MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE

(An Autonomous College)

Affiliated to Periyar University, Salem | Accredited by **NAAC** with '**A**' Grade

Recognized by **UGC** under Section 2(f) & 12 (B)

ESTD-1994

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE (Autonomous)

A UNIT OF VANETRA GROUP

Learn. Lead

DEGREE OF MASTER OF SCIENCE

Learning Outcomes – Based Curriculum Framework

– Choice Based Credit System

Syllabus for M.Sc., Organic Chemistry

(Semester Pattern)

(For Candidates admitted from the academic year 2023-2024 and onwards)

Regulation and Syllabus for
M.Sc., Organic Chemistry
(With effect from the Academic Year 2024-25)

Vision:

To redefine the scope of higher education by infusing into each of our pursuits, initiatives that will encourage intellectual, emotional, social and spiritual growth, thereby nurturing a generation of committed, Knowledgeable and socially responsible citizens.

Mission:

*To Ensure State of the world learning experience

*To Espouse value based Education

*To Empower rural education

*To Instill the sprite of entrepreneurship and enterprise

*To create a resource pool of socially responsible world citizens

QUALITY POLICY

To Seek – To Strive – To Achieve greater heights in Arts and Science, Engineering, Technological and Management Education without compromising on the Quality of Education.

DEPARTMENT OF CHEMISTRY

Vision:

Department is dedicated to provide a high quality education in Chemistry for the students and to create young chemist to survive for social and scientific well-being.

Mission:

- To develop the department as a research ground for rural students
- To ensure that the department is equipped with highly sophisticated instruments

PREAMBLE

Master of Science in Organic Chemistry (M.Sc.) program is two years of study. Due to the relevance of chemistry in many various businesses and research domains, offer a wide variety of work options across multiple industries. In the end, the M.Sc. in Organic Chemistry gives students a wide range of career options and the ability to work in a variety of industries, including government, research, and academia. With the right information, abilities, and experience, M.Sc. Organic Chemistry graduates can have prosperous and meaningful careers in the fields of their choice. Furthermore, the most popular options for higher education among students are an M.Phil or Ph.D. in Chemistry.

PROGRAMME LEARNING OUTCOME NATURE AND EXTENT OF THE PROGRAMME

Master of Science in Organic chemistry Program will provide enhanced understanding of fundamental and chemical sciences that were applied to the graduates. It will equip the students with the knowledge and abilities necessary to take on difficult assignments in both academia and industry and information to create jobs for themselves and others.

The program offers trans disciplinary and integrative courses that expose students to cutting-edge advancements in the chemical sciences as well as other related sciences. Choice-based curricula have the potential to enhance students' analytical and problem-solving skills. It is intended to bring out the best in each student, help them hone their scientific temper, and keep them up to date with the latest advancements in the field. The two years of the M.Sc. Organic Chemistry program are broken up into four semesters. The program will use tutorial, seminar-based classes, lectures, and practical's to educate and learn. Approximately 40% of each course's syllabus may be given online during the duration of the program using a blended teaching and learning methodology. Formal lectures will be used to teach the curriculum, supplemented by prepared presentations, audio, and video resources as needed. Employ other instructional tools as needed. The curriculum also includes the extra requirements, such as project work, industry trips, and summer training.

AIM OF THE PROGRAMME

- To provide to learners both fundamental and advanced understanding of the Chemical sciences.
- To equip students with disciplinary, inter-disciplinary, and multidisciplinary focused on research knowledge in higher education, fostering lifelong learning.
- To provide a pool of educated, talented, and innovative graduates prepared to take on demanding jobs in academia, research facilities, and various Chemical businesses.
- To cultivate responsible, proactive citizens with scientific thinking and the ability to solve local issues good balance between theories, computing and practical experiments updated lab classes that are in line with new or current research.

GRADUATE ATTRIBUTES

GA 1 Disciplinary Knowledge
GA 2 Self-directed Learning
GA 3 Multi-cultural Competency
GA 4 Research-related Skill
GA 5 Analytical Reasoning
GA 6 Moral and Ethical Reasoning
GA 7 Communication Skill

Disciplinary Knowledge:

a) ability to identify, speak and write about different literary genres, forms, periods and movements
b) ability to understand and engage with various literary and critical concepts and categories
c) ability to read texts closely, paying attention to themes, generic conventions, historical contexts, and linguistic and stylistic variations and innovations
d) ability to understand appreciate, analyze, and use different theoretical frameworks
e) ability to locate in and engage with relevant scholarly works in order to develop one's own critical position and present one's views coherently and persuasively
f) ability to situate one's own reading, to be aware of one's position in terms of society, religion, caste, region, gender, politics, and sexuality to be self-reflexive and self-questioning

g) ability to understand the world, to think critically and clearly about the local and the global through a reading of literatures in translation and in the original, to be a located Indian citizen of the world

h) ability to see and respect difference and to transcend binaries

Self-Directing Learning:

a) ability to work independently in terms of reading literary and critical texts

b) ability to carry out personal research, postulate questions and search for answers

Multicultural Competence:

a) ability to engage with and understand literature from various nations and reasons and languages

b) ability to respect and transcend differences

Research-Related Skills:

a) ability to problematize; to formulate hypothesis and research questions, and to identify and consult relevant sources to find answers

b) ability to plan and write a research paper

Analytical Reasoning:

a) ability to evaluate the strengths and weaknesses in scholarly texts spotting flaws in their arguments

b) ability to use critics and theorists to create a framework and to substantiate one's argument in one's reading of literary texts

Moral and Ethical Reasoning:

a) ability to interrogate one's own ethical values, and to be aware of ethical issues

b) ability to read values inherited in literary texts and criticism viz, the environment, religion and spirituality, as also structures of power

Communication Skills:

a) Ability to speak and write clearly in standard, academic English

b) Ability to listen to and read carefully various viewpoints and engage with them.

c) Ability to use critical concepts and categories with clarity

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO1	:	Post Graduates will be able to promote learning environment to meet the Industry expectation
PEO2	:	Post Graduates will be incorporated the critical thinking with good Communication and Leadership skills to become a self-employed
PEO3	:	Post Graduates will be upholding the human values and environmental sustenance for the betterment of the society

PROGRAMME OUTCOMES (POs)

PO1	:	Post graduates will attain profound proficiency and expertise
PO2	:	Post graduates will be ensured with corporative self – directed learning
PO3	:	Post graduates will acquire acumen to handle diverse contexts and function in domains of multiplicity
PO4	:	Post graduates will exercise intelligence in research Investigations and Introducing innovations
PO5	:	Post graduates will learn ethical values and commit to Professional ethics.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1	:	Construct a firm foundation in the fundamentals and connect the application with the current developments in chemistry
PSO2	:	Gain knowledge in laboratory techniques and be able to perform new experiments, obtain experimental data and its interpretation through the theoretical principle
PSO3	:	Possess capacity of working in research labs and related fields, ability to design a synthetic route for new compounds and transform innovative ideas into reality.
PSO4	:	Carry professional skills to handle standard equipment and to analyze the data, to be employed in the various sectors like chemical, pharmaceutical, food, and materials industries
PSO5	:	Stimulate the students to prepare for competitive examinations, and professional careers and get trained for industrial entrepreneurship

REGULATIONS (2024-2025)

1. DURATION OF THE PROGRAME

1.1 Two years (Four semesters)

1.2 Each academic year shall be divided into two semesters. The odd semesters shall consist of the period from June to November of each year and the even Semesters from December to May of each year.

1.3 There shall be not less than 90 working days for each semester.

2. ELIGIBILITY FOR ADMISSION

2.1 A candidate who (1) has passed the B.Sc., Chemistry as the Main subject of study or (2) is a Graduate in B.Sc., Chemistry, or (3) an examination of Universities accepted by the Syndicate of the Periyar University as equivalent there to, shall be permitted to appear and qualify for the M. Sc., Degree examination in this Branch at Muthayammal College of Arts and Science (Autonomous), Rasipuram.

3. CREDIT REQUIRMENTS AND ELIGIBILITY FOR AWARD OF DEGREE

3.1. A Candidate shall be eligible for the award of the Degree only if he/she has undergone the prescribed course of study in a College affiliated to the University for a period of not less than two academic years and passed the examinations of all the four Semesters prescribed earning a minimum of 91 credits as per the distribution given in Regulation fulfilled such other conditions as have been prescribed thereof.

4. COURSE OF STUDY, CREDITS AND SCHEME OF EXAMINATION

4.1 The Course Components and Credit Distribution shall consist of the following: (Minimum Number of Credits to be obtained)

S. No.	Study Components	Credit Distribution
01	Core, Elective, EDC, and Project Courses	**84**
02	Internship	**02**
03	Human Rights	**02**
04	Professional Competency Skills	**02**
05	Extension Activity	**01**
Total Credits		**91**

4.1.1 Extension Activity:

Students shall be awarded a maximum of 1 Credit for Compulsory Extension Service. All the Students shall have to enroll for clubs / NSO (Sports & Games) Retract / Youth Red Cross or any other Service Organizations in the College and shall have to put in compulsory minimum attendance of 40 hours which shall be duly certified by the Principal of the College before 31st March in a year. If a student lacks 40 hours attendance in the first year, he or she shall have to compensate the same during the subsequent years.

Those students who complete minimum attendance of 40 hours in one year will get 'half-a- credit and those who complete the attendance of 80 or more hours in Two Years will get 'one credit'. Literacy and Population Education and Field Work shall be compulsory components in the above extension service activities.

4.2 Inclusion of the Massive Open Online Courses (MOOCs) available on SWAYAM and NPTEL

4.2.1 Students can choose the MOOC Course Available on SWAYAM and NPTEL under Core, Elective or Soft skill category. He/ she will be awarded degree only after producing valid certificate of the MOOC course for credit Mobility

5. REQUIREMENTS FOR PROCEEDING TO SUBSEQUENT SEMESTER

5.1 Eligibility: Students shall be eligible to go to subsequent semester only if they earn sufficient attendance as prescribed by the Periyar University.

5.2 Attendance: All Students must earn 75% and above of attendance for appearing for the End Semester Examination.(Theory/Practical)

5.3 Condonation of shortage of attendance: If a Student fails to earn the minimum attendance (Percentage stipulated), the Principals shall condone the shortage of attendance up to a maximum limit of 10% (i.e. between 65% and above and less than 75%) after collecting the prescribed fee for Theory/Practical examination separately, towards the condonation of shortage of attendance. Such fees collected and should be remitted to the University.

5.4 Non-eligibility for condonation of shortage of attendance: Students who have secured less than 65% but more than 50% of attendance are NOT ELIGIBLE for condonation of shortage of attendance and such Students will not be permitted to

appear for the regular examination, but will be allowed to proceed to the next year/next semester of the program and they may be permitted to take next University examination by paying the prescribed condonation fee

5.5 Detained students for want of attendance: Students who have earned less than 50% of attendance shall not be permitted to proceed to the next semester and to complete the Program of study. Such Students shall have to repeat the semester, which they have missed by rejoining after completion of final semester of the course, by paying the fee for the break of study as prescribed by the College from time to time.

5.6 Condonation of shortage of attendance for married women students: In respect of married women students undergoing PG programs, the minimum attendance for condonation (Theory/Practical) shall be relaxed and prescribed as 55% instead of 65% if they conceive during their academic career. Medical certificate from the Doctor (D.G.O) from the Government Hospital and the prescribed fee along with attendance details shall be forwarded to the college to consider the condonation of attendance mentioning the category

5.7 Zero Percent (0%) Attendance: The Students, who have earned 0% of attendance, have to repeat the program (by rejoining) without proceeding to succeeding semester and they have to obtain prior permission from the College/University immediately to rejoin the program.

5.8 Transfer of Students and Credits: The strength of the credits system is that it permits inter-Institutional transfer of students. By providing mobility, it enables individual students to develop their capabilities fully by permitting them to move from one Institution to another in accordance with their aptitude and abilities by obtaining necessary permission from the university.

5.8.1. Transfer of Students is permitted from one Institution to another Institution for the same program with same nomenclature.

Provided, there is a vacancy in the respective program of Study in the Institution where the transfer is requested.

Provided the Student should have passed all the courses in the Institution from where the transfer is requested.

5.8.2 The marks obtained in the courses will be converted and grades will be assigned as per the College norms.

5.8.3 The transfer students are eligible for classification.

5.8.4 The transfer students are not eligible for Ranking, Prizes and Medals.

5.8.5 Students who want to go to foreign Universities up to two semesters or Project Work with the prior approval of the Departmental/College Committee are allowed to get transfer of credits and marks which will be converted in to Grades as per the University norms and are eligible to get CGPA and Classification; they are not eligible for Ranking, Prizes and Medals.

5.9. Students are exempted from attendance requirements for online courses of the College and MOOC's.

6. EXAMINATION AND EVALUATION

6.1 Register for all subjects: Students shall be permitted to proceed from the First Semester up to Final Semester irrespective of their failure in any of the Semester Examination. For this purpose, Students shall register for all the arrear subjects of earlier semesters along with the current (subsequent) Semester Subjects.

6.2 Marks for Internal and End Semester Examinations

Category	Theory	Practical
Internal Assessment	25	40
End semester Examination	75	60

6.3 Procedure for Awarding Internal Marks Internal Examination Marks – Theory

Components	Marks
CIA I & II	10
Attendance	5
Assignment/Quiz	5
Seminar	5
Total	25

6.4. Awarding Marks for Attendance (out of 5)

Percentage of Attendance	Marks
Below 60%	0 marks
60% to 75%	3 marks
75% to 90%	4 marks
Above 90%	5 marks

6.5. Components for Practical CIA.

Components	Marks
CIA -I	15
CIA - II	15
Observation Note	05
Attendance	5
Total	40

6.6. Components for Practical ESE.

Components	Marks
Completion of Experiments	50
Record	05
Viva voce	05
Total	60

6.7. Internship/ Industrial Training, Mini Project and Major Project Work

Internship/Industrial Training		Project Work		
	Marks	Components		Marks
CIA*[1]		CIA		
Work Diary	25	a) Attendance	20 Marks	50
Report	50	b) Review / Work Diary*[1]	30 Marks	
Viva-voce Examination	25			
Total	100			
		ESE*[2]		
		a) Final Report	120 Marks	150
		b) Viva-voce	30 Marks	
		Total		200

*1 Evaluation of report and conduct of viva voce will be done jointly by Internal and External Examiners

6.8. Guidelines for Professional Competency Skill- Online Mode - Online Exam 3 hours

Components	Marks
100 Objective Type Questions 100*1=100 Marks	100

Objective type Questions from Question Bank.

- The passing minimum for this paper is 50%
- In case, the candidate fails to secure 50% passing minimum, he/ she may have to reappear for the same in the subsequent semesters.

6.9 Components for Human Rights Course (CIA Only)

The Course Human Rights is to be treated as 100% CIA course which is offered in II Semester for I year PG students.

Total Marks for the Course =100

Components	Marks
Two Tests	75
Assignments	25
Total	**100**

- In case the candidate fails to secure 50 marks, which is the passing minimum, he/she may have to reappear for the same in the subsequent semesters

QUESTION PAPER PATTERN FOR CIA I, II AND ESE	
(3 HOURS)	MAXIMUM:75Marks
SECTION-A (Objective Type) Answer ALL Questions **ALL Questions Carry EQUAL Marks**	**(10 x 1=10 marks)**
SECTION-B (Analytical Type) Answer any THREE Questions out of FIVE Questions **ALL Questions Carry EQUAL Marks**	**(3 x 5 = 15 marks)**
SECTION-C (Either or Type) Answer ALL Questions **ALL Questions Carry EQUAL Marks**	**(5 x 10 = 50 marks)**
(Syllabus for CIA-I 2.5 Unit ,Syllabus for CIA-II All 5 Unit)	

6.10 PASSING MINIMUM

6.10.1 There shall be no passing minimum for Internal.

6.10.2 For external examination, passing minimum shall be 50% [Fifty Percentage] of the maximum marks prescribed for the course for each Course/Practical/Project and Viva-Voce.

6.10.3 In the aggregate [External/Internal] the passing minimum shall be of 50%.

6.10.4 He / She shall be declared to have passed the whole examination, if he/she passes in all the Courses and Practical wherever prescribed as per the scheme of the

examinations by earning 90 CREDITS. He/she shall also fulfill the extension activities prescribed earning a minimum of 1 credit to qualify for the Degree.

6.11 SUPPLEMENTARY EXAMINATION:

Supplementary Examinations is conducted for the students who appeared in the final semester examinations. Eligible criteria for appearing in the Supplementary Examinations are as follows:

6.11.1 Eligibility: A Student who is having arrear of only one theory course in any of the semester or two theory course in the Final semester of the PG degree programme alone is eligible for Supplementary Examinations.

6.11.2 Non-eligibility for those completed the program: Students who have completed their Program duration but having arrears are not eligible to appear for Supplementary Examinations.

6.12. RETOTALLING, REVALUATION AND PHOTOCOPY OF THE ANSWER SCRIPTS:

6.12.1 Re-totaling: All UG Students who appeared for their Semester Examinations are eligible for applying for re-totaling of their answer scripts.

6.12.2 Revaluation: All current batch Students who have appeared for their Semester Examinations are eligible for Revaluation of their answer scripts. Passed out candidates are not eligible for Revaluation.

6.12.3 Photo copy of the answer scripts: Students who have applied for revaluation can apply for the Photocopy of answer scripts by paying prescribed fee.

7. CLASSIFICATION OF SUCCESSFUL STUDENTS

RANGE OF MARKS	GRADE POINTS	LETTER GRADE	DESCRIPTION
90-100	9.0-10.0	O	Outstanding
80-89	8.0-8.9	D+	Excellent
75-79	7.5-7.9	D	Distinction
70-74	7.0-7.4	A+	Very Good
60-69	6.0-6.9	A	Good
50-59	5.0-5.9	B	Average
00-49	0.0	U	Re-appear
ABSENT	0.0	AAA	ABSENT

7.1. Computation of Grade Point Average (GPA) in a Semester, Cumulative Grade Point Average (CGPA) and Classification

$$\textbf{GPA for a Semester: } = \frac{\sum_i C_i G_i}{\sum_i C_i}$$

Ci= Credits earned for course I in any semester,

That is, GPA is the sum of the multiplication of grade points by the credits of the courses divided by the sum of the credits of the courses in a semester.

$$\textbf{CGPA for the entire programme: } = \sum_n \sum_i C_{n_i} G_{n_i} \Big/ \sum_n \sum_i C_{ni}$$

That is, CGPA is the sum of the multiplication of grade points by the credits of the entire programme divided by the sum of the credits of the courses of the entire programme

Gi=Grade Points obtained for course in any semester; n=Semester in which such courses were credited.

7.2 Letter Grade and Classification

CGPA	GRAD E	CLASSIFICATION OF FINAL RESULT
9.5-10.0	O+	First Class -Exemplary*
9.0 and above but below9.5	O	
8.5 and above but below 9.0	D++	First Class with Distinction*
8.0 and above but below 8.5	D+	
7.5 and above but below 8.0	D	
7.0 and above but below 7.5	A++	First Class
6.5 and above but below 7.0	A+	
6.0 and above but below 6.5	A	
5.5 and above but below 6.0	B+	Second Class
5.0 and above but below 5.5	B	
0.0 and above but below 5.0	U	Re-appear

*The Students who have passed in the first appearance and within the prescribed semester of the PG Program are eligible.

8. RANKING

Students who pass all the examinations prescribed for the Program in the FIRST APPEARANCE ITSELF ALONE are eligible for Ranking I, II and III.

9. MAXIMUM PERIOD FOR COMPLETION OF THE PROGRAM TO QUALIFY FOR A DEGREE

9.1.A Student who for whatever reasons is not able to complete the program within the normal period (N) or the Minimum duration prescribed for the programme, may be allowed two years period beyond the normal period to clear the backlog to be qualified for the degree. (Time Span = N+2 years for the completion of programme.)

*****

M.Sc., ORGANIC CHEMISTRY abstract under LOCF-CBCS Pattern with effect from 2023-2024 Onwards

Structure of Credit Distribution as per the TANSCHE / UGC Guidelines

S. No.	Study Components	Sem I		Sem II		Sem III		Sem IV		No. of Paper	Total Credit
		No. of Paper	Credit	No. of Paper	Credit	No. of Paper	Credit	No. of Paper	Credit		
1	DISCIPLINE SPECIFIC COURSE(DSC)-THEORY	2	10	2	10	2	10	2	10	8	40
2	DSC - PRACTICAL	1	4	1	4	1	5	1	3	4	16
3	DISCIPLINE SPECIFIC ELECTIVE COURSES (DSE)	2	6	2	6	1	3			5	15
4	PROJECT WORK							1	5	1	5
5	INTERNSHIP					1	2			1	2
6	GENERIC ELECTIVE COURSES (GEC)- EDC					1	4			1	4
7	SKILL ENHANCEMENT COURSES (SEC)			1	2	1	2			2	4
8	HUMAN RIGHTS			1	2					1	2
9	ONLINE COMPETITIVE EXAMINATION							1	2	1	2
10	EXTENSION ACTIVITY							1	1	1	1
	Cumulative Credits	5	20	7	24	7	26	6	22	25	91

Total No. of Subjects	25
Marks	**2500**
Total Credits	91
Extra Credits	4
Total Credits	**95**

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE (Autonomous) - Rasipuram - 637 408
Scheme of Examinations LOCF-CBCS Pattern
(for the Students Admitted from the Academic Year:2023-2024 Onwards)
Programme : M.Sc. ORGANIC CHEMISTRY

S. No.	STUDY COMPONENTS	COURSE_CODE	TITLE OF THE COURSE	Hrs./W		CREDIT POINTS	MAX. MARKS		
				Lect.	Lab.		CIA	ESE	TOTAL
SEMESTER - I									
1	DSC THEORY - I	23M1POCC01	CO-ORDINATION AND NUCLEAR CHEMISTRY	7	-	5	25	75	100
2	DSC THEORY - II	23M1POCC02	STEROCHEMISTRY AND ORGANIC REACTION MECHANISM	7	-	5	25	75	100
3	DSC PRACTICAL - I	23M1POCP01	PRACTICAL: ORGANIC CHEMISTRY - I	-	6	4	40	60	100
4	DSE THEORY - I		ELECTIVE - I	5	-	3	25	75	100
5	DSE THEORY - II		ELECTIVE - II	5	-	3	25	75	100
			TOTAL	**24**	**6**	**20**	**140**	**360**	**500**
SEMESTER II									
1	DSC THEORY - III	23M2POCC03	ORGANIC REACTION MECHANISM	6	-	5	25	75	100
2	DSC THEORY - IV	23M2POCC04	QUANTUM CHEMISTRY AND GROUP THEORY	6	-	5	25	75	100
3	DSC PRACTICAL - II	23M2POCP02	PRACTICAL: INORGANIC CHEMISTRY	-	6	4	40	60	100
4	DSE THEORY - III		ELECTIVE - III	4	-	3	25	75	100
5	DSE THEORY - IV		ELECTIVE - IV	4	-	3	25	75	100
6	SEC THEORY - I	23M2POCS01	INDUSTRIAL CHEMISTRY	4	-	2	25	75	100

7	HUMAN RIGHTS	23M2PHR01	HUMAN RIGHTS	-	-	2	100	-	100
			TOTAL	**24**	**6**	**24**	**240**	**435**	**700**
SEMESTER III									
1	DSC THEORY - V	23M3POCC05	PHYSICAL METHODS IN CHEMISTRY	6	-	5	25	75	100
2	DSC THEORY - VI	23M3POCC06	BIO-ORGANIC CHEMISTRY	6	-	5	25	75	100
3	DSC PRACTICAL - III	23M3POCP03	PRACTICAL: ORGANIC CHEMISTRY - II	-	6	5	40	60	100
4	DSE THEORY - V		ELECTIVE - V	5	-	3	25	75	100
5	EDC THEORY - I		EDC THEORY	4	-	4	25	75	100
6	SEC THEORY - II	23M3POCS02	SOFTWARE PACKAGE FOR CHEMISTS - MATLAB, ORIGIN AND CHEMDRAW	3	-	2	100	-	100
7	INTERNSHIP	23M3POCIS1	INTERNSHIP	-	-	2	100	-	100
			TOTAL	**24**	**6**	**26**	**340**	**360**	**700**
SEMESTER IV									
1	DSC THEORY - VII	23M4POCC07	ORBTIAL SYMMETRY, PHOTOCHEMISTRY AND NON-CONVENTIONAL TECHNIQUES IN ORGANIC SYNTHESIS	6	-	5	25	75	100
2	DSC THEORY - VIII	23M4POCC08	CHEMISTRY OF NATURAL PRODUCTS	6	-	5	25	75	100
3	PROJECT WORK	23M4POCPR1	PROJECT WORK	10	-	5	50	150	200
4	DSC PRACTICAL - IV	23M4POCPO4	PRACTICAL: ANALYTICAL INSTRUMENTATION TECHNIQUES	-	4	3	40	60	100
5	ONLINE COMPETITIVE EXAMINATION	23M4POCOE1	ORGANIC CHEMISTRY FOR COMPETITIVE EXAMINATIONS	4	-	2	100	-	100

6	EXTENSION ACTIVITY	23M4PEXA01	EXTENSION ACTIVITY	-	-	1	-	-	-
			TOTAL	**26**	**4**	**21**	**240**	**360**	**600**
			OVER ALL TOTAL	**98**	**22**	**91**	**960**	**1515**	**2500**
1	EXTRA CREDIT COURSE - ONLINE		MOOC Courses offered in SWAYAM/NPTEL	-	-	2	-	-	-
2	VALUE ADDED COURSE		VALUE ADDED COURSE	-	-	2	-	-	-

HoD **Member Secretary of Academic Council** **Principal**

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram – 637408

M. Sc.- Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M1POCC01	**CO-ORDINATION AND NUCLEAR CHEMISTRY**	**DSC THEORY - I**	**I**	**7**	**4**	**3**	**-**	**5**
Objective	Students will understand the theories of co–ordination compounds, their stability and realize the concept of nuclear reactions and applications of radio isotopes.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Theories of coordination compounds** VB theory-CFT-Splitting of d orbital in ligand field and different symmetries-CFSE-Factors affecting the magnitude of 10 Dq-Evidence for crystal field stabilization (Structural and thermodynamic effects) - Spectrochemical series – Site selection in spinels - tetragonal distortion from octahedral symmetry-John Teller distortion - Nephelauxetic effect-MO theory of octahedral, tetrahedral and Square planar complexes-pi bonding and molecular orbital theory - experimental evidence for pi bonding.	K2	16
II	**Stability and Stereochemical Aspects** Stability of complexes - thermodynamic aspects of complex formation, factors affecting stability, stability correlations, statistical and chelate effects; Determination of stability constants - polarographic, photometric and potentiometric methods. Stereochemical aspects - stereoisomerism in inorganic complexes,isomerism arising out of ligand distribution and ligand conformation, chirality. Macrocyclic ligand types - porphyrins, corrins, Schiff bases, crown ethers, cryptates and catenands (simple complexes).	K3	16
III	**Reaction Mechanism of transition metal complexes** Energy profile of a reaction-reactivity of metal complexes- inert and labile complexes-kinetic application of valence bond and crystal field theories. Kinetics of octahedral substitutions- acid hydrolysis- factors affecting acid hydrolysis- base hydrolysis- conjugate base mechanism-direct and indirect evidences in favour of conjugate mechanism- anation reactions- reactions without metal ligand bond cleavage. Substitution reactions in square planar complexes- the trans effect- mechanism of the substitution reactions. Redox reactions- electron transfer reactions-mechanism of one electron transfer reactions- outer sphere type reactions- cross reactions and Marcus-Hush theory, inner sphere type reactions.	K4	16

IV	**Nuclear Chemistry – I** The nucleus-subatomic particles and their properties-mass defect - binding energy - n/ p ratio in stable and meta stable nuclei-Different types of nuclear forces-Liquid drop model and shell model. Modes of radioactive decay-Theory of alpha decay, beta decay and gamma radiation, Orbital electron capture, nuclear isomerism-internal conversion. Detection and determination of activity-GM, Scintillation and Cherenkov counters. Particle Accelerators: Linear accelerator-cyclotron, synchrotron, betatron and bevatron	K4	16
V	**Nuclear Chemistry – II** Nuclear Reactions: Q-value, columbic barrier- nuclear cross section-different types of nuclear reactions projectile capture-particle emission, spallation, fission and fusion-product distributions - Theories of fission, use of fission products, fissile and fertile isotopes - U-238, U- 235, PU-239, Th-232 -stellar energy-synthesis of new elements. Radio-Isotopes: Applications-isotopes as tracers - neutron activation analysis and isotopic dilution analysis - uses in structure and mechanistic studies - Carbon dating – Radio pharmacology, Radiation protection and safety precautions - Disposal of nuclear waste.	K5	16
Course Outcome	**CO1**: Learn about Various theories of co-ordination compounds, the reaction mechanisms of complexes and properties of nuclear reactions.	K1	
	CO2: Understand the Stability and stereo chemical aspects of co-ordination compounds	K2	
	CO3: Apply various techniques to study the stability of complexes and nuclear reactions	K3	
	CO4: Analyze the Different types of nuclear forces	K4	
	CO5: Understand the various application of radio isotopes	K5	

Learning Resources	
Text Books	1. R. Gopalan and V. Ramalingam, Concise Co-ordination Chemistry, Vikas Publishing House Pvt. Ltd., 2008. 2. Cotton and Wilkinson : Advanced inorganic Chemistry, 6th ed., Wiley Eastern (P), Ltd.,1999 3. H.J.Emeleus and A.G.Sharp : Modern aspects of Inorganic Chemistry, IV Edn.,1989. 4. Gurdeep Raj, Advanced Inorganic Chemistry-II Goel Publishing House, 2014.
Reference Books	1. F. Basolo and R.G. Pearson, Mechanism of Inorganic Reactions, Wiley Eastern, 1967. 2. J.E.Huheey, E.A.Keiter and R.L.Keiter, Inorganic chemistry-Principles of structure and reactivity, 4th edition, Pearson-Education,2002
Website Link	1.https://www.sas.upenn.edu/mcnemar/apchem/nuclear.pdf 2.https://archive.nptel.ac.in/courses/104/101/104101137/ 3.https://archive.nptel.ac.in/courses/104/101/104101136/

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc.- Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards										
Course Code	**Course Title**			**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M1POCC01	**COORDINATION AND NUCLEAR CHEMISTRY**			**DSC THEORY - I**	**I**	**7**	**4**	**3**	**-**	**5**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	S	S	M	M	M	M
CO2	M	M	M	S	S	S	M	M	S	S
CO3	S	S	M	S	S	S	S	S	M	M
CO4	M	M	S	S	M	S	L	M	S	S
CO5	M	S	M	S	M	S	M	M	M	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Group Discussion and CSIR/GATE question paper solving	
Teaching and Learning Methods	Chalk and Board class, Use of Molecular Models and PPT Presentation	
Assessment Methods	Seminar, Assignment, CIA examinations and End Semester Examinations	
Designed By	**Verified By HoD**	**Approved By Member Secretary**
Mr. S. Ramkumar	Dr. N. Nithiya	Dr. S. Shahitha

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram – 637408

M. Sc.- Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M1POCC02	**STEREOCHEMISTRY AND ORGANIC REACTION MECHANISM**	**DSC THEORY - II**	**I**	**7**	**4**	**3**	**-**	**5**
Objective	Students will realize the significance and relevance of stereochemistry and role of electrophilic as well as nucleophilic substitution reaction and selectivity in organic transformations, concept of reaction mechanism of substitution Vs reactivity.							

Unit	Course Content	Knowledge Levels	Sessions
I	**STEREOCHEMISTRY-I** Chirality, Symmetry elements, Asymmetric and Dissymmetric chiral molecules. Calculation of number of optical isomers. Stereochemistry of mono and di-substituted cyclopropane, cyclobutane, cyclopentane and cyclohexane. Stereochemistry of tri-substituted cyclopentane, tri-substituted pentane and tetra-substituted hexane. Description of various types of optically active compounds including allenes, spiranes, biphenyls, cyclophanes and helicenes.	K3	16
II	**STEREOCHEMISTRY-II** Compounds containing two asymmetric centers - Erythro and threo isomers. Conversion of Fischer projection into perspective forms. Erythro and Threo Inter conversion of Fischer to Sawhorse and Newman projections. Zig-Zag representation of glucose. Interpretation of homotopic, enantiotopic and diastereotopic atoms and faces. Origin of Re- and Si-faces. Prochiral chiral carbon. R & S nomenclature of simple compounds, allenes, spiranes, biphenyls, Ansa compounds and cyclophane systems. Optical rotation and enantiomeric excess (ee). Stereospecific and Stereoselective reactions. Asymmetric Synthesis-Crams rule and Felkin Anh Model. Conformational analysis of cyclohexane and di-substituted cyclohexanes.	K4	16

III	**EFFECT OF STRUCTURE ON REACTIVITY** Resonance and field effects, resonance and steric effects, quantitative treatment- the Hammett equation- linear free energy relationship, substituent constant and reaction constant and limitations of Hammett equation, Taft equation, thermodynamically and kinetically controlled reactions, Hammond's postulate, Non- kinetic methods of determining mechanism- isolation, trapping and detection of intermediates, isotopic labeling, crossover experiments, product analysis, stereo chemical evidence, kinetic method -kinetic isotope effect.	K3	16
IV	**REACTION INTERMEDIATES AND ALIPHATIC ELECTROPHILIC SUBSTITUTION** Reaction intermediates - Formation, stability and structure of carbonium ions, carbanions, carbenes, nitrenes and free radicals. Aliphatic electrophilic substitution- SE1, SE2 and SEi mechanisms and electrophilic substitution by double bond shift, hydrogen electrophile-keto-enol tautamerism, halogen electrophile-halogenation of aldehydes and ketones, nitrogen electrophile- aliphatic diazonium coupling, sulphur electrophile- sulphonation and carbon electrophile- Stork-enamine reaction.	K3	16
V	**ALIPHATIC NUCLEOPHILIC SUSBTITUTION** Mechanism of nucleophlic substitution reaction: SN1, SN2 and SNi mechanisms. Solvent and leaving group effects and neighboring group participation (NGP). Substitution at carbonyl, vinylic and bridgehead system. Substitution with ambident nucleophiles: “O” Vs “C” alkylation. Role of LDA, crown ethers and phase transfer catalysts (PTC) in nucleophilic substitution reactions. Generation of enolates, enolate selectivity (Kinetic Vs Thermodynamic), alkylation of enolates and stereochemistry of enolate alkylation. Mechanism of ester hydrolysis (only BAC2, AAC2 and AAL1). Alkylation of active methylene compounds. Asymmetric alkylation (Evans, Enders and Meyers procedures). Preparation and synthetic utility of enamines	K6	16
Course Outcome	**CO1:** Learn about different aspects involved in stereochemistry and the relevance of the topic in all branches including biology	K1	
	CO2: Understand the basic concept and origin of asymmetric synthesis	K2	
	CO3: Learn about the significance of reaction intermediates and the rate of the reaction	K3	
	CO4: Demonstrate on the selectivity and synthetic utility of substitution reactions	K5	
	CO5: Correlate the relevance of conformation and reactivity in organic synthesis	K6	
Learning Resources			

Text Books	1.Kalsi, P. S & Oza, R. S. Organic Reactions: Stereochemistry and Mechanism, New Age International ,2018 2. Clayden, J, Greeves, N. Warren, S. Organic Chemistry, 2nd Edition, Oxford University Press.,2017 3. Graham Solomons, T. W, Fryhle, C. B. Organic Chemistry, 10th Edition, Wiley,2014			
Reference Books	1. Carey, F. A & Giuliano, R. M. ; Organic Chemistry 8th Edition, McGraw Hill (I) Pvt Ltd,2012 2. Bruice, P. Y. Organic Chemistry, 7th Edition, Dorling Kindersley (I) Pvt Ltd,2014 3. Wade, Jr, L. G. & Singh, M. S. Organic Chemistry 6th Edition, Dorling Kindersley (I) Pvt Ltd,2008. 4. Finar, I. L. Vol 2 Organic Chemistry: Stereochemistry and the Chemistry of Natural product, IIIrd Edition, Pearson,2018			
Website Link	1.https://www.organic chemistry.org/ reactions.htm 2.http://www.orgsyn.org/ 3.https://chemistrynotes.com/pages/organic-chemistry-notes 4. https://nptel.ac.in/content/storage2/courses/104103071/pdf/mod8.pdf			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc.- Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards										
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**		
23M1POCC02	**STEREOCHEMISTRY AND ORGANIC REACTION MECHANISM**	**DSC THEORY - II**	**I**	**7**	**4**	**3**	**-**	**5**		

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	S	S	S	M	S	S	M
CO2	S	S	M	S	S	S	M	M	M	L
CO3	S	L	M	S	S	S	S	L	L	M
CO4	S	M	L	S	M	S	L	M	S	M
CO5	S	L	M	S	M	S	M	L	L	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Group discussion and CSIR/GATE question paper solving
Teaching and Learning Methods	Chalk and Board class, Use of Molecular Models and PPT Presentation
Assessment Methods	Seminar, Assignment, CIA examinations and End Semester Examinations

Designed By	**Verified By HoD**	**Approved By Member Secretary**
Mrs. M. Sathya	Dr. N. Nithiya	Dr. S. Shahitha

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram – 637408

M. Sc.- Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
24M1POCC02	**STEREOCHEMISTRY AND ORGANIC REACTION MECHANISM**	**DSC THEORY - II**	**I**	**7**	**4**	**3**	**-**	**5**
Objective	Students will realize the significance and relevance of stereochemistry and role of electrophilic as well as nucleophilic substitution reaction and selectivity in organic transformations, concept of reaction mechanism of substitution vs reactivity.							

Unit	Course Content	Knowledge Levels	Sessions
I	**STEREOCHEMISTRY-I** Chirality, Symmetry elements, Asymmetric and Dissymmetric chiral molecules. Calculation of number of optical isomers. Stereochemistry of mono and di-substituted cyclopropane, cyclobutane, cyclopentane and cyclohexane. Stereochemistry of tri-substituted cyclopentane, tri-substituted pentane and tetra-substituted hexane. Description of various types of optically active compounds including allenes, spiranes, biphenyls, cyclophanes and helicenes	K3	16
II	**STEREOCHEMISTRY-II** Compounds containing two asymmetric centers-Erythro and threo isomers. Conversion of Fischer projection into perspective forms. Erythro and Threo Inter conversion of Fischer to Sawhorse and Newman projections. Zig-Zag representation of glucose. Interpretation of homotopic, enantiotopic and diastereotopic atoms and faces. Origin of Re- and Si-faces. Prochiral chiral carbon. R & S nomenclature of simple compounds, allenes, spiranes, biphenyls, Ansa compounds and cyclophane systems. Optical rotation and enantiomeric excess (ee). Stereospecific and Stereoselective reactions. Asymmetric Synthesis-Crams rule and Felkin Anh Model. Conformational analysis of cyclohexane and di-substituted cyclohexanes.	K4	16

III	**EFFECT OF STRUCTURE ON REACTIVITY** Resonance and field effects, resonance and steric effects, quantitative treatment- the Hammett equation- linear free energy relationship, substituent constant and reaction constant and limitations of Hammett equation, Taft equation, thermodynamically and kinetically controlled reactions, Hammond's postulate, Non- kinetic methods of determining mechanism- isolation, trapping and detection of intermediates, isotopic labeling, crossover experiments, product analysis, stereo chemical evidence, kinetic method -kinetic isotope effect.	K3	16
IV	**REACTION INTERMEDIATES AND ALIPHATIC ELECTROPHILIC SUBSTITUTION** Reaction intermediates - Formation, stability and structure of carbonium ions, carbanions, carbenes, nitrenes and free radicals. Aliphatic electrophilic substitution- SE1, SE2 and SEi mechanisms and electrophilic substitution by double bond shift, hydrogen electrophile-keto-enol tautamerism, halogen electrophile-halogenation of aldehydes and ketones, nitrogen electrophile- aliphatic diazonium coupling, sulphur electrophile- sulphonation and carbon electrophile- Stork-enamine reaction.	K3	16
V	**ALIPHATIC NUCLEOPHILIC SUSBTITUTION** Mechanism of nucleophlic substitution reaction: SN1, SN2 and SNi mechanisms. Solvent and leaving group effects and neighboring group participation (NGP). Substitution at carbonyl, vinylic and bridgehead system. Substitution with ambident nucleophiles: “O” Vs “C” alkylation. Role of LDA, crown ethers and phase transfer catalysts (PTC) in nucleophilic substitution reactions. Generation of enolates, enolate selectivity (Kinetic Vs Thermodynamic), alkylation of enolates and stereochemistry of enolate alkylation. Mechanism of ester hydrolysis (only BAC2, AAC2 and AAL1). Alkylation of active methylene compounds. Asymmetric alkylation (Evans, Enders and Meyers procedures). Preparation and synthetic utility of enamines	K6	16
Course Outcome	**CO1:** Learn about different aspects involved in stereochemistry and the relevance of the topic in all branches including biology	K1	
	CO2: Understand the basic concept and origin of asymmetric synthesis	K2	
	CO3: Learn about the significance of reaction intermediates and the rate of the reaction	K3	
	CO4: Demonstrate on the selectivity and synthetic utility of substitution reactions	K5	
	CO5: Correlate the relevance of conformation and reactivity in organic synthesis	K6	
Learning Resources			

Text Books	1.Kalsi, P. S & Oza, R. S. Organic Reactions: Stereochemistry and Mechanism, New Age International ,2018 2. Clayden, J, Greeves, N. Warren, S. Organic Chemistry, 2nd Edition, Oxford University Press.,2017 3. Graham Solomons, T. W, Fryhle, C. B. Organic Chemistry, 10th Edition, Wiley,2014			
Reference Books	1. Carey, F. A & Giuliano, R. M. ; Organic Chemistry 8th Edition, McGraw Hill (I) Pvt Ltd,2012 2. Bruice, P. Y. Organic Chemistry, 7th Edition, Dorling Kindersley (I) Pvt Ltd,2014 3. Wade, Jr, L. G. & Singh, M. S. Organic Chemistry 6th Edition, Dorling Kindersley (I) Pvt Ltd,2008. 4. Finar, I. L. Vol 2 Organic Chemistry: Stereochemistry and the Chemistry of Natural product, IIIrd Edition, Pearson,2018			
Website Link	1.https://www.organic chemistry.org/ reactions.htm 2.http://www.orgsyn.org/ 3.https://chemistrynotes.com/pages/organic-chemistry-notes 4. https://nptel.ac.in/content/storage2/courses/104103071/pdf/mod8.pdf			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc.- Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards											
Course Code	**Course Title**				**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
24M1POCC02	**STEREOCHEMISTRY AND ORGANIC REACTION MECHANISM**				**DSC THEORY - II**	**I**	**7**	**4**	**3**	**-**	**5**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	S	S	S	M	S	S	M
CO2	S	S	M	S	S	S	M	M	M	L
CO3	S	L	M	S	S	S	S	L	L	M
CO4	S	M	L	S	M	S	L	M	S	M
CO5	S	L	M	S	M	S	M	L	L	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Group discussion and CSIR/GATE question paper solving
Teaching and Learning Methods	Chalk and Board class, Use of Molecular Models and PPT Presentation
Assessment Methods	Seminar, Assignment, CIA examinations and End Semester Examinations

Designed By	**Verified By HoD**	**Approved By Member Secretary**
Mrs. M. Sathya	Dr. N. Nithiya	Dr. S. Shahitha

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram – 637408

M. Sc.- Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M1POCP01	**ORGANIC CHEMISTRY PRACTICAL-I**	**DSC-PRACTICAL - I**	**I**	**6**	**-**	**-**	**6**	**4**
Objective	Students will understand the basic techniques used in organic laboratory for preparation and analysis of organic mixtures							

S. No.	Course Content	Knowledge Levels	Sessions
1	**Single Stage Preparations** Preparation of *p*-benzoquinone	K6	30
2	Preparation of 2,5-ditertiarybutylhydroquinone	K6	
3	Preparation of 4,6-dimethylcoumarin	K6	
4	Preparation of dibenzyllideneacetone	K6	
5	Preparation of 2,4-dinitrotoluene	K6	
6	Preparation of benzhydrol	K6	
7	**Separation and analysis:** A. Two component mixtures.	K6	
8	**Separation and analysis:** A. Two component mixtures.	K6	
9	**Separation and analysis:** A. Two component mixtures.	K6	
10	**Separation and analysis:** A. Two component mixtures.	K6	
11	**Separation and analysis:** B. Three component mixtures.	K6	
Course Outcome	**CO1: I**dentifying good laboratory practices in handling laboratory glasswares and chemicals	K1	
	CO2: Gather experience in the maintenance of laboratory notebook	K2	
	CO3: Prepare oneself with common laboratory techniques such as reflux, recrystallization, vacuum filtration, aqueous extraction and melting point determination	K3	
	CO4: Deduce the difficulties involved in the preparation of organic compounds	K4	
	CO5: Articulate the differences in theory and practical concept.	K3	
Learning Resources			

Text Books	1. F G Mann and B C Saunders, Practical Organic Chemistry, Pearson Education, India, 4th edition 2. N K Vishnoi, Advanced Practical organic Chemistry, 3rd edition, Vikas Publishers, 2023.
Reference Books	1. Vogel, A.I.; Tatchell, A. R.; Furnis, B. S.; Hannaford, A. J.; Smith, Vogel's Textbook of Practical Organic Chemistry, 5th Edition, Pearson Education, 2003
Website Link	1.https://www.youtube.com/watch?v=1oO-fQvMrkE 2. https://www.youtube.com/watch?v=oROSQnzSdZE

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc.- Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards										
Course Code	**Course Title**		**Course Type**		**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M1POCP01	**ORGANIC CHEMISTRY PRACTICAL-I**		**DSC-PRACTICAL - I**		**I**	**6**	**-**	**-**	**6**	**4**

CO-PO Mapping

CO Number	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	L	M	M	M	S	M	L	S	M
CO3	S	M	S	S	S	S	S	S	M	S
CO4	S	S	L	M	M	S	M	M	M	L
CO5	M	M	S	S	S	S	M	L	L	M

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	-
Teaching and Learning Methods	Audio Video lecture, Demonstration and Video presentation
Assessment Methods	CIA and ESE examinations

Designed By	**Verified By HoD**	**Approved By Member Secretary**
Mrs. M. Sathya	Dr. N. Nithiya	Dr. S. Shahitha

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram – 637408

M.Sc. – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2POCC03	**ORGANIC REACTION MECHANISM**	**DSC THEORY – III**	**II**	**6**	**4**	**2**	**-**	**5**
Objective	Students will study the basic concepts of different kinds of organic reactions and the reagents and rearrangement reactions along with mechanistic details.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Addition and Elimination Reactions** Electrophilic addition to carbon–carbon double and triple bonds. Nucleophilic addition to carbon–carbon multiple bonds. Generation and addition of carbenes-Michael addition and Robinson annulation. Nucleophilic addition to –C=O bond- A study of Mannich, benzoin, Darzen‟sglycidic ester, Stobbe and Knovenegal condensation reactions-Wittig, Wittig-Horner olefination reaction- Julia & Peterson alkene synthesis. Elimination reactions: E1, E2, E1cb and Ei-elimination. Conformation of mechanism; solvent, substrate, leaving group effects-Saytzeff‟s*Vs*Hoffman elimination; Chugaev and Cope elimination.	K2	16
II	**Molecular Rearrangements and Name Reactions** A study of mechanism of the following rearrangements: Beckmann, Curtius, Hoffmann, Schmidt, Lossen, Wolff, Pinacol, Wagner Meerwin, Demyanov, Dienone-Phenol, Favorski, Benzidine, Claisen, Cope, Sommlet- Hauser, Pummerer and Von-Richter rearrangements. A study of the following name reactions: Dieckmann cyclization, Hoffmann-Loffler Freytag reaction, Shapiro reaction, Eschenmoser-Tanabe and Ramburg-Backlund reactions.	K3	16
III	**Oxidation and Reduction Reactions** Oxidation with Cr and Mn reagents; Oxidation with LTA, DDQ and SeO_2; Oxidation using DMSO either with DCC or Ac_2O or Oxalyl chloride; Oxidation using Dess Martin reagent. Hydroxylation of olefinic double bonds (OsO_4, $KMnO_4$); Woodward and Prevost oxidation. Epoxidation using peracids including Sharplessepoxidation, Ozonolysis. Reduction with $NaBH_4$, $LiAlH_4$, Li(*t*BuO)$_3$AlH, DIBAL-H, Red-Al, Et_3SiH and Bu_3SnH; Reduction using selectrides, Birch reduction. Hydrogenation (homogenous and heterogeneous), hydration of carbon- carbon double and triple bonds. Asymmetric reduction of carbonyl functions (Corey's procedure).	K4	16

IV	**Aromatic Electrophilic &NucleophilicSusbtitution Reactions** Aromatic electrophilic substitution: mechanism of nitration, sulfonation, Friedel-Crafts alkylation and acylation reactions. Synthesis of di- and tri-substituted benzenes from benzene or mono-substituted benzenes. Haworth reaction (for naphthalene), Scholl reaction, Vilsmeier-Haackformylation, Gattermann reaction, Reimer-Tiemann and Bischler-Napieralski reactions. Aromatic nucleophilic substitution in aryl halides by Meisenheimer complex mechanism and benzyne mechanism. Various methods of benzyne generation and reactions of benzynes (inter and intramolecular). Reactions of aryldiazonium salts. Zeigler alkylation, Vicarious Nucleophilic Substitution (VNS), Chichibabin and Schiemann reactions.	K5	16
V	**Reagents in Organic Chemistry** Reagents and their uses – LDA, DCC, DDQ, DBU, DIBAL, 9-BBN, NBS, 1,3-dithiane (umpolug), trimethylsilylchloride, trimetylsilyliodide, Baker's yeast, Gilman's reagent and Wilkinson's catalyst	K6	16
Course Outcome	**CO1:** Understand different aspects of addition reactions and elimination reactions	K1	
	CO2: Familiar with various types of molecular rearrangements and their mechanisms	K2	
	CO3: Apply the concept of atom or group migration involved in molecular rearrangements	K3	
	CO4: Analyze the significance and mechanism of various types oxidation and reduction reactions	K4	
	CO5: Evaluate the selectivity and synthetic utility of addition, elimination, oxidation and reduction reactions	K5	

Learning Resources

Text Books	1. Ahluwalia, V. K., Oxidation in Organic Synthesis, Ane Books Pvt. Ltd., 2012 2. Smith, M. B., March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure, 7th Edition, John Wiley & Sons, Inc, 2015. 3. Carruthers, W. & Coldham, I., Modern Methods of Organic Synthesis, 4th Edition, Cambridge University press, UK, 2015. 4. Stuart Warren, Organic Synthesis: The Disconnection Approach, 2nd Edition, Wiley, 2007. 5. Carey, F. A. & Sundberg, R. J., Advanced Organic Chemistry- Part A and B. 5th Edition, Springer, 2008.
Reference Books	1. Clayden, J, Greeves, N, Warren, S & Wothers, P., Organic Chemistry, Oxford University Press, 2000. 2. House, H. O., Modern Organic Synthesis, 2nd Edition. W. A. Benjamin, New York, 1998.
Website Link	1.https://nptel.ac.in/courses/104/101/104101005/ 2.https://nptel.ac.in/courses/104/101/104101127/ 3. https://onlinecourses.swayam2.ac.in/ugc19_ch01/preview

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc. – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards												
Course Code	**Course Title**				**Course Type**		**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2POCC03	**ORGANIC REACTION MECHANISM**				**DSC THEORY - III**		**II**	**6**	**4**	**2**	**-**	**5**
CO-PO Mapping												
CO Number	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	S	S	S	S	S	S	M	S	M	S		
CO2	S	M	M	S	S	S	L	M	S	M		
CO3	S	S	L	M	S	M	M	S	L	S		
CO4	S	M	M	M	S	S	M	M	L	S		
CO5	S	M	S	M	S	M	L	M	S	M		
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG			

Tutorial Schedule	Group discussions, CSIR/GATE question paper solving	
Teaching and Learning Methods	Chalk and Board class, Molecular models, and PPT Presentation	
Assessment Methods	Seminar, Assignment, CIA examinations and End Semester Examination	
Designed By	**Verified By HoD**	**Approved By Member Secretary**
Mr. S. Ramkumar	Dr. N. Nithiya	Dr. S. Shahitha

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram – 637408

M.Sc. – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
24M2POCC03	**ORGANIC REACTION MECHANISM**	**DSC THEORY – III**	**II**	**6**	**4**	**2**	**-**	**5**
Objective	Students will study the basic concepts of different kinds of organic reactions and the reagents and rearrangement reactions along with mechanistic details.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Addition and Elimination Reactions** Electrophilic addition to carbon–carbon double and triple bonds. Nucleophilic addition to carbon–carbon multiple bonds. Generation and addition of carbenes-Michael addition and Robinson annulation. Nucleophilic addition to –C=O bond- A study of Mannich, benzoin, Darzen‟s glycidic ester, Stobbe and Knovenegal condensation reactions-Wittig, Wittig-Horner olefination reaction- Julia & Peterson alkene synthesis. Elimination reactions: E1, E2, E1cb and Ei-elimination. Conformation of mechanism; solvent, substrate, leaving group effects-Saytzeff‟s *Vs* Hoffman elimination; Chugaev and Cope elimination.	K2	16
II	**Molecular Rearrangements** A study of mechanism of the following rearrangements: Beckmann, Hoffmann, Curtius, Lossen, Schmidt, Wagner Meerwin, Pinacol-Pinacolone, Demyanov, Benzil-Benzilic acid, Wolff, Dienone-Phenol, Favorski, Benzidine, Claisen, Cope, Fries, Sommlet- Hauser, Pummerer and Von-Richter rearrangements.	K3	16
III	**Oxidation and Reduction Reactions** Oxidation with Cr and Mn reagents; Oxidation with LTA, DDQ and SeO_2; Oxidation using DMSO either with DCC or Ac_2O or Oxalyl chloride; Oxidation using Dess Martin reagent. Hydroxylation of olefinic double bonds (OsO_4, $KMnO_4$); Woodward and Prevost oxidation. Epoxidation using peracids including Sharpless epoxidation, Ozonolysis. Reduction with $NaBH_4$, $LiAlH_4$, $Li(tBuO)_3AlH$, DIBAL-H, Red-Al, Et_3SiH and Bu_3SnH; Reduction using selectrides, Birch reduction. Hydrogenation (homogenous and heterogeneous), hydration of carbon- carbon double and triple bonds. Asymmetric reduction of carbonyl functions (Corey's procedure).	K4	16

IV	**Aromatic Electrophilic & Nucleophilic Susbtitution Reactions** Aromatic electrophilic substitution: mechanism of nitration, sulfonation, Friedel-Crafts alkylation and acylation reactions. Synthesis of di- and tri-substituted benzenes from benzene or mono-substituted benzenes. Haworth reaction (for naphthalene), Scholl reaction, Vilsmeier-Haack formylation, Gattermann reaction, Reimer-Tiemann and Bischler-Napieralski reactions. Aromatic nucleophilic substitution in aryl halides by Meisenheimer complex mechanism and benzyne mechanism. Various methods of benzyne generation and reactions of benzynes (inter and intramolecular). Reactions of aryldiazonium salts. Zeigler alkylation, Vicarious Nucleophilic Substitution (VNS), Chichibabin and Schiemann reactions.	K5	16
V	**Name Reactions and reagents in Organic Chemistry** A study of the following name reactions: Dieckmann cyclization, Hoffmann-Loffler Freytag reaction, Shapiro reaction, Sonogashira coupling, Suzuki coupling, Eschenmoser-Tanabe and Ramburg-Backlund reactions. Reagents and their uses – LDA, DCC, DDQ, DBU, 9-BBN, NBS, 1,3- dithiane (umpolug), trimethylsilylchloride, trimethylsilyliodide, Baker's yeast, Gilman's reagent and Wilkinson's catalyst	K6	16
Course Outcome	**CO1:** Understand different aspects of addition reactions and elimination reactions	K1	
	CO2: Familiar with various types of molecular rearrangements and their mechanisms	K2	
	CO3: Apply the concept of atom or group migration involved in molecular rearrangements	K3	
	CO4: Analyze the significance and mechanism of various types oxidation and reduction reactions	K4	
	CO5: Evaluate the selectivity and synthetic utility of addition, elimination, oxidation and reduction reactions	K5	

Learning Resources

Text Books	1. Ahluwalia, V. K., Oxidation in Organic Synthesis, Ane Books Pvt. Ltd., 2012 2. Smith, M. B., March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure, 7th Edition, John Wiley & Sons, Inc, 2015. 3. Carruthers, W. & Coldham, I., Modern Methods of Organic Synthesis, 4th Edition, Cambridge University press, UK, 2015. 4. Stuart Warren, Organic Synthesis: The Disconnection Approach, 2nd Edition, Wiley, 2007. 5. Carey, F. A. & Sundberg, R. J., Advanced Organic Chemistry- Part A and B. 5th Edition, Springer, 2008.
Reference Books	1. Clayden, J, Greeves, N, Warren, S & Wothers, P., Organic Chemistry, Oxford University Press, 2000. 2. House, H. O., Modern Organic Synthesis, 2nd Edition. W. A. Benjamin, New York, 1998.
Website Link	1.https://nptel.ac.in/courses/104/101/104101005/ 2.https://nptel.ac.in/courses/104/101/104101127/ 3. https://onlinecourses.swayam2.ac.in/ugc19_ch01/preview

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc. – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards													
Course Code	**Course Title**				**Course Type**		**Sem**	**Hours**	**L**	**T**	**P**	**C**	
24M2POCC03	**ORGANIC REACTION MECHANISM**				**DSC THEORY - III**		**II**	**6**	**4**	**2**	**-**	**5**	
CO-PO Mapping													
CO Number	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**		**PSO3**	**PSO4**	**PSO5**		
CO1	S	S	S	S	S	S	M		S	M	S		
CO2	S	M	M	S	S	S	L		M	S	M		
CO3	S	S	L	M	S	M	M		S	L	S		
CO4	S	M	M	M	S	S	M		M	L	S		
CO5	S	M	S	M	S	M	L		M	S	M		
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG				
Tutorial Schedule	Group discussions, CSIR/GATE question paper solving												
Teaching and Learning Methods	Chalk and Board class, Molecular models, and PPT Presentation												
Assessment Methods	Seminar, Assignment, CIA examinations and End Semester Examination												
Designed By	**Verified By HoD**							**Approved By Member Secretary**					
Mr. S. Ramkumar	Dr. N. Nithiya							Dr. S. Shahitha					

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram – 637408

M.Sc. – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2POCC04	**QUANTUM CHEMISTRY AND GROUP THEORY**	**DSC THEORY - IV**	**II**	**6**	**4**	**2**	**-**	**5**
Objective	Students will understand the basic concepts of Quantum Mechanics and group theory and their applications to Chemistry							

Unit	Course Content	Knowledge Levels	Sessions
I	**Quantum Chemistry – I** Planck's theory of black body radiation – Photoelectric effect; de – Broglie equation – Heisenberg uncertainty principle – Compton effect; operators and commutation relations – quantum mechanical postulates – Schrodinger equation and its solution to the problem of a particle in one and three dimensional boxes – the harmonic oscillator.	K2	16
II	**Quantum Chemistry –II** Application of Schrödinger equation to rigid rotator and hydrogen atom –origin of quantum numbers – probability distribution of electrons. Approximation methods – Perturbation and Variation methods – Slater determinant - application to hydrogen and helium atom — Spin - orbit interaction – LS coupling and JJ coupling – ground state term symbols for simple atoms.	K3	16
III	**Quantum Chemistry III** Theory of chemical bonding – Born – Oppenheimer approximation – LCAO – MO approximation for hydrogen molecule ion and hydrogen molecule – Valence Bond theory of hydrogen molecule – Concept of hybridisation – sp, sp2 and sp3 hybridisation – Huckel Molecular orbital (HMO) theory for conjugated π- systems application to ethylene, butadiene and benzene – Self consistent field approximation – Hartree and Hartree – Fock self consistent field theory .	K4	16
IV	**Group Theory – I** Symmetry elements and symmetry operations – Point groups – identification and representation of groups – comparison of molecular and crystallographic symmetry – Reducible and irreducible representation – Direct product representation – Great orthogonality theorem and its consequences – Character table and its uses.	K5	16

V	**Group Theory – II** Symmetry selection rules for vibrational, Electronic and Raman Spectra – determination of vibrational modes in non-linear molecules such as H_2O, NH_3, CH_4 and XeF_4 – symmetry of hybrid orbitals in non-linear molecules (H_2O, NH_3, CH_4, XeF_4 and PCl_5) - Electronic spectra of formaldehyde.	K5	16
Course Outcome	**CO1:** Discuss the characteristics of wave functions and symmetry functions	K1	
	CO2: Classify the symmetry operations and wave equations	K2	
	CO3: Apply the concepts of Quantum mechanics and Group theory to predict the electronic structure	K3	
	CO4: Specify the appropriate irreducible representations for theoretical applications	K4	
	CO5: Develop skills in evaluating the energies of molecular spectra.	K5	

Learning Resources

Text Books	1. R.K. Prasad, Quantum Chemistry, New Age International Publishers, New Delhi, 2010, 4th revised edition. 2. F. A. Cotton, Chemical Applications of Group Theory, John Wiley & Sons, 2003, 2nd edition. 3. A. Vincent, Molecular Symmetry and Group Theory. A Programmed Introduction to Chemical Applications, John and Willy & Sons Ltd., 2013, 2nd Edition. 4. G. K. Vemulapalli, Physical Chemistry, Prentice Hall of India Pvt. Ltd. 2001. 5. D.A. McQuarrie, Quantum Chemistry, Viva Books PW. Ltd, 2nd edition, 2013.
Reference Books	1. N. Levine, Quantum Chemistry, Allyn& Bacon Inc, 1983, 4th edition. 2. D.A. McQuarrie and J. D. Simon, Physical Chemistry, A Molecular Approach, Viva Books Pvt. Ltd, New Delhi, 2012. 3. R.L. Flurry. Jr, Symmetry Group Theory and Chemical applications, Prentice Hall. Inc, 1980 4. J. M. Hollas, Symmetry in Molecules, Chapman and Hall, London, 2011, Reprint
Website Link	1. https://nptel.ac.in/courses/104101124 2. https://ipc.iisc.ac.in/~kls/teaching.html

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc. – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards														
Course Code	**Course Title**					**Course Type**			**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2POCC04	**QUANTUM CHEMISTRY AND GROUP THEORY**					**DSC THEORY - IV**			**II**	**6**	**4**	**2**	**-**	**5**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	M	S	M	S
CO2	S	M	M	S	S	S	S	M	S	S
CO3	S	S	M	M	S	S	M	S	S	M
CO4	S	S	M	S	S	S	M	M	S	S
CO5	S	M	S	M	S	S	S	M	S	M
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	CSIR/GATE question paper solving	
Teaching and Learning Methods	Chalk and Board class and PPT Presentation	
Assessment Methods	Seminar, Assignment, CIA examinations and End Semester Examination	
Designed By	**Verified By**	**Approved By** Member Secretary
Mr. S. Ramkumar	Dr. N. Nithiya	Dr. S. Shahitha

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram – 637408

M.Sc. – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2POCP02	**PRACTICAL: INORGANIC CHEMISTRY**	**DSC PRACTICAL - II**	**II**	**6**	**-**	**-**	**6**	**4**
Objective	Students will gain knowledge on the principle behind separation of metal ions and to analyse them present in salt mixture, to prepare inorganic complexes and to estimate the amount of ions accurately present in binary mixtures.							

S. No.	Course Content	Knowledge Levels	Sessions
I	**Analysis of mixture of cations:** Analysis of a mixture of four cations containing two common cations and two rare cations. Cations to be tested. Group-I: W, Tl and Pb. Group-II: Se, Te, Mo, Cu, Bi and Cd. Group-III: Tl, Ce, Th, Zr, V, Cr, Fe, Ti and U. Group-IV: Zn, Ni, Co and Mn. Group-V: Ca, Ba and Sr. Group-VI: Li and Mg.	K3	30
II	**Preparation of metal complexes:** a. Preparation of tristhiourea copper(I)sulphate b. Preparation of potassium trioxalate chromate(III) c. Preparation of tetrammine copper(II) sulphate d. Preparation of Reineck's salt e. Preparation of hexa thioureacopper(I) chloride dihydrate f. Preparation of cis-Potassium tri oxalate diaquachromate(III) g. Preparation of sodium trioxalato ferrate(III) h. Preparation of hexathiourea lead(II) nitrate	K6	
III	**Complexometric Titration:** 1. Estimation of zinc, nickel, magnesium, and calcium. 2. Estimation of mixture of metal ions-pH control, masking and damasking agents. 3. Determination of calcium and lead in a mixture (pH control). 4. Determination of manganese in the presence of iron. 5. Determination of nickel in the presence of iron.	K5	
Course Outcome	**CO1:** Identify the anions and cations present in a mixture of salts.	K1	
	CO2: Apply the principles of semi micro qualitative analysis to categorize acid radicals and basic radicals.	K2	

	CO3: Acquire the qualitative analytical skills by selecting suitable confirmatory tests and spot tests.	K3	
	CO4: Choose the appropriate chemical reagents for the detection of anions and cations.	K5	
	CO5: Synthesize coordination compounds in good quality.	K6	

Learning Resources				
Text Books	1. A. Jeya Rajendran, Microanalytical Techniques in Chemistry: Inorganic Qualitative Analysis, United global publishers, 2021. 2. V. V. Ramanujam, Inorganic Semimicro Qualitative Analysis; 3rd ed., The National Publishing Company, Chennai, 1974. 3. Vogel's Text book of Inorganic Qualitative Analysis, 4th ed., ELBS, London.			
Reference Books	1. G. Pass, and H. Sutcliffe, Practical Inorganic Chemistry; Chapman Hall, 1965. 2. W. G. Palmer, Experimental Inorganic Chemistry; Cambridge University Press, 1954.			
Website Link	1. https://www.youtube.com/watch?v=ZQQVlGCtEns 2. https://www.youtube.com/watch?v=lbP2dlvoupU 3. https://www.youtube.com/watch?v=SilzJBCEins			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc. – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards													
Course Code	**Course Title**					**Course Type**			**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2POCP02	**PRACTICAL: INORGANIC CHEMISTRY**					**DSC PRACTICAL - II**			**II**	**6**	**-**	**-**	**6**	**4**
CO-PO Mapping														
CO Number	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**				
CO1	S	S	S	S	M	S	S	S	S	M				
CO2	M	S	S	S	S	M	S	S	S	S				
CO3	S	S	M	S	S	S	S	M	S	S				
CO4	M	S	S	S	S	M	S	S	S	S				
CO5	M	S	M	S	S	M	S	M	S	S				
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG					
Tutorial Schedule	-													
Teaching and Learning Methods	Demo and Practical class													
Assessment Methods	CIA and End Semester Examination													
Designed By	**Verified By**								**Approved By** Member Secretary					
Mr. S. Ramkumar	Dr. N. Nithiya								Dr. S. Shahitha					

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram – 637408

M.Sc –Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3POCC05	**PHYSICAL METHODS IN CHEMISTRY**	**DSC THEORY-V**	**III**	**6**	**4**	**2**	**-**	**5**
Objective	Students will be able to acquire deep understanding of electronic structural changes of metal complexes upon interaction with visible light and the basic theory and instrumentation and applications of various spectroscopic techniques							

Unit	Course Content	Knowledge Levels	Sessions
I	**Electronic Spectroscopy (Physical & Inorganic Chemistry)** Spectra of hydrogen and many electron atoms, angular momentum of many electron atoms, term symbols, spectra of many electron atoms Zeeman effect. Spectra of diatomic molecules, Representation of electronic states through potential energy diagrams-Frank Condon principle. Intensities of electronic transitions- theoretical treatment of absorption intensities, transition dipole moment integral, oscillator strength, selection rules parity, spin and symmetry considerations, Factors inducing forbidden transitions vibronic and spin orbit coupling, polarisation bands. Electronic spectra of inorganic complexes – Selection rules (Laporte, orbital and spin selection rules), band intensities, band widths, spectra in solids, spectra of aqueous solutions of d^1 - d^9 ions in Oh and Td environments.	K2	16
II	**Mossbauer & Raman Spectroscopy, X-Ray And Thermal Methods of Analyses (Analytical Chemistry)** Mossbauer spectroscopy: Introduction, principle, instrumentation, recoil energy, Doppler effect, number of MB signals, isomer shift, quadrupole splitting, magnetic hyperfine splitting applications to ^{57}Fe, ^{119}Sn and ^{129}I compounds. Raman Spectroscopy: SERS, SERRS. ATR techniques –UV, IR, Raman. Principle & application of ORD and CD in the identification of complexes. X-ray diffraction – Bragg equation, space groups and point groups, diffraction methods. Thermal methods of analysis – TGA, DTA and DSC – Principle and applications.	K3	16

III	**Nuclear Magnetic Resonance (Organic Chemistry)** Origin of NMR spectrum-Nuclear spin states – NMR active nuclei – Nuclear magnetic moment–Larmor equation – Absorption of energy and resonance– Population density of nuclear spin states. Relaxation mechanisms, Bloch equation (only significance and derivation not required). Comparison of CW and FT instrument–Chemical shift Standards in NMR–Shielding and Deshielding– Factors affecting chemical shift. Spin- spin coupling–splitting origin and rules– factors affecting coupling constant: cis, trans, gem, ortho, meta, para coupling– exchange with deuterium. Vicinity of the proton, Long range coupling, Karplus equation and curve. 1J, 2 J, 3 J, 4 J and 5 J coupling in NMR, order of NMR spectrum. Spin systems: Two interacting nuclei: A_2, AB, AX, AA‟BB‟, dd, pair of doublet, AB quartet. Three interacting nuclei: AMX, ABX, ABC systems (only pattern is required).Simplification of complex NMR spectra - NOE. Basic principles and applications of VTNMR & MRI. ^{13}C NMR–difficulties in recording ^{13}C NMR: Homo nuclear and hetero nuclear coupling. Decoupling technique: SFORD and Off resonance decoupled spectrum identification of various types of carbon using ^{13}C NMR.DEPT spectra. Basic principles of 2DNMR (COSY, NOSEY, HSQC & HMBC)	K3	16
IV	**UV, IR, MS (Organic Chemistry)** Electronic absorption-Beer Lamberts law, Types of electronic excitation. Chromophore and Auxochrome, Bathochromic and Hypsochromic shifts. UV-vis spectra of simple organic compounds such as alkenes, phenols, anilines, carbonyl compounds and 1,3- diketones. Woodward and Fieser rule for calculation of λ-max values of dienes and unsaturated ketones. **Infrared spectra:** Identification of functional groups in Organic compounds, Finger print region. Inter and intra molecular hydrogen bonding origin, basics and block diagram of Mass spectrum-Various types of ionisation techniques, stability of molecular ions, Meta stable ions. Base peaks and isotope peaks.Fragmentation patterns of organic molecules such as benzenes, phenyl halides, phenol benzyl alcohols, benzyl halides, aliphatic alcohols, aliphatic as well as aromatic aldehydes, ketones, acids, esters and amides. Fragmentation patterns of aliphatic/ aromatic nitro and amine compounds. Fragmentation patterns of hetero cyclic compounds (furan, pyrrole and pyridine only). McLafferty rearrangements of organic molecules. Structural determination of Organic Compounds using UV, IR, NMR and Mass Spectra.	K4	16

V	**ESR (INORGANIC CHEMISTRY)** ESR Spectra of d^1-d^9 Transition Metal Complexes with examples. Interpretation of g in cubic, axial and rhombohedral geometries. Calculation of g values with simple examples. Intensities of $g^{\parallel}$ and $g^{\perp}$ peaks. Evidence for Metal-Ligand bond covalency - Cu(II) –Bis – Salicylaldimine, BisSalilcylaldoximato copper(II) $[(NH_3)_5CoO_2CoNH_3)_5]^{5+}$,Cu(II)- diethyl dithiophosphinate, Vanadyldithiophosphinate, Copper(II)tetra phenyl porphyrin,Co(II)- phthalocyanine, $K_2[IrCl_6]$. Interpretation of "g"and "A" values from ESR spectral data in - i)MnF_6^{4-}, ii) CoF_6^{4-} and CrF_6^{3-} ***Current Trends - Spectroscopy of acids***	K5	16
	***.....* Self study**		
Course Outcome	**CO1:** Interpret the various absorption bands in the visible, IR and microwave region to understand the structural bonding, geometry and reactivity of inorganic coordination complexes.	K1	
	CO2: Understand the basic concept, interpretation and application of electronic spectra of hydrogen and many electron atoms also to derive angular momentum of many electron atoms and term symbols of atom.	K2	
	CO3: Knowledge of crystal, vibrational, thermal, ATR and imaging modes to characterise chemical compounds.	K3	
	CO4: Correlate the basic theory with the instrumentation techniques for recording UV, IR, NMR, ESR, MS, XRD, Raman, Mossbauer and Thermal spectra of chemical compounds.	K4	
	CO5: Interpret the various applications of UV, IR, NMR, TGA, DSC, XRD, Raman, Mossbauer, ESR and MS spectra of compounds to understand their structural characteristics.	K5	

Learning Resources	
Text Books	1. C. N. Banwell; E. M. Mc Cash, Fundamentals of Molecular Spectroscopy, IV Edition, McGraw Hill, 2017. 2. W. Kemp, Organic spectroscopy, 2nd Edition, MACMILLAN Publishers, 2019 3. P. S. Kalsi, Spectroscopy of Organic compounds,7th Edition, New Age international, 2016.
Reference Books	1. R. M. Silverstein, F. X. Webster, D. J. ,Kiemble, D. L. Bryce, Spectrometric Identification of organic compounds, 8thEdition, Wiley, 2016. 2. J. E. Huheey, E. A. Keiter, R. L. Keiter and O. K. Medhi, Inorganic Chemistry: Principles of Structure and Reactivity, IV th Edition, Pearson Education, 2016 3. D. A. Skoog, F. Holler, S. Crouch, Principles of Instrumental Analysis,7th Edition, Brooks/Cole publisher, 2017.

Website Link	1. https://nptel.ac.in/content/storage2/courses/102103044/pdf/mod2.pdf 2. https://www2.chemistry.msu.edu/courses/cem351/FS16_HUANG/Lecture_P presentation/Ch_10_Lecture_Presentation.pdf49 3. https://www.slideshare.net/siraj174/sir-aj-nmr-spectroscopy-lecture			
Self-Study Material	https://rb.gy/u9izti			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc. – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards														
Course Code	**Course Title**					**Course Type**			**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3POCC05	**PHYSICAL METHODS IN CHEMISTRY**					**DSC THEORY-V**			**III**	**6**	**4**	**2**	**-**	**5**
CO-PO Mapping														
CO Number	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**				
CO1	S	S	S	M	S	S	M	S	S	S				
CO2	S	M	S	S	S	S	S	M	M	S				
CO3	S	M	S	S	S	S	M	S	S	S				
CO4	S	S	S	M	S	S	M	S	M	S				
CO5	S	S	M	S	S	S	M	S	S	S				
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG					
Tutorial Schedule	Group Discussion and Problem solving from Competitive examination QP													
Teaching and Learning Methods	Chalk and Board class and powerpoint presentation													
Assessment Methods	Assignment, Seminar, CIA and ESE examinations													
Designed By	**Verified By**							**Approved By** Member Secretary						
Mr. V. Santhoshkumar	Dr. N. Nithiya							Dr. S. Shahitha						

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram – 637408

M. Sc. –Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3POCC06	**BIO-ORGANIC CHEMISTRY**	**DSC THEORY- VI**	**3**	**6**	**4**	**2**	**-**	**5**
Objective	Students will learn about the composition, functions, and biological roles of proteins, terpenoids, vitamins, carbohydrates and Nucleic acid.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Carbohydrates** Introduction, Classification, Determination of configuration and ring size of D- glucose and D-fructose, Ferrier, Hanesian reactions and Ferrier rearrangement, Determination of structure and ring size of sucrose and maltose, Structure and biological functions of starch and cellulose.	K1	16
II	**Vitamins** Vitamins-Structural elucidation and synthesis of Retinol, Thiamine, Riboflavin, Pyridoxine, Pantothenic acid, Ascorbic acid, Tocopherols, Vitamin K, Cyanocobalamine.	K2	16
III	**Terpenoids and Carotenoids** Terpenoids – Structural elucidation and synthesis of Menthol, Abietic acid, Squalene and Phytol. Carotenoids – Synthesis of Alpha Carotene, Beta Carotene and Vitamin A2.	K3	16
IV	**Nucleic acid and Lipids** Nucleic acid – Structure and synthesis of Nucleosides and Nucleotides, Primary, Secondary and Tertiary structure of DNA, Types of RNA and their structures, Replication, Transcription, Translation, Genetic code and Finger printing. Lipids – Introduction, Classification, Chemical synthesis and Biosynthesis of Phospholipids and Glycolipids.	K4	16
V	**Proteins, Enzymes and Coenzymes** Proteins- Biological importance, Peptide synthesis by solid phase and solution phase methods. Enzymes- Definition, Classification, Mechanism of enzyme action- lock & key model, induced Fit theory and substrate strain theory and Mechanism of enzyme catalysis. Coenzymes- Introduction, Classification, Structure and biological functions of Coenzyme A, Thiamine pyrophosphate (TPP), Pyridoxal phosphate (PLP), Flavin adenine nucleotide FAD, $FADH_2$ and Adenosine triphosphate (ATP**)** ***Current trends:** **New era of peptides in treatment and diagnosis***	K5	16

	***……* Self-study**		
Course Outcome	**CO1:** To remember the fundamentals of carbohydrate and its classification	K1	
	CO2: Understand the structure of vitamins using the concepts of organic chemistry	K2	
	CO3: Apply the concepts of GOC for structural elucidation of terpenoids and synthesis of carotenoids	K3	
	CO4: Comprehend about the structure and biological functions of proteins and enzymes	K4	
	CO5: Analyze the structure and biological applications of nucleic acids and lipids	K5	

Learning Resources				
Text Books	1. I.L. Finar, Organic Chemistry, Volume II, 5th Edition, First Indian reprint, Pearson Education Asia Private Ltd., 2022. 2. V.K. Ahluwalia, Chemistry of Natural Products, Ane Books Pvt.Ltd, 1st Edition, 2016. 3. J.L.Jain,Sunjay Jain Fundamental of Biochemistry, S.Chand and Co, New Delhi,2016.			
Reference Books	1. S. H. Pine, J. B. Hendrick son, D. J. Cram and G. S. Hammond, Organic Chemistry, Fourth Edition, McGraw Hill Company, 2016 2. S. M. Mukherji and S. P. Singh, Reaction Mechanism in Organic Chemistry, Macmillan,2007			
Website Link	1. https://nptel.ac.in/courses/104105040 2. https://nptel.ac.in/courses/102105089 3. https://youtu.be/rlH1ym916Fo			
Self-Study Material	https://www.udemy.com/course/new-era-of-peptides-in-treatment-and-diagnosis/?couponCode=NVDPRODIN35			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc. – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards										
Course Code	**Course Title**			**Course Type**		**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3POCC06	**BIO-ORGANIC CHEMISTRY**			**DSC THEORY- VI**		**III**	**6**	**4**	**2**	**-**	**5**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	M	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	M	S	S	M	S	M	S
CO5	S	S	S	S	S	S	M	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Group Discussion and Problem solving from Competitive examination QP	
Teaching and Learning Methods	Chalk and Board class and Use of Molecular Models	
Assessment Methods	Assignment, Seminar, CIA and ESE examinations	
Designed By	**Verified By**	**Approved By** Member Secretary
Mr. S. Ramkumar	Dr. N. Nithiya	Dr. S. Shahitha

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram – 637408

M. Sc. – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3POCP03	**PRACTICAL: ORGANIC CHEMISTRY - II**	**DSC PRACTICAL - III**	**III**	**6**	**-**	**-**	**6**	**5**
Objective	Students will acquire practical training on double stage organic preparations and estimations							

S. No.	Course Content	Knowledge Levels	Sessions
1	**DOUBLE STAGE ORGANIC PREPARATIONS** 1. Synthesis of organic compounds involving Friedel Crafts alkylation and acylation reactions 2. Synthesis of nitro compounds 3. Synthesis of Halogenated Compounds 4. Synthesis of Aldehydes involving Formylation Reactions 5. Synthesis of organic compounds by using Pd catalyzed coupling reactions 6.Synthesis of organic compounds involving nucleophilic substitution reaction	K6	30
2	**ESTIMATIONS** a) Estimation of Phenol (bromination) b) Estimation of Aniline (bromination) c) Estimation of Ethyl methyl ketone (iodimetry) d) Estimation of Glucose (redox) e) Estimation of Ascorbic acid (iodimetry) f) Estimation of Aromatic nitro groups (reduction)	K5	
Course Outcome	**CO1**: Gain practical skills on double stage preparations of organic compounds	K4	
	CO2: Expertise in estimating the given organic groups or compounds	K5	
	CO3: Gain experience on purification of organic compounds by recrystallization	K5	
	CO4: Get adequate knowledge in synthetic organic chemistry	K4	
	CO5: Characterization of prepared compounds by UV and IR spectroscopy.	K5	
Learning Resources			

Text Books	1. Furniss, B. S., Hannaford, A. J., Smith, P. W. G., & Tatchell, A. R., Vogel's Textbook of Practical Organic Chemistry, 5th Edition., Pearson Education, 2003. 2. Mann, F. G & Saunders, B. C., Practical Organic Chemistry, fourth edition, Pearson Education India, 2009. 3. Gnanaprakasam, N. S. & Ramamurthy, G., Organic Chemistry Lab Manual, Viswanathan, S. Printers & Publishers Pvt Ltd., 2009.
Reference Books	1. Mohan, J., Organic Analytical Chemistry, Theory and Practice, Narosa, 2010. 2. Ahluwalia,V.K.Bhagat,P. & Aggarwal, R., Laboratory Techniques in Organic Chemistry, IK International Publishing House Pvt. Ltd., 2013
Website Link	1.https://www.youtube.com/watch?v=N96JaRnE7n0YouTube:https://www.youtube.com/watch?v=0RwDowIgXqk

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc. – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards														
Course Code	**Course Title**					**Course Type**			**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3POCP03	**PRACTICAL: ORGANIC CHEMISTRY -II**					**DSC PRACTICAL-III**			**III**	**6**	**-**	**-**	**6**	**5**
CO-PO Mapping														
CO Number	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**				
CO1	S	S	S	S	M	S	M	S	S	M				
CO2	S	M	M	S	S	S	S	S	S	S				
CO3	S	S	S	S	S	S	S	S	S	S				
CO4	M	S	S	S	S	S	S	S	S	S				
CO5	M	S	S	S	S	S	S	M	S	M				
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG					
Tutorial Schedule	-													
Teaching and Learning Methods	Demo and Practical Class													
Assessment Methods	CIA and ESE examinations													
Designed By	**Verified By**								**Approved By** Member Secretary					
Ms. S. Eswari	Dr. N. Nithiya								Dr. S. Shahitha					

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram – 637408

M.Sc – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M4POCC07	**ORBITAL SYMMETRY, PHOTOCHEMISTRY, AROMATICITY AND NON-CONVENTIONAL TECHNIQUES IN ORGANIC SYNTHESIS**	**DSC THEORY-VII**	**IV**	**6**	**4**	**2**	**-**	**5**
Objective	Students will learn about the concepts of pericyclic reactions, photochemical reactions, aromaticity and unconventional techniques of synthesis and retrosynthesis							

Unit	Course Content	Knowledge Levels	Sessions
I	**BASIC CONCEPT OF MOLECULAR ORBITAL THEORY AND PERICYCLIC REACTION IN ORGANIC REACTIONS** Basic concept of conservation of orbital symmetry, electrocyclic and cyclo addition reactions, correlation diagram, FMO, PMO treatment. Ring closure reaction focusing system such as butadiene, pentadienyl anion, pentadienylcation, allyl anion, allylcation, hexatriene, heptatrienylcation, heptatrienyl anion and octatetraene. Stereoselectivity, regioselectivity, peri selectivity and site selectivity in cycloaddition. 1,3-dipolar cycloaddition, click reaction, 2 + 2, 4 + 2, 4 + 4, 6 +2 and 6+4 cyclo addition reactions. Secondary orbital interactions in cycloadditions. Normal and Inverse electron demand Diels-Alder reaction	K3	17
II	**PERICYCLIC REACTION IN ORGANIC REACTIONS** Sigmatropic and Cheleotropic reactions, correlation diagram, FMO & PMO treatment. Hydrogen migration. Carbon migration with symmetric and asymmetric centre. C-C bond migration, Orbital treatment for Cope, Claisen and 2,3-Sigmatropic reaction. Applications of Sigmatropic and Cheleotropic reactions in organic synthesis.	K4	15
III	**ORGANIC PHOTOCHEMISTRY** Organic photochemistry: Principles of photochemistry, Fate of excited state: Physical and Chemical process; [2 + 2] photochemical cycloaddition; Paterno-Büchi reaction; Photochemistry of cyclohexadienone, Norrish type I & II reactions. Oxidation and reduction reactions: Reaction with singlet oxygen. Selected reactions: Photo Fries, Barton, diπmethane, oxa & aza di-π methane rearrangements	K4	16

IV	A**ROMATICITY AND NON-CONVENTIONAL TECHNIQUES** Aromaticity - Study of benzenoid and non - benzenoids compounds in the light of Huckel's rule. Aromaticity of annulenes. Basic principles of non-conventional techniques: Microwave, Sonication, Ball - milling techniques in organic reaction. Organic reactions in aqueous phase; Ionic liquids and their applications in organic synthesis. Concept of green chemistry - Atom economy.	K5	16
V	**RETROSYNTHESIS AND PROTECTING GROUPS** Retrosynthetic Analysis – Definition, Synthon approach, Synthetic equivalent reagent, Functional group interconversion, Linear and Convergent method in organic synthesis. Disconnection approach – one group disconnection. Retro synthesis of Alcohols, Olefins, Aliphatic and Aromatic Ketones and Retro Diels – Alder reaction Protecting groups – Protection of Alcohols, 1, 2 – diols, Amines, Carbonyls and carboxylic acid ***Current Trends - Quenching of excited states photochemistry of carbonyl compounds***	K6	16
	***…….* Self-study**		
Course Outcome	**CO1:** Recollect the different aspects of pericyclic reactions and skills for the utilization of the reactions in the organic synthesis	K2	
	CO2: Able to predict the relevant con - rotatory and dis - rotatory rotation in electrocyclic ring - opening and ring - closure reactions	K3	
	CO3: Apply the Woodward – Hoffmann rules to realize the reaction feasibility and selectivity	K4	
	CO4: Scrutinize the concepts of photochemistry and apply the concepts in synthesis & applications of various types of photochemical reactions	K5	
	CO5: Appraise the applications of non - conventional techniques organic reaction	K6	

Learning Resources	
Text Books	1. J. Singh, Photochemistry and Pericyclic Reactions, New Age International Publishers, 2019. 2. S. Sankararaman, Pericyclic Reactions, A Textbook: Reactions, Applications and Theory, Wiley-VCH, 2005. 3. B. Halton, & J. M. Coxon, Organic Photochemistry, Cambridge University Press, 2011.
Reference Books	1. I. L. Finar, Organic Chemistry, Stereochemistry and the Chemistry of Natural product,Pearson Education India, Volume. 2, 5th Edition, 2002. 2. P. Y. Bruice, Organic Chemistry, Dorling Kindersley (I) Pvt. Ltd, 7th Edition, 2014. 3. I. Fleming, Molecular Orbitals and Organic Chemical Reactions Student Edition, Wiley, 2009.
Website Link	1.Portal:http://www.stereoelectronics.org/webPR/PR_hom e.html 2.Videos:https://nptel.ac.in/courses/104/106/104 3.https://courses.mookit.in/course/course00

Self-Study Material	https://onlinecourses.nptel.ac.in/noc24_cy23/preview?user_email=dhilipdinesh1992@gmail.com			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc. – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards										
Course Code	**Course Title**					**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M4POCC07	**ORBITAL SYMMETRY, PHOTOCHEMISTRY, AROMATICITY AND NON-CONVENTIONAL TECHNIQUES IN ORGANIC SYNTHESIS**					**DSC THEORY-VII**	**IV**	**6**	**4**	**2**	**-**	**5**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	S	S	S	S	S	S	S
CO2	S	S	M	S	S	S	M	M	S	S
CO3	S	S	S	S	S	S	S	S	M	M
CO4	M	S	S	S	M	S	L	S	S	S
CO5	S	S	S	S	M	S	M	S	M	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Group Discussion and Problem solving from Competitive examination QP	
Teaching and Learning Methods	Chalk and Board class and Power Point presentation	
Assessment Methods	Assignment, Seminar, CIA and ESE examinations	
Designed By	**Verified By**	**Approved By** Member Secretary
Dr. P. Dhilip	Dr. N. Nithiya	Dr. S. Shahitha

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram – 637408

M.Sc. – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M4POCC08	**CHEMISTRY OF NATURAL PRODUCTS**	**DSC THEORY-VIII**	**IV**	**6**	**4**	**2**	**-**	**5**
Objective	To make students realise the importance of Natural Products and their Biological Significance							

Unit	Course Content	Knowledge Levels	Sessions
I	**ALKALOIDS** Total Synthesis of the following alkaloids: Preussin, Swainsonine, Horsifiline, Epibatidine, Camptothecin, Ellipticine, Ibogamine and Reserpine (Racemic as well as Chiral Synthesis wherever applicable)	K4	16
II	**STEROIDS** Total Synthesis of Steroids: Androsterone, Testosterone, Estrone,Estradiol, 2-Methoxyestradiol and Progesterone (Racemic as well as Chiral Synthesis wherever applicable). Conversion of Cholesterol into the above mentioned steroids. Chiral as well as Racemic synthesis of Prostaglandins PGE1, PGE2 and PGE3	K5	16
III	**TERPENES** Total Synthesis of Terpenes: Cedrene, Caryophyllene and Longifolene (Racemic as well as Chiral Synthesis wherever applicable). Menthol, 70 Hirsutene, Capnellene, Silphiperfolene and 5-Oxosilphiperfolene (Racemic as well as Chiral Synthesis wherever applicable).	K5	17
IV	**BIOSYNTHESIS** Biosynthesis of Alkaloids, Steroids, Terpenes and Prostaglandins.	K5	15
V	**ANTHOCYANINS:** General nature of anthocyanins, structure of anthocyanidins, synthesis of pelargonidin chloride, cyanidin chloride, delphinidin chloride and peonidin chloride.Synthesis and structural elucidation of flavones and isoflavones. ***Current Trends - Natural products as medicine***	K6	16
	***……..* Self-study**		
Course Outcome	**CO1:** Design retro-synthetic pattern of any given target compound	K4	
	CO 2: Well versed with design and total synthesis of natural products	K5	

	CO 3: Understand the significance of the key reactions in assembling skeletal framework of natural products	K5	
	CO 4: Comprehend the synthetic utility of organic reactions alkaloids, Steroids, Terpenes	K5	
	CO 5: Synthesis of pelargonidin chloride, cyanidin chloride, delphinidin chloride and peonidin chloride.	K6	

Learning Resources				
Text Books	1.Finar, I. L. Pearson Organic Chemistry: Stereochemistry and the Chemistry of Natural product, III Edition, 2018 2. Carey, F. A. & Sundberg, R.J. Advanced Organic Chemistry-PartA & B, Springer, Vth Edition, 2015			
Reference Books	1. Norman R. O. C & Coxon, J. Principles of Organic Synthesis, 3 rd Edition, 2017 2.Wyatt, P & Warren, S. Organic Synthesis: Strategy and Control, Wiley 2013 3. Corey, E. J & Cheng, X.-M; The Logics of Chemical Synthesis, VCH, ISBN: 978-81-265-3034-,2011 4. Nicolau, K. C & Sorenson, E. J Classics in Total Synthesis, VCH, ISBN: 978-3-527-29231-8,1996;			
Website Link	1. https://organicchemistrydata.org/hansreich/resources/syntheses/?page=a bscisic-acid-constantino%2F 2. https://people.chem.umass.edu/mcdaniel/chem269/experiments/trimyrist in/Natural-product-synthesis-an-art.pdf			
Self-Study Material	1..https://authors.library.caltech.edu/25034/31/BPOCchapter30.pdf 2.https://w3pharm.u-shizuoka-ken.ac.jp/~yakuzo/pass-eng/pdf-eng.html			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc. – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards														
Course Code	**Course Title**					**Course Type**			**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M4POCC08	**CHEMISTRY OF NATURAL PRODUCTS**					**DSC THEORY-VIII**			**IV**	**6**	**4**	**2**	**-**	**5**

CO-PO Mapping

CO Number	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	M	S	M	S	S	S	M	S	M	S
CO2	M	S	M	S	S	S	M	S	M	S
CO3	L	S	M	S	S	S	M	S	M	S
CO4	M	S	S	S	S	S	M	S	M	S
CO5	L	M	S	M	S	S	M	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Group Discussion and learning through molecular models	
Teaching and Learning Methods	Chalk and Board class and PPT Presentation	
Assessment Methods	Assignment, Seminar, CIA and ESE examinations	
Designed By	**Verified By**	**Approved By** Member Secretary
Mrs. M. Sathya	Dr. N. Nithiya	Dr. S. Shahitha

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram - 637408

M.Sc. –Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M4POCP04	**PRACTICAL: ANALYTICAL INSTRUMENTATION TECHNIQUES**	**DSC PRACTICAL - IV**	**IV**	**4**	**-**	**-**	**4**	**3**
Objective	Students will gain knowledge about chromatographic methods for identification of different constituents also, evaluate and analyse different constituents by turbidimetry, conductivity measurements, emissionand absorption techniques.							

S. No.	Course Content	Knowledge Levels	Sessions
1	**Conductometric and Potentiometric Titrations (any 5)** Determination of the equivalent conductance of a weak acid at different concentrations and verifying Ostwald dilution law. Calculation of the dissociation constant of the acid.	K4	30
2	Determination of the equivalent conductance of a strong electrolyte at different concentrations and examining the validity of the Onsager‟s theory as limiting law at high dilutions.	K5	
3	Conductometric titration of a mixture of HCl and CH_3COOH Vs NaOH.	K5	
4	Potentiometric titration of a mixture of HCl and CH_3COOH Vs NaOH	K5	
5	Determination of pKa of weak acid by EMF method.	K5	
6	Potentiometric titration of FAS Vs $K_2Cr_2O_7$	K5	
7	Potentiometric titration of KI Vs $KMnO_4$.	K5	
8	Determination of the pH of buffer solution by EMF method using Quinhydrone and Calomel electrode.	K5	
9	**Advanced Techniques (any 2)** Determination of spectro-photometrically the mole ratio of the ferrithiocyanate complex and equilibrium constant for the complex formation.	K5	
10	Estimation of the amount of sulphate present in the given solution using Nephelometricturbidimeter.	K5	
11	Estimation of the amount of nitrate present in the given solution using spectrophotometric method.	K5	
12	Determination of caffeine in soft drinks by HPLC	K5	
13	Analysis of water quality through COD, DO, BOD measurements.	K5	
14	Assay of Riboflavin and Iron in tablet formulations by spectrophotometry	K5	
15	Separation of (a) mixture of Azo dyes by TLC (b) mixture of metal ions by Paper chromatography	K5	

16	Estimation of chlorophyll in leaves and phosphate in waste water by colorimetry	K5	
17	**Structural Determination using Spectroscopic Techniques (any 5 compounds)** Interpretation and identification of the given spectra of various organic compounds arrived at from the following instruments 1.UV-Visible 2.IR 3.NMR 4.Mass	K6	
Course Outcome	**CO1:** Recall the principles associated with various inorganic organic and physical chemistry experiments	K3	
	CO2: Scientifically plan and perform all the experiments	K3	
	CO3: Observe and record systematically the readings in all the experiments	K4	
	CO4: Calculate and process the experimentally measured values and compare with graphical data	K5	
	CO5: Interpret the experimental data scientifically to improve students efficiency for societal developments	K6	

Learning Resources	
Text Books	1. S. B. Furnis, Vogel's textbook of practical organic chemistry. LONGMAN SCIENTIFIC AND TECHNICAL, 2020. 2. J. Mendham, Barnes, J. D. Denney, R. C. Thomas, M.J.K. Mate, Vogel's textbook of quantitative chemical analysis, Pearson education India, Sixth edition, 2009 3. J. Derek Woollins, John Wiley, Inorganic Experiments, Wiley-VCH, 3rd revised edition, 2010.
Reference Books	1. N. S. Gnanapragasam and G. Ramamurthy, Organic Chemistry – Labmanual, S. Viswanathan Co. Pvt. Ltd, 2009. 2. J. N. Gurtu and R. Kapoor, Advanced Experimental Chemistry, S. Chand and Co., 2011. 3. C. Arora, S. Bhattacharya, Advanced Physical Chemistry Practical Guide, Bentham Science Publishers. 2022
Website Link	1. https://bit.ly/3QESF7t 2. https://bit.ly/3QANOnX

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc. – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards														
Course Code	**Course Title**					**Course Type**			**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M4POCP04	**PRACTICAL: ANALYTICAL INSTRUMENTATION TECHNIQUES**					**DSC PRACTICAL - IV**			**IV**	**4**	**-**	**-**	**4**	**3**
CO-PO Mapping														
CO Number	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**				
CO1	S	S	S	S	S	S	S	S	S	S				
CO2	S	S	S	S	S	S	S	S	M	M				
CO3	S	S	M	S	S	S	S	S	S	S				
CO4	S	S	S	S	S	S	S	S	M	S				
CO5	S	M	S	M	S	S	S	S	S	S				
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG					
Tutorial Schedule	-													
Teaching and Learning Methods	Demo and Practical Classes													
Assessment Methods	CIA and ESE examinations													
Designed By	**Verified By**								**Approved By** Member Secretary					
Dr. P. Dhilip	Dr. N. Nithiya								Dr. S. Shahitha					

List of Elective Course (DSE) Details for M.Sc., Organic Chemistry
SYLLABUS - LOCF-CBCS Pattern
EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards

S. No.	SEM	COURSE_CODE	TITLE OF THE COURSE
1	I	23M1POCE01 / 24M1POCE01	PHARMACEUTICAL CHEMISTRY
2	I	23M1POCE02	NAME REACTIONS IN ORGANIC CHEMISTRY
3	II	23M2POCE03 / 24M2POCE03	MATERIAL SCIENCE
4	II	23M2POCE04 / 24M2POCE04	FUNCTIONAL GROUP TRANSFORMATION IN ORGANIC CHEMISTRY
5	III	23M3POCE05	BIOLOGICAL CHEMISTRY

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram – 637408

M. Sc., Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M1POCE01	**PHARMACEUTICAL CHEMISTRY**	**DSE THEORY - I**	**I**	**5**	**3**	**2**	**-**	**3**
Objective	Students will understand the advanced concepts of pharmaceutical chemistry and the processes involved in the synthesis, analysis and characterization of drugs							

Unit	Course Content	Knowledge Levels	Sessions
I	**Physical properties in Pharmaceuticals:** Physical properties of drug molecule: physical properties. Refractive index- Definition, explanation, formula, importance, determination, specific & molar refraction. Optical activity\rotation- monochromatic & polychromatic light, optical activity, angle of rotation, specific rotation examples, measurement of optical activity. Dielectric constant & Induced Polarization- Dielectric constant explanation &determination.Rheology of pharmaceutical systems: Introduction, Definition, Applications, concept of viscosity, Newton's law of flow, Kinematic, Relative, Specific, Reduced & Intrinsic viscosity. Newtonian system, non-Newtonian system- Plastic flow, Pseudoplastic flow, Dilatent flow. Viscosity measurements- selection of viscometer for Newtonian and non-Newtonian system.	K2	12
II	**Isotopic Dilution analysis:** Principle and applications, Neutron activation analysis: Principle, advantages and limitations, Scintillation counters. Body scanning. Introduction to radiopharmaceuticals. Properties of various types of radiopharmaceuticals, Radiopharmaceuticals as diagnostics, as therapeutics, for research and sterilization,Physico Chemical Properties and drug action. Physico chemical properties of drugs (a) Partition coefficient, (b) solubility (c) surface activity, (d) degree of ionization.	K2	12

III	**Drug dosage and product development:** Introduction to drug dosage Forms & Drug Delivery system – Definition of Common terms. Drug Regulation and control, pharmacopoeias formularies, sources of drug, drug nomenclature, routes of administration of drugs products, need for a dosage form, classification of dosage forms. Drug dosage and product development. Introduction to drug dosage Forms & Drug Delivery system – Definition of Common terms. Drug Regulation and control, pharmacopoeias formularies, sources of drug, drug nomenclature, routes of administration of drugs products, need for a dosage form, classification of dosage forms.	K3	12
IV	**Development of new drugs:** Introduction, procedure followed in drug design, the research for lead compounds, molecular modification of lead compounds. Structure-Activity Relationship (SAR): Factors effecting bioactivity, resonance, inductive effect,isoterism, bioisosterism, spatial considerations, biological properties of simple functional groups,theories of drug activity, occupancy theory, rate theory, induced-fit theory,4.3Quantitative structure activity relationship(QSAR): Development of QSAR, drug receptor interactions, the additivity of group contributions, physico-chemical parameters, lipophilicity parameters, electronic parameter, ionizationconstants, steric parameters, chelation parameters, redox potential, indicator-variables.	K5	12
V	**Computers in Pharmaceutical Chemistry:** Need of computers for chemistry. Computers for Analytical Chemists-Introduction to computers: Organization of computers, CPU, Computer memory, I/O devices, information storage, software components. Application of computers in chemistry: Programming in high level language (C+) to handle various numerical methods in chemistry – least square fit, solution to simultaneous equations, interpolation, extrapolation, data smoothing, and numerical differentiation and integrations.	K5	12
Course Outcome	**CO1:** Identify the suitable drugs for various diseases.	K1	
	CO2: Apply the principles of various drug action and drug design.	K2	
	CO3: Acquire the knowledge on product development based on SAR.	K3	
	CO4: Apply the knowledge on applications of computers in chemistry.	K5	
	CO5: Synthesize new drugs after understanding the concepts of SAR.	K6	
Learning Resources			

Text Books	1. C.V.S. Subramanyam, Text Book of Physical Pharmaceutics-II, 2nd edition, Vallabh Prakashan Publishers, 2019. 2. G.R Chatwal, Medicinal Chemistry (Organic Pharmaceutical Chemistry), Himalaya Publishing house, 2022. 4. Jayshree Ghosh, Textbook of Pharmaceutical Chemistry, S. Chand & company Ltd., 2017. 5. Dr. S. Lakshmi, Pharmaceutical Chemistry, Sultan Chand & Sons, 2004.			
Reference Books	1. K.V. Raman,Computers in chemistry, Tata Mc.Graw-Hill, 1993. 2. S.K Pundir, Anshu Bansal Computers for Chemists, , A pragate prakashan., 2nd edition, New age international (P) limited, New Delhi, 2018. 3. Physical Pharmacy and Pharmaceutical Sciences by Martins, Patrick J. Sinko, Lippincott. William and Wilkins, 2016. 4. S.J. Carter, Cooper and Gunn's Tutorial Pharmacy, 6th edition by CBS Publisher Ltd., 2005 5. Ansels Pharmaceutical Dosage forms and Drug Delivery System by Allen Popvich and Ansel, Indian edition-B.I. Publication Pvt. Ltd., 2004.			
Website Link	1. Types of Chemotherapy Drugs | SEER Training (cancer.gov) 2. Physiology, Body Fluids - StatPearls - NCBI Bookshelf (nih.gov)			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc. – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards														
Course Code	**Course Title**					**Course Type**			**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M1POCE01	**PHARMACEUTICAL CHEMISTRY**					**DSE THEORY - I**			**I**	**5**	**3**	**2**	**-**	**3**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M	S	S	S	S	M
CO2	M	S	S	S	S	M	S	S	S	S
CO3	S	S	M	S	S	S	S	M	S	S
CO4	M	S	S	S	S	M	S	S	S	S
CO5	M	S	M	S	S	M	S	M	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Group Discussion and video class	
Teaching and Learning Methods	Chalk and Board class, Google meet classrooms and PPT Presentation	
Assessment Methods	Assignment, Seminar, CIA and ESE examinations	
Designed By	**Verified By**	**Approved By** Member Secretary
Mr. S. Ramkumar	Dr. N. Nithiya	Dr. S. Shahitha

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram – 637408

M. Sc., Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
24M1POCE01	**PHARMACEUTICAL CHEMISTRY**	**DSE THEORY - I**	**I**	**5**	**3**	**2**	**-**	**3**
Objective	Students will understand the advanced concepts of pharmaceutical chemistry and the processes involved in the synthesis, analysis and characterization of drugs							

Unit	Course Content	Knowledge Levels	Sessions
I	**Physical properties in Pharmaceuticals:** Physical properties of drug molecule: physical properties. Refractive index- Definition, explanation, formula, importance, determination, specific & molar refraction. Optical activity\rotation- monochromatic & polychromatic light, optical activity, angle of rotation, specific rotation examples, measurement of optical activity. Dielectric constant & Induced Polarization- Dielectric constant, concept of viscosity, Newton's law of flow, Kinematic, Relative, Specific, Reduced & Intrinsic viscosity. Newtonian system, non-Newtonian system- Plastic flow, Pseudoplastic flow, Dilatent flow. Viscosity measurements- selection of viscometer for Newtonian and non-Newtonian system.	K2	12
II	**Isotopic Dilution analysis:** Principle and applications, Neutron activation analysis: Principle, advantages and limitations, Scintillation counters. Bodyscanning. Introduction to radiopharmaceuticals. Properties of various types of radiopharmaceuticals, Radiopharmaceuticals as diagnostics, as therapeutics, for research and sterilization,Physico Chemical Properties and drug action. Physico chemical properties of drugs (a) Partition coefficient, (b) solubility (c) surface activity, (d) degree of ionization.	K2	12
III	**Drug dosage and product development:** Introduction to drug dosage Forms & Drug Delivery system – Definition of Common terms. Drug Regulation and control, pharmacopoeias formularies, routes of administration of drugs products, need for a dosage form, classification of dosage forms. Drug dosage and product development. Introduction to drug dosage Forms & Drug Delivery system – Definition of Common terms. Drug Regulation and control, pharmacopoeias formularies, sources of drug, drug nomenclature, routes of administration of drugs products, need for a dosage form, classification of dosage forms.	K3	12

IV	**Development of new drugs:** Introduction, procedure followed in drug design, the research for lead compounds, molecular modification of lead compounds. Structure Activity Relationship (SAR): Factors effecting bioactivity, resonance, inductive effect, isoterism, bioisosterism, spatial considerations, biological properties of simple functional groups, theories of drug activity, occupancy theory, rate theory, induced-fit theory, Quantitative structure activity relationship (QSAR): Development of QSAR, drug receptor interactions, the additivity of group contributions, physico-chemical parameters, lipophilicity parameters, electronic parameter, ionization constants, steric parameters, chelation parameters, redox potential, indicator-variables.	K5	12
V	**Computers in Pharmaceutical Chemistry:** Need of computers for chemistry. Computers for Analytical Chemists Introduction to computers: Organization of computers, CPU, Computer memory, I/Odevices, information storage, software components. Application of computers in chemistry: Programming in high level language (C+) to handle various numerical methods in chemistry – least square fit, solution to simultaneous equations, interpolation, extrapolation, data smoothing, and numerical differentiation and integrations.	K5	12
Course Outcome	**CO1:** Identify the suitable drugs for various diseases.	K1	
	CO2: Apply the principles of various drug action and drug design.	K2	
	CO3: Acquire the knowledge on product development based on SAR.	K3	
	CO4: Apply the knowledge on applications of computers in chemistry.	K5	
	CO5: Synthesize new drugs after understanding the concepts of SAR.	K6	
Learning Resources			
Text Books	1. C.V.S. Subramanyam, Text Book of Physical Pharmaceutics-II, 2nd edition, Vallabh Prakashan Publishers, 2019. 2. G.R Chatwal, Medicinal Chemistry (Organic Pharmaceutical Chemistry), Himalaya Publishing house, 2022. 4. Jayshree Ghosh, Textbook of Pharmaceutical Chemistry, S. Chand & company Ltd., 2017. 5. Dr. S. Lakshmi, Pharmaceutical Chemistry, Sultan Chand & Sons, 2004.		

Reference Books	1. K.V. Raman,Computers in chemistry, Tata Mc.Graw-Hill, 1993. 2. S.K Pundir, Anshu Bansal Computers for Chemists, , A pragate prakashan., 2nd edition, New age international (P) limited, New Delhi, 2018. 3. Physical Pharmacy and Pharmaceutical Sciences by Martins, Patrick J. Sinko, Lippincott. William and Wilkins, 2016. 4. S.J. Carter, Cooper and Gunn's Tutorial Pharmacy, 6th edition by CBS Publisher Ltd., 2005 5. Ansels Pharmaceutical Dosage forms and Drug Delivery System by Allen Popvich and Ansel, Indian edition-B.I. Publication Pvt. Ltd., 2004.			
Website Link	1. Types of Chemotherapy Drugs | SEER Training (cancer.gov) 2. Physiology, Body Fluids - StatPearls - NCBI Bookshelf (nih.gov)			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc. – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards														
Course Code	**Course Title**					**Course Type**			**Sem**	**Hours**	**L**	**T**	**P**	**C**
24M1POCE01	**PHARMACEUTICAL CHEMISTRY**					**DSE THEORY - I**			**I**	**5**	**3**	**2**	**-**	**3**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M	S	S	S	S	M
CO2	M	S	S	S	S	M	S	S	S	S
CO3	S	S	M	S	S	S	S	M	S	S
CO4	M	S	S	S	S	M	S	S	S	S
CO5	M	S	M	S	S	M	S	M	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Group Discussion and video class	
Teaching and Learning Methods	Chalk and Board class, Google meet classrooms and PPT Presentation	
Assessment Methods	Assignment, Seminar, CIA and ESE examinations	
Designed By	**Verified By**	**Approved By** Member Secretary
Mr. S. Ramkumar	Dr. N. Nithiya	Dr. S. Shahitha

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE

(Autonomous)

Rasipuram – 637408

M.Sc., Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M1POCE02	**NAME REACTIONS IN ORGANIC CHEMISTRY**	**DSE THEORY – II**	**I**	**5**	**3**	**2**	**-**	**3**
Objective	Students will understand new carbon-carbon formation by name reactions, heterocycle synthesis significances of name reaction in organic synthesis and Importance of substitution reaction and their synthetic utilities.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Carbon-Carbon bond formation reactions** Perkin, Knovenagel, Wittig, Wittig-Horner, Vilsmeier Haack, McMurray, Glacer, Mannich, Pschorr, Simmons-Smith and Thorpe reactions. Michael addition, 1,3-dipolar addition, carbine and their addition and Diel's-Alder reaction	K3	12
II	**Heterocycle forming reactions** Paal-Knorr synthesis of pyrroles; Hantsch synthesis of pyridines, Madelung, Reissert and Bischler synthesis of indole**;** Skraup, Friedländer, Doebner-Miller and Konard-Limpatch synthesis of quinoline. Pomerantz-Fritsch synthesis of isoquinoline	K4	12
III	**Name reactions on substitution and substituents** Chichibabin reaction, Eschweiler Clark reaction, Polonowski reaction, Reissert reaction, Sommlett reactions, Mitsunobu reaction, Leukart reaction, Bucherer reaction, Willegerodt reaction and Willegerodt-Kindler reaction	K5	12
IV	**Catalytic hydrogenation** Homogenous and heterogenous catalytic reductions, Dissolving metal reductions including Birch reduction, Bouveault-Blanc reduction, clemmensen and Wolff Kishner reductions, MPV reduction , Metal hydride reductions- $NABH_4$., $LIAlH_4$, LTBA, BH_3, BU_3SnH and Sodium cyano borohydride.	K5	12
V	**Miscellaneous Reactions** Dieckmann cyclization, Shapiro, Stork enamine, Sharpless asymmetric epoxidation, Robinson annulation, Duff, Simmons-Smith, Hoffman - Loffler- Freytag, Bamford Stevens, Henry, Ugi, Wadsworth-Emmons, Barton and ene reactions.	K5	12

Course Outcome	**CO1:** Understand the mechanism involved in organic name reactions	K2	
	CO2: Understand key intermediates involved in organic name reactions	K2	
	CO3: Apply the name reactions for the synthesis of Heterocyclic compounds	K4	
	CO4: Analyse the functional group transformations and study the reactivity of molecules	K4	
	CO5: Design the synthesis of organic molecules based on the Name reactions	K5	

Learning Resources				
Text Books	1. March, J. ; Advanced Organic Chemistry, 6th Edition, Wiley ,2007 2. Carey, F. Sundberg R. J. Advanced Organic Chemistry-Part A and B- 5th Edition, Springer, 2007.			
Reference Books	1. Clayden, J, Greeves, N, Warren, S. Organic Chemistry, 2nd Edition, Oxford, 2012. 2. Carruthers, W. & Coldham, I., Modern Methods of Organic Synthesis, 4th Edition, Cambridge University press, UK, 2015			
Website Link	1.https://nptel.ac.in/courses/104/103/104103110/ 2. https://nptel.ac.in/courses/104/105/104105034/ 3.https://nptel.ac.in/courses/104/101/104101115/			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc. – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards														
Course Code	**Course Title**					**Course Type**			**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M1POCE02	**NAME REACTIONS IN ORGANIC CHEMISTRY**					**DSE THEORY – II**			**I**	**5**	**3**	**2**	**-**	**3**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M	S	S	S	S	S
CO2	S	S	M	S	S	S	M	S	S	M
CO3	M	M	S	S	S	S	S	M	S	M
CO4	S	S	S	S	S	M	S	M	S	S
CO5	S	S	S	M	S	S	S	S	M	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Group Discussion and Problem solving from Competitive examination QP	
Teaching and Learning Methods	Chalk and Board class and powerpoint presentation	
Assessment Methods	Assignment, Seminar, CIA and ESE examinations	
Designed By	**Verified By**	**Approved By** Member Secretary
Mrs. M. Sathya	Dr. N. Nithiya	Dr. S. Shahitha

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram – 637408

M.Sc., Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2POCE03	**MATERIAL SCIENCE**	**DSE THEORY - III**	**II**	**4**	**3**	**1**	**-**	**3**
Objective	Students will understand the methodology in crystal growth, characterization techniques for crystals and its properties and applications.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Crystallography:** Symmetry - unit cell and Miller indices -crystal systems - Bravais lattices - point groups and space groups - X-ray diffraction-Laue equations-Bragg's law-reciprocal lattice and its application to geometrical crystallography. Crystal structure–powder and single crystalapplications. Electron charge density maps, neutron diffraction-method and applications.	K2	12
II	**Crystal growth methods:** Nucleation–equilibrium stability and metastable state. Single crystal –Low and high temperature, solution growth– Gel and sol-gel. Melt growth Bridgeman-Stockbarger, Czochralski methods. Flux technique, physical and chemical vapour transport. Lorentz and polarization factor - primary and secondary extinctions.	K3	12
III	**Properties of crystals:** Optical studies - Electromagnetic spectrum (qualitative) refractive index – reflectance – transparency, translucency and opacity. Types of luminescence – photo-, electro-, and injection luminescence, LEDs – organic, Inorganic and polymer LED materials - Applications. Dielectric studies- Polarisation - electronic, ionic, orientation, and space charge polarisation. Effect of temperature. dielectric constant, dielectric loss. Types of dielectric breakdown–intrinsic, thermal, discharge, electrochemical and defect breakdown.	K4	12

IV	**Special Materials:** Superconductivity: Meissner effect, Critical temperature and critical magnetic Field, Type I and II superconductors, BCS theory-Cooper pair, Applications.Soft and hard magnets – Domain theory Hysteresis Loop-Applications. Magneto andgian magneto resistance. Ferro, ferri and antiferromagnetic materials-applications, magnetic parameters for recording applications. Ferro-, Piezo-, and pyro electric materials – properties and applications. Shape memory Alloys-characteristics and applications, Non-linear optics-Second Harmonic Generators, mixing of Laser wavelengths by quartz, ruby and $LiNbO_3$.	K4	12
V	**Materials for Renewable Energy Conversion:** Solar Cells: Organic, bilayer, bulk heterojunction, polymer, perovskite based. Solar energy conversion: lamellar solids and thin films, dye-sensitized photo voltaic cells, coordination compounds anchored onto semiconductor surfaces - Ru(II) and Os(II) polypyridyl complexes. Photochemical activation and splitting of water, CO_2 and N_2. Manganese based photo systems for water-splitting. Complexes of Rh, Ru, Pd and Pt - photochemical generation of hydrogen from alcohol.	K5	12
Course Outcome	**CO1:** Understand and recall the synthesis and characteristics of crystal structures, semiconductors, magnets, nanomaterials and renewable energy materials.	K1	
	CO2: Integrate and assess the structure of different materials and their properties.	K2	
	CO3: Analyse and identify new materials for energy applications.	K3	
	CO4: Explain the importance of crystal structures, piezoelectric and pyroelectric materials, nanomaterials, hard and soft magnets,	K4	
	CO5: Design and develop new materials with improved property for energy applications.	K5	
Learning Resources			
Text Books	1. S. Mohan and V. Arjunan, Principles of Materials Science, MJP Publishers, 2016. 2. Arumugam, Materials Science, Anuradha Publications, 2007. 3. Giacavazzo et. al., Fundamentals of Crystallography, International Union of Crystallography. Oxford Science Publications, 2010 4. Woolfson, An Introduction to Crystallography, Cambridge University Press, 2012. 5. James F. Shackelford and Madanapalli K. Muralidhara, Introduction to Materials Science for Engineers. 6th ed., PEARSON Press, 2007.		
Reference Books	1. Suggested Readings 1. M.G. Arora, Solid State Chemistry, Anmol Publications, New Delhi, 2001. 2. R.K. Puri and V.K. Babbar, Solid State Physics, S Chand and Company Ltd, 2001. 3. H.P. Meyers, Introductory Solid State Physics, Viva Books Private Limited, 1998. 4. A.R. West, Solid State Chemistry and Applications, John-Wiley and sons, 1987.		

Website Link	1. http://xrayweb.chem.ou.edu/notes/symmetry.html. 2. http://www.uptti.ac.in/classroom-content/data/unit%20cell.pdf. 3. https://bit.ly/3QyVg2R 4. https://archive.nptel.ac.in/courses/112/106/112106227/ 5. https://archive.nptel.ac.in/courses/112/106/112106227/

L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc. – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards											
Course Code	**Course Title**					**Course Type**		**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2POCE03	**MATERIAL SCIENCE**					**DSE THEORY - III**		**II**	**4**	**3**	**1**	**-**	**3**

CO-PO Mapping

CO Number	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	S	S	S	S	M	S	S	S	S	S
CO2	S	M	S	S	S	S	M	S	S	S
CO3	S	S	M	M	S	S	S	M	S	M
CO4	S	M	S	S	M	S	M	S	M	S
CO5	S	S	M	S	S	S	S	M	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Group Discussion and Problem solving from Competitive examination QP	
Teaching and Learning Methods	Chalk and Board class and powerpoint presentation	
Assessment Methods	Assignment, Seminar, CIA and ESE examinations	
Designed By	**Verified By**	**Approved By** Member Secretary
Mr. S. Ramkumar	Dr. N. Nithiya	Dr. S. Shahitha

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram – 637408

M.Sc., Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
24M2POCE03	**MATERIAL SCIENCE**	**DSE THEORY - III**	**II**	**4**	**3**	**1**	**-**	**3**
Objective	Students will understand the methodology in crystal growth, characterization techniques for crystals and its properties and applications.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Crystallography:** Symmetry - unit cell and Miller indices -crystal systems - Bravais lattices - point groups and space groups - X-ray diffraction-Laue equations-Bragg's law-reciprocal lattice and its application to geometrical crystallography. Crystal structure–powder and single crystal applications. Electron charge density maps, neutron diffraction-method and applications.	K2	12
II	**Crystal growth methods:** Nucleation–equilibrium stability and meta stable state. Single crystal – Low and high temperature, solution growth– Gel and sol-gel. Melt growth Bridgeman-Stockbarger, Czochralski methods. Flux technique.	K3	12
III	**Properties of crystals:** Optical studies - Electromagnetic spectrum (qualitative) refractive index – reflectance – transparency, translucency and opacity. Types of luminescence – photo-, electro-, and injection luminescence, LEDs – organic, Inorganic and polymer LED materials - Applications. Dielectric studies- Polarisation - electronic, ionic, orientation, and space charge polarisation. Effect of temperature. Dielectric constant, dielectric loss. Types of dielectric breakdown–intrinsic, thermal, discharge, electrochemical and defect breakdown.	K4	12

IV	**Special Materials:** Superconductivity: Meissner effect, Critical temperature and critical magnetic Field, Type I and II superconductors, BCS theory-Cooper pair, Applications. Soft and hard magnets – Domain theory Hysteresis Loop-Applications. Magneto and gian magneto resistance. Ferro, ferri and antiferromagnetic materials-applications, magnetic parameters for recording applications. Ferro-, Piezo-, and pyro electric materials – properties and applications. Shape memory Alloys-characteristics and applications, Non-linear optics-Second Harmonic Generators, mixing of Laser wavelengths by quartz, ruby and $LiNbO_3$.	K4	12
V	**Materials for Renewable Energy Conversion:** Solar Cells: Organic, bilayer, bulk heterojunction, polymer, perovskite based. Solar energy conversion: lamellar solids and thin films, dye-sensitized photo voltaic cells, coordination compounds anchored onto semiconductor surfaces - Ru(II) and Os(II) polypyridyl complexes. Photochemical activation and splitting of water, CO_2 and N_2. Manganese based photo systems for water-splitting. Complexes of Rh, Ru, Pd and Pt - photochemical generation of hydrogen from alcohol.	K5	12
Course Outcome	**CO1:** Understand and recall the synthesis and characteristics of crystal structures, semiconductors, magnets, nanomaterials and renewable energy materials.	K1	
	CO2: Integrate and assess the structure of different materials and their properties.	K2	
	CO3: Analyse and identify new materials for energy applications.	K3	
	CO4: Explain the importance of crystal structures, piezoelectric and pyroelectric materials, nanomaterials, hard and soft magnets,	K4	
	CO5: Design and develop new materials with improved property for energy applications.	K5	
Learning Resources			
Text Books	1. S. Mohan and V. Arjunan, Principles of Materials Science, MJP Publishers, 2016. 2. Arumugam, Materials Science, Anuradha Publications, 2007. 3. Giacavazzo et. al., Fundamentals of Crystallography, International Union of Crystallography. Oxford Science Publications, 2010 4. Woolfson, An Introduction to Crystallography, Cambridge University Press, 2012. 5. James F. Shackelford and Madanapalli K. Muralidhara, Introduction to Materials Science for Engineers. 6th ed., PEARSON Press, 2007.		
Reference Books	1. Suggested Readings 1. M.G. Arora, Solid State Chemistry, Anmol Publications, New Delhi, 2001. 2. R.K. Puri and V.K. Babbar, Solid State Physics, S Chand and Company Ltd, 2001. 3. H.P. Meyers, Introductory Solid State Physics, Viva Books Private Limited, 1998. 4. A.R. West, Solid State Chemistry and Applications, John-Wiley and sons, 1987.		

Website Link	1. http://xrayweb.chem.ou.edu/notes/symmetry.html. 2. http://www.uptti.ac.in/classroom-content/data/unit%20cell.pdf. 3. https://bit.ly/3QyVg2R 4. https://archive.nptel.ac.in/courses/112/106/112106227/ 5. https://archive.nptel.ac.in/courses/112/106/112106227/

L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc. – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards													
Course Code	**Course Title**					**Course Type**			**Sem**	**Hours**	**L**	**T**	**P**	**C**
24M2POCE03	**MATERIAL SCIENCE**					**DSE THEORY - III**			**II**	**4**	**3**	**1**	**-**	**3**

CO-PO Mapping

CO Number	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	S	S	S	S	M	S	S	S	S	S
CO2	S	M	S	S	S	S	M	S	S	S
CO3	S	S	M	M	S	S	S	M	S	M
CO4	S	M	S	S	M	S	M	S	M	S
CO5	S	S	M	S	S	S	S	M	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Group Discussion and Problem solving from Competitive examination QP	
Teaching and Learning Methods	Chalk and Board class and powerpoint presentation	
Assessment Methods	Assignment, Seminar, CIA and ESE examinations	
Designed By	**Verified By**	**Approved By** Member Secretary
Mr. S. Ramkumar	Dr. N. Nithiya	Dr. S. Shahitha

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram – 637408

M.Sc., Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2POCE04	**FUNCTIONAL GROUP TRANSFORMATION IN ORGANIC CHEMISTRY**	**DSE THEORY - IV**	**II**	**4**	**3**	**1**	**-**	**3**
Objective	Students will learn various types of functional group transformations involving different types of reactions like oxidation, reduction and in miscellaneous category of reagents and to carry specific synthetic transformations.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Functional Group Transformations Using Oxidizing Reagents** Use of Chromium reagents (CrO_3, $K_2Cr_2O_7$, CrO_2Cl_2, PCC, PDC and PFC). Use of Manganese reagents ($KMnO_4$, MnO_2, CTAP). Use of RuO_4, $KBrO_3$, DMSO, NCS, $NaIO_4$, peracids and boranes.	K3	12
II	**Functional Group Transformations Using Reducing Reagents** Use of $NaBH_4$, $NaCNBH_3$, $LiAlH_4$ and Bu_3SnH; Use of Sn/HCl, Zn/HCl, Hydrazine, Li-NH_3, Na/alcohol, Pd/H_2 and Raney Ni.	K4	12
III	**Functional Group Transformations Using Miscellaneous Type Of Reagents** Use of $SOCl_2$, PBr_3, PPh_3-CCl_4, LiBr, NaI, NBS, PPh_3-X_2, Lawesson's reagent, Mitsunobu reagent, CH_2N_2, $TMSCHN_2$ and Barbier-Weil and degradation. Conversion of aldehyde to ketone and vice versa; Conversion of aldehyde to cyanide, Conversion of cyanide to ester, Conversion of ketone/aldehydeto phenol; conversion of ketone to enone.	K3	12
IV	**Reagent in organic chemistry** Reagents and their uses – LDA, DCC, DDQ, DBU, DIBAL, 9-BBN, NBS, 1,3- dithiane (umpolug), trimethylsilylchloride, trimetylsilyliodide, Baker's yeast, Gilman's reagent and Wilkinson's catalyst	K4	12
V	**Five Member Heterocycles With Two Heteroatoms** Imidazole, oxazole, thiazole and their benzo analogues-Synthesis, reactivity including lithiation and aromatic character. Comparative study of their reactivity. Isoxazole, isothiazole and pyrazole-Synthesis and reactivity including lithiation. Indole, benzo[*b*]thiophene and benzo[*b*]furan-Synthesis and reactivity including lithiation.	K5	12

Course Outcome	**CO1:** Understand different types of functional group transformations involving various reagents like oxidization and reduction.	K1	
	CO2: Familiarize with functional group transformations involving miscellaneous category of reagents	K2	
	CO3: Adhere knowledge to the synthesis of heterocyclic compounds with two heteroatoms.	K3	
	CO4: Identify suitable reagents to perform chemo-selective functional group transformations.	K4	
	CO5: Evaluation of different types of synthetic transformations involving oxidizing, reducing and miscellaneous category of reagents.	K5	

Learning Resources				
Text Books	1. Michael B. Smith, March's Advanced Organic Chemistry: Reactions, Mechanisms and Structure, 7th Edition, Wiley, 2015 2. Carey, F. A. & Sundberg, R. J. , Advanced Organic Chemistry- Part A and B. 5th Edition, Springer., 2008 3. Clayden, J, Greeves, N. Warren, S., Organic Chemistry, 2nd Ed, Oxford University Press, 2017.			
Reference Books	1. Graham Solomons, T. W, Fryhle, C. B., Organic Chemistry, 10th Edition, Wiley, 2014. 2. Carruthers W., Modern Methods in Organic Synthesis, South Asia Ed. 4th ed., Cambridge University Press, 2015.			
Website Link	1. https://archive.nptel.ac.in/courses/104/103/104103111/ 2. https://archive.nptel.ac.in/courses/104/103/104103023/			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc. – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards													
Course Code	**Course Title**					**Course Type**			**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2POCE04	**FUNCTIONAL GROUP TRANSFORMATION IN ORGANIC CHEMISTRY**					**DSE THEORY - IV**			**II**	**4**	**3**	**1**	**-**	**3**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	S	S	M	M
CO2	S	M	M	S	S	S	S	M	S	S
CO3	S	M	S	M	S	M	S	M	M	S
CO4	S	S	M	M	S	S	S	M	S	S
CO5	S	S	S	S	S	S	M	S	S	M
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Group Discussion and Problem solving from Competitive examination QP	
Teaching and Learning Methods	Chalk and Board class and powerpoint presentation	
Assessment Methods	Assignment, Seminar, CIA and ESE examinations	
Designed By	**Verified By**	**Approved By** Member Secretary
Mr. S. Ramkumar	Dr. N. Nithiya	Dr. S. Shahitha

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram – 637408

M.Sc., Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
24M2POCE04	**FUNCTIONAL GROUP TRANSFORMATION IN ORGANIC CHEMISTRY**	**DSE THEORY - IV**	**II**	**4**	**3**	**1**	**-**	**3**
Objective	Students will learn various types of functional group transformations involving different types of reactions like oxidation, reduction and in miscellaneous category of reagents and to carry specific synthetic transformations.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Functional Group Transformations Using Oxidizing Reagents** Use of Chromium reagents (CrO_3, $K_2Cr_2O_7$, CrO_2Cl_2, PCC, PDC and PFC). Use of Manganese reagents ($KMnO_4$, MnO_2, CTAP). Use of RuO_4, $KBrO_3$, DMSO, NCS, $NaIO_4$, peracids and boranes.	K3	12
II	**Functional Group Transformations Using Reducing Reagents** Use of Ascorbic acid, Glucose, Tin chloride, oxalic acid, sodium thiosulphate, $NaCNBH_3$, Diborane, Sodium sulphite, Hydrazine, Li-NH_3, Na/alcohol, Pd/H_2 and Raney Ni.	K4	12
III	**Functional Group Transformations Using Miscellaneous Type Of Reagents** Use of $SOCl_2$, PBr_3, PPh_3-CCl_4, LiBr, NaI, NBS, PPh_3-X_2, Lawesson‟s reagent, CH_2N_2, and $TMSCHN_2$. Conversion of aldehyde to ketone and vice versa; Conversion of aldehyde to cyanide, Conversion of cyanide to ester, Conversion of ketone/aldehyde to phenol; conversion of ketone to enone.	K3	12
IV	**Modern synthetic methods** Synthesis of simple organic molecules using reactions like acylation and alkylation of enamines and active methylene compounds. Sulphur ylides. Carbon-carbon bond formation through coupling reactions - Stille, Negishi, Kumada, Hiyama, Tsuji-Trost, Baylis-Hillman reaction, Kulinkovich reaction, Ritter reaction, Sakurai reaction, Brook rearrangement, Tebbe olefination. Heck, Nozaki-Hiyama, Buchwald-Hartwig.	K4	12

V	**Five Member Heterocycles With Two Heteroatoms** Imidazole, oxazole, thiazole and their benzo analogues-Synthesis, reactivity including lithiation and aromatic character. Comparative study of their reactivity. Isoxazole, isothiazole and pyrazole-Synthesis and reactivity including lithiation. Indole, benzo[*b*]thiophene and benzo[*b*]furan-Synthesis and reactivity including lithiation.	K5	12
Course Outcome	**CO1:** Understand different types of functional group transformations involving various reagents like oxidization and reduction.	K1	
	CO2: Familiarize with functional group transformations involving miscellaneous category of reagents	K2	
	CO3: Adhere knowledge to the synthesis of heterocyclic compounds with two heteroatoms.	K3	
	CO4: Identify suitable reagents to perform chemo-selective functional group transformations.	K4	
	CO5: Evaluation of different types of synthetic transformations involving oxidizing, reducing and miscellaneous category of reagents.	K5	

Learning Resources	
Text Books	1. Michael B. Smith, March's Advanced Organic Chemistry: Reactions, Mechanisms and Structure, 7th Edition, Wiley, 2015 2. Carey, F. A. & Sundberg, R. J. , Advanced Organic Chemistry- Part A and B. 5th Edition, Springer., 2008 3. Clayden, J, Greeves, N. Warren, S., Organic Chemistry, 2nd Ed, Oxford University Press, 2017.
Reference Books	1. Graham Solomons, T. W, Fryhle, C. B., Organic Chemistry, 10th Edition, Wiley, 2014. 2. Carruthers W., Modern Methods in Organic Synthesis, South Asia Ed. 4th ed., Cambridge University Press, 2015.
Website Link	1. https://archive.nptel.ac.in/courses/104/103/104103111/ 2. https://archive.nptel.ac.in/courses/104/103/104103023/

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc. – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards													
Course Code	**Course Title**					**Course Type**		**Sem**	**Hours**	**L**	**T**	**P**	**C**
24M2POCE04	**FUNCTIONAL GROUP TRANSFORMATION IN ORGANIC CHEMISTRY**					**DSE THEORY - IV**		**II**	**4**	**3**	**1**	**-**	**3**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	S	S	M	M
CO2	S	M	M	S	S	S	S	M	S	S
CO3	S	M	S	M	S	M	S	M	M	S
CO4	S	S	M	M	S	S	S	M	S	S
CO5	S	S	S	S	S	S	M	S	S	M
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Group Discussion and Problem solving from Competitive examination QP	
Teaching and Learning Methods	Chalk and Board class and powerpoint presentation	
Assessment Methods	Assignment, Seminar, CIA and ESE examinations	
Designed By	**Verified By**	**Approved By** Member Secretary
Mr. S. Ramkumar	Dr. N. Nithiya	Dr. S. Shahitha

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram – 637408

M. Sc., Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3POCE05	**BIOLOGICAL CHEMISTRY**	**DSE THEORY- V**	**III**	**5**	**3**	**2**	**-**	**3**
Objective	Students will understand the functions of carbohydrate in biological chemistry, significance of amino acids in biological systems and role of heavy metals in the human body- therapeutic and toxicity levels.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Carbohydrates**: Pyranose and furanose forms of aldo-hexose and ketohexose-methods used for the determination of ring size-conformation of aldo-hexopyranose-structure and synthesis of lactose and sucrose. A brief study of starch and cellulose. **Lipids and Membranes:** Molecular structure of lipids. Fatty Acids, Triglycerides Types of membrane lipids **Amino acids and Proteins:** Amino acids and Protein structure, Analysis of N-terminal and C-terminals in a polypeptide. Sanger method, Edman degradation and Enzymatic analysis. Primary, secondary and tertiary structure of proteins. Structure of collagen, myoglobin and haemoglobin.	K1	12
II	**Nucleic acids**: Chemistry of nucleic acids, nucleosides and nucleotides – Structure RNA and DNA and their biological importance. **Biomolecules: Antibiotics and vitamins:** A detailed study of structure, and stereochemistry of penicillin, cephalosporin. Chemistry and physiological action of ascorbic acid, thiamin, riboflavin and pyridoxine – Elementary aspect of vitamin A, E, K and B_{12}.	K2	12

III	**Bio-Inorganic Chemistry:** Essential and trace metal ions: Enzymes - Nomenclature and classificationCoenzymes - Vitamin B_{12}, Carboxypeptidase and Superoxide dismutase Heme-enzyme - Peroxidase and catalases. Oxygen carriers: Heme Proteins - Haemoglobin, myoglobin - Structure Oxygenation and stereochemistry - Bohr effect. Non-heme oxygen carriers - Hemerythrin and hemocyanin. Nitrogen fixation: Introduction, types of nitrogen fixing microorganisms. Nitrogenase enzyme - Metal clusters in nitrogenase - redox property - Biological redox systems: Cytochromes -Classification, cytochrome a, b and c. Cytochrome P_{450}. Transport of electrons: Iron-Sulphur Proteins: Rubredoxins and Ferredoxins, Structural and Spectral features of Iron- Sulphur Proteins. Photosynthesis and chlorophyl's	K3	12
IV	**Bio-Physical Chemistry:** Thermodynamics and biology-Basic concepts of structure and functionality membranes-structure, function transport properties, aspects of electrochemical phenomena – active transport, ionophores, biological energy storage systems – stepwise mechanism of photosynthesis versus potential. Enzymes - Nomenclature and classification, chemical kinetics, the free energy of activation and the effects of catalysts, kinetics of enzyme catalyzed reactions – Michaelis - Menten equation - Effect of pH, temperature on enzyme reactions, Factors contributing to the catalytic efficiency of enzymes. Membranes - Phase Equilibria, Donnan effect, Donnan Potential, Phase transition in Lipid bilayers, Free energy determination for ATP hydrolysis from sodium-potassium pump, Allosteric effects – Monod-WymanChangeux Theory, Assigning of Statistical weights for Helix-Coil transition in proteins, Study by spectroscopic methods.	K4	12
V	**Bio-Analytical Chemistry:** Essentials of trace elements and chemical toxicology: Trace elements in biological system. Metal ion toxicity - classes of toxic metal compounds– detoxification. Metals in medicine: Anti-arthritis drugs – Au and Cu in rheumatoid arthritis – Li in psychiatry – Pt, Au and metallocenes in anticancer drugs- metals in radio diagnosis, radio therapy and magnetic resonance imaging. Transport and storage of metals: Mechanism – Fe, Cu, Zn and V storage and transport – metallothioeins. Molecular mechanism of iron transport across the membrane – sodium and potassium ion pumps. Pollution studies – Effluent and water treatment. ***Current trends - Drugs used for treatment of SARS-CoV-2 virus***	K5	12
	***….* Self-study**		
Course	**CO1:** Learn about structural and functions of carbohydrates, lipids, membranes, amino acids, proteins, antibiotics and vitamins	K1	

Outcome	**CO 2:** Understand structure and biological importance of RNA and DNA	K2	
	CO 3: Interpret the key function of metal ions such as Fe, Co, Ni Zn and Cu in living systems	K3	
	CO4: Compile the Toxicity of metals and their effects in the biological system	K4	
	CO 5:Evaluate the toxicity of drugs used in cancer and radiodiagnosis	K5	

Learning Resources

Text Books	1. Zubay, G, L Brown (William C.) Co Biochemistry, 4th Edition,. 1997 2. Nelson, D, L Lehninger, A, L Cox M, W.H. Freeman M. Principles of Biochemistry, New York: 5 th Edition, 2008 3. John McMurray, ; Organic Chemistry, , Brooks/Cole, 8th Edition,2008 4. Finar, I. L. Organic Chemistry: Stereochemistry and the Chemistry of Natural product, III Edition, 2018
Reference Books	1. Kaim, W, Schwederski, B, Klein, A. Wiley, Bioinorganic chemistry: Inorganic Elements in the chemistry of life, 2nd Edition,2013 2. Das Asim K. Bioinorganic Chemistry, , Books and Allied (P) Limited, 1 st Edition, 2007 3. Mugherjee G. N, Arabinda D, Elements of Bioinorganic Chemistry, U. N. Dhur & Sons Pvt. Ltd. 4 th Edition,1993 4.Satake M. Mido YBioinorganic Chemistry, , Discovery Publishing House, New Delhi ,1996
Website Link	1.https://www.youtube.com/watch?v=iuW3nk5EADg 2.https://www.youtube.com/watch?v=aeC7M9PDjQw
Self-Study Materials	1.https://www.mdpi.com/books/book/2135-carbohydrates-2018 2.https://link.springer.com/book/10.1007/978-3-030-77791-3 3.https://www.ncbi.nlm.nih.gov/books/NBK557845/ 4.https://books.google.com/books/about/Bioanalytical_Chemistry.html?id=bM4Ftfx2rgEC

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc. – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards														
Course Code	**Course Title**					**Course Type**			**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3POCE05	**BIOLOGICAL CHEMISTRY**					**DSE THEORY - V**			**III**	**5**	**3**	**2**	**-**	**3**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	M	S	M	S
CO2	S	M	M	S	S	S	M	S	M	S
CO3	S	S	M	S	S	S	S	S	M	S
CO4	S	S	S	M	S	S	M	S	M	S
CO5	S	S	S	S	S	S	M	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Group Discussion and Problem solving from Competitive examination QP	
Teaching and Learning Methods	Chalk and Board class and powerpoint presentation	
Assessment Methods	Assignment, Seminar, CIA and ESE examinations	
Designed By	**Verified By**	**Approved By** Member Secretary
Mrs. M. Sathya	Dr. N. Nithiya	Dr. S. Shahitha

List of Skill Based Elective Course (SEC) Details for M.Sc., Organic Chemistry SYLLABUS - LOCF-CBCS Pattern EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards			
S. No.	**SEM**	**COURSE_CODE**	**TITLE OF THE COURSE**
1	II	23M2POCS01	INDUSTRIAL CHEMISTRY
2	III	23M3POCS02	SOFTWARE PACKAGE FOR CHEMISTS – MATLAB, ORIGIN AND CHEMDRAW

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram – 637408

M.Sc., Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2POCS01	**INDUSTRIAL CHEMISTRY**	**SEC THEORY - I**	**II**	**4**	**2**	**2**	**-**	**2**
Objective	Students will gain Knowledge on the important chemical and reagents used in chemical industries, basic principle behind various mixtures used in chemical industries and their selection in respective applications, safety and Hazardous criteria related to unit process and fertilizer							

Unit	Course Content	Knowledge Levels	Sessions
I	**Principles Of Chemical Technology:** Introduction – basic principles of chemical technology – importance of chemical technology – classification of technological process – designing and modeling of chemical plants – unit process and unit operations. Basic requirements of industrial reactors – choice and selectivity of reactor – basic principles of homogeneous and heterogeneous processes and reactors with examples.	K2	6
II	**Raw Materials and Energy for Chemical Industry:** Raw materials – Characteristics of raw materials and their resources – methods of raw material concentration – integral utilization of raw materials. Energy for chemical industry – power and fuels – classification of fuels – coal – fuel gases and liquid fuels – petroleum – cracking – chemical corrosion – types of corrosion and preventive measures.	K3	6
III	**Small Scale Chemical Industries:** Electro-thermal and electro- chemical industries: electroplating – surface coating industries – oils, fats and waxes – soaps and detergents – cosmetics. Match industries and Fire Works: Manufacture of some industrially important chemicals like potassium chlorate, potassium nitrate, barium nitrate and red phosphorous – metal powders.	K3	6
IV	**Large Scale Chemical Industries:** Manufacturing process – raw materials – composition and uses of products in Portland cement – ceramics – plastics, synthetic fibres – 67 synthetic rubber – fertilizers – insecticides and pesticides – photo film industries – commercial aspects of starting an industry	K5	6

V	**Safety Signs And Colours Used In Industries:** Industrial Hazards and Accidents – Classification of Hazards – Physical, chemical Biological, Ergonomic and stress Hazards – Causes, prevention and control – case study on industrial accidents – Bhopal gas Tragedy – Heat stress – sources and control – Noise pollution in industry – sources and control.	K6	6
Course Outcome	**CO1:** Understand and recall the principles involved in chemical technology	K1	
	CO2: Integrate raw materials and energy of chemical industry	K2	
	CO3: Analyze the process of Electro-thermal and electro- chemical industries	K3	
	CO4: Investigate the Manufacturing process of cement and pesticide, etc	K5	
	CO5: Implement the Safety Signs and Colours used in Industries to avoid accidents	K6	

Learning Resources	
Text Books	1. A. K. De, Environmental Chemistry, New Age International Publishers, 9th ed., 2018. 2. R.K. Goel, Process know-how and material of construction for Chemical Industries, S.B. Publ., Delhi, 1977. 3. B.N. Chakrabarthy, Industrial Chemistry, Oxford and IBH Publ., Now Delhi, 1984. 4. Industrial Safety and Environment – A.K. Gupta,Laxmi Publications Pvt. Ltd., 3rd ed., 2023.
Reference Books	1. Mukhlynov (ed.), Chemical Technology, Vol.1, Mir Publication, Moscow, 3rdedn., 1979. 2. R. Norris Shreve and J.A. Brink, Jr. Chemical Process Industries, 4thedn., McGraw Hill, Tokyo, 1977.
Website Link	1.https://prochoicesafetygear.com/ppe/blog/safety-signage/colour-for-marking-physical-hazards-saa-industrial-safety-colour-code/

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc. – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards													
Course Code	**Course Title**				**Course Type**		**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M2POCS01	**INDUSTRIAL CHEMISTRY**				**SEC THEORY - I**		**II**	**4**	**2**	**2**	**-**	**2**	
CO-PO Mapping													
CO Number	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**			
CO1	S	S	S	S	S	S	M	S	S	S			
CO2	S	M	S	M	L	S	L	M	S	S			
CO3	S	L	M	S	M	S	S	M	L	S			
CO4	S	S	M	S	S	S	S	S	L	M			
CO5	S	M	S	L	M	S	M	L	M	S			
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG				
Tutorial Schedule	Group discussion												
Teaching and Learning Methods	Chalk and Board class and PPT Presentation												
Assessment Methods	Assignment, Seminar, CIA and ESE examinations												
Designed By	**Verified By**					**Approved By** Member Secretary							
Dr. N. Nithiya	Dr. N. Nithiya					Dr. S. Shahitha							

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram - 637408

M.Sc., Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3POCS02	**SOFTWARE PACKAGE FOR CHEMISTS – MATLAB, ORIGIN AND CHEMDRAW**	**SEC THEORY - II**	**III**	**3**	**2**	**1**	**-**	**2**
Objective	Students will acquire a basic knowledge in Software Packaging used by Chemists namely Matlab, Origin and Chemdraw							

Unit	Course Content	Knowledge Levels	Sessions
I	**Handling of Variable, Comments and Functions:** Basic concepts of MATLAB and its applications in various field – History and its various Basic operation – Important functions – understanding variables – different types of variables – creating Scripts and understanding commands – operation on matrix – File handling and text processing	K3	6
II	**Programming and Data Conversion:** Programming in MATLAB – Plot functions and programming – 2-D plots (two vectors) and 3-D plots with three vectors – Additional 2D plots – working with structure and map container data types – cell data types – converting between different data types	K5	6
III	**Basics of Origin:** Spreadsheet – Basic of origin – various mathematical functions for plotting, statistical calculations – Drawing of various plots and its functions – Background correction for various plots	K3	6
IV	**Origin for Data Analysis:** Curve fitting using polynomial, exponential, Gaussian, Lorrentzian, Boltzmann, reciprocal functions, Computing area under a curve, peak finding, deconvolution of curve – Bar chats - 3D plotting – error bars in plotting	K5	6
V	**Chemdraw:** Basic concepts of Chemdraw – Functions – various arrows used in the chemical equations – concept of drawing of chemical equations – Concepts of valence of atoms in a molecule – Drawing of simple molecules, macro molecules, inorganic complex, organometallic complex, peptides and dendrimers – drawing of catalytic cycles and organic reaction mechanism.	K5	6

Course Outcome	**CO1:** Paraphrase the basic concepts of MATLAB, ORIGIN and CHEMDRAW and its use for Chemists.	K2	
	CO2: Build a program for 2D and 3D plots using MATLAB	K3	
	CO3: Construct the plotting for various functions and data analysis using ORIGIN	K4	
	CO4: Construct the curve fitting plots with the help of functions using ORIGIN	K4	
	CO5: Draw the structure of molecules using CHEMDRAW	K5	

Learning Resources				
Text Books	1. Amos Gilat, MATLAB: An Introduction with Applications, 4ed , 2012 2. S.N. Alam, S.S. Alam, Understanding Matlab: A Textbook for Beginners, 2019, Dreamtech Press 3. Jake Woods, Chemdraw Professional (Tutorial User Guide) Kindle Edition, 2019.			
Reference Books	1. Muhammad Arsalan, Azka Awais, Origin Software Complete Usage Instruction and Graph Representation: A complete Guide for new users, LAP LAMBERT Academic Publishing, 2022.			
Website Link	https://onlinecourses.nptel.ac.in/noc24_ma41/preview https://www.youtube.com/watch?v=twciwBq-ziY&list=PLWgqLpcPbMge5iNrKfIkg4vgRNwkj2ptT			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc. – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards													
Course Code	**Course Title**				**Course Type**		**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M3POCS02	**SOFTWARE PACKAGE FOR CHEMISTS – MATLAB, ORIGIN AND CHEMDRAW**				**SEC THEORY - II**		**III**	**3**	**2**	**1**	**-**	**2**	
CO-PO Mapping													
CO Number	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**			
CO1	S	S	S	S	M	S	L	S	S	M			
CO2	S	M	S	S	S	S	M	S	M	S			
CO3	S	S	M	M	S	M	S	M	S	S			
CO4	S	M	S	S	M	S	S	S	S	M			
CO5	M	S	S	S	S	S	S	M	S	S			
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG				
Tutorial Schedule	Group discussion												
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class and Demo class												
Assessment Methods	Only Internal Examination CIA – I – 50 Marks CIA – II – 50 Marks												
Designed By	**Verified By**						**Approved By** Member Secretary						
Dr. N. Nithiya	Dr. N. Nithiya						Dr. S. Shahitha						

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram – 637408

M.Sc., Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3POCIS1	**INTERNSHIP**	**INTERNSHIP**	**III**	**-**	**-**	**-**	**-**	**2**
Objective	To Learn academic credit and develop new skills, work habits and attitudes necessary for job success. Internships must take place outside college viz., Research Institute, Chemical industries.							

Guidelines for internship training programme	**Knowledge Levels**	**Sessions**
I. The students are expected to have a practical training in any industry or Research institute to enable them to acquaint him / her with the procedure, practice and working of companies. II. Each student should undergo industrial training for a minimum period of two weeks at the end of the Second semester vacation. III. He / She shall undergo the above training in the institutions like other Institutes, R&D Lab, private limited and public limited companies, CLRI, CECRI,NIT,IIT, Molecular connexions, Milk, Water & soil testing labs, Microlabs, Biocon, Biosis, Golbal calcium & Sandmar. IV. Students may make their own arrangements in fixing the companies for candidates should submit a report in not less than 25 type written pages. V. Candidates should submit the attendance certificate from the institution for having attended the training for two weeks. VI. Industrial training reports shall be prepared by the students under the supervision of the faculty of the department. VII. Industrial training report must contain the following: Cover page Copy of training certificate Profile of the industry, Objectives, work diary, Acknowledgement, content, Aim & scope, Report about the work undertaken by them during the tenure of training Observation and conclusion about the concern Findings VIII. Internship viva – voce examination will be conducted with internal & external examiners at the end of the third semester and the credits will be awarded	K6	90

Course Outcome	**CO1:** Upgrade the learning in a professional environment	K3	
	CO2: Gaining experience with current science & technology	K4	
	CO3: Contributing to significant projects	K4	
	CO4: Building personal skills, Developing a resume that highlights desirable skills	K4	

	CO5: Networking with people working in the science community	K5	

Learning Resources				
Learning Resources : Hands on training				
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc. – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards										
Course Code	**Course Title**			**Course Type**		**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3POCIS1	**INTERNSHIP**			**INTERNSHIP**		**III**	**-**	**-**	**-**	**-**	**2**

CO-PO Mapping										
CO Number	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	M	S	S	M	M	S	M	S	S	S
CO2	M	S	M	S	M	S	S	M	S	S
CO3	S	S	S	S	S	S	M	S	S	S
CO4	S	M	S	S	S	S	S	S	M	M
CO5	S	S	S	S	S	S	S	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Preparation of Work diary & Internship report preparation	
Teaching and Learning Methods	Training in industries, PT Classes, Smart classroom	
Assessment Methods	Attendance, Internal & external viva-voce exams	
Designed By	**Verified By**	**Approved By Member Secretary**
Mrs. A. Dhivya	Dr. N. Nithiya	Dr. S. Shahitha

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram – 637408

M.Sc Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M4POCPR1	**PROJECT WORK**	**PROJECT WORK**	**IV**	**10**	**-**	**-**	**10**	**5**
Objective	To Identify Problems related to their area of interest in the Chemistry and Chemical industry and enhance problem solving skills and research knowledge.							

Details	Course Content	Knowledge Levels	Sessions
Cover Page & Title Page	**Cover Page & Title Page:** The fonts and locations of various items on this page should be exactly as shown in a specimen copy**.**	K4,K6	
Inside cover page	Inside cover page Same as cover page.	K4,K6	
Bonafide Certificate	**Bonafide Certificate**: The Bonafide Certificate shall be in double line spacing using Font Style Times New Roman and Font Size 14.	K4,K6	
Acknowledgement	**Acknowledgement:** This should not exceed one page. The candidate should convey his appreciation to all whom have played a role for completion of his M. Sc Project work.	K4,K6	
Abstract	**Abstract:** An abstract should provide a concise summary of your research project. It should include the principal objectives of the study, methods employed, a summary of the results and primary conclusions. It should contain approximately 250 words written in the past tense and should not include references.	K4,K6	
Contents	**Table of Contents:** The table of contents should list all headings, sub headings after the table of contents page, as well as any titles preceding it. The title page and Bonafide Certificate will not find a place among the items listed in the Table of Contents. One and a half spacing should be adopted for typing the matter under this head.	K4,K6	
Tables	**List of Tables**: The list should use exactly the same captions as they appear above the tables in the text. 1.5 spacing should be adopted for typing the matter under this head.	K4,K6	
Figures	**List of Figures**: The list should use exactly the same captions as they appear below the figures in the body of the text. One and a half spacing should be adopted for typing the matter under this head. All charts, graphs, maps, photographs and diagrams should be designated as figures. X and Y axes titles are mandatory for all the graphs.	K4,K6	
Symbols	**List of Symbols, Abbreviations and Nomenclature:** 1.5 spacing should be adopted or typing the matter under this head. Standard symbols, abbreviations etc. should be used.	K4,K6	

Chapters	**Chapter I - Introduction:** Statement of the Problem, Significance, Need for the study, Objectives	K4,K6	
	Chapter II- Aim & Scope	K4,K6	
	Chapter III- Experimental methods: Procedures, Hypothesis.	K4,K6	
	Chapter IV- Results and Discussion: Tables and Figures, Statistical Presentations, Hypothesis Testing.	K4,K6	
	Chapter V- Conclusion	K4,K6	
	Chapter VI-References	K4,K6	
	References	K4,K6	
GUIDELINES FOR PROJECT PREPARATION			
Numbering	● Every page in the project report, except the project report title page, must be accounted for and numbered. ● The page numbering, starting from acknowledgements and till the beginning of the introductory chapter, should be printed in small Roman numbers, i.e, i, ii, iii, iv..... ● The page number of the first page of each chapter should not be printed (but must be accounted for). All page numbers from the second page of each chapter should be printed using Arabic numerals, i.e. 2,3,4,5... ● All printed page numbers should be located at the right corner at the bottom of the page.	K4,K6	
Chapters	● Use only Arabic numerals. Chapter numbering should be centered on the top of the page using large bold print. <Size 14><Times New Roman>	K4,K6	
TEXT			
Regular Text	**Regular Text**: Times Roman 12 pts and normal print.	K4,K6	
Chapter Heading	**Chapter Heading -** Times Roman 14 pts. Bold and capital.	K4,K6	
Section Headings	**Section Headings -** Times roman 12 pts. Bold and capital.	K4,K6	
Subsection Headings	**Subsection Headings** - times roman 12 pts. bold print and Leading capitals i.e, only first letter in each word should be in capital.	K4,K6	
Special Text	**Special Text-** Italics/Superscript /Subscript/Special symbols, etc., as per necessity. Special text may include footnotes, endnotes, physical or chemical symbols, mathematical notations, etc.	K4,K6	
Sections	**Sections:** Use only Arabic numerals with decimals. Section numbering should be left justified using bold print. Example: 1.1, 1.2, 1.3, etc.	K4,K6	
Sub Sections	**Sub Sections:** Use only Arabic numerals with two decimals. Subsection numbering should be left Justified using bold print. Example: 1.1.1, 1.1.2, 1.1.3, etc.	K4,K6	

References	Use only Arabic numerals. Serial numbering should be carried out based on Alphabetical order of surname or last name of first author. The format is written like, author name followed by year followed by title of the work followed by details of the journal. Same font as regular text, serial number and all authors names to be in bold print. Title and Journal names should be in italic. 1. **Alvarez LH and Cervantes FJ**, 2011. "(Bio) nanotechnologies to enhance environmental quality and energy production". *J ChemTechnolBiot*86 (1354–1363). 2. **Banjong B, Rattanai B, Zongporn J, Naratip V**, 2010. "Grass blade-like microparticle $MnPO_4 \cdot H_2O$ prepared by a simple precipitation at room temperature".*Power Techno.* 203 (310 - 314).	K4,K6	
Typing Instructions	**Typing Instructions:** The impression on the typed copies should be black in color. One and a half spacing should be used for typing the general text. The general text shall be typed in the Font style 'Times New Roman' and Font size 12. Use A4 (210 mm X 297 mm) bond un-ruled paper (80 gsm) for all copies submitted. Use one side of the paper for all printed/typed matter.	K4,K6	
Justification	**Justification:** The text should be fully justified	K4,K6	
Margins	**Margins:** The margins for the regular text are as follows LEFT - 1.5" RIGHT - 1" TOP - 1" BOTTOM - 1"	K4,K6	
Paragraph Spacing	Use 6 pts before & 6 pts after paragraphs. All paragraphs in the seminar/project report should be left justified completely, from the first line to the last line. Use 1.5 spacing between the regular text and quotations. Provide double spaces between: (a) From top of page to chapter title, (a) Chapter title and first sentence of a chapter, Use single spacing (a) In footnotes and endnotes for text. (b) In explanatory notes for tables and figures. (c) In text corresponding to bullets, listings, and quotations in the main body of seminar/project report. Use single space in references and double space between references.	K4,K6	
Tables	All tables should have sharp lines, drawn in black ink, to separate rows/columns as and when necessary. Tables should follow immediately after they are referred to for the first time in the text. Splitting of paragraphs, for including tables on a page, should be avoided. Provide double spaces on the top and the bottom of all tables to separate them from the regular text, wherever applicable. The title of the table etc. should be placed on the top of the table. The title should be centered with respect to the table. The titles must be in the same font as the regular text	K4,K6	

	and should be single spaced.		
Figures	All figures, drawings, and graphs should be drawn in black ink with sharp lines and adequate contrast between different plots if more than one plot is present in the same graph. The title of the figure etc. should be placed on the bottom of the figure. Figures should follow immediately after they are referred to for the first time in the text. Splitting of paragraphs, for including figures on a page, should be avoided. Provide double spaces on the top and the bottom of all figures to separate them from the regular text, wherever applicable. Figures should be centered with respect to the figure. The titles must be in the same font as the regular text and should be single spaced. The title format is given below: Fig. <blank><chapter number>.<serial number><left indent><figure	K4,K6	
Page Dimension & Binding Specifications	The project report should be prepared in A4 size. The dissertation shall be properly bound; The bound front cover should indicate in Silver and embossed letter.	K4,K6	
Course Outcome	**CO1:** Identification of research idea	K2	
	CO2: Analyze of problem solving skills	K4	
	CO3: Analyze sources for conduct of Research	K4	
	CO4: Evaluate the research report	K5	
	CO5: Create the research report	K6	

Learning Resources

Text Books	1. Research Methodology: Methods and Techniques, by C.R. Kothari,New Age Publications, 2009.			
Reference Books	1.Research Methodology: Methods and Techniques by C.R. Kothari, New Age Publications, 1985. 2.Essentials of Research Design and Methodology by: Geoffrey R. Marczyk, David DeMatteo, David Festinger, 2005.			
Website Link	1. http://gen.lib.rus.ec/			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc. – Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards										
Course Code	**Course Title**			**Course Type**		**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M4POCPR1	**PROJECT WORK**			**PROJECT WORK**		**IV**	**10**	**-**	**-**	**10**	**5**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	M	S	M	M	S	S	S
CO2	S	S	S	S	S	M	S	S	S	S
CO3	S	S	S	S	S	S	S	S	M	M
CO4	S	S	S	M	S	S	S	S	M	M
CO5	M	M	M	S	S	M	M	S	M	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	-
Teaching and Learning Methods	-
Assessment Methods	**EA - 100%** 1. Project Report - 150 Marks 2. Viva-Voce - 50 Marks 3. Total - 200 Marks

Designed By	**Verified By**	**Approved By Member Secretary**
Mrs. A.Dhivya	Dr. N. Nithiya	Dr. S. Shahitha

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE

(Autonomous)

Rasipuram – 637408

M.Sc. –Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M4POCOE1	**ORGANIC CHEMISTRY FOR COMPETITIVE EXAMINATIONS**	**ONLINE COMPETITIVE EXAMINATION**	**IV**	**4**	**4**	**-**	**-**	**2**
Objective	To improve the competency skills of the students and to make them confident to attend the competitive examinations							

Unit	Course Content	Knowledge Levels	Sessions
I	Assemblage of different topics related to Chemistry in particular, Organic, Inorganic, Physical, Pharmaceutical, Spectroscopy, Analytical, Forensic, Food Chemistry etc. Major emphasis has been put forth to include recent developments in the subjects. This course aims to give a holistic view of all the topics which comprised of some factual text points, multiple choice questions (MCQ), it is extremely suitable for students pursuing their higher degree in University/institute for their entrance exams, students preparing for various national and state level competitive entrance exams such as CSIR/UGC-NET/JRF/SRF; ICMR, DBT, GATE, BARC, TIFR, IISc, JNU, BHU etc. to get admission in Ph.D., in Chemistry. In addition, it is also useful for UPSC and states PSC. **Rules for creating MCQ pattern.** 1. Objective type online examination will be conducted at the end of 4th semester. 2. Questions must be taken from all previous question papers of CSIR-NET, SET, GATE, IISc, BARC, TIFR, UPSC, IBPS and Common Entrance Test for Ph.D. 3. **Test critical thinking**. Multiple choice questions to test the superficial knowledge. Learners to interpret facts, evaluate situations, explain cause and effect, make inferences, and predict results. 4. **Emphasize Higher-Level Thinking** Use memory-plus application oriented questions. These questions require students to recall principles, rules or facts in a real life context	K6	20

	Eg.1 Ability to Justify Methods and Procedures In the synthesis of polydimethylsiloxane, the chain forming , branching and terminating agent respectively , are a. 20 , 28 , 50 and 126 b. 24 , 28 ,82 and 126 c. 20 , 50 , 80 and 184 d. 28 , 50 , 82 and 180 Eg.2 Ability to Interpret Cause-and-Effect Relationships The chemical potential (μ) of 2 molar Na_2SO_4 solution is expressed in terms of mean ionic activity co-efficient ($\gamma_{\pm}$) as a. $\mu_0 + 5\ RT\ ln2 + 3\ RT\ ln\ \gamma_{\pm}$ b. $\mu_0 + 3\ RT\ ln2 + 3\ RT\ ln\ \gamma_{\pm}$ c. $\mu_0 + 5\ RT\ ln\ \gamma_{\pm}$ d. $\mu_0 + 4\ RT\ ln\gamma_{\pm}$ 5. **Mix up the order of the correct answers** Keep correct answers in random positions and don't let them fall into a pattern that can be detected 6. **Use a Question Format** Multiple-choice items to be prepared as questions (rather than incomplete statements) Incomplete Statement Format: The capital of California is in Direct Question Format------ Less effective. In which of the following cities is the capital of California? - This is Best format. 7. **Keep Option Lengths Similar** Avoid making your correct answer the long or short answer 8. **Avoid the "All the Above" and "None of the Above" Options** Students merely need to recognize two correct options to get the answer correct 9. HOD's instruct to the faculty to prepare minimum 500 questions booklet (cumulatively for each programme) with solutions and circulate among the students. 10. Each Department has to prepare the Questions (MCQ pattern with four answers) and submit to ICT.		

Course Outcome	**CO1:** Identification of pattern of questions asked in competitive exams	K2	
	CO2: Analyze the topics that are repeated in competitive exams	K4	
	CO3: Able to categorize the topics and select the topics of their interest	K4	
	CO4: Ability to solve problems related to each topic	K5	
	CO5: Get confidence about appearing for competitive exams	K6	

Learning Resources				
Text Books	1. Trueman's UGC NET Chemical Sciences - 2023 Edition Paperback – 1, M. Gagan, January 2023 2. Joint CSIR-UGC NET: Chemical Sciences - Previous Years' Papers (Solved) Paperback, RPH Editorial Board , Ramesh Publishing House, 2024. 3. CSIR NET Chemical Science Previous Year Questions Papers with Answers and Detailed Solutions from 2011- Dec 2023 | Best Book for CSIR UGC NET JRF, GATE, SET Examinations in India Paperback, IFAS PUBLICATIONS, 2024.			
Reference Books	1. NTA CSIR UGC NET/SET (JRF & Lecturership) Chemical Sciences Paperback, Preeti Gupta (JRF) Dr. Aditya Tomar, Dr. Naveen Sharma, Arihant Publications, 2023. 2. GATE Chemistry book - (2000-2024) 25 years Previous Year Questions with detailed explanation Upto date gate organic, inorganic and physical chemistry PYQ Paperback, IFAS Publications (Author) 2024.			
Website Link	1. https://ifasonline.com/			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc.- Organic Chemistry Syllabus LOCF - CBCS with effect from 2023-2024 Onwards										
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**		
23M4POCOE1	**ORGANIC CHEMISTRY FOR COMPETITIVE EXAMINATIONS**	**ONLINE COMPETITIVE EXAMINATION**	**IV**	**4**	**2**	**2**	**-**	**2**		

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	S	S	S	S	S	S	S
CO2	S	S	M	S	S	S	M	S	M	S
CO3	S	M	M	S	S	S	S	M	S	S
CO4	S	S	S	M	M	S	M	S	S	M
CO5	M	S	S	S	S	S	S	S	M	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Video classes
Teaching and Learning Methods	Problem solving class
Assessment Methods	Assignment, CIA-I and CIA-II

Designed By	**Verified By HoD**	**Approved By Member Secretary**
Mrs. A. Dhivya	Dr. N. Nithiya	Dr. S. Shahitha