through rigorous academic training, the program fosters critical thinking, problem-solving abilities, and a spirit of scientific inquiry, preparing students to tackle challenging scientific questions.

Upon successful completion of the M.Sc. Chemistry students are well-prepared to embark on rewarding careers in diverse fields. They can pursue opportunities in research and development, where they contribute to the advancement of scientific knowledge and the discovery of new materials and processes. Additionally, graduates can find fulfilling roles in quality control, ensuring the safety and effectiveness of various products and processes.

Moreover, the course lays the groundwork for potential teaching careers, empowering graduates to impart their knowledge and passion for chemistry to the next generation of students. Furthermore, the program provides a solid foundation for those considering further studies at the doctoral level, where they can explore cutting-edge research and make significant contributions to the field. Students will develop a deep understanding of chemical concepts and their practical applications in areas such as pharmaceuticals, materials science, polymer science, dyes industries, environmental science, fermentation, food & dairy and forensics etc.

Overall, chemists play a crucial role in addressing real-world challenges, such as sustainable energy, environmental conservation, and advancements in healthcare and technology. By applying their knowledge and skills, M.Sc. Chemistry graduates become catalysts for progress and innovation, driving society towards a brighter future.

4 PROGRAMME OBJECTIVES (POS)

PO 1. To impart knowledge of Chemical sciences and application of chemistry in day-to-day life.

PO 2. To strengthen the in-field practical knowledge of the students by providing them hands-on experimentation, project work and field work.

PO 3. To develop capability of thinking, understanding/analyzing and interpreting and solving problems to meet the need of industries such as pharmaceuticals, materials science, polymer science, dyes industries, environmental science, food & dairy, forensics, Academia, etc. and research.

PO 4. To make learners understand about ethical aspects, safety aspects and their responsibilities towards mankind and the environment.

PO 5. To make students capable of finding entrepreneurship opportunities for betterment of society, environment.

PO 6. To make the students avail of all the basic knowledge required for various competitive examinations related to the Sciences.

5 PROGRAM SPECIFIC OUTCOMES (PSOS)

Upon completion of the M.Sc. Chemistry program, the students would:

PSO 1. Have the knowledge of advanced principles of Chemistry and its understanding.

PSO 2. Be able to apply their practical skills and knowledge to identify and resolve the problems related to and serve various Chemical Industries such as pharmaceuticals, materials science, polymer science, dyes industries, environmental science, food & dairy etc.

PSO 3. This program fosters interdisciplinary learning habits, enabling students to utilize modern analytical tools and software for industry and research analysis.

PSO 4. Be able to cultivate professional ethics and equip students to pursue careers in various sectors as chemists, researchers, educators, managers, regulators and professionals in chemistry-related industries.

PSO 5. Develop high-quality research encouraging scientific thinking and approach for research.

PSO 6. Develop skills for further higher studies, competitive examinations and employment.

6 PROGRAM HIGHLIGHTS:

<table>
<tr><td>Course Level</td><td colspan="7">PG</td></tr>
<tr><td>Program</td><td colspan="7">Postgraduate in Science</td></tr>
<tr><td>Duration</td><td colspan="7">2 years (4 semesters)</td></tr>
<tr><td>Examination Type</td><td colspan="7">Semester system (1-4 semesters)</td></tr>
<tr><td>Intake</td><td colspan="7">40</td></tr>
<tr><td>Eligibility</td><td colspan="7">Master degree in Chemistry</td></tr>
<tr><td rowspan="8">Mapping between POs and PSOs</td><td></td><td>PSO 1.</td><td>PSO 2.</td><td>PSO 3.</td><td>PSO 4.</td><td>PSO 5.</td><td>PSO 6.</td></tr>
<tr><td>PO 1.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>PO 2.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>PO 3.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>PO 4.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>PO 5.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>PO 6.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Job Positions</td><td colspan="7">Scientist, Teacher, RnD Officials, QA/QC Executives in various sectors of Chemistry domain such as pharmaceuticals, materials science, polymer science, dyes industries, environmental science, forensics, Academia etc.</td></tr>
</table>

7 SCHEME OF ASSESSMENT

Following is the scheme of assessment followed by the university –

Weightage (%)	Continuous Assessment (CA) (40%)	End Semester Examination (ESE) (60%)
100%	[Internal written Theory Exam] (20%) + [Assignments/Presentations/Viva/group discussion/Journal/ MCQ/QUIZ etc. + Attendance] (20% - Any Two)	End Semester Examination (ESE) Theory/Practical Exams Whole Syllabus

8 Credit Structure

Proposed PG Credit structure for PG -2023					
Semester	**Major (4)**	**DSE(4)**	**Project/Internship**	**Dissertation**	**Total**
1	4*4=16 (Th) 2*4= 08 (Pr)	-	-	-	24
2	4*4=16 (Th) 2*4= 08 (Pr)	-	-	-	24
3	3*4=12 (Th) 1*4=04 (Pr)	**(1*4) Any One** Group A Group B	1*4=4	-	24
4	1*4=04	**Any One** Group A Group B	1*4 = 4(add to Dissertation)	1*12=12	24
Total	**12*4=48** (Th) **5*4 =20** (Pr) **68**	**2*4=08**	**1*4=4** **1*4=4** **08**	**1*12=12**	**96**

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SCHOOL OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF CHEMISTRY

M.Sc. Organic Chemistry

SEMESTER 3

SYLLABUS

As per NEP-2020

w.e.f 2024-25

9 Course Structure – Paper Titles SEMESTER 3

Semester	Major (4)	DSE (4) Anyone	Project/Internship (4)	Dissertation	Total
3	Advanced Organic Chemistry (Th)	Polymer Chemistry	Project	-	06
	Organic Chemistry Specific Topics-I (Th)	Medicinal Chemistry			
	Organic Chemistry Specific Topics-II (Th)				
	Organic Chemistry Practical -III (Pr)			-	

10 Teaching and Evaluation Scheme for bsc Chemistry academic year 2024-25

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VANITA VISHRAM WOMEN'S UNIVERSITY, SURAT

SCHOOL OF SCIENCE AND TECHNOLOGY

TEACHING & EXAMINATION SCHEME FOR M.Sc. Chemistry Programme, AY 2024-25

Semester	Course Code	Course Category	Course Title	Teaching Scheme				Examination Scheme													
								Theory						Practical							
				Contact Hours					CCE		SEE				CCE		SEE				
				Theory	Practical	Total	Total Credit	Credit	Max.	Passing	Max.	Passing	CCE+SEE Passing	Credit	Max.	Passing	Max.	Passing	CCE+SEE Passing	Total	Total Credit
III (Organic Chemistry)	CH21380	CC	Advanced Organic Chemistry (Theory)	4	0	4	5	4	40	16	60	24	40	0	0	0	0	0	0	100	4
	CH21390	CC	Organic Chemistry Specific Topics-I Theory)	4	0	4	5	4	40	16	60	24	40	0	0	0	0	0	0	100	4
	CH21400	CC	Organic Chemistry Specific Topics-II (Theory)	4	0	4	5	4	40	16	60	24	40	0	0	0	0	0	0	100	4
	CH21410	CC	Organic Chemistry Practical-III (Practical)	0	8	8	4	0	0	0	0	0	0	4	40	16	60	24	40	100	4
	CH21460	CC	Project (Practical)	0	8	8	4	0	0	0	0	0	0	4	40	16	60	24	40	100	4
	CH24090	DSE-A	Polymer Chemistry (Theory)	4	0	4	4	4	40	16	60	24	40	0	0	0	0	0	0	100	4
	CH24100	DSE-B	Medicinal Chemistry (Theory)																		
TOTAL MARKS																				**600**	**24**

VANITA VISHRAM WOMEN'S UNIVERSITY, SURAT

SCHOOL OF SCIENCE AND TECHNOLOGY
Department of Chemistry
M.Sc. Organic Chemistry Program
Semester III

CH21380 : Advanced Organic Chemistry (Th)

Credit 4 **Contact Hour per week: 4**

Outline of the Course:

Course type	Theory
Purpose of Course	It aims to delve deeper into the intricacies of organic reactions, mechanisms, and synthesis strategies. It enhances students' proficiency in complex organic transformations, fosters critical thinking, and prepares them for advanced research, innovation, and specialized careers in organic chemistry-related industries and academia.
Course Objective	CO 1. Understanding the mechanism and stereochemistry aspects of organic reactions of alcohols and carbonyl compounds. CO 2. To obtain the useful transformation through oxidizing and reducing agents and its dynamic stereochemistry. CO 3. To understand the reaction of enolates in organic synthesis. CO 4. Sigmatropic reactions and its application in organic chemistry with stereochemistry.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	April 2024
Pre-requisite	● Basic concepts of elimination and substitution reactions. ● General aspects of oxidation and reduction reactions. ● Basic concepts of HOMO and LUMO of organic molecules. ● Basic concepts of pericyclic reactions and its applications.
Teaching Methodology	Class Room Teaching, Use of ICT, Class exercise, Discussion and Assignment
Evaluation Method	40% Continuous Assessment (CA) 60% End Semester Examination (ESE)

Course Content:

Units	Particulars	% Weightage of Unit	Minimum Nos. of Hours
1	**Enolate and functional groups restoration reactions** Reactions of enolates with carbonyl compounds: the aldol and Claisen reactions, Enols and enolates-Acylation of enolates by ester, Directed C-acylation of enols and enolate, Conjugate additions of enolates- Convergent plans for synthesis, Thermodynamic control, Selection of reagents for enol(ate) conjugate addition, Tandem reactions and Robinson annulation.	25 %	15
2	**Oxidation** Metal based oxidizing reagents: A review and detailed discussion of chromium, silver. Non-metal based oxidizing reagents: DMSO, peroxide, peracid. Miscellaneous oxidizing reagents: IBX, DMP, DDQ, periodate. alkenes to alcohols/carbonyls without bond cleavage, hydroboration-oxidation.	25 %	15
3	**Reduction** (a) Catalytic homogeneous and heterogeneous hydrogenation, Wilkinson catalyst. (b) Metal based reductions using Li/Na in liquid ammonia, magnesium, zinc. (c) Hydride transfer reagents: $NaBH_4$, $LiAlH_4$, DIBAL-H. (d) Enantioselective reductions (Chiral Boranes, Corey-Bakshi-Shibata) and Noyori asymmetric hydrogenation.	25 %	15
4	**Sigmatropic rearrangements** Illustration of electron deficient and electron rich skeletal rearrangements; Sigmatropic rearrangements-Claisen and related rearrangements, Cope and oxy-Cope rearrangements; 2,3-sigmatropic rearrangements and ene reaction.	25 %	15

REFERENCE:

1. Clayden, J.; Greeves, N.; Warren, S.; Wothers, P.; Organic Chemistry, Oxford University Press Inc., New York (2001).
2. McMurry, J.E. Fundamentals of Organic Chemistry, Seventh edition Cengage Learning, 2013.
3. P Sykes, A GuideBook to Mechanism in Organic Chemistry, 6th Edition (1997), Orient Longman, New Delhi.
4. Advanced Organic Chemistry Part A: Structure and Mechanisms by Carey & Sundberg, 5th Edition, 2000, Springer.
5. Photochemistry and Pericyclic Reactions by Jagdamba Singh and Jaya Singh (2010) New Academic Science Limited, UK
6. March's Advanced Organic Chemistry Reactions, Mechanisms, And Structure 7th Edition, (2013) Michael B. Smith. Wiley.

COURSE OUTCOMES:

Upon successful completion of the course,

CO 1.	To understand the major concepts, theoretical principles and experimental findings in chemistry of carbonyl compounds.
CO 2.	Students will gain the knowledge of reducing reagents and implement its concept in future research in organic chemistry.
CO 3.	Students will be able to know the importance of oxidizing reagents in organic synthesis.
CO 4.	Students will understand the applications of sigmatropic rearrangement in organic synthesis.

COURSE OUTCOMES MAPPING

Unit No.	Title of the Unit	Course Outcomes			
		CO 1	CO 2	CO 3	CO 4
1	**Enolate and functional groups restoration reactions**				
2	**Oxidation**				
3	**Reduction**				
4	**Sigmatropic rearrangements**				

COURSE ARTICULATION MATRIX

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1						
CO2						
CO3						
CO4						

VANITA VISHRAM WOMEN'S UNIVERSITY, SURAT
SCHOOL OF SCIENCE AND TECHNOLOGY
Department of Chemistry
M.Sc. Organic Chemistry Program
Semester III

CH21390 : Organic Chemistry Specific Topics-I

Credit 4 **Contact Hour per week: 4**

Outline of the Course:

Course type	Theory
Purpose of Course	Organic Chemistry Specific Topics deepen understanding, focusing on key concepts like synthesis, mechanisms, spectroscopy, and materials. They prepare for advanced research in academia and industry, fostering problem-solving and critical thinking through rigorous coursework and experiments. Ultimately, they equip students for successful careers in diverse fields.
Course Objective	CO 1. Learn the important aspects of NMR spectrometry and their applications. CO 2. The chemistry of basic introduction part of Sulfur, silicon, and phosphorus ylides. CO 3. Understand the important aspects of reagents for better understanding of organic synthesis. CO 4. Understand the important aspects of Pharmaceutical industries
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	April 2024
Prerequisite	Elementary knowledge of Chemistry
Teaching Methodology	Class Room Teaching, Use of ICT, Class exercise, Discussion and Assignment
Evaluation Method	40% Continuous Assessment (CA) 60% End Semester Examination (ESE)

Course Content:

Units	Particulars	% Weightage of Unit	Minimum Nos. of Hours
1	**Unit-I NMR Spectroscopy** Theory, principles and instrumentation of NMR spectroscopy. (i) ^{1}H NMR Spectroscopy Proton resonance condition, Aspects of PMR spectra – number of signals, chemical shift, factors influencing chemical shift, deshielding, Anisotropic effect, chemical shift values and correlation for protons bonded to carbons, effect of deuteration, spin-spin coupling, (n+1) rule, factors affecting coupling constant "J" (ii) ^{13}C NMR spectroscopy Types of ^{13}C NMR Spectra: proton coupled and decoupled ^{13}C spectra, chemical shift, calculations of chemical shifts, factors affecting chemical shifts.	25 %	15
2	**Unit-II Sulfur, silicon, and phosphorus in organic chemistry** Useful main group elements Sulfur: an element of contradictions, Sulfur-stabilized anions, Sulfonium salts Sulfonium ylides, Silicon and carbon compared Allyl silanes as nucleophiles, The selective synthesis of alkenes, The properties of alkenes depend on their geometry, Exploiting cyclic compounds Equilibration of alkenes E and Z, alkenes can be made by stereoselective addition to alkynes, Predominantly E alkenes can be formed by stereoselective elimination reactions, The Julia olefination is regiospecific and connective Stereospecific eliminations can give pure single isomers of alkenes, alkenes—the Wittig reaction.	25 %	15
3	**Unit-III Reagents for Organic Synthesis** Introduction, Preparation and Industrial Applications of the following, (1) N-Bromosuccinimide (NBS) (2) Grubbs 1st and 2nd generation catalyst (3) N,N-dicyclohexylcarbodiimide (DCC) (4) Lead tetra-acetate (LTA) (5) n- butyllithium (6) Grignard Reagent (7) Diazomethane (8) Polyphosphoric acid.	25 %	15
4	**Unit-IV Basic Concept of Drugs** Introduction, Classifications: On the basis of their chemical structure and therapeutic action, Nomenclature: Proprietary and Non-proprietary name, Nomenclature of new drugs by WHO, Names of drugs: Generic and brand names, Theories of drug action: Occupancy theory, Rate theory and induced fit theory Biological defense, chemical defenses, Ferguson principle, Absorption of drugs: Routes of administration, factors that affect on absorption, Physicochemical properties: Solubility, Partition coefficients, Ionization constant, Electronic effect, Steric effect.	25 %	15

REFERENCE:

1. D.H. Williams and I.F. Fleming, Spectroscopic Methods in Organic Chemistry, 4th Edition (1988), Tata-McGraw Hill, New Delhi.

2. Nuclear Magnetic Resonance – Basic Principles- Atta-Ur-Rehman, Springer- Verlag (1986).
3. One and Two dimensional NMR Spectroscopy – Atta-Ur-Rehman, Elsevier (1989).
4. Organometallic Chemistry by P. L. Pauson (Edward Arnold, 1968).
5. Principles of Organometallic Chemistry by Coats, Green, Powell & Wade (Chapman and Hall, 1977).
6. Heterocyclic Chemistry- J A Joule and Smith.
7. Heterocyclic chemistry by V. K. Ahluwalia, Narosa publishing house.
8. Guidebook to organic synthesis-R K Meckie, D M Smith and R A Atken.
9. Medicinal Chemistry by G. R. Chatwal.
10. A textbook of Pharmaceutical Chemistry by Jayshree Ghosh.
11. Pharmaceutical Process development: Current Chemical and Engineering Challenges, J. Blacker and M. T. Williams, RSC Cambridge, UK.

COURSE OUTCOMES:

Upon successful completion of the course,

CO 1.	Students will learn the concept of Drugs and its metabolism.
CO 2.	Students will gain knowledge of chemistry of sulfur, silicon and related compounds.
CO 3.	Students will understand the application of NMR Spectroscopy in organic synthesis.
CO 4.	This course can help students to increase their conceptual base and understanding in these topics which will be needed by students in their pursuit of research in organic chemistry and other allied branches of chemistry.

COURSE OUTCOMES MAPPING

Unit No.	Title of the Unit	Course Outcomes				
		CO 1	CO 2	CO 3	CO 4	CO 5
1	NMR Spectroscopy					
2	Sulfur, silicon, and phosphorus in organic chemistry					
3	Reagents for Organic Synthesis					
4	Basic Concept of Drugs					

COURSE ARTICULATION MATRIX

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1						
CO2						
CO3						
CO4						

VANITA VISHRAM WOMEN'S UNIVERSITY, SURAT
SCHOOL OF SCIENCE AND TECHNOLOGY
Department of Chemistry
M.Sc. Organic Chemistry Program
Semester II

CH21400: Organic Chemistry Specific Topics-II

Credit 4 **Contact Hour per week: 4**

Outline of the Course:

Course type	Theory
Purpose of Course	Higher study in chemistry is a current need of the competitive environment. The M.Sc. Chemistry and chemistry programmes provides knowledge and skill-based training to the students to flourish in research and in the professional career. The course offers a deep understanding of concept, theory and experiments that make students reach knowledge of chemistry. The dissertation in the end semester provides a research environment for the student to build a career in the research field.
Course Objective	CO 1. Use of protection and deprotection of the groups and its regio, chemo and stereochemistry. CO 2. Understanding of disconnection approach and its applications. CO 3. Synthesis of cyclic molecules with selected organic reactions and its applications. CO 4. Chemistry and preparation of organometallic reagents. CO 5. Use of organometallic reagents in transformation to useful organic compounds.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	April 2024
Pre-requisite	Elementary knowledge of Chemistry
Teaching Methodology	Class Room Teaching, Use of ICT, Class exercise, Discussion and Assignment
Evaluation Method	40% Continuous Assessment (CA) 60% End Semester Examination (ESE)

Course Content:

Units	Particulars	% Weightage of Unit	Minimum Nos. of Hours
1	**Chemoselectivity, Regioselectivity and protecting groups** Need of protecting groups – Protection of alcohols, Carbonyl, Carboxylic acid and amino groups, Synthetic equivalent groups and examples on transformations, Regioselectivity in electrophilic aromatic substitution, Electrophilic attack on alkenes, Regioselectivity in radical reactions, Nucleophilic attack on allylic compounds, Electrophilic attack on conjugated dienes, Conjugate addition Regioselectivity in action.	25 %	15
2	**Disconnection Approach** Introduction to disconnection, Concept of synthon, Synthetic equivalent, Functional group interconversion (i) One group disconnection: Disconnection and synthesis of alcohols, olefins, simple ketones, acids and its derivatives (ii) Two groups disconnection: Disconnections in 1,3-deoxygenated skeletons, preparation of β-hydroxy carbonyl compounds, α,β-unsaturated carbonyl compounds, 1,3-dicarbonyls, 1,5- dicarbonyls and use of Mannich reaction (iii) Pericyclic reactions: Disconnections based on Diels-Alder reaction and electrocyclic reaction: Its use in organic synthesis.	25 %	15
3	**Ring Synthesis** Introduction to ring synthesis (i) Synthesis of saturated heterocycles: Synthesis of 3 and 4 membered rings (ii) heterocycles in organic synthesis: Synthesis of alkanes and cycloalkanes from thiophene, Synthesis of alkenes and cycloalkenes from pyridines, Synthesis of Aromatic compounds from pyrilium salts, pyridazine, thiophenes and furan.	25 %	15
4	**Organometallic Compounds and Their Applications** (i) Carbon-metal bonds in organometallic compounds, Synthesis and applications of Organolithium, Organozinc and Lithium organocuprate.	25 %	15

(ii) Basic concept of organoboranes, Preparation of organoboranes, Stereochemistry of hydroboration, Mechanism of hydroboration – oxidation, Synthetic applications.		

REFERENCE:

1. Organic synthesis using transition metals-Roderick Bates (Wiley).
2. Organic chemistry – J. Clayden, N. Greeves, S. Warren and P. Wothers (Oxford Press).
3. Some modern methods of organic synthesis – W. Carruthers (Cambridge).
4. Organic synthesis – Michael B. Smith.
5. Advanced organic chemistry, Part B – F. A Carey and R. J. Sundberg, 5th edition (2007).

COURSE OUTCOMES:

After completion the course, the learner shall be able to:

CO 1.	An ability to employ critical thinking and efficient problem-solving skills in the basic areas of organic chemistry.
CO 2.	Study use of protection and deprotection of the groups and its regio, chemo and stereochemistry.
CO 3.	Understanding of disconnection approach and its applications.
CO 4.	Knowledge of chemistry ring synthesis, preparation and use of organometallic reagents in transformation to useful organic compounds.

COURSE OUTCOMES MAPPING

Unit No.	Title of the Unit	Course Outcomes			
		CO 1	CO 2	CO 3	CO 4
1	**Chemoselectivity, Regioselectivity and protecting groups**				
2	**Disconnection Approach**				
3	**Ring Synthesis**				
4	**Organometallic Compounds and Their Applications**				

COURSE ARTICULATION MATRIX

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1						
CO2						
CO3						
CO4						

VANITA VISHRAM WOMEN'S UNIVERSITY, SURAT

SCHOOL OF SCIENCE AND TECHNOLOGY

Department of Chemistry

M.Sc. Organic Chemistry Program

Semester II

CH21410: Organic Chemistry Practical-III

Credit 4 **Contact Hour per week: 4**

Outline of the Course:

Course type	Practical
Purpose of Course	Higher study in chemistry is a current need of the competitive environment. The M.Sc. Chemistry and chemistry programmes provides knowledge and skill-based training to the students to flourish in research and in the professional career. The course offers a deep understanding of concept, theory and experiments that make students reach knowledge of chemistry. The dissertation in the end semester provides a research environment for the student to build a career in the research field.
Course Objective	CO 1. Draw logical and detailed mechanisms for various fundamental reactions of arenes. CO 2. Be able to apply concepts associated with these general reaction types to product prediction, synthesis design, and reaction mechanism. CO 3. To introduce and practice various softwares used for data handling and data sorting. CO 4. To gain an understanding of how to use different softwares for chemical structure drawing.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	April 2024
Pre-requisite	Elementary knowledge of Chemistry
Teaching Methodology	Class Room Teaching, Use of ICT, Class exercise, Discussion and Assignment
Evaluation Method	40% Continuous Assessment (CA) 60% End Semester Examination (ESE)

Course Content:

Units	Particulars	% Weightage of Unit	Minimum Nos. of Hours
1	**Preparation of industrially important compounds by following Name reactions. (Any Four)** 1. Sandmeyer reaction (p-chlorotoluene from p-toluidine). 2. Fischer indole synthesis (1,2,3,4-tetrahydrocarbazole from cyclohexanone and phenylhydrazine). 3. Riemer-Tiemann reaction (Salicylaldehyde from phenol). 4. Skraup synthesis (Quinoline from aniline). 5. 2-hydroxy 1-naphthaldehyde from Beta- naphthol.	**60 %**	
2	**Computer software tools**: MS Office software for type writing and for creating data sheets, tables & graphs	**20%**	
3	**Structure Drawing Tools**: Exposure to available freeware packages like: Chemsketch, Chemdraw	**20%**	

REFERENCE:

1. Monograph on Green Chemistry Laboratory Experiments by Green Chemistry Task Force Committee, DST.
2. Small scale preparation by Arther I.Vogel.

COURSE OUTCOMES:

After completion the course, the learner shall be able to:

CO 1.	Students will learn and apply basic techniques used in the organic laboratory for preparation, purification and identification of organic compounds.
CO 2.	Students will synthesize organic compounds and identify the corresponding alteration in the functional groups
CO 3.	Students will correctly calculate reaction yield for relevant lab experiments.
CO 4.	Able to apply knowledge of various softwares for better data analysis and data presentation. Will be able to handle and manage data to generate graphical presentations.
CO 5.	Able to draw chemical structure and can generate basic properties of it.

COURSE OUTCOMES MAPPING

Unit No.	Title of the Unit	Course Outcomes				
		CO 1	CO 2	CO 3	CO 4	CO 5
1	**Preparation**					
2	**Computer software tools**					
3	**Structure Drawing Tools**					

COURSE ARTICULATION MATRIX

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1						
CO2						
CO3						
CO4						

VANITA VISHRAM WOMEN'S UNIVERSITY, SURAT
SCHOOL OF SCIENCE AND TECHNOLOGY
Department of Chemistry
M.Sc. Organic Chemistry Program
Semester III
DSE-I

CH24090 : Polymer Chemistry

Credit 4 **Contact Hour per week: 4**

Outline of the Course:

Course type	Theory
Purpose of Course	Higher study in chemistry is a current need of the competitive environment. The M.Sc. Organic Chemistry provides knowledge and skill-based training to the students to flourish in research and in the professional career. The course offers a deep understanding of concept, theory and experiments that make students reach knowledge of organic chemistry. The dissertation in the end semester provides a research environment for the student to build a career in the research field.
Course Objective	CO1. The aim is to give basic understanding of polymers and their importance as well as application in various fields. CO2. To furnish a strong foundation in the subject of polymer chemistry. CO3. To gain the understanding of various methods of polymer processing.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	April 2024
Pre-requisite	Elementary knowledge of Polymers
Teaching Methodology	Class Room Teaching, Use of ICT, Class exercise, Discussion and Assignment
Evaluation Method	40% Continuous Assessment (CA) 60% End Semester Examination (ESE)

Course Content:

Units	Particulars	% Weightage of Unit	Minimum Nos. of Hours
1	**Chemistry and Mechanism of polymerization:** History of Polymers, Introduction to polymers with emphasis on important concepts such as – monomers, functionality and physical state (amorphous and crystalline), classification of polymers: Natural and Synthetic, Organic and Inorganic, Thermoplastic and Thermosetting etc., geometry and stereo regularity. Nomenclature of polymers. Definition of polymerization, factors affecting on polymerization, Addition polymerization (free radical, ionic and co-ordination polymerization).Condensation polymerization.	25 %z	15
2	**Concept of polymer molecular weight:** Importance of molecular weight control. Arthemitic mean-molecular weight, number –average molecular weight (M_n) ,Weight average molecular weight, (M_w), and sedimentation and viscosity average molecular weight (M_v). Molecular weight and degree of polymerization, polydispersity and molecular weight distribution, practical significance of polymer molecular weight. Determination of molecular weight- End group analysis, cryoscopic method, light scattering & viscometry.	25 %	15
3	**Polymer processing and testing** Processing of polymers: Moulding-compression moulding, injection moulding, Blow moulding, Extrusion moulding, Thermoforming, Determination of glass transition temperature: dilatometric method, Thermomechanical method(TMA), calorimetric method. Rheology of Polymers, Structure–Rheology Relationship Typical Stress–Strain Behavior Use of Rheology to Produce Better Final Products	25 %	15
4	**Speciality Polymers** ***Thermoplastic polymers***: Polycarbonate(Lexan),Preparation, Physical properties, Applications ***Biodegradable polymers***: Features, Factors, Physical properties and applications of Polyhydroxybutarete (PHB), Polyhydroxyvalarate (PHV) ***Conducting Polymers:*** Intrinsically Conducting Polymers (ICP), Doped Conducting Polymers(DCP) and Coordination Conducting Polymers (CCP), Conductivity in Conducting Polymers, Applications and Limitation.	25 %	15

REFERENCE BOOKS:

- Polymer Chemistry- Seymour& Carreher, Marcel Dekkar, NY.
- Polymer Science -Gowarikar, Wiley Estern Ltd. New Delhi
- Principles of Polymerization-Odian G, wiley Inter Science, New Delhi
- Fundamentals of Polymer Science and Engineering- anilkumar & S.K. Gupta, Tata McGraw Hill, New Delhi
- Textbook of Polymer Science - F.W. Billmeyer.

COURSE OUTCOMES:

Upon successful completion of the course, the learner shall be able to:

CO 1	Have a strong foundation in understanding the basic chemical and polymer reactions
CO 2	Develop practical skills along with their theory components of polymers.
CO 3	Help in them in academic institutions and in R & D programmes of industries

COURSE OUTCOMES MAPPING

Unit No.	Title of the Unit	Course Outcomes		
		CO 1	CO 2	CO 3
1	Chemistry and Mechanism of polymerization			
2	Concept of polymer molecular weight			
3	Polymer processing and testing			
4	Speciality polymers			

COURSE ARTICULATION MATRIX

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1						
CO2						
CO3						

VANITA VISHRAM WOMEN'S UNIVERSITY, SURAT
SCHOOL OF SCIENCE AND TECHNOLOGY
Department of Chemistry
M.Sc. Organic Chemistry Program
Semester III
DSE-II

CH24100 : Medicinal Chemistry

Credit 4 **Contact Hour per week: 4**

Outline of the Course:

Course type	Theory
Purpose of Course	To provide a comprehensive understanding of the principles and techniques involved in designing, synthesizing, and optimizing pharmaceutical compounds. It equips students with the knowledge and skills necessary to contribute to the discovery and development of new drugs, preparing them for careers in pharmaceutical research, drug development, and related fields.
Course Objective	CO1. To understand structural influences on mechanism of pharmacologic action (structure-activity relationship) (Structural influences on pharmacologic/toxicological/therapeutic profiles CO2. To develop synthetic approach of active pharmaceutical ingredient of selected class of pharmacological drug. CO3. To learn the synthesis of drugs based on ring size. CO4. To gain knowledge of SAR.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	April 2024
Pre-requisite	▪ Basic concept of Drug Delivery and metabolism. ▪ Basic concept of Heterocyclic chemistry. ▪ Understanding of reaction mechanisms.
Teaching Methodology	Class Room Teaching, Use of ICT, Class exercise, Discussion and Assignment
Evaluation Method	40% Continuous Assessment (CA) 60% End Semester Examination (ESE)

Course Content:

Units	Particulars	% Weightage of Unit	Minimum Nos. of Hours
1.	**Structure and activity** Structure and activity: Relationship between chemical structure and biological activity (SAR). Receptor Site Theory. Approaches to drug design. Introduction to combinatorial synthesis in drug discovery.	25 %	15
2	**Drugs based on five and six membered aromatic ring** A. Drugs based on a substituted benzene ring: Chloramphenicol, tolazamide, diclophenac, intriptyline. B. Drugs based on five-membered heterocycles: Tolmetin, oxaprozine, sulconazole, nizatidine, imolamine. C. Drugs based on six-membered heterocycles: quinine, ciprofloxacin, methylclothiazide, citrine, terfenadine.	25 %	15
3	**Drugs based on monocyclic fused heterocycles** A. Drugs based on seven-membered heterocyclic rings fused to benzene: Chlordiazepoxide, diazepam. B. Drugs based on heterocycles fused to two benzene rings: Quinacrine, β-Lactam antibiotics: Penicillin, cephalosporin.	25 %	15
4	**Drugs based on bicyclic fused heterocycles** A. Drugs based on five-membered heterocycles fused to six-membered rings: Acyclovir, methotrexate. B. New Chemical Entities as Clinical agents Synthetic: Ritonavir. Natural: Hamamelitannin, pinophilin A & B.	25 %	15

REFERENCE BOOKS:

- A. Burger, Medicinal Chemistry, Vol. I-III, (1995) Wiley Interscience Publications, New York.
- W. O. Foye, Principles of Medicinal Chemistry, 3rd Edition (1989), Lea & Febiger/ Varghese Publishing House, Bombay.
- D. Lednicer and L. A. Mitscher, The Organic Chemistry of Drug Synthesis, (1977) Vol. IIII, Wiley Interscience.
- A. Kar, Medicinal Chemistry, (1993) Wiley Eastern Ltd., New Delhi.
- N. K. Terrett, Combinatorial Chemistry, (1998) Oxford Univ. Press, Oxford.
- Daniel Lednicer Strategies for organic drug synthesis and design (2009), John Wiley & Sons, New York.

COURSE OUTCOMES:

Upon successful completion of the course, the learner shall be able to:

CO 1	The gained knowledge of the connection between the structural features of the drugs and their physico-chemical characteristics, mechanism of action and use.
CO 2	Students will understand the synthetic pathways for selected drugs.
CO 3	Help in them in academic institutions and in R & D programmes of industries

COURSE OUTCOMES MAPPING

Unit No.	Title of the Unit	Course Outcomes		
		CO 1	CO 2	CO 3
1	Structure and activity			
2	Drugs based on five and six membered aromatic ring			
3	Drugs based on monocyclic fused heterocycles			
4	Drugs based on bicyclic fused heterocycles			

COURSE ARTICULATION MATRIX

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1						
CO2						
CO3						

VANITA VISHRAM WOMEN'S UNIVERSITY, SURAT
SCHOOL OF SCIENCE AND TECHNOLOGY
Department of Chemistry
M.Sc. Organic Chemistry Program
Semester III
Core Course
CH21460: Project (Pr)

Credit: 4 **Contact Hour per week: 08**

Course type	Practical
Purpose of Course	Higher study in chemistry is a current need of the competitive environment. The M.Sc. Organic Chemistry provides knowledge and skill-based training to the students to flourish in research and in the professional career. To train students to find reference material. To train students to analyze, condense and evaluate articles/reports. To understand the importance of different types of scientific writing /documentation. To help students develop an ability to make effective presentations. To develop competence in writing and abstracting skills
Course Objective	To be able to learn how to search, write and present research/experimental work.
Minimum weeks per Semester	15 (Including Research/ Experimental, examination, preparation, holidays etc.)
Last Review / Revision	April 2024
Prerequisite	Elementary knowledge of various chemical methodologies
Teaching Methodology	Experiment Performance, Use of ICT, Class exercise, Discussion and Assignment
Evaluation Method	40% Continuous Assessment (CA) 60% End Semester Examination (ESE)

12 Teaching Methodology

A teaching method comprises the principles and methods used by teachers to enable student learning. In order to achieve its objective of focused process- based learning and holistic development, the teacher/faculty may use a variety of knowledge delivery methods:

12.1 Lectures/Class works:

Lectures should be designed to provide the learners with interesting and fresh perspectives on the subject matter. Lectures should be interactive in a way that students work with their teachers to get new insights in the subject area, on which they can build their own bridges to higher learning. Classwork has the ability to enhance relationships between teachers and students. Create goal- oriented tasks for students to prepare and enable self-learning.

12.2 Discussions/ Seminars/Presentation:

Discussions / seminars / presentations are critical components of learning and can be used as a platform for students to be creative and critical with old and new ideas. Besides developing critiquing skills, arriving at consensus on various real-life issues and discussion groups lead to innovative problem-solving and ultimately to success.

12.3 Case Studies/ Self-Study:

Real case studies, wherever possible, should be encouraged in order to challenge students to find creative solutions to complex problems of individual, community, society and various aspects of the knowledge domain concerned. Technology is transforming higher Education learning and teaching through various case studies to improve overall standards.

12.4 Practical/Problem sheet:

Practical ability is the essential requirement for computer science undergraduates' ability structure, and it emphasizes that computer science undergraduates should have a good grasp of theory from practice and then apply the theory to practice, improving them own software developing skills and employability.

12.5 Assignments:

Computer science assignments not only help students overcome their fear and stress but also help them learn more interesting facts about the subjects of computer science which are part of their syllabus and also out of curriculum.

12.6 Industrial Tours:

Computer Science students have to know the things practically through interaction, working methods and employment practices. Moreover, it gives exposure from an academic point of view. Main aim of the industrial visit is to provide an exposure to students about the practical working environment.

12.7 Team Work:

Teamwork based projects challenge the student to apply the technical knowledge they gain in college to solve meaningful and complex problems. Positive collaboration in the form of team work is critical in the classroom environment, for which it is necessary to transcend one's prejudices and predilections so as to achieve the desired outcomes. In the process of teamwork, learners will acquire the skills of managing knowledge acquisition and other collaborative learners, thereby understanding how to incorporate and balance personalities.

13 Keywords

- Masters of Science (M.Sc.) in Organic Chemistry
- Spectroscopy
- Organometallic
- Pericyclic reactions
- Oxidation
- Reduction
- Medicinal Chemistry
- Polymer Chemistry