SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI

(AFFILIATED TO MADURAI KAMARAJ UNIVERSITY, MADURAI.
RE-ACCREDITED WITH 'A' GRADE (THIRD CYCLE) BY NAAC WITH CGPA 3.11)

Programme Scheme, Scheme of Examination and Syllabi

(From 2023-2024 Batch onwards)

Department of Chemistry

PG Programme

Approved in the Academic Council – XIV held on 31/07/2023

Curriculum Design and Development Cell
Annexure L

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Curriculum Design and Development Cell

HOD	Dean of Pure Science	Dean of Academic Affairs	Principal

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTY
MEMBERS OF BOARD OF STUDIES

S.No.	Board Members	Name and Designation
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2.	University Nominee	**Dr.M.Rajan,** Assistant Professor, Department of Natural Products Chemistry, School of Chemistry, Madurai Kamaraj University,Madurai – 625021 Phone : 9488014084 Mail id: rajanm153@gmail.com
3.	Academic Expert 1.	**Dr.P.Gajendran,** Associate Professor, Department of Chemistry, The Madura College, Madurai-11 Phone: 9865777350. Mail id: haigaja78@yahoo.com
4.	Academic Expert 2.	**Dr. A. J.Sunija,** Assistant Professor, Department of Chemistry, Mannar Thirumalai Naicker College,Pasumalai, Madurai. Phone: 6382277809 Mail id: sunijaaj@gmail.com
5.	Industrialist	**Mr.R. Kumar,** Sujitha Chemicals, Mettur Dam, Salem Phone: 0427 – 2332242, Mobile: 9443238489 Mail id: sujichem@yahoo.co.in
6.	Alumnus	**Mr.R.Thangapandi** Junior Officer, Quality Control and Environment Department, Tuticorin alkali chemical and fertilizers limited, Tuticorin-628005. Phone: 7339036096 Mail id:thangapandi161298@gmail.com
Members		
7.	Mr. S. Alagappan	Guest Faculty in Chemistry
8.	Dr. M. Murugalakshmi	Assistant Professor of Chemistry
9.	Mrs. M. Sankareswari	Assistant Professor of Chemistry
10.	Mr. M. Nazeer	Assistant Professor of Chemistry
11.	Dr. J. Sherin	Assistant Professor of Chemistry
12.	Dr. R. Deepa	Assistant Professor of Chemistry

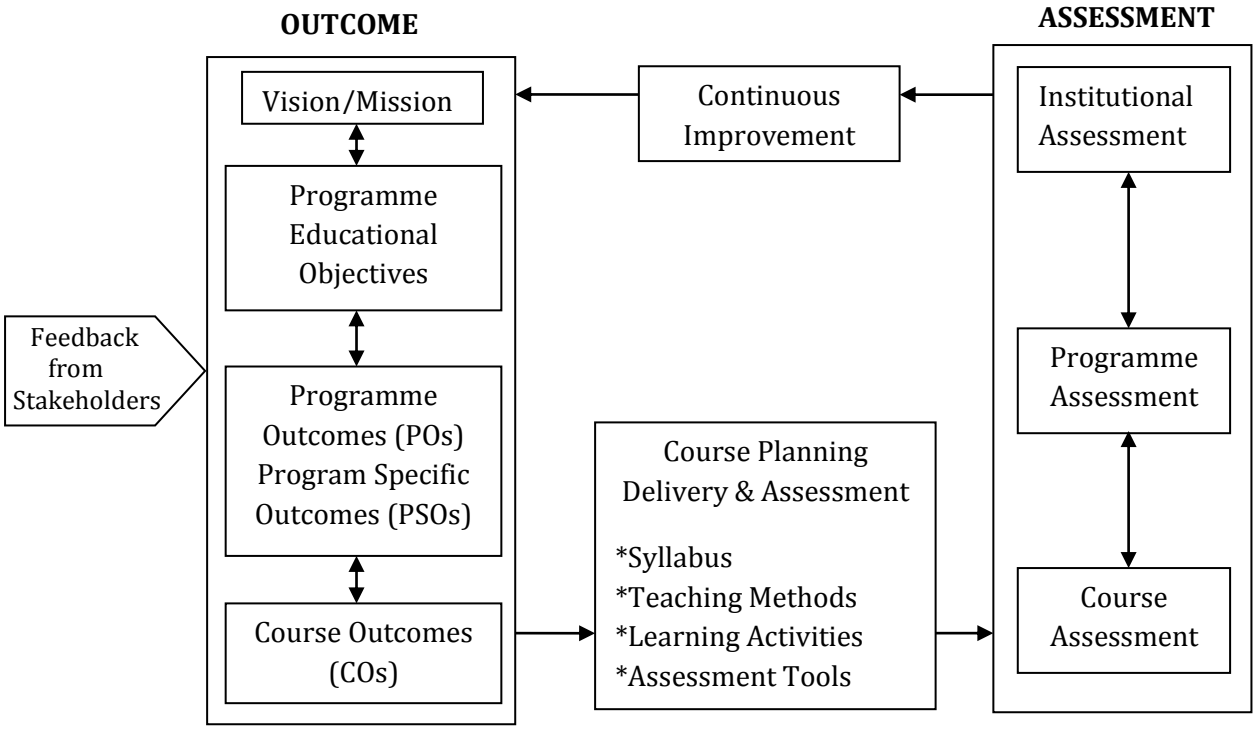
SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
(Affiliated to Madurai Kamaraj University, Re-accredited with A Grade (CGPA 3.11) by NAAC)
DEPARTMENT OF CHEMISTRY
PG Programme – M. Sc Chemistry
GUIDELINES FOR OUTCOME-BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM
(From 2023-2024 Batch onwards)

INTRODUCTION

Sri Kaliswari College in its pursuit of imparting quality education has marked a remarkable growth in terms of academic excellence, infrastructure, student strength, ICT facilities, library and placement records since its establishment in 2000-2001.This institution constitutes an academic community that is committed to encourage the student community to experience and share knowledge, identify their potential, enhance the employability skills and enable them to pursue their goals. After the conferment of autonomous status in the year 2012, the college has so far gone for revision of the syllabi three times and is continually updating the syllabi to meet the needs and demands of the student community.

The institution in its success journey of imparting quality education has been Re-Accredited with A grade with (CGPA 3.11) in its third cycle of accreditation by NAAC. As an added feather to its cap, the institution has taken a giant leap to embrace the Outcome-Based Education system to enable the student community to develop their knowledge, skill and attitude simultaneously through a focused learning and help the graduates to compete with their global counterparts and prepare them for life.

I. OUTCOME-BASED EDUCATION (OBE) FRAMEWORK



II. VISION OF THE INSTITUTION

- To impart quality higher education to produce highly talented youth capable of developing the nation

III. MISSION OF THE INSTITUTION

- Ensuring quality in all aspects of the activities
- Developing the latent skills of the rural youth
- Providing value - based education to instill courage and confidence
- Nurturing the entrepreneurial skills of the rural youth
- Creating competency to meet global challenges
- Imbibing social awareness and social responsibilities

IV. VISION OF THE DEPARTMENT

- To produce quality chemistry professional with technical skill and applied knowledge to pursue higher education and research and to fulfill the jobs/employment opportunities in industries, scientific projects and allied sectors at regional and national levels.

V. MISSION OF THE DEPARTMENT

- To provide an academically sound environment that ensures understanding of key chemical concepts, principles and theories and cognitive development of students in a holistic manner.
- To provide knowledge and skills to the students thus enabling them to undertake further studies in chemistry related areas or multidisciplinary areas that can be helpful for self-employment/entrepreneurship.
- To mould a responsible citizen who is aware of most basic domain-independent knowledge, including critical thinking and communication.

VI. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The Graduates will

PEO1: achieve advance in-depth knowledge of chemistry and can pursue research programme in national and international level institution.

PEO2: able to identify, formulate, analyze synthesis and interpret various chemical compounds with modern instrumentation techniques to satisfy the needs of the society and the industries.

PEO3: equip with skills in research, critical thinking and analytical area.

PEO4: strengthen professional attitude with ethical values to enhance entrepreneurial skills.

PEO5: develop creativity, inventiveness, leadership and lifelong learning to become a successful professional.

VII. PROGRAMME OUTCOMES (POs)

PO1: Disciplinary knowledge

Acquire comprehensive and scientific knowledge in the field of science.

PO2: Critical thinking, Problem solving and Analytical reasoning

Engage in critical investigation through principle approaches or methods and draw realistic conclusions of problems by employing highly developed analytical and quantitative skills.

PO3: Scientific reasoning and Research related skills

Ability to analyze, draw conclusions from qualitative/quantitative data and critically evaluate ideas and also acquire necessary research skills to carry out an experiment or investigation.

PO4: Communication skills and Digital literacy

Communicate effectively on scientific achievements, basic concepts and recent developments with society at large and make use of appropriate software to prepare project report.

PO5: Ethics, Values and Multicultural competence

Embrace ethical principles in all their activities, commit to professional and research ethics and practice tolerance and respect differences.

PO6: Team Work, Leadership and Employability skills

Recognize the opportunities and contribute positively in collaborative scientific research and acquire the pre-requisite skills required for placements and higher education.

PO7: Self-directed and Life-long learning

Recognize the need for engaging in independent and life-long learning in the emerging areas of the field of specialization.

VIII. PROGRAMME SPECIFIC OUTCOMES (PSOs) – M.Sc. CHEMISTRY

On successful completion of B.Sc. Chemistry, the students will

PSO1: acquire comprehensive knowledge and understanding of both theoretical and experimental/applied chemistry knowledge in various fields like Analytical chemistry, Physical Chemistry, Inorganic Chemistry, Organic Chemistry, Material chemistry, etc.

PSO2: develop skills to identify chemistry related problems, analysis and application of data using appropriate methodologies.

PSO3: design scientific experiments through statistical hypothesis testing, appropriate questions, planning and reporting experimental investigation.

PSO4: communicate effectively the concepts through technical writing as well as through oral presentation and acquire the ability to work in chemical simulation software and related computational work.

PSO5: embrace moral and research ethics, including fair benefit sharing, plagiarism, scientific misconduct and so on and develop the ability to spot data fabrication and fake news by applying rational skepticism and analytical reasoning.

PSO6: act as a team player by contributing in laboratory, field based situation and industry by acquiring technical, communicative, problem solving, intellectual and leadership skills.

PSO7: engage in independent and lifelong learning through use of advanced ICT techniques for personal academic growth as well as for increasing employability opportunity.

IX. PO-PSO Mapping Matrix – M.Sc. Chemistry

PO / PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
PO1	✓						
PO2		✓					
PO3			✓				
PO4				✓			
PO5					✓		
PO6						✓	
PO7							✓

X. PO-PEO Mapping Matrix – M.Sc. Chemistry

PO / PEO	PEO1	PEO2	PEO3	PEO4	PEO5
PO1	✓	✓	✓		
PO2		✓	✓		✓
PO3		✓	✓	✓	✓
PO4		✓		✓	
PO5			✓	✓	✓
PO6			✓	✓	✓
PO7		✓			✓

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
(Affiliated to Madurai Kamaraj University, Re-accredited with A Grade (CGPA 3.11) by NAAC)
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry

REGULATIONS

Duration of the Programme **:** Two years (equivalent to four semesters)

Eligibility

Candidate should have passed B. Sc. Chemistry or any other degree accepted by the Syndicate of the Madurai Kamaraj University, Madurai as its equivalent.

Medium of Instruction : English

Age Limit

Maximum age limit : No Age limit

Transitory Permission

Students joined from 2023 - 2025 may be permitted to write their examinations in this pattern up to April 2028.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme – M.Sc. Chemistry
SCHEME OF EXAMINATION

For all the PG Programmes, the internal and external marks are distributed as follows:

For all Theory Courses: Internal Marks: 25; External Marks: 75

For Courses with both Theory and Practical, assessment will be for both Theory and Practical.

For Skill Enhancement Professional Competency Course: Internal Assessment for 100 Marks in Online Mode will be conducted (Objective Type Questions)

For all Practical Courses, Project and Internship : Internal Marks: 25; External Marks: 75

Internal Mark Distribution for Theory Courses

Assessment Type	Marks	Scheme of Assessment
Internal Test	10 marks	Two Internal Tests and 1 Model Exam will be conducted and average of the best two will be considered
Written Assignment E-Assignment/ Case Studies/ Reviews/ Field Assignments/ Poster Presentations/ Portfolios	5 marks	Any two of the Assignments will be given and the average of the two will be considered
Seminar	5 marks	One Seminar for each course
Viva/ Oral Exam/ Group Discussion/ Role Play	5 marks	Test will be conducted in any one of the Oral Mode

Internal Mark Distribution for Practical Courses

Assessment Type	Marks	Scheme of Assessment
Lab work /Program Execution	15 marks	Two Internal Tests will be conducted and the average of the two will be considered
Observation/Record Notebook	5 marks	Assessment will be done during every practical class
Viva –Voce / Lab Quiz	5 marks	Two Lab Quiz Tests/viva-voce will be conducted and the average of the two will be considered

External Mark Distribution for Practical Courses

Assessment Type	Marks	Scheme of Assessment
Lab work/Program Execution	65 marks	End result of the Practical
Viva –Voce	10 marks	Oral Mode Test

Internal Mark Distribution for Courses with both Theory and Practical

Assessment Type	Marks	Scheme of Assessment
Internal Test	10 marks	Two Internal Tests and 1 Model Exam will be conducted and average of the best two will be considered
Written Assignment E-Assignment/ Case Studies/ Reviews/ Field Assignments/ Poster Presentations/ Portfolios	5 marks	Any two of the Assignments will be given and the average of the two will be considered
Lab work /Program Execution	10 marks	Two Internal Tests will be conducted and the average of the two will be considered

External Mark Distribution for Courses with both Theory and Practical

Assessment Type	Marks	Scheme of Assessment
External Written Test	50 marks	Two hours External Exam will be conducted for 50 marks
Lab work /Program Execution	20 marks	End result of the Practical
Viva –Voce	05 marks	Oral Mode Test

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme – M.Sc. Chemistry
QUESTION PAPER PATTERN

Internal Test – 40 Marks – 1 hr 45 mins Duration

S.No	Type of Questions	Marks
1.	Objective type Questions: Multiple Choice – 5 questions Answer in a Word/Sentence – 4 questions	 05 04
2.	Short Answer–2 questions –either or type	3x7=21
3.	Long Answer–1 question – either or type	1x10=10

Summative Examinations - 75 Marks -3 hrs Duration

S.No	Type of Questions	Marks
1.	Objective type Questions: Multiple Choice – 5 questions Answer in a Word/Sentence – 5 questions	 05 05
2.	Short Answer - 5 questions – either or type	5x7=35
3.	Long Answer - 3 questions – either or type	3x10=30

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry

Attainment of Course outcomes

Attainment of Course outcomes is computed using Direct and Indirect assessment methods. Direct Method of Assessment is based on performance of the students in the Continuous Internal Assessment Tests, Summative Examinations and supporting activities such as Seminar, Assignment, Case study, Group Discussion, Quiz, etc., and Indirect Method of Assessment is based on periodical feedback from the students at the end of each course.

Weightage of Direct and Indirect Assessment in computation of attainment of each course is 70% for Direct Assessment and 30% for Indirect Assessment.

Direct Assessment of Course outcome attainment

i) Rubrics:

Internal Assessment contributes 60% and Summative Examinations Assessment contributes 40% to the Direct Assessment of a course outcome for Theory Courses. For the Practical Courses, Internal Assessment contributes 70% and Summative Examinations Assessment contributes 30% to the Direct Assessment of a course outcome.

ii) Setting of Target:

50% of the maximum mark is set as target of Internal Assessment tools and the average mark of the class is set as target of Summative Examinations Assessment.

Formula for calculating percentage attainment of each course outcome

Based on the result of Summative Examinations and Internal Assessment tools, the number of students scoring more than the target is found out.

For each Internal Assessment Tools,

$$\text{Percentage attainment of each course outcome} = \frac{\text{No. of. Students who scored more than the target in the concerned course outcome}}{\text{Total Number of Students}} \times 100$$

Percentage attainment of each Course outcome for Internal Assessment tools = Average of percentage attainment of all Internal Assessment tools

For Summative Examinations,

$$\text{Percentage attainment of each Course outcome} = \frac{\text{No. of. Students who scored more than the target in the concerned CO}}{\text{Total Number of Students}} \times 100$$

Formula for calculating Attainment Percentage of Course outcome of a course

Percentage Attainment of Course outcome for Internal Assessment tools = Average of percentage attainment of all COs

Percentage Attainment of Course outcome for Summative Examinations = Average of percentage attainment of all COs

Final Direct Assessment of Course outcome Attainment

For Theory Courses

Percentage Attainment of Course outcome through Direct Assessment = (0.6 x percentage attainment of CO for internal assessment tool) + (0.4 x percentage attainment of CO for summative examinations)

For Practical Courses

Percentage Attainment of Course outcome through Direct Assessment = 0.7 x percentage attainment of CO for Internal Assessment tools + 0.3 x percentage attainment of CO for Summative Examinations

Indirect Assessment of CO Attainment

The course outcome feedback is conducted at the end of every semester by distributing structured feedback questionnaire to the students. The analysis of this feedback questionnaire is done on the following score. The feedback forms will be sorted with various scores and feedbacks with a score more than 5.5 are considered as satisfactory level for calculations for indirect attainment.

A : 10-8.5 **B :** 8.4-7.0 **C :** 6.9-5.5 **D :** 5.4-4.0 **E :** 3.9-0

$$\text{Percentage attainment for each CO} = \frac{\text{Satisfaction Number}}{\text{Response Received}} \times 100$$

Percentage Attainment of CO of a course = Average of percentage attainment of all COs

Final Assessment of CO attainment

Average course attainment = 0.7 x Direct assessment of CO attainment + 0.3 x Indirect assessment of CO attainment

Expected Level of Attainment for each of the Course Outcomes

Percentage of CO Attainment	Level of Attainment
= 70% and above	Excellent
= 60 - <70 %	Very good
= 50 - <60 %	Good
= 40 - <50 %	Satisfactory
Below 40%	Not Satisfactory

Assessment of PO attainment

At the end of the each programme, the Direct PO Assessment is done from the CO Attainment of all courses. The Direct PO Attainment for a particular course is determined from the attainment values obtained for each course outcome related to that PO and the CO-PO mapping values.

Weighted contribution of the course in attainment of each PO $= \frac{\text{Weighted Percentage of contribution of the course in attainmentof each PO x average course attainment}}{100}$

Percentage attainment for each PO $= \frac{\text{Total weightage of all courses contributed to each PO}}{\text{Total weightage of all courses contributed to all POs}} \times 100$ x weighted contribution of the course in the attainment of each PO

Percentage Attainment of PO = Average of Percentage attainment of all POs

Expected Level of Attainment for each of the Programme Outcomes

Percentage of PO Attainment	Level of Attainment
= 70% and above	Excellent
= 60 - <70 %	Very good
= 50 - <60 %	Good
= 40 - <50 %	Satisfactory
Below 40%	Not Satisfactory

Attainment of Programme Educational Objectives (PEO)

PEOs are assessed after 3 to 4 years of graduation. Attainment is measured based on the Feedback from Stakeholders

1. Alumni
2. Parents
3. Employer

The analysis of this feedback questionnaire is done on the following score. The feedback forms will be sorted with various scores and feedbacks with a score more than 5.5 are considered as satisfactory level for calculations for Indirect Attainment.

A : 10-8.5 **B :** 8.4-7.0 **C :** 6.9-5.5 **D :** 5.4-4.0 **E :** 3.9-0

$$\text{Percentage attainment of PEOs} = \frac{\text{Satisfaction number}}{\text{Response Received}} \times 100$$

Expected Level of Attainment for each of the Programme Educational Objectives

Percentage of PEO Attainment	Level of Attainment
= 70% and above	Excellent
= 60 - <70 %	Very good
= 50 - <60 %	Good
= 40 - <50 %	Satisfactory
Below 40%	Not Satisfactory

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DEPARTMENT OF CHEMISTRY

PG Programme - M.Sc. Chemistry

CURRICULUM STRUCTURE

OUTCOME-BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM

(From 2023-2024 Batch onwards)

Courses	Sem I	Sem II	Sem III	Sem IV	Credits
Core Courses	7 (5) 7 (5) 6P (4)	6 (5) 6 (5) 6P (4)	6 (5) 6 (5) 6P (5) 6P (4)	6 (5) 6 (5)	57
Project with Viva Voce	-	-	-	10 (7)	7
Elective Courses	5 (3) 5 (3)	4 (3) 4 (3) 4(2)(NME-I)	3 (3) 3(2)(NME-II)	4(3)	22
Skill Enhancement Course/ Professional Competency Skill	-	-	-	4 (2)	2
Internship/ Industrial Training	-	-	(2)	-	2
Extension Activity	-	-	-	(1)	1
Total Hours(Per week)/Credits	30(20)	30(22)	30(26)	30(23)	91 120

Self-paced Learning (Swayam Course)	-	-	2 Credits	-	2 Credits

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DEPARTMENT OF CHEMISTRY

PG Programme - M.Sc. Chemistry

CURRICULUM PATTERN

OUTCOME-BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM

(From 2023-2024 Batch onwards)

PROGRAMME CODE –PCH

Semester	Course Code	Course Name	Hours	Credits	Internal Marks	External Marks
I	23PCHC11	**Core Course - I:** Organic Reaction Mechanism -I	7	5	25	75
	23PCHC12	**Core Course - II:** Structure and Bonding in Inorganic Compounds	7	5	25	75
	23PCHC1P	**Core Course - III:** Practical: Organic Chemistry	6	4	25	75
	23PCHO11 23PCHO12	**Elective Courses Generic/ Discipline Specific - I:** 1. Pharmaceutical Chemistry 2. Nanomaterials and Nanotechnology	5	3	25	75
	23PCHO13 23PCHO14	**Elective Courses Generic/ Discipline Specific - II:** 1. Electrochemistry 2. Molecular Spectroscopy	5	3	25	75
		Total	**30**	**20**		
II	23PCHC21	**Core Course - IV:** Organic Reaction Mechanism - II	6	5	25	75
	23PCHC22	**Core Course - V:** Physical Chemistry - I	6	5	25	75
	23PCHC2P	**Core Course - VI**: Practical: Inorganic Chemistry	6	4	25	75
	23PCHO21 23PCHO22	**Elective Courses Generic/ Discipline Specific - III:** 1. Medicinal Chemistry 2. Green Chemistry	4	3	25	75
	23PCHO23 23PCHO24	**Elective Courses Generic/ Discipline Specific - IV:** 1. Bio-Inorganic Chemistry 2. Material Science	4	3	25	75
	23PCHN21	**Non-Major Elective Course - I**: Chemistry In Food Preservation	4	2	25	75
		Total	**30**	**22**		
	23PCHC31	**Core Course - VII:** Organic Synthesis and	6	5	25	75

		Photochemistry				
	23PCHC32	**Core Course - VIII:** Coordination Chemistry - I	6	5	25	75
	23PCHC3P	**Core Course - IX:** Practical: Physical Chemistry	6	5	25	75
III	23PCHC3Q	**Core Course - X:** Practical: Analytical Instrumentation techniques	6	4	25	75
	23PCHO31 23PCHO32	**Elective Courses Generic/ Discipline Specific - V:** 1. Pharmacognosy and Phytochemistry 2. Biomolecules and Heterocyclic Compounds	3	3	25	75
	23PCHN31	**Non-Major Elective Course - II**: Chemistry of Consumer Products	3	2	25	75
	23PCHJ31	Internship/Industrial Training	-	2	25	75
		Total	**30**	**26**		
	23PCHC41	**Core Course - XI:** Coordination Chemistry - II	6	5	25	75
	23PCHC42	**Core Course - XII:** Physical Chemistry - II	6	5	25	75
	23PCHJ41	**Core Course - XIII:** Project with Viva Voce	10	7	25	75
IV	23PCHO41 23PCHO42	**Elective Courses Generic/ Discipline Specific - VI:** 1. Chemistry of Natural Products 2. Polymer Chemistry	4	3	25	75
	23PCHS41	**Skill Enhancement Course**: **Professional Competency Course:** Chemistry for Competitive Examinations	4	2	100	-
		Extension Activity	-	1	100	-
		Total	**30**	**23**		

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DEPARTMENT OF CHEMISTRY

PG Programme - M.Sc. Chemistry

OUTCOME-BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM

(From 2023-2024 Batch onwards)

PROGRAMME ARTICULATION MATRIX (PAM)

Semester	Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7
I	23PCHC11	**Core Course - I:** Organic Reaction Mechanism -I	15	13	10	07	02	07	07
	23PCHC12	**Core Course - II:** Structure and Bonding in Inorganic Compounds	14	14	10	07	03	07	07
	23PCHC1P	**Core Course - III:** Practical: Organic Chemistry	15	13	11	05	06	06	07
	23PCHO11 23PCHO12	**Elective Courses Generic/ Discipline Specific - I:** 1. Pharmaceutical Chemistry 2. Nanomaterials and Nanotechnology	12	11	08	05	04	03	03
	23PCHO13 23PCHO14	**Elective Courses Generic/ Discipline Specific - II:** 1. Electrochemistry 2. Molecular Spectroscopy	13	11	09	05	04	04	05
II	23PCHC21	**Core Course - IV:** Organic Reaction Mechanism - II	15	13	09	05	04	04	03
	23PCHC22	**Core Course - V:** Physical Chemistry - I	15	13	10	05	04	03	03
	23PCHC2P	**Core Course - VI**: Practical: Inorganic Chemistry	15	14	10	05	07	05	06
	23PCHO21 23PCHO22	**Elective Courses Generic/ Discipline Specific - III:** 1. Medicinal Chemistry 2. Green Chemistry	13	09	08	07	03	07	07
	23PCHO23 23PCHO24	**Elective Courses Generic/ Discipline Specific - IV:** 1. Bio-Inorganic Chemistry 2. Material Science	13	10	08	07	06	04	06
	23PCHN21	**Non-Major Elective Course - I**: Chemistry In Food Preservation	12	07	04	09	03	07	07

III	23PCHC31	**Core Course - VII:** Organic Synthesis and Photochemistry	15	13	11	05	04	05	04
	23PCHC32	**Core Course - VIII:** Coordination Chemistry - I	15	13	10	06	05	04	04
	23PCHC3P	**Core Course - IX:** Practical: Physical Chemistry	15	14	12	08	06	06	07
	23PCHC3Q	**Core Course - X:** Practical: Analytical Instrumentation techniques	15	14	12	08	06	07	07
	23PCHO31 23PCHO32	**Elective Courses Generic/ Discipline Specific - V:** 1. Pharmacognosy and Phytochemistry 2. Biomolecules and Heterocyclic Compounds	12	10	07	06	04	03	07
	23PCHN31	**Non-Major Elective Course - II**: Chemistry of Consumer Products	11	08	07	07	03	07	07
	23PCHJ31	Internship/Industrial Training	08	12	04	07	01	05	08
IV	23PCHC41	**Core Course - XI:** Coordination Chemistry - II	15	13	11	07	04	05	05
	23PCHC42	**Core Course - XII:** Physical Chemistry - II	15	13	10	06	05	04	04
	23PCHJ41	**Core Course - XIII:** Project with Viva Voce	14	10	11	12	06	05	05
	23PCHO41 23PCHO42	**Elective Courses Generic/ Discipline Specific - VI:** 1. Chemistry of Natural Products 2. Polymer Chemistry	12	10	08	05	05	06	05
	23PCHS41	**Skill Enhancement Course**: **Professional Competency Course:** Chemistry for Competitive Examinations	10	09	07	06	06	07	07
		Extension Activity	08	02	01	07	09	08	05
Total Weightage of all Courses Contributing to PO			**317**	**269**	**208**	**157**	**110**	**129**	**136**

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DEPARTMENT OF CHEMISTRY

PG Programme - M.Sc. Chemistry

OUTCOME-BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM

(From 2023-2024 Batch onwards)

PROGRAMME ARTICULATION MATRIX – WEIGHT PERCENTAGE

Semester	Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7
I	23PCHC11	**Core Course - I:** Organic Reaction Mechanism -I	4.73	4.83	4.81	4.46	1.82	5.43	5.15
	23PCHC12	**Core Course - II:** Structure and Bonding in Inorganic Compounds	4.42	5.2	4.81	4.46	2.73	5.43	5.15
	23PCHC1P	**Core Course - III:** Practical: Organic Chemistry	4.73	4.83	5.29	3.18	5.45	4.65	5.15
	23PCHO11 23PCHO12	**Elective Courses Generic/ Discipline Specific - I:** 1. Pharmaceutical Chemistry 2. Nanomaterials and Nanotechnology	3.79	4.09	3.85	3.18	3.64	2.33	2.21
	23PCHO13 23PCHO14	**Elective Courses Generic/ Discipline Specific - II:** 1. Electrochemistry 2. Molecular Spectroscopy	4.1	4.09	4.33	3.18	3.64	3.1	3.68
II	23PCHC21	**Core Course - IV:** Organic Reaction Mechanism - II	4.73	4.83	4.33	3.18	3.64	3.1	2.21
	23PCHC22	**Core Course - V:** Physical Chemistry - I	4.73	4.83	4.81	3.18	3.64	2.33	2.21
	23PCHC2P	**Core Course - VI**: Practical: Inorganic Chemistry	4.73	5.2	4.81	3.18	6.36	3.88	4.41
	23PCHO21 23PCHO22	**Elective Courses Generic/ Discipline Specific - III:** 1. Medicinal Chemistry 2. Green Chemistry	4.1	3.35	3.85	4.46	2.73	5.43	5.15
	23PCHO23 23PCHO24	**Elective Courses Generic/ Discipline Specific - IV:** 1. Bio-Inorganic Chemistry 2. Material Science	4.1	3.72	3.85	4.46	5.45	3.1	4.41
	23PCHN21	**Non-Major Elective Course - I**: Chemistry In Food Preservation	3.79	2.6	1.92	5.73	2.73	5.43	5.15

III	23PCHC31	**Core Course - VII:** Organic Synthesis and Photochemistry	4.73	4.83	5.29	3.18	3.64	3.88	2.94
	23PCHC32	**Core Course - VIII:** Coordination Chemistry - I	4.73	4.83	4.81	3.82	4.55	3.1	2.94
	23PCHC3P	**Core Course - IX:** Practical: Physical Chemistry	4.73	5.2	5.77	5.1	5.45	4.65	5.15
	23PCHC3Q	**Core Course - X:** Practical: Analytical Instrumentation techniques	4.73	5.2	5.77	5.1	5.45	5.43	5.15
	23PCHO31 23PCHO32	**Elective Courses Generic/ Discipline Specific - V:** 1. Pharmacognosy and Phytochemistry 2. Biomolecules and Heterocyclic Compounds	3.79	3.72	3.37	3.82	3.64	2.33	5.15
	23PCHN31	**Non-Major Elective Course - II**: Chemistry of Consumer Products	3.47	2.97	3.37	4.46	2.73	5.43	5.15
	23PCHJ31	Internship/Industrial Training	2.52	4.46	1.92	4.46	0.91	3.88	5.88
IV	23PCHC41	**Core Course - XI:** Coordination Chemistry - II	4.73	4.83	5.29	4.46	3.64	3.88	3.68
	23PCHC42	**Core Course - XII:** Physical Chemistry - II	4.73	4.83	4.81	3.82	4.55	3.1	2.94
	23PCHJ41	**Core Course - XIII:** Project with Viva Voce	4.42	3.72	5.29	7.64	5.45	3.88	3.68
	23PCHO41 23PCHO42	**Elective Courses Generic/ Discipline Specific - VI:** 1. Chemistry of Natural Products 2. Polymer Chemistry	3.79	3.72	3.85	3.18	4.55	4.65	3.68
	23PCHS41	**Skill Enhancement Course**: **Professional Competency Course:** Chemistry for Competitive Examinations	3.15	3.35	3.37	3.82	5.45	5.43	5.15
		Extension Activity	2.52	0.74	0.48	4.46	8.18	6.2	3.68
Total Weightage of all Courses Contributing to PO			**100**	**100**	**100**	**100**	**100**	**100**	**100**

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry
SEMESTER - I
CORE COURSE – I: ORGANIC REACTION MECHANISM - I (23PCHC11)
(From 2023-2024 Batch onwards)

HOURS/WEEK: 7 (L-6, T-1) **INT. MARKS: 25**
CREDITS : 5 **EXT. MARKS: 75**
DURATION : 105 hrs **MAX. MARKS: 100**

Course Objectives

- To understand the feasibility and the mechanism of various organic reactions.
- To comprehend the techniques in the determination of reaction mechanisms.
- To understand the concept of stereochemistry involved in organic compounds.
- To correlate and appreciate the differences involved in the various types of organic reaction mechanisms.
- To design feasible synthetic routes for the preparation of organic compounds.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K2]: explain reaction mechanism , principles of organic chemistry

CO2[K3]: determine reaction mechanism, substitution reaction and stereochemistry of organic molecules

CO3[K4]: compare the reaction mechanism, substituent effect in aromaticity and aliphatic compounds and stereochemistry

CO4[K5]: interpret the principles of kinetic and non- kinetic methods, mechanism of electrophilic and nucleophilic substitution reaction, racemization, Crams-Prelog rule, ORD, cotton effect, Hammett principle and asymmetric synthesis

CO5[K6]: predict reaction intermediates, synthesize organic compounds, electrophilic, nucleophilic substitution – aromatic & aliphatic compounds and stereochemistry to propose a mechanism for the given reaction.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	3	1	1	-	1	1
CO2[K3]	3	2	1	2	-	1	1
CO3[K4]	3	3	2	2	-	1	1
CO4[K5]	3	3	3	1	1	2	2
CO5[K6]	3	2	3	1	1	2	2
Weightage of the course	15	13	10	07	02	07	07
Weighted percentage of Course contribution to POs	**4.73**	**4.83**	**4.81**	**4.46**	**1.82**	**5.43**	**5.15**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I – METHODS OF DETRMINATION OF REACTION MECHANISM (21 hrs)

Reaction Intermediates, the Transition State, Reaction Coordinate Diagrams, Thermodynamic and Kinetic Requirements of Reaction: Hammond Postulate. Methods of Determining Mechanism: Non-Kinetic Methods – Product Analysis, Determination of Intermediates – Isolation, Detection and Trapping Cross – Over Experiments, Isotopic Labeling, Isotopic Effects and Stereo Chemical Evidences. Kinetic Methods – Relation of Rate and Mechanism. Effect of Structure on Reactivity: Hammett and Taft Equations, Linear Free Energy Relationship, Partial Rate Factor, Substituent and Reaction Constants.

UNIT II - AROMATIC AND ALIPHATIC ELECTROPHILIC SUBSTITUTION (21 hrs)

Aromaticity: Aromaticity in Benzenoid, Non-Benzenoid – Heterocyclic Compunds and Annulenes. Aromatic Electrophilic Substitution: Orientation and Reactivity of Di and Polysubstituted Phenol, Nitrobenzene and Halobenzene. Reactions Involving Nitrogen Electrophiles: Sulphonation; Halogen Electrophiles: Chlorination and Bromination; Carbon Elecrophiles: Friedel-Craft's Alkylation, Acylation and Arylation Reactions. Aliphatic Electrophilic Substitution Mechanims: S_E2 and S_Ei, S_E1 – Mechanism and Evidences.

UNIT III – AROMATIC AND ALIPHATIC NUCLEOPHILIC SUBSTITUTION (21 hrs)

Aromatic Nucleophilic Substitution: Mechanisms – S_NAr, S_N1 and Benzyne Mechanisms – Evidences- Reactivity, Effect of Structure, Leaving Group and Attacking Nucleophile. Reactions: Oxygen and Sulphur – Nucleophiles, Bucherer

and Rosenmund Reactions, Von Richter, Sommelt – Hauser and Smiles Rearrangements. S_N1 Ion Pair, S_N2, Mechanisms and Evidences. Aliphatic Nucleophilic Substitution at an Allylic Carbon, Aliphatic Trigonal Carbon and Vinyl Carbon. S_N1, S_N2 S_Ni and S_E1 Mechanisms and Evidences, Swain – Scott, Grunwald – Winstein Relationship – Ambident Nucleophiles.

UNIT IV- STEREOCHEMISTRY -I (21 hrs)

Introduction to Molecular Symmetry and Chirality – Axis, Plane, Center, Alternating Axis of Symmetry. Optical Isomerism Due to Asymmetric and Dissymetric Molecules With C, N, S Based Chiral Centers. Optical Purity, Prochirality, Enantitropic and Diastereotropic Atoms, Groups, Faces, Axial and Planar Chirality, Chrality due to Helical Shape, Methods of Determining the Configuration. Racemic Modifications: Racemization by Thermal, Anion, Cation, Reversible Formation, Epimerization, Mutarotation. D, L System, Cram's and Prelog's Rules: R, S- Notations, Porr, Pros, Side Phase and Re Phase Cahn – Ingold – Prelog's Rules, Absolute and Relative Configurations. Configurations of Alkenes, Spiranes, Biphenyls, Cyclooctene, Helicene, Binaphthyls, Ansa and Prostereoisomerism, Chiral Shift Reagents and Chiral Solvating Reagents. Criteria for Optical Purity: Resolution of Racemic Modifications, Asymmetric Transformations, Asymmetric Synthesis, Destruction. Stereoselective and Stereospecific Synthesis.

UNIT V – STEREOCHEMISTRY – II (21 hrs)

Conformation and Reactivity of Acyclic Systems, Intramolecular Rearrangements, Neighboring Group Participation, Chemical Consequences of Conformational Equilibrium – Curtin – Hammett Principle. Stability of Five and Six – Membered Rings: Mono-, Di- and Polysubstituted Cyclohexanes, Conformation and Reactivity in Cyclohexane Systems. Fused and Bridged Rings: Bicyclic, Poly Cyclic Systems, Decalins and Brett's Rule. Optical Rotation and Optical Rotatory Dispersion, Conformational Asymmetry, ORD Curves, Octant Rule, Configuration and Conformation, Cotton Effect, Axial Haloketone Rule and Determination of Configuration.

TEXTBOOKS

1. March J and Smith M, *Advanced Organic Chemistry,* 5th Edition, John Wiley & Sons, 2001.
2. Gould E. S, *Mechanism and Structure in Organic* Chemistry, Holt, Rinehart and Winston Inc, 1959.
3. Kalsi P. S, *Stereochemistry of Carbon Compounds*, 8th Edition, New Age International Publishers, 2015.
4. Bruice P. Y, *Organic Chemistry,* 7th Edition, Prentice Hall, 2013.

5. Clayden J, Greeves N and Warren S, *Organic Chemistry.* Oxford University Press, 2nd Edition, 2014.

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1. Carey F. A and Sundberg R. J. *Advanced Organic Chemistry Part – A and B*, 5th Edition, Kluwer Academic/ Plenum Publishers, 2007.
2. Morris D. G, *Stereochemistry*, *RSC Tutorial Chemisry Text 1,* 2001.
3. Isaacs N. S, *Physical Organic Chemistry,* ELBS, Longman, UK, 1987.
4. Eliel E. L, *Stereochemistry of Carbon Compounds,* Tata- McGraw Hill, 2000.
5. Finar I. L, Organic Chemistry. *Vol -1 & 2,* 6th Edition. Pearson Education: Asia, 2004.

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1. https://sites.google.com/site/chemistryebookscollection02/home/organic-chemistry/organic
2. https://www.organic-chemistry.org/
3. https://youtu.be/_gJcWRbF1Tk
4. https://youtu.be/mf3vgIZlQMQ
5. https://youtu.be/e9-N-F2reOE

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry
SEMESTER - I
CORE COURSE – II: STRUCTURE AND BONDING IN INORGANIC COMPOUNDS (23PCHC12)
(From 2023-2024 Batch onwards)

HOURS/WEEK: 7 (L-6, T-1) **INT. MARKS: 25**
CREDITS : 5 **EXT. MARKS: 75**
DURATION : 105 hrs **MAX. MARKS: 100**

Course Objectives

- To determine the structural properties of main group compounds and clusters.
- To gain fundamental knowledge on the structural aspects of ionic crystals.
- To familiarize various diffraction and microscopic techniques.
- To study the effect of point defects and line defects in ionic crystals.
- To evaluate the structural aspects of solids.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K2]: express the various theories in bonding, clusters and solid state chemistry

CO2[K3]: employ the theories, concept of packing and various characterization techniques in the crystals and cages.

CO3[K4]: analyze the ionic crystals by the XRD, SEM, TEM, structure of ionic soils and cages and defects in crystals

CO4[K5]: interpret the solid state compounds, silicones and clusters.

CO5[K6]: discuss the various concepts in solid state and cluster compounds

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	3	1	1	-	1	1
CO2[K3]	3	3	1	2	-	1	1
CO3[K4]	3	3	2	2	1	1	1
CO4[K5]	3	3	3	1	1	2	2
CO5[K6]	2	2	3	1	1	2	2
Weightage of the course	14	14	10	07	03	07	07
Weighted percentage of Course contribution to POs	**4.42**	**5.2**	**4.81**	**4.46**	**2.73**	**5.43**	**5.15**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I – STRUCTURE OF MAIN GROUP COMPOUNDS AND CLUSTERS (21 hrs)

VB Theory – Effect of Lone Pair and Electronegativity of Atoms (Bent's Rule) on The Geometry of the Molecules; Structure of Silicates – Applications of Paulings Rule of Electrovalence – Isomorphous Replacements in Silicates – Ortho, Meta and Pyro Silicates – One Dimensional, Two Dimensional and Three-Dimensional Silicates. Structure of Silicones, Structural and Bonding Features of B-N, S-N And P-N Compounds; Poly Acids – Types, Examples and Structures; Borane Cluster: Structural Features of Closo, Nido, Arachano and Klado; Carboranes, Hetero and Metalloboranes; Wade's Rule to Predict the Structure of Borane Cluster; Main Group Clusters – Zintl Ions and Mno Rule.

UNIT II – SOLID STATE CHEMISTRY - I (21 hrs)

Ionic Crystals: Packing of Ions in Simple, Hexagonal and Cubic Close Packing, Voids in Crystal Lattice, Radius Ratio, Crystal Systems and Bravis Lattices, Symmetry Operations in Crystals, Glide Planes And Screw Axis; Point Group and Space Group; Solid State Energetics: Lattice Energy – Born-Lande Equation – Kapustinski Equation, Madelung Constant.

UNIT III – SOLID STATE CHEMISTRY - II (21 hrs)

Structural Features of the Crystal Systems: Rock Salt, Zinc Blende & Wurtzite, Fluorite and Anti-Fluorite, Rutile and Anatase, Cadmium Iodide and Nickel Arsenide; Spinels -Normal and Inverse Types And Perovskite Structures. Crystal Growth Methods: from Melt and Solution (Hydrothermal, Sol-Gel Methods) – Principles and Examples.

UNIT IV – TECHNIQUES IN SOLID STATE CHEMISTRY (21 hrs)

X-Ray Diffraction Technique: Bragg's Law, Powder Diffraction Method – Principle and Instrumentation; Interpretation of XRD Data – JCPDS Files, Phase Purity, Scherrer Formula, Lattice Constants Calculation; Systematic Absence of Reflections; Electron Diffraction Technique – Principle, Instrumentation and Application. Electron Microscopy – Difference Between Optical and Electron Microscopy, Theory, Principle, Instrumentation, Sampling Methods and Applications of SEM and TEM.

UNIT V – BAND THEORY AND DEFECTS IN SOLIDS (21 hrs)

Band Theory – Features and its Application of Conductors, Insulators and Semiconductors, Intrinsic and Extrinsic Semiconductors; Defects in Crystals – Point Defects (Schottky, Frenkel, Metal Excess and Metal Deficient) and their Effect on the Electrical and Optical Property, Laser and Phosphors; Linear Defects and its Effects Due to Dislocations.

TEXTBOOKS

1. West A. R, *Solid State Chemistry and its applications,* 2nd Edition, John Wiley & Sons Ltd, 2014.
2. Bhagi A. K and Chatwal G. R, *A Textbook of Inorganic Polymers*, Himalaya Publishing House, 2001.
3. Smart L. S, Moore E, *Solid state Chemistry – An Introduction, 4*th Edition, CRC Press, 2012.
4. Purcell K. F and Kotz J. C, *Inorganic Chemistry*, W. B. Saunders Company: Philadelphia, 1977.
5. Huheey J. E, Keiter E. A and Keiter R. L, *Inorganic Chemistry, 4*th Edition, Harper and Row: New York, 1983.

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1. Douglas D. E, McDaniel D. H and Alexander J. J, 3rd Edition, *Concepts and Models in Inorganic Chemistry*, 1994.
2. Tilley R. J. D, *Understanding Solids - The Science of Materials*, 2nd Edition, Wiley Publication, 2013.
3. Rao C N R and Gopalakrishnan J, *New Directions in Solid State Chemistry*, 2nd Edition, Cambridge University Press, 199.
4. Moeller T, *Inorganic Chemistry, A Modern Introduction*; John Wiley: New York, 1982.
5. Shriver D. F, Atkins P. W and Langford C. H, *Inorganic Chemistry,* 3rd Edition, Oxford University Press: London, 2001.

Web Source

1. https://ocw.mit.edu/courses/3-091-introduction-to-solid-state chemistry-fall-2018/video_galleries/lecture-videos/

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry
SEMESTER - I
CORE COURSE – III: PRACRICAL: ORGANIC CHEMISTRY (23PCHC1P)
(From 2023-2024 Batch onwards)

HOURS/WEEK: 6 (L-5, T-1) **INT. MARKS: 25**
CREDITS : 4 **EXT. MARKS: 75**
DURATION : 90 hrs **MAX. MARKS: 100**

Course Objectives

- To understand the concept of separation, qualitative analysis and preparation of organic compounds.
- To develop analytical skill in the handling of chemical reagents for separation of binary and ternary organic mixtures.
- To analyze the separated organic components systematically and derivatize them suitably.
- To construct suitable experimental setup for the organic preparations involving two stages.
- To experiment different purification and drying techniques for the compound processing.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K2]: explain separation of organic mixture by chemical method
CO2[K3]: perform organic analysis and preparation by following systematic procedure
CO3[K4]: analyze organic compounds by qualitative and quantitative methods
CO4[K5]: decide synthetic route for the preparation of organic compounds by multistep synthesis
CO5[K6]: assemble principles of volumetric analysis for the quantitative estimation of organic compounds.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	2	1	1	2	1
CO2[K3]	3	2	2	1	1	1	2
CO3[K4]	3	3	2	1	1	1	1
CO4[K5]	3	3	2	1	1	1	1
CO5[K6]	3	3	3	1	2	1	2
Weightage of the course	15	13	11	05	06	06	07
Weighted percentage of Course contribution to POs	**4.73**	**4.83**	**5.29**	**3.18**	**5.45**	**4.65**	**5.15**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I – SEPARATION AND ANALYSIS **(30 hrs)**

A. Two Component Mixtures.
B. Three Component Mixtures.

UNIT II – ESTIMATIONS **(30 hrs)**

1. Estimation of Phenol (Bromination)
2. Estimation of Aniline (Bromination)
3. Estimation of Ethyl methyl ketone (Iodimetry)
4. Estimation of Glucose (Redox)
5. Estimation of Ascorbic acid (Iodimetry)
6. Estimation of Aromatic nitro groups (Reduction)
7. Estimation of Glycine (Acidimetry)
8. Estimation of Formalin (Iodimetry)
9. Estimation of Acetyl Group in Ester (Alkalimetry)
10. Estimation of Hydroxyl Group (Acetylation)
11. Estimation of Amino Group (Acetylation)

UNIT III – TWO STAGE PREPARATIONS **(30 hrs)**

1. p-Bromoacetanilide from Aniline
2. p-Nitroaniline from Acetanilide
3. 1,3,5-Tribromobenzene from Aniline
4. Acetyl salicyclic acid from Methyl Salicylate
5. Benzilic acid from Benzoin
6. m-Nitroaniline from Nitrobenzene
7. m-Nitrobenzoic acid from Methyl Benzoate

REFERENCE

Book

1. Furniss B. S, Hannford A. J, Smith P. W. G and Tatchell A. R, *Vogel's Textbook of Practical organic chemistry.* 5th Edition, England: Longman Scientific and Technical, 1989.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry
SEMESTER - I
ELECTIVE COURSE GENERIC/ DISCIPLINE SPECIFIC – I: PHARMACEUTICAL CHEMISTRY (23PCHO11)
(From 2023-2024 Batch onwards)

HOURS/WEEK: 5 (L-4, T-1) **INT. MARKS: 25**
CREDITS : 3 **EXT. MARKS: 75**
DURATION : 75 hrs **MAX. MARKS: 100**

Course Objectives

- To understand the advanced concepts of pharmaceutical chemistry.
- To recall the principle and biological functions of various drugs.
- To train the students to know the importance as well the consequences of various drugs.
- To have knowledge on the various analysis and techniques.
- To familiarize on the drug dosage and its structural activities.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K2]: express the principles and applications of isotopic dilution analysis and drug dosage, product development in pharmaceutical chemistry.

CO2[K3]: draw the structures of various drugs used in isotopic dilution analysis, drug dosage and development of new drugs in pharmaceutical chemistry .

CO3[K4]: classify the dosage form based on their drug dosage and product development, properties of drugs

CO4[K5]: appraise the use of various drugs by its action of computers in pharmaceutical chemistry

CO5[K6]: develop the new drugs and pharmaceutical products

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	2	1	1	-	-	1
CO2[K2]	3	2	1	1	1	-	-
CO3[K3]	2	2	2	1	1	1	1
CO4[K4]	2	3	2	1	1	1	-
CO5[K5]	2	2	2	1	1	1	1
Weightage of the course	12	11	08	05	04	03	03
Weighted percentage of Course contribution to POs	**3.79**	**4.09**	**3.85**	**3.18**	**3.64**	**2.33**	**2.21**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I – PHYSICAL PROPERTIES IN PHARMACEUTICALS (15 hrs)

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.

UNIT II – ISOTOPIC DILUTION ANALYSIS (15 hrs)

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 – Partition Coefficient, Solubility, Surface Activity, Degree of Ionization.

UNIT III – DRUG DOSAGE AND PRODUCT DEVELOPMENT (15 hrs)

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.

UNIT IV – DEVELOPMENT OF NEW DRUGS (15 hrs)

Introduction, Procedure Followed in Drug Design, the Research tor 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.

UNIT V- COMPUTERS IN PHARMACEUTICAL CHEMISTRY (15 hrs)

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, Numerical Differentiation and Integrations.

TEXTBOOKS

1. Chatwal G. R, *Medicinal Chemistry*, 2nd Edition, Himalaya Publishing House, 2002.
2. Jeyashree Ghosh, *A Text Book of Pharmaceutical Chemistry*, 3rd Edition, New Delhi: S. Chand & Company LTD, 2003.
3. Raman K. V, *Computers in Chemistry,* Tata McGraw-Hill, 1993.

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1. Partrick G. L, *An introduction to Medicinal Chemistry*. II, Oxford University Press, 2001.
2. Nagradi T, *Medicinal Chemistry-A Biochemical Approach*, Oxford University Press, 2004.
3. Taylor J. B and Kennewell P. D, *Introductory Medicinal Chemistry*, Ellisworth Publishers, 1985.

4. Pundir S. K, Anshu Bansal, Pragate Prakashan A, *Computers for Chemistry,* 2nd Edition, New Age International (P) Limited : New Delhi.

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2. https://www.youtube.com/watch?v=iayAqsXdTzc
3. https://www.youtube.com/watch?v=ArqFVMMmmw4

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry
SEMESTER - I
ELECTIVE COURSE GENERIC/ DISCIPLINE SPECIFIC – I: NANOMATERIALS AND NANOTECHNOLOGY (23PCHO12)
(From 2023-2024 Batch onwards)

HOURS/WEEK: 5 (L-4, T-1) **INT. MARKS: 25**
CREDITS : 3 **EXT. MARKS: 75**
DURATION : 75 hrs **MAX. MARKS: 100**

Course Objectives

- To understand the concept of nano materials and nano technology.
- To understand the various types of nano materials and their properties.
- To understand the applications of synthetically important nano materials.
- To correlate the characteristics of various nano materials synthesized by new technologies.
- To design synthetic routes for synthetically used new nano materials.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K2]: describe the various concepts in nanotechnology, synthesis, properties, characterization

CO2[K3]: interpret the properties of semiconductor nanomaterials , nanocomposite, synthesis, applications, characterization

CO3[K4]: outline the concepts of nanotechnolgical synthesis, properties, nanocomposites, applications

CO4[K5]: assess the features of nanotechnology in synthesis, properties, nanocomposite and characterization

CO5[K6]: adapt and understand the approaches of synthesis, properties, application, characterization of nano in new technology.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	1	1	-	-	1
CO2[K3]	3	2	1	1	1	-	-
CO3[K4]	2	2	2	1	1	1	1
CO4[K5]	2	3	2	1	1	1	-
CO5[K6]	2	2	2	1	1	1	1
Weightage of the course	12	11	08	05	04	03	03
Weighted percentage of Course contribution to POs	**3.79**	**4.09**	**3.85**	**3.18**	**3.64**	**2.33**	**2.21**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I– NANOTECHNOLOGY (15 hrs)

Introduction of Nanomaterials and Nanotechnologies, Introduction-Role of Size, Classification – 0D, 1D, 2D, 3D. Synthesis – Bottom-Up, Top-Down, Consolidation of Nano Powders. Features of Nanostructures, Background of Nanostructures. Techniques of Synthesis of Nanomaterials, Tools of the Nanoscience. Applications of Nanomaterials and Technologies**.**

UNIT II – SYNTHESIS OF NANOPARTCLE (15 hrs)

Bonding and structure of the Nanomaterials, Predicting the Type of Bonding in a Substance Crystal Structure. Metallic Nanoparticles, Surfaces of Materials, Nanoparticle Size and Properties. Synthesis – Physical and Chemical Methods - Inert Gas Condensation, Arc Discharge, Laser Ablation, Sol-Gel, Solvothermal and Hydrothermal – CVD – Types, Metallo Organic, Plasma Enhanced, and Low-Pressure CVD. Microwave Assisted and Electrochemical Synthesis.

UNIT III – PROPERTIES (15 hrs)

Mechanical Properties of Materials, Theories Relevant to Mechanical Properties. Techniques to Study Mechanical Properties of Nanomaterials, Adhesion and Friction, Thermal Properties of Nanomaterials Nanoparticles: Gold and Silver, Metal Oxides: Silica, Iron Oxide and Alumina – Synthesis and Properties.

UNIT IV– NANOMATERIAL (15 hrs)

Electrical Properties, Conductivity and Resistivity, Classification of Materials Based on Conductivity, Magnetic Properties, Electronic Properties of Materials. Classification of Magnetic Phenomena. Semiconductor Materials – Classification – Ge, Si, GaAs, SiC, GaN, GaP, CdS,PbS. Identification of Materials as p- and n-Type Semiconductor – Hall Effect – Quantum and Anomalous, Hall Voltage – Interpretation of Charge Carrier Density. Applications of Semiconductors: p-n Junction as Transistors and Rectifiers, Photovoltaic and Photogalvanic Cell.

UNIT V– NANOCOMPOSITES (15 hrs)

Nano Thin Films, Nanocomposites. Application of Nanoparticles in Different Fields. Core-Shell Nanoparticles – Types, Synthesis, and Properties. Nanocomposites – Metal, Ceramic and Polymer – Matrix Composites – Applications. Characterization – SEM, TEM and AFM – Principle, Instrumentation and Applications.

TEXTBOOKS

1. Mohan S and Arjunan V, *Principles of Materials Science*, MJP Publishers, 2016.
2. Arumugam, *Material Science,* Anuradha Publications, 2007.
3. Giacavazzo, *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 Edition, PEARSON Press, 2007.

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1. Hornyak G. L, Moore J. J, Tibbals H. F, Dutta J, *Fundamental of Nanotechnology*, CRC Press, 2009.
2. Zhen Guo and Li Tan, *Fundamentals and Applications of Nanomaterials,* Artech House: London Publication, 2009.
3. Ghosh P, *Polymer Science and technology Plastics, Rubber and composites*, Tata McGraw Hill, 2001.

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1. https://nptel.ac.in/courses/118/104/118104008/
2. https://nptel.ac.in/courses/113/104/113104076/
3. https://onlinecourses.nptel.ac.in/noc20_cy21/preview
4. https://nptel.ac.in/courses/103/107/103107139/

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry
SEMESTER - I
ELECTIVE COURSE GENERIC/ DISCIPLINE SPECIFIC – II:
ELECTROCHEMISTRY (23PCHO13)
(From 2023-2024 Batch onwards)

HOURS/WEEK: 5 (L-4, T-1) **INT. MARKS: 25**
CREDITS : 3 **EXT. MARKS: 75**
DURATION : 75 hrs **MAX. MARKS: 100**

Course Objectives

- To understand the behavior of electrolytes in terms of conductance, ionic atmosphere, interactions.
- To familiarize the structure of the electrical double layer of different models.
- To compare electrodes between current density and over potential.
- To discuss the mechanism of electrochemical reactions.
- To highlight the different types of over voltages and its applications in electro analytical techniques.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K2]: explain the concept of electrolytes in solution, electrode-electrolyte interface, electrode reactions, electrodics, batteries and compare the structures of electrical double layer of different models.

CO2[K3]: predict the kinetics of electrode reactions ,theories of electrolytes, electrolyte interfacial phenomenon and electrode polarization.

CO3[K4]: analyze mechanism of electrochemical reactions, principle of polarography, electrode reactions, structure of electrical double layer and ionic activity of electrolytes.

CO4[K5]: discuss the theories of electrolytes, electrical double layer, electrodics of electrode reactions and polarography.

CO5[K6]: predict the concept of storage devices, mechanism of electrochemical reactions, phenomenon of electrode-electrolyte interface and behavior of electrolytes.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	2	1	-	-	1
CO2[K3]	3	2	2	1	1	1	1
CO3[K4]	3	2	2	1	1	1	1
CO4[K5]	2	3	2	1	1	1	1
CO5[K6]	2	2	1	1	1	1	1
Weightage of the course	13	11	09	05	04	04	05
Weighted percentage of Course contribution to POs	**4.1**	**4.09**	**4.33**	**3.18**	**3.64**	**3.1**	**3.68**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I – IONICS (15 hrs)

Arrhenius Theory – Limitations, Van't Hoff Factor and its Relation to Colligative Properties – Deviation from Ideal Behavior – Ionic Activity – Mean Ionic Activity and Mean Ionic Activity Coefficient-Concept of Ionic Strength-Debye Huckel Theory of Strong Electrolytes – Activity Coefficient of Strong Electrolytes Determination of Activity Coefficient Ion Solvent and Ion-Ion Interactions – Born Equation – Debye-Huckel Bjerrum Model – Derivation of Debye-Huckel Limiting Law at Appreciable Concentration of Electrolytes Modifications and Applications – Electrolytic Conduction – Debye-Huckel Onsager Treatment of Strong Electrolyte – Qualitative and Quantitative Verification and Limitations – Evidence for Ionic Atmosphere – Ion Association and Triple Ion Formations.

UNIT II – ELECTRODE-ELECTROLYTE INTERFACE (15 hrs)

Interfacial Phenomena – Evidences for Electrical Double Layer – Polarizable and Non-Polarizable Interfaces – Electrocapillary Phenomena – Lippmann Equation Electro Capillary Curves – Electro-Kinetic Phenomena – Electro-Osmosis – Electrophoresis – Streaming and Sedimentation Potentials – Colloidal and Poly Electrolytes – Structure of Double Layer – Helmholtz – Perrin – Guoy – Chapman And Stern Models of Electrical Double Layer – Zeta Potential and Potential at Zero Charge – Applications and Limitations.

UNIT III – ELECTRODICS OF ELEMENTARY ELECTRODE REACTIONS (15 hrs)

Behavior Of Electrodes – Standard Electrodes and Electrodes at Equilibrium – Anodic and Cathodic Currents – Condition for the Discharge of Ions – Nernst Equation – Polarizable and Non-Polarizable Electrodes – Model of Three

Electrode System – Over Potential – Rate of Electro Chemical Reactions – Rates of Simple Elementary Reactions – Butler-Volmer Equation – Significance of Exchange Current Density – Net Current Density and Symmetry Factor – Low and High Field Approximations – Symmetry Factor and Transfer Coefficient Tafel Equations and Tafel Plots.

UNIT IV – ELECTRODICS OF MULTISTEP MULTI ELECTRON SYSTEM (15 hrs)

Rates of Multi-Step Electrode Reactions – Butler-Volmer Equation for a Multi-Step Reaction – Rate Determining Step – Electrode Polarization and Depolarization – Transfer Coefficients – its Significance and Determination – Stoichiometric Number – Electro-Chemical Reaction Mechanisms – Rate Expressions – Order and Surface Coverage – Reduction of I^{3-}, Fe^{2+}, And Dissolution Of Fe To Fe^{2+} – Overvoltage – Chemical and Electro Chemical – Phase – Activation and Concentration Over Potentials – Evolution of Oxygen and Hydrogen at Different pH Pourbiax and Evan's Diagrams.

UNIT V – CONCENTRATION POLARIZATION, BATTERIES AND FUEL CELLS (15 hrs)

Modes of Transport of Electro Active Species – Diffusion – Migration and Hydrodynamic Modes – Role of Supporting Electrolytes – Polarography – Principle And Applications – Principle of Square Wave Polarography – Cyclic Voltammetry – Anodic And Cathodic Stripping Voltammetry and Differential Pulse Voltammetry – Sodium And Lithium – Ion Batteries and Redox Flow Batteries – Mechanism of Charge Storage – Conversion and Alloying – Capacitors – Mechanism of Energy Storage – Charging at Constant Current and Constant Voltage – Energy Production Systems – Fuel Cells – Classification – Alkaline Fuel Cells – Phosphoric Acid Fuel Cells – High Temperature Fuel Cells.

TEXTBOOKS

1. Crow D. R, *Principles and Applications of Electrochemistry*, 4th Edition, Chapman & Hall/CRC, 2014.
2. Rajaram J and Kuriakose J. C, *Kinetics and Mechanism of chemical transformations*, Macmillan India Ltd: New Delhi, 2011.
3. Glasstone S, *Electro Chemistry*, Affiliated East-West Press: New Delhi, 2008.
4. Viswanathan B, Sundaram S, Venkataraman R, Rengarajan K and Raghavan P. S, *Electrochemistry-Principles and applications*, S. Viswanathan Printers: Chennai, 2007.
5. Joseph Wang, *Analytical Electrochemistry*, 2nd Edition, Wiley, 2004.

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1. Bockris J. O. M. and Reddy A. K. N, *Modern Electro Chemistry*, vol.1 and 2B, Springer, Plenum Press: New York, 2008.
2. Philip H. Rieger, *Electrochemistry*, 2nd Edition, Springer: New York, 2010.
3. Antropov L. I, *Theoretical Electrochemistry*, Mir Publishers, 1977.
4. Kapoor K. L, *A Text book of Physical Chemistry*, volume-3, Macmillan, 2001.

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1. https://www.pdfdrive.com/modern-electrochemistry-e34333229.
2. https://www.digimat.in/nptel/courses/video/104106137/L04.html
3. https://www.youtube.com/watch?v=ssnjcxtr5Rg
4. https://www.youtube.com/watch?v=l2ENx_Y0dNU

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry
SEMESTER - I
ELECTIVE COURSE GENERIC/ DISCIPLINE SPECIFIC – II: MOLECULAR SPECTROSCOPY (23PCHO14)
(From 2023-2024 Batch onwards)

HOURS/WEEK: 5 (L-4, T-1)	**INT. MARKS: 25**
CREDITS : 3	**EXT. MARKS: 75**
DURATION : 75 hrs	**MAX. MARKS: 100**

Course Objectives

- To understand the influence of rotation and vibrations on the spectra of the polyatomic molecules.
- To study the principle of Raman spectroscopy, ESR spectroscopy, EPR spectroscopy and fragmentation patterns in Mass spectroscopy.
- To highlight the significance of Franck-Condon principle to interpret the selection rule, intensity and types of electronic transitions.
- To interpret the first and second order NMR spectra in terms of splitting and coupling patterns using correlation techniques such as COSY, HETCOR, NOESY.
- To carry out the structural elucidation of molecules using different spectral techniques

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K2]: explain the importance of rotational, Raman , vibrational ,electronic, NMR, ESR, mass ,Mossbauer and EPR spectroscopy.

CO2[K3]: apply the principles of spectroscopy for the structural elucidation of the molecule.

CO3[K4]: inspect the structure of compounds through different spectroscopic techniques.

CO4[K5]: interpret the UV, IR, Raman, XPS, Mass, EPR, NMR, Mossbauer and ESR spectroscopic techniques,

CO5[K6]: discuss the knowledge on principle, instrumentation and structural elucidation of simple molecules using different Spectroscopy techniques.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	2	1	-	-	1
CO2[K3]	3	2	2	1	1	1	1
CO3[K4]	3	2	2	1	1	1	1
CO4[K5]	2	3	2	1	1	1	1
CO5[K6]	2	2	1	1	1	1	1
Weightage of the course	13	11	09	05	04	04	05
Weighted percentage of Course contribution to POs	**4.1**	**4.09**	**4.33**	**3.18**	**3.64**	**3.1**	**3.68**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I – ROTATIONAL AND RAMAN SPECTROSCOPY (15 hrs)

Rotational Spectra of Diatomic and Polyatomic Molecules – Intensities of Rotational Spectral Lines – Effect of Isotopic Substitution – Non-Rigid Rotators – Classical Theory of the Raman Effect – Polarizability as a Tensor – Polarizability Ellipsoids – Quantum Theory of the Raman Effect – Pure Rotational Raman Spectra of Linear and Asymmetric Top Molecules – Stokes and Anti-Stokes Lines – Vibrational Raman Spectra – Raman Activity of Vibrations – Rule of Mutual Exclusion – Rotational Fine Structure – O and S Branches – Polarization of Raman Scattered Photons.

UNIT II – VIBRATIONAL SPECTROSCOPY (15 hrs)

Vibrations of Molecules – Harmonic and Anharmonic Oscillators – Vibrational Energy Expression – Energy Level Diagram- Vibrational Wave Functions and their Symmetry – Selection Rules – Expression for the Energies of Spectral Lines – Computation of Intensities – Hot Bands – Effect of Isotopic Substitution – Diatomic Vibrating Rotor – Vibrational-Rotational Spectra of Diatomic Molecules – P, R Branches – Breakdown of the Born-Oppenheimer Approximation- Vibrations of Polyatomic Molecules – Symmetry Properties- Overtone and Combination Frequencies- Influence of Rotation on Vibrational Spectra of Polyatomic Molecule- P, Q, R Branches- Parallel and Perpendicular Vibrations of Linear and Symmetric Top Molecules.

UNIT III – ELECTRONIC SPECTROSCOPY (15 hrs)

Electronic Spectroscopy – Electronic Spectroscopy of Diatomic Molecules – Frank-Condon Principle – Dissociation and Pre-Dissociation Spectra – $\pi \rightarrow \pi^*$,

$n \rightarrow \pi^*$ Transitions and their Selection Rules – Photoelectron Spectroscopy – Basic Principles – Photoelectron Spectra of Simple Molecules – X-Ray Photoelectron Spectroscopy (XPS) – Lasers: Laser Action – Population Inversion – Properties of Laser Radiation – Examples of Simple Laser Systems.

UNIT IV – NMR AND ESR SPECTROSCOPY (15 hrs)

NMR Spectroscopy: Chemical Shift – Factors Influencing Chemical Shifts – Electronegativity and Electrostatic Effects – Mechanism of Shielding and De-Shielding – Spin Systems: First Order and Second Order Coupling of AB Systems – Simplification of Complex Spectra – **Spin-Spin Interactions:** Homonuclear Coupling Interactions – AX, AX_2, AB Types – Vicinal – Germinal and Long-Range Coupling – Spin Decoupling – Nuclear Overhauser Effect (NOE) – Factors Influencing Coupling Constants and Relative Intensities – ^{13}CNMR and Structural Correlations, Satellites – Brief Introduction To 2D NMR – COSY – NOESY – Introduction to ^{31}P, ^{19}F NMR – **ESR Spectroscopy:** Characteristic Features of ESR Spectra – Line Shapes and Line Widths – ESR Spectrometer – The G Value And The Hyperfine Coupling Parameter (A) – Origin of Hyperfine Interaction – Interpretation of ESR Spectra And Structure Elucidation of Organic Radicals Using ESR Spectroscopy – Spin Orbit Coupling and Significance of G-Tensors – Zero/Non-Zero Field Splitting – Kramer's Degeneracy – Application to Transition Metal Complexes (Having One to Five Unpaired Electrons) Including Biological Molecules and Inorganic Free Radicals – ESR Spectra of Magnetically Dilute Samples.

UNIT V – MASS SPECTROMETRY, EPR AND MOSSBAUER SPECTROSCOPY (15 hrs)

Ionization Techniques – Electron Ionization (EI) – Chemical Ionization (CI) – Desorption Ionization (FAB/MALDI) – Electrospray Ionization (ESI) – Isotope Abundance – Molecular Ion – Fragmentation Processes of Organic Molecules – Deduction of Structure Through Mass Spectral Fragmentation – High Resolution – Effect of Isotopes on the Appearance of Mass Spectrum – EPR Spectra of Anisotropic Systems – Anisotropy in g-Value – Causes of Anisotropy – Anisotropy in Hyperfine Coupling – Hyperfine Splitting Caused by Quadrupole Nuclei –Zero-Field Splitting (ZFS) And Kramer's Degeneracy – Applications of EPR to Organic And Inorganic Systems – Structural Elucidation of Organic Compounds By Combined Spectral Techniques – Principle of Mossbauer Spectroscopy: Doppler Shift- Recoil Energy- Isomer Shift – Quadrupole Splitting- Magnetic Interactions – Applications: Mossbauer Spectra of High and Low-Spin Fe and Sn Compounds.

TEXTBOOKS

1. Banwell C.N and McCash E. M, *Fundamentals of Molecular Spectroscopy*, 4th Edition, Tata McGraw Hill: New Delhi, 2000.

2. Silverstein R. M and Webster F. X, *Spectroscopic Identification of Organic Compounds*, 6th Edition, John Wiley & Sons: New York, 2003.
3. Kemp W, *Applications of Spectroscopy*, English Language Book Society, 1987.
4. Williams D. H and Fleming I, *Spectroscopic Methods in Organic Chemistry,* 4th Edition, Tata McGraw-Hill Publishing Company: New Delhi, 1988.
5. Drago R. S, *Physical Methods in Chemistry*, Saunders: Philadelphia, 1992.

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1. Atkins P. W and De Paula J, *Physical Chemistry*, 7th Edition, Oxford University Press: Oxford, 2002.
2. Levine I. N, *Molecular Spectroscopy*, John Wiley & Sons: New York, 1974.
3. Rahman A, *Nuclear Magnetic Resonance-Basic Principles*, Springer-Verlag: New York, 1986.
4. Nakamoto K, *Infrared and Raman Spectra of Inorganic and coordination Compounds*, Part B, 5th Edition, John Wiley& Sons Inc.: New York, 1997.
5. Weil J. A, Bolton J. R and Wertz J. E, *Electron Paramagnetic Resonance*; Wiley Interscience, 1994.

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2. https://www.youtube.com/watch?v=TXW0T3RhbRE
3. https://www.youtube.com/watch?v=RtBviEyWWFo

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry
SEMESTER - II
CORE COURSE – IV: ORGANIC REACTION MECHANISM - II (23PCHC21)
(From 2023-2024 Batch onwards)

HOURS/WEEK: 6 (L-5, T-1) **INT. MARKS: 25**
CREDITS : 5 **EXT. MARKS: 75**
DURATION : 90 hrs **MAX. MARKS: 100**

Course Objectives

- To understand the concept of aromaticity in benzenoid, non-benzenoid, heterocyclic and annulene compounds.
- To understand the mechanism involved in various types of organic reactions with evidences.
- To understand the applications of synthetically important reagents.
- To correlate the reactivity between aliphatic and aromatic compounds.
- To design synthetic routes for synthetically used organic reactions.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K2]: examine the basic principles of elimination, oxidation – reduction reactions, rearrangements, addition, reagents involved in organic compounds

CO2[K3]: apply the principles of addition, elimination, oxidation, reduction, rearrangement reactions, reagents used in organic compounds

CO3[K4]: compare elimination reactions, oxidation, reduction, rearrangements, reagents and reactivity in organic compounds

CO4[K5]: justify the mechanism, rearrangements, reagents, synthesis routes of given reactions

CO5[K6]: discuss the concept of reaction mechanism, rearrangements, reactions, synthesis and propose scheme for organic reaction.

CO-PO Mapping table (Course Articulation Matrix)

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	1	1	-	-	-
CO2[K3]	3	2	2	1	1	1	-
CO3[K4]	3	3	2	1	1	1	1
CO4[K5]	3	3	2	1	1	1	1
CO5[K6]	3	3	2	1	1	1	1
Weightage of the course	15	13	09	05	04	04	03
Weighted percentage of Course contribution to POs	**4.73**	**4.83**	**4.33**	**3.18**	**3.64**	**3.1**	**2.21**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I – ELIMINATION AND FREE RADICAL REACTIONS (18 hrs)

Mechanisms: E_2, E_1, and E_1CB Mechanisms. Syn- and Anti-Eliminations. Orientation of the Double Bond: Hoffmann and Saytzeff Rules. Reactivity: Effect of Substrate, Attacking Bases, Leaving Group and Medium. Stereochemistry of Eliminations in Acyclic and Cyclic Systems, Pyrolytic Elimination. Long Lived and Short-Lived Radicals – Production of Radicals by Thermal and Photochemical Reactions, Detection and Stability of Radicals, Characteristics of Free Radical Reactions and Free Radical, Reactions of Radicals; Polymerization, Addition, Halogenations, Aromatic Substitutions, Rearrangements. Reactivity: Reactivity on Aliphatic, Aromatic Substrates, Reactivity in the Attacking Radical, Effect of Solvent.

UNIT II – OXIDATION AND REDUCTION REACTIONS (18 hrs)

Mechanisms: Direct Electron Transfer, Hydride Transfer, Hydrogen Transfer, Displacement, Addition **–** Elimination, Oxidative and Reductive Coupling Reactions. Mechanism of Oxidation Reactions: Dehydrogenation by Quinones, Selenium Dioxides, Ferricyanide, Mercuric Acetate Lead Tetraacetate, Permanganate, Manganese Dioxide, Osmium Tetroxide, Oxidation of Saturated Hydrocarbons, Alkyl Groups, Alcohols, Halides and Amines. Reactions Involving Cleavage of C-C Bonds **–** Cleavage of Double Bonds, Oxidative Decarboxylation, Allylic Oxidation, Oxidation by Chromium Trioxide **–** Pyridine, DMSO **–** Oxalyl Chloride (Swern Oxidation) and Corey **–** Kim Oxidation, Dimethyl Sulphoxide **–** Dicyclohexyl Carbodiimide (DMSO-DCCD). Mechanism of Reduction Reactions: Wolff-Kishner, Clemmenson, Rosenmund, Reduction with Trialkyl And Triphenyltin Hydrides, Mcfadyen **–** Steven's Reduction, Homogeneous

Hydrogenation, Hydroboration With Cyclic Systems, MPV and Bouveault **–** Blanc Reduction**.**

UNIT III – REARRANGEMENTS (18 hrs)

Rearrangements to Electron Deficient Carbon: Pinacol-pinacolone and Semi-Pinacolone Rearrangements **–** Applications and Stereochemistry, Wagner-Meerwein, Demjanov, Dienone-Phenol, Baker-Venkataraman, Benzilic Acid and Wolff Rearrangements. Rearrangements to Electron Deficient Nitrogen: Hofmann, Curtius, Schmidt, Lossen, Beckmann and Abnormal Beckmann Rearrangements. Rearrangements to Electron Deficient Oxygen: Baeyer-Villiger Oxidation and Dakin Rearrangements. Rearrangements to Electron Rich Atom: Favorskii, Quasi-Favorskii, Stevens, [1,2]-Wittig and [2,3]-Wittig Rearrangements. Fries and Photo Fries Rearrangement. Intramolecular Rearrangements – Claisen, Abnormal Claisen, Cope, Oxy-Cope Benzidine Rearrangements.

UNIT IV – ADDITION TO CARBON MULTIPLE BONDS (18 hrs)

Mechanisms: (a) Addition to Carbon-Carbon Multiple Bonds- Addition Reactions Involving Electrophiles, Nucleophiles, Free Radicals, Carbenes and Cyclic Mechanisms-Orientation and Reactivity, Hydrogenation of Double and Triple Bonds, Michael Reaction, Addition of Oxygen and Nitrogen; (b) Addition to Carbon-Hetero Atom Multiple Bonds: Mannich Reaction, Acids, Esters, Nitrites, Addition of Grignard Reagents, Wittig Reaction, Prins Reaction. Stereochemical Aspects of Addition Reactions. Addition to Carbon-Hetero atom Multiplebonds: Addition of Grignard Reagents, Organozinc and Organolithium Reagents to Carbonyl and Unsaturated Carbonyl Compounds. Mechanism of Condensation Reactions Involving Enolates – Stobbe Reactions. Hydrolysis of Esters and Amides, Ammonolysis of Esters.

UNIT V - REAGENTS AND MODERN SYNTHETIC REACTIONS (18 hrs)

Lithium Diisopropylamine (LDA), Azobisisobutyronitrile (AIBN), Sodium Cyanoborohydride ($NaBH_3CN$), meta-Chloroperbenzoic Acid (m-CPBA), Dimethyl Aminiopyridine (DMAP), n-Bu_3SnD, Triethylamine (TEA), Diazobicyclo[5.4.0]undec-7-ene (DBU), Diisopropylazodicarboxylate (DIAD), Diethylazodicarboxylate (DEAD), N-bromosuccinimide (NBS), Trifluoroacetic Acid (TFA), Tetramethyl Piperiridin-1-oxyl (TEMPO), Phenyltrimethylammonium Tribromide (PTAB). Diazomethane and Zn-Cu, Diethyl maleate (DEM), Copper diacetylacetonate ($Cu(acac)_2$), $TiCl_3$, $NaIO_4$, Pyridinium Chlorochromate (PCC), Pyridinium Dichromate (PDC), Meisenheimer Complex**.** Suzuki Coupling, Heck Reaction, Negishi Reaction, Baylis-Hillman Reaction.

TEXTBOOKS

1. March J and Smith M, *Advanced Organic Chemistry,* 5th Edition, John Wiley & Sons, 2001**.**
2. Gould E. S, *Mechanism and Structure in Organic Chemistry,* Holt, Rinehart and Winston Inc., 1959.
3. Kalsi P. S, *Stereochemistry of carbon compounds*, 8th Edition, New Age International Publishers, 2015.
4. Bruice P. Y, *Organic Chemistry*, 7th Edition, Prentice Hall, 2013.
5. Morrison R. T, Boyd R. N and Bhattacharjee S. K, *Organic Chemistry*, 7th Edition, Pearson Education, 2010.

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2. Fieser L. F and Fieser M, *Organic Chemistry*, Asia Publishing House, Bombay, 2000.
3. Gould E. S, *Mechanism and Structure in Organic Chemistry,* Holt, Rinehart and Winston Inc., 1959.
4. Gilchrist T. L, *Heterocyclic Chemistry*, Longman Press, 1989.
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SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry
SEMESTER - II
CORE COURSE – V: PHYSICAL CHEMISTRY - I (23PCHC22)
(From 2023-2024 Batch onwards)

HOURS/WEEK: 6 (L-5, T-1) **INT. MARKS: 25**
CREDITS : 5 **EXT. MARKS: 75**
DURATION : 90 hrs **MAX. MARKS: 100**

Course Objectives

- To recall the fundamentals of statistical thermodynamics.
- To correlate the theories of reaction rates for the evaluation of thermodynamic parameters
- To study the principles of rotational, vibrational, electronic, NMR and ESR spectroscopy
- To study the mechanism and kinetics of reactions
- To carry out the structural elucidation of molecules using different spectral techniques.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K2]: explain the basic concepts of spectroscopy, Statistical thermodynamics and chemical kinetics

CO2[K3]: apply the principles of spectroscopy, thermodynamic and kinetics to determine the structure, thermodynamic parameters and rate of reactions respectively.

CO3[K4]: examine the various thermodynamic parameters, chain reactions and structure of the molecules

CO4[K5]: explain the theories of complex reactions, statistical thermodynamics and spectroscopic techniques

CO5[K6]: discuss the reaction rates, statistical approach of the function and structural elucidation of the molecules

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	2	1	1	-	1
CO2[K3]	3	2	2	1	-	-	-
CO3[K4]	3	3	2	1	1	1	1
CO4[K5]	3	3	2	1	1	1	-
CO5[K6]	3	3	2	1	1	1	1
Weightage of the course	15	13	10	05	04	03	03
Weighted percentage of Course contribution to POs	**4.73**	**4.83**	**4.81**	**3.18**	**3.64**	**2.33**	**2.21**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I – ROTATIONAL AND VIBRATIONAL SPECTROSCOPY (18 hrs)

Rotational Spectroscopy: Rotational Spectra of Diatomic and Polyatomic Molecules – Intensities of Rotational Spectral Lines – Effect of Isotopic Substitution – Non-Rigid Rotators – **Vibrational Spectroscopy:** Vibrations of Molecules – Harmonic and Anharmonic Oscillators – Vibrational Energy Expression – Energy Level Diagram- Vibrational Wave Functions and their Symmetry – Selection Rules – Expression for the Energies of Spectral Lines – Computation of Intensities – Hot Bands – Effect of Isotopic Substitution – Diatomic Vibrating Rotor – Vibrational-Rotational Spectra of Diatomic Molecules – P, R Branches – Breakdown of the Born-Oppenheimer Approximation- Vibrations of Polyatomic Molecules – Symmetry Properties- Overtone and Combination Frequencies- Influence of Rotation on Vibrational Spectra of Polyatomic Molecule- P, Q, R Branches- Parallel and Perpendicular Vibrations of Linear and Symmetric Top Molecules.

UNIT II – RAMAN AND ELECTRONIC SPECTROSCOPY (18 hrs)

Raman Spectroscopy: Classical Theory of the Raman Effect – Polarizability as a Tensor – Polarizability Ellipsoids – Quantum Theory of the Raman Effect – Pure Rotational Raman Spectra of Linear and Asymmetric Top Molecules – Stokes and Anti-Stokes Lines – Vibrational Raman Spectra – Raman Activity of Vibrations – Rule of Mutual Exclusion – Rotational Fine Structure – O and S Branches – Polarization of Raman Scattered Photons. **Electronic Spectroscopy**: Electronic Spectroscopy of Diatomic Molecules – Frank-Condon Principle – Dissociation and Pre-Dissociation Spectra – $\pi \rightarrow \pi^*$, $n \rightarrow \pi^*$ Transitions and their Selection Rules – Photoelectron Spectroscopy – Basic Principles –

Photoelectron Spectra of Simple Molecules – X-Ray Photoelectron Spectroscopy (XPS) – Lasers: Laser Action – Population Inversion – Properties of Laser Radiation – Examples of Simple Laser Systems.

UNIT III – NMR AND ESR SPECTROSCOPY (18 hrs)

NMR Spectroscopy: Chemical Shift – Factors Influencing Chemical Shifts – Electronegativity and Electrostatic Effects – Mechanism of Shielding and De-Shielding – Spin Systems: First Order and Second Order Coupling of AB Systems – Simplification of Complex Spectra – **Spin-Spin Interactions:** Homonuclear Coupling Interactions – AX, AX_2, AB Types – Vicinal – Germinal and Long-Range Coupling – Spin Decoupling – Nuclear Overhauser Effect (NOE) – Factors Influencing Coupling Constants and Relative Intensities – ^{13}CNMR and Structural Correlations, Satellites – Brief Introduction To 2D NMR – COSY – NOESY – **ESR Spectroscopy:** Characteristic Features of ESR Spectra – Line Shapes and Line Widths – ESR Spectrometer – The G Value And The Hyperfine Coupling Parameter (A) – Origin of Hyperfine Interaction – Interpretation of ESR Spectra And Structure Elucidation of Organic Radicals Using ESR Spectroscopy – Spin Orbit Coupling and Significance of G-Tensors – Zero/Non-Zero Field Splitting – Kramer's Degeneracy – Application to Transition Metal Complexes (Having One to Five Unpaired Electrons) Including Biological Molecules and Inorganic Free Radicals – ESR Spectra of Magnetically Dilute Samples.

UNIT IV – STATISTICAL THERMODYNAMICS (18 hrs)

Introduction of Statistical Thermodynamics Concepts of Thermodynamic and Mathematical Probabilities – Distribution of Distinguishable and Non-Distinguishable Particles – Assemblies – Ensembles – Canonical Particles – Maxwell-Boltzmann – Fermi Dirac – Bose-Einstein Statistics – Comparison And Applications - Partition Functions – Evaluation of Translational, Vibrational And Rotational Partition Functions for Monoatomic, Diatomic And Polyatomic Ideal Gases – Thermodynamic Functions In Terms of Partition Functions - Calculation Of Equilibrium Constants – Statistical Approach to Thermodynamic Properties: Pressure-Internal Energy – Entropy – Enthalpy – Gibb's Function - Helmholtz Function - Residual Entropy – Equilibrium Constants and Equipartition Principle – Heat Capacity of Mono and Di Atomic Gases – Ortho and Para Hydrogen – Heat Capacity of Solids – Einstein and Debye Models.

UNIT V – KINETICS AND FAST REACTIONS (18 hrs)

Homogeneous Catalysis – Acid- Base Catalysis – Mechanism of Acid Base Catalyzed Reactions – Bronsted Catalysis Law – Enzyme Catalysis – Michelis-Menton Catalysis. Kinetics of Complex Reactions – Reversible Reactions-Consecutive Reactions – Parallel Reactions – Chain Reactions – Chain Length –

Kinetics of $H_2 - Cl_2$ & $H_2 - Br_2$ Reactions (Thermal And Photochemical Reactions) – Rice Herzfeld Mechanism – Study of Fast Reactions – Relaxation Methods – Thermodynamics Properties from Partition Functions – Sackur-Tetrode Equation. Temperature and Pressure Jump Methods Electric and Magnetic Field Jump Methods – Stopped Flow Flash Photolysis Methods – Pulse Radiolysis – Kinetics of Polymerization – Free Radical, Cationic, Anionic Polymerization – Anionic Polymerization – Polycondensation

TEXTBOOKS

1. Banwell C.N and McCash E. M, *Fundamentals of Molecular Spectroscopy*, 4th Edition, Tata McGraw Hill: New Delhi, 2000.
2. Kemp W, *Applications of Spectroscopy*, English Language Book Society, 1987.
3. Gupta M. C, *Statistical Thermodynamics*, New Age International Pvt. Ltd: New Delhi, 1995.
4. Laidler K. J, *Chemical Kinetics,* 3rd Edition, Pearson, 2013.
5. Rajaram J and Kuriokose J. C, *Kinetics and Mechanisms of chemical transformation,* Macmillan India Ltd, Reprint, 2011.

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1. Mcqurrie D. A and Simon J. D, *Physical Chemistry - A Molecular Approach,* Viva Books Pvt. Ltd: New Delhi, 1999.
2. Rastogi R. P and Misra R. R, *Classical Thermodynamics*, Vikas Publishing Pvt. Ltd: NewDelhi, 1990.
3. Maron S. H and Lando J. B, *Fundamentals of Physical Chemistry,* Macmillan Publishers: New York, 1974.
4. Tsiimiriski K. B, *Kinetic Methods of Analysis,* Pergamom Press, 1996.

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1. https://www.youtube.com/watch?v=9GMBpZZtjXM
2. https://www.youtube.com/watch?v=zVEKh_mCGqw
3. https://www.youtube.com/watch?v=k3Y_Tonfqtu

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry
SEMESTER - II
CORE COURSE – VI: PRACTICAL: INORGANIC CHEMISTRY (23PCHC2P)
(From 2023-2024 Batch onwards)

HOURS/WEEK: 6 (L-5, T-1) **INT. MARKS: 25**
CREDITS : 4 **EXT. MARKS: 75**
DURATION : 90 hrs **MAX. MARKS: 100**

Course Objectives

- To understand and enhance the visual observation as an analytical tool for the quantitative estimation of ions.
- To recall the principle and theory in preparing standard solutions.
- To train the students for improving their skill in estimating the amount of ion accurately present in the solution
- To estimate metal ions, present in the given solution accurately without using instruments.
- To determine the amount of ions, present in a binary mixture accurately.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K2]: estimate the amount of copper, calcium, ferrous and zinc present in the given solution by volumetrically and the amount of zinc, magnesium, copper and nickel by complexometric titration

CO2[K3]: determine the amount of nickel, barium, zinc and copper present in the given solution by gravimetric method

CO3[K4]: compare and contrast complexometry, gravimetry & volumetry

CO4[K5]: predict the familiar and less familiar cations in the given inorganic salt mixture

CO5[K6]: develop the skills and tricks in the inorganic qualitative and quantitative analysis.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	3	2	1	1	1	2
CO2[K3]	3	3	2	1	2	1	1
CO3[K4]	3	2	2	1	2	1	1
CO4[K5]	3	3	2	1	1	1	1
CO5[K6]	3	3	2	1	1	1	1
Weightage of the course	15	14	10	05	07	05	06
Weighted percentage of Course contribution to POs	**4.73**	**5.2**	**4.81**	**3.18**	**6.36**	**3.88**	**4.41**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' NoCorrelation)

UNIT I – ANALYSIS OF MIXTURE OF CATIONS (30 hrs)

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.

UNIT II – PREPARATION OF METAL COMPLEXES (30 hrs)

Preparation of inorganic complexes:

a. Preparation of tristhioureacopper(I) sulphate
b. Preparation of potassium trioxalatechromate(III)
c. Preparation of tetramminecopper(II) sulphate
d. Preparation of Reineck's salt
e. Preparation of hexathioureacopper(I) chloridedihydrate
f. Preparation of *cis*-Potassium trioxalatediaquachromate(III)
g. Preparation of sodium trioxalatoferrate(III)
h. Preparation of hexathiourealead(II) nitrate

UNIT III – COMPLEXOMETRIC TITRATION (30 hrs)

1. Estimation of Zinc, Nickel, Magnesium, and Calcium.
2. Estimation of Mixture of Metal Ions, pH Control, Masking and Demasking 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.

TEXTBOOKS

1. Jeya Rajendran A, *Microanalytical Techniques in Chemistry: Inorganic Qualitative Analysis,* United global publishers, 2021.
2. Ramanujam V. V, *Inorganic Semimicro Qualitative Analysis,* 3rd Edition, The National Publishing Company: Chennai, 1974.
3. Jeffery H, Bassett, Mendham and Denney, *Vogel's Quantitative chemical Analysis*, Longman Scientific and Technical: England, 1989.

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Books

1. Pass G and Sutcliffe H, *Practical Inorganic Chemistry,* Chapman Hall, 1965.
2. Palmer W. G, *Experimental Inorganic Chemistry,* Cambridge University Press, 1954.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry
SEMESTER - II
ELECTIVE COURSE GENERIC/ DISCIPLINE SPECIFIC – III: MEDICINAL CHEMISTRY (23PCHO21)
(From 2023-2024 Batch onwards)

HOURS/WEEK: 4 **INT. MARKS: 25**
CREDITS : 3 **EXT. MARKS: 75**
DURATION : 60 hrs **MAX. MARKS: 100**

Course Objectives

- To study the chemistry behind the development of pharmaceutical materials.
- To gain knowledge on mechanism and action of drugs.
- To understand the need of antibiotics and usage of drugs.
- To familiarize with the mode of action of diabetic agents and treatment of diabetes.
- To identify and apply the action of various antibiotics.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K2]: express the various terms used in medicinal and pharmaceutical chemistry

CO2[K3]: describe the structural features of various drugs used in pharmaceuticals

CO3[K4]: examine the structure of various drugs used in pharmaceuticals

CO4[K5]: interpret the drugs based on their functions and classify the membrane bound receptors

CO5[K6]: predict the use of various drugs by its action.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	1	1	-	1	1
CO2[K3]	3	2	1	2	-	1	1
CO3[K4]	3	2	2	2	1	1	1
CO4[K5]	2	1	2	1	1	2	2
CO5[K6]	2	2	2	1	1	2	2
Weightage of the course	13	09	08	07	03	07	07
Weighted percentage of Course contribution to POs	**4.1**	**3.35**	**3.85**	**4.46**	**2.73**	**5.43**	**5.15**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I – INTRODUCTION TO RECEPTORS (12 hrs)

Introduction, Targets, Agonist, Antagonist, Partial Agonist. Receptors, Receptor Types, Theories of Drug – Receptor Interaction, Drug Synergism, Drug Resistance, Physicochemical Factors Influencing Drug Action.

UNIT II – ANTIBIOTICS (12 hrs)

Introduction, Targets of Antibiotics Action, Classification of Antibiotics, Enzyme-Based Mechanism of Action, SAR of Penicllins and Tetracyclins, Clinical Application of Penicillins, Cephalosporin. Current Trends in Antibiotic Therapy.

UNIT III – ANTIHYPERTENSIVE AGENTS AND DIURETICS (12 hrs)

Classification of Cardiovascular Agents, Introduction to Hypertension, Etiology, Types, Classification of Antihypertensive Agents, Classification and Mechanism of Action of Diuretics, Furosemide, Hydrochlorothiazide, Amiloride.

UNIT IV – ANTINEOPLASTIC AGENTS & ANTITUBERCULARS (12 hrs)

Antineoplastic Agents: Classification – Synthesis – Assay – Cyclophosphamide – Ifosamide – Chlorambucil – Busulfun – Decarbazine – Methotrexate – Azathioprine – 6-Mercaptopurine – 5-Fluorouracil – Cis-platin – **Antitubulercular Drugs**: Classification – Synthesis – Assay – Isoniazid – Rifampicin – Pyrazinamine – Ethambutol – Thiacetazone – Para Amino Salicylic Acid and Ethionamide.

UNIT V – ANALGESICS, ANTIPYRETICS AND ANTI-INFLAMMATORY DRUGS (12 hrs)

Introduction, Mechanism of Inflammation, Classification and Mechanism of Action and Paracetamol, Ibuprofen, Diclofenac, Naproxen, Indomethacin, Phenylbutazonea and Meperidine. Medicinal Chemistry of Antidiabetic Agents Introduction, Types of Diabetics, Drugs Used for the Treatment, Chemical Classification, Mechanism of Action, Treatment of Diabetic Mellitus. Chemistry of Insulin, Sulfonyl Urea.

TEXTBOOKS

1. Wilson and Gisvold's, *Textbook of Organic Medicinal and pharmaceutical Chemistry,* 2011.
2. Graham L. Patrick, *An Introduction to Medicinal Chemistry,* 5th Edition, Oxford University Press, 2013.
3. Jeyashree Ghosh, *A Textbook of Pharmaceutical Chemistry,* S. Chand and Co. ltd, 1999.

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1. Parimoo P, *Textbook of Medicinal Chemistry*, CBS publishers, New Delhi, 1995
2. Prasannan K. G and Rajan R, *Text book of Medical Biochemistry,* 3rd Edition, Orient Longman, 2001

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2. https://www.youtube.com/watch?v=eAgwWAlS0io
3. https://www.youtube.com/watch?v=9xAod4o2CNA

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry
SEMESTER - II
ELECTIVE COURSE GENERIC/ DISCIPLINE SPECIFIC – III:
GREEN CHEMISTRY (23PCHO22)
(From 2023-2024 Batch onwards)

HOURS/WEEK: 4 **INT. MARKS: 25**
CREDITS : 3 **EXT. MARKS: 75**
DURATION : 60 hrs **MAX. MARKS: 100**

Course Objectives

- To discuss the principles of green chemistry.
- To propose green solutions for chemical energy storage and conversion.
- To propose green solutions for industrial production of Petroleum and Petrochemicals.
- To propose solutions for pollution prevention in Industrial chemical and fuel production, automotive industry and Shipping industries.
- To propose green solutions for industrial production of Surfactants, Organic and inorganic chemicals.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K2]: indicate the basic principle, chemical techniques and methodology used in conventional industrial preparations and in green innovations

CO2[K3]: find out the various technology used in chemical industries and in laboratory

CO3[K4]: compare the advantages of organic reactions assisted by renewable energy sources and non-renewable energy sources

CO4[K5]: assess the principles of PTC, ionic liquid, microwave and ultrasonic assisted organic synthesis

CO5[K6]: predict the synthetic pathway of various organic reactions using greener solvents, catalyst, ionic liquids, biomass and methods

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	1	1	-	1	1
CO2[K3]	3	2	1	2	-	1	1
CO3[K4]	3	2	2	2	1	1	1
CO4[K5]	2	1	2	1	1	2	2
CO5[K6]	2	2	2	1	1	2	2
Weightage of the course	13	09	08	07	03	07	07
Weighted percentage of Course contribution to POs	**4.1**	**3.35**	**3.85**	**4.46**	**2.73**	**5.43**	**5.15**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I – INTRODUCTION (12 hrs)

Introduction – Need for Green Chemistry – Goals of Green Chemistry – Limitations of Green Chemistry – Chemical accidents – terminologies – International Green Chemistry Organizations and Twelve principles of Green Chemistry with examples.

UNIT II – GREEN REAGENTS AND SOLVENTS (12 hrs)

Choice of Starting Materials – Reagents – Catalysts and Solvents in Detail – Green Chemistry in Day Today Life – Designing Green Synthesis – Green Reagents: Dimethyl Carbonate – Green Solvents: Water – Ionic Liquids – Criteria – General Methods of Preparation – Effect on Organic Reaction – Supercritical Carbon Dioxide – Properties – Advantages – Drawbacks and a few Examples of Organic Reactions in $scCO_2$ – Green Synthesis – Adipic Acid and Catechol.

UNIT III – GREEN CATALYSIS (12 hrs)

Environmental Pollution – Green Catalysis – Acid Catalysts – Oxidation Catalysts – Basic Catalysts – Polymer Supported Catalysts – Poly Styrene Aluminium Chloride – Polymeric Super Acid Catalysts – Poly Supported Photosensitizers

UNIT IV – GREEN SYNTHESIS (12 hrs)

Phase Transfer Catalysis in Green Synthesis – Oxidation using Hydrogen Peroxide – Crown Ethers – Esterification – Saponification – Anhydride Formation – Elimination Reaction – Displacement Reaction – Applications in Organic Synthesis.

UNIT V – MICROWAVE AND SONO CHEMISTRY ASSISTED GREEN SYNTHESIS (12 hrs)

Micro Wave Induced Green Synthesis – Introduction – Instrumentation – Principle And Applications – Sonochemistry – Instrumentation – Cavitation Theory – Ultra Sound Assisted Green Synthesis and Applications.

TEXTBOOKS

1. Ahulwalia V. K, and Kidwai, M. R, *New Trends in Green Chemistry,* Anamalaya Publishers, 2005.
2. McCabe W. L, Smith J. C and Harriott P, *Unit Operations of Chemical Engineering,* 7th Edition, McGraw-Hill: NewDelhi, 2005.
3. Swan J. M and Black D. St. C, *Organometallics in Organic Synthesis,* Chapman Hall, 1974.
4. Ahulwalia V. K and Aggarwal R, *Organic Synthesis: Special Techniques,* Narosa Publishing House: New Delhi, 2001.
5. De A. K, *Environmental Chemistry,* New Age Publications, 2017.

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1. Anastas P. T and Warner J. K, *Green Chemistry-Theory and Practical,* University Press, 1998.
2. Matlack A. S, *Introduction to Green Chemistry*, Marcel Dekker, 2001.
3. Cann M. C and Connely M. E, *Real-World Cases in Green Chemistry,* American Chemical Society: Washington, 2000
4. Ryan M. A and Tinnes and M. *Introduction to Green Chemistry,* American Chemical Society: Washington, 2002.
5. Chandrakanta Bandyopadhyay. *An Insight into Green Chemistry.* Books and Allied (P) Ltd, 2019

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1. https://archive.nptel.ac.in/courses/121/106/121106014/
2. https://www.youtube.com/watch?v=1cxXAeQn-M4
3. https://www.youtube.com/watch?v=NYWWtxI7dFY

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry
SEMESTER - II
ELECTIVE COURSE GENERIC/ DISCIPLINE SPECIFIC – IV: BIO-INORGANIC CHEMISTRY (23PCHO23)
(From 2023-2024 Batch onwards)

HOURS/WEEK: 4 **INT. MARKS: 25**
CREDITS : 3 **EXT. MARKS: 75**
DURATION : 60 hrs **MAX. MARKS: 100**

Course Objectives

- To understand the role of trace elements.
- To understand the biological significance of iron, sulpur.
- To study the toxicity of metals in medicines.
- To have knowledge on diagnostic agents.
- To discuss on various metalloenzymes properties.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K2]: identify the role of trace elements**,** oxygen carriers, biological redox systems and copper proteris.

CO2[K3]: explain the biological redox systems, metallo enzymes, transport phenomenon of proteins, metal toxicity and properties of enzymes.

CO3[K4]: analyze the toxicity in metals, concept of metalloproteins, photosynthesis and essential trace elements.

CO4[K5]: discuss the concept of diagnosis, storage of metal ions, therapeutic compounds, mechanism of enzyme, structure and function of chlorophyll.

CO5[K6]: elaborate nitrogen fixation process, photosynthetic mechanism, enzymes, proteins and co enzymes.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	1	2	2	-	1
CO2[K3]	3	2	1	2	1	1	1
CO3[K4]	3	2	1	1	1	1	1
CO4[K5]	2	2	2	2	1	1	1
CO5[K6]	2	2	3	1	1	1	2
Weightage of the course	13	10	08	07	06	04	06
Weighted percentage of Course contribution to POs	**4.1**	**3.72**	**3.85**	**4.46**	**5.45**	**3.1**	**4.41**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I – BIOMETALS (12 hrs)

Essential and trace elements – Role of Metal Ion in Basic Biological reactions - Transport and Storage of Metal Ions – Fe, Cu V, Ca and Zn – Structure and Function of Biological Membranes – Molecular Mechanism of Ion Transport Across the Membrane – Sodium and Potassium Ion Pumps – Calcium Pump – Ionophores

UNIT II – OXYGEN CARRIERS AND METALLOENZYMES (12 hrs)

Oxygen carriers – Hemoglobin and myoglobin – Structure and Workfunction – Bohr Effect – Binding of CO, NO, CN with Myoglobin and Hemoglobin – Non-Heme oxygen carriers – Hemerythrin and hemocyanin Synthetic Oxygen Carriers – Metalloenzymes: Zinc Enzymes – Carboxypeptidase A and Carbonic Anhydrase – Iron Enzymes – Catalase, Peroxidase – Coenzymes – Vitamin B_{12} Coenzymes

UNIT III – BIOLOGICAL REDOX SYSTEM (12 hrs)

Biological redox system: Cytochromes – Classification – Structure and work Function of Cytochrome c – Cytochrome P-450 – Iron-sulphur proteins – Rubredoxin – Ferredoxin – 2Fe-2S, 4Fe-4S, 3Fe-4S, 8Fe-8S and Nonredox Fe-S Protein. Photosynthesis: Photosystem-I and Photosystem-II – Chlorophylls Structure and Function.

UNIT IV – COPPER PROTERINS (12 hrs)

Copper Proteins: Introduction – Classification – Blue Copper Proteins – Structure and Reactivity of Azurin – Plastocyanin – Ceruloplasmin – Laccase –

Ascorbic Acid Oxidase – Nonblue Copper Proteins: Structure and Reactivity of Galactose oxidase – Amine Oxidase – Superoxide Dismutase – Cytochrome c Oxidase – *Invivo* Nitrogen Fixation **–** Types of Nitrogen Fixing Microorganisms **–** Structure and Reactivity of Nitrogenase Enzyme

UNIT IV – METALS IN MEDICINE (12 hrs)

Metal Toxicity of Hg, Cd, Zn, Pb, As, Sb **–** Therapeutic Compounds **–** Vanadium Based Diabetes Drugs – Gold as Antiarthritics – Li in Psychiatry **–** Platinum-Containing Anticancer Agents **–** Chelation therapy Cancer treatment **–** Diagnostic Agents **–** Technetium Imaging Agents **–** Gadolinium MRI Imaging Agents **–** Temperature and Critical Magnetic Field.

TEXTBOOKS

1. Huheey J. E, Keitler E. A and Keitler R. L, *Inorganic Chemistry*, 4th Edition, Harper Collins College Publishers: New York, 2012.
2. Purcell K .F and Kotz, *Inorganic chemistry*, WB Saunders Co: USA.
3. Mugherjea G. N and Arabinda Das, *Elements of Bioinorganic Chemistry*, 1993.
4. R. Gopalan, V. Ramalingam, *Concise Coordination Chemistry*, S. Chand, 2001.
5. Asim K. Das, *Inorganic Chemistry: Biological and Environmental Aspects,* Books and Allied(P) Ltd: Kolkata, 2004.

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1. Satake M and Mido Y, *Bioinorganic Chemistry*, Discovery Publishing House: New Delhi, 1996.
2. Hughes M. N, *The Inorganic Chemistry of Biological processes*, 2nd Edition, Wiley: London, 1982
3. Hay R. W*, Bio Inorganic Chemistry,* Ellis Horwood, 1987.
4. Roat-Malone R. M, *Bio Inorganic Chemistry*, John Wiley, 2002.
5. Loehr T. M, *Iron carriers and Iron proteins*, VCH, 1989.

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2. https://www.youtube.com/watch?v=TFCW2IxNRhk
3. https://www.youtube.com/watch?v=TdtxeHjevJ0

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry
SEMESTER - II
ELECTIVE COURSE GENERIC/ DISCIPLINE SPECIFIC – IV:
MATERIAL SCIENCE (23PCHO24)
(From 2023-2024 Batch onwards)

HOURS/WEEK: 4 **INT. MARKS: 25**
CREDITS : 3 **EXT. MARKS: 75**
DURATION : 60 hrs **MAX. MARKS: 100**

Course Objectives

- To understand the crystal structure, growth methods and X-ray scattering.
- To explain the optical, dielectric and diffusion properties of crystals.
- To recognize the basis of semiconductors, superconductivity materials and magnets.
- To study the synthesis, classification and applications of nanomaterials.
- To learn about the importance of materials used for renewable energy conversion

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K2]: express the basic knowledge on advanced materials based properties of crystals, special materials, crystallography and crystal growth methods.

CO2[K3]: apply their knowledge in the field of crystal growth methods, properties of crystals and special materials.

CO3[K4]: classify different types of special materials and materials for energy conversions.

CO4[K5]: assess the ways of prediction of special materials, properties of crystals and crystal growth methods.

CO5[K6]: predict the new types of materials used in the materials for renewable energy conversion.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	1	2	2	-	1
CO2[K3]	3	2	1	2	1	1	1
CO3[K4]	3	2	1	1	1	1	1
CO4[K5]	2	2	2	2	1	1	1
CO5[K6]	2	2	3	1	1	1	2
Weightage of the course	13	10	08	07	06	04	06
Weighted percentage of Course contribution to POs	**4.1**	**3.72**	**3.85**	**4.46**	**5.45**	**3.1**	**4.41**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I – CRYSTALLOGRAPHY (12 hrs)

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.

UNIT II – CRYSTAL GROWTH METHODS (12 hrs)

Nucleation – Equilibrium Stability and Metastable State. Single Crystal – Low and High Temperature, Solution Growth – Gel and Sol-Gel. 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.

UNIT III – PROPERTIES OF CRYSTALS (12 hrs)

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.

UNIT IV – SPECIAL MATERIALS (12 hrs)

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 $LiNbO_3$.

UNIT V – MATERIALS FOR RENEWABLE ENERGY CONVERSION (12 hrs)

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.

TEXTBOOKS

1. Mohan S and Arjunan V, *Principles of Materials Science*, MJP Publishers, 2016.
2. Arumugam, *Materials Science*, Anuradha Publications, 2007.
3. Giacavazzo, *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 Edition, PEARSON Press, 2007.

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1. Arora M. G, *Solid State Chemistry*, Anmol Publications: New Delhi, 2001.
2. Puri R. K and Babbar V. K, *Solid State Ph*ysics, S Chand and Company Ltd, 2001.
3. Kittel C, *Solid State Physics*, John-Wiley and sons: New York, 1966.
4. Meyers H. P, *Introductory Solid State Physics*, Viva Books Private Limited, 1998.
5. West A. R, *Solid State Chemistry and Applications*, John-Wiley and sons, 1987.

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2. https://www.youtube.com/watch?v=WuclTFbINq4
3. https://www.youtube.com/watch?v=6LPtaolrFxc

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry
SEMESTER - II
NON-MAJOR ELECTIVE COURSE – I:
CHEMISTRY IN FOOD PRESERVATION (23PCHN21)
(From 2023-2024 Batch onwards)

HOURS/WEEK: 4 **INT. MARKS: 25**
CREDITS : 2 **EXT. MARKS: 75**
DURATION : 60 hrs **MAX. MARKS: 100**

Course Objectives

- To understand the principles of food preservation.
- To realize the techniques in the preservation of foods.
- To learn the concept of food additives, fermentation.
- To correlate the role of dehydration in food preservation.
- To recognize the traditional methods in food preservation.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K2]: explain the methods of preservation, food laws, additives, fermentation

CO2[K3]: compare the methods of food preservation

CO3[K4]: examine the importance of food preservation, processing, fermentation, laws, additives

CO4[K5]: interpret the basics of food preservation

CO5[K6]: predict the different ideas of preservation of food.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	1	-	2	-	2	1
CO2[K3]	3	1	1	2	-	2	2
CO3[K4]	2	2	1	2	1	2	1
CO4[K5]	2	2	1	3	1	-	2
CO5[K6]	2	1	1	-	1	1	1
Weightage of the course	12	07	04	09	03	07	07
Weighted percentage of Course contribution to POs	**3.79**	**2.6**	**1.92**	**5.73**	**2.73**	**5.43**	**5.15**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I – FOOD PRESERVATION METHODS – I (12 hrs)

Principles – Meaning Mode of Action and Changes in Foods – Use of High Temperature (Heat Preservation) – Moist and Dry Heat Methods –Blanching – Dehydration – Concentration – Canning – Commercial Sterilization – Pasteurization – Use of Low Temperatures – Cold Preservation: Freezing and Refrigeration – Air freezing – Indirect Contact Freezing – Immersion Freezing – Dehydro-Freezing – Cryo-freezing – Changes in Foods During Refrigeration and Frozen Storage

UNIT II – FOOD PRESERVATION METHODS – II (12 hrs)

Dehydration and Concentration – Benefits and Factors Affecting Heat and Mass Transfer – Physical and Chemical Changes During Dehydration and Concentration – Methods and Techniques Used (Air Convection, Drum Driers and Vacuum Driers) – Use of Various Evaporators for Concentration of Foods.

UNIT III – RADIATION IN FOOD PROCESSING (12 hrs)

Use of Ionizing Radiation and Microwave Heating: Ionizing Radiations and Sources – Units of Radiation – Radiation Effects – Mechanism of Microwave Heating – Application of Radiation Technology.

UNIT IV – FERMENTATION, FOOD ADDITIVES, FOOD LAWS (12 hrs)

Use of Fermentation – Benefits and Mechanisms of Fermentation – Fermented Food Products (e.g Beer, Wine, Soya Sauce, Cheese, Soya bean products) – Microbial vs Industrial Fermentation – Use of Food Additives – Broad Classes – Intentional and Unintentional Food Additives – Laws and Regulations – Food Enzymes and Their Applications in Food Industry – Application of Hurdle Technology.

UNIT V – TRADITIONAL METHODS OF FOOD PRESERVATION (12 hrs)

Smoking – Sun Drying – Pickling/ Salting –Fermentation Recent Advances in Food Preservation – Pulse Electric Field Special Packaging – Use of Technology for Minimal Processing for Preservation of Fresh Foods – Use of Antioxidants in Food Preservation – Cold Pressed Juices – Use of Natural Preservatives – Preservatives on Food Labels

TEXTBOOKS

1. Borvers J, *Food Theory and Application,* 2nd Edition, New York: Maxwell MacMillan International Edition, 1992.
2. Manay N. S. and Sharaswamy S. M, *Foods: Facts and Principles*, New Age International Publishers: New Delhi, 1997.

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1. Scottsmith and Hui Y. H, *Food Processing Principles and Applications,* London Blackwell Publishing, 2004.
2. Subbulakshmi G and Udipi S. A, *Foods Processing and Preservation*, New Age International (P) Ltd. Publishing: New Delhi, 2001.

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1. https://youtu.be/2Admn5dmMqo
2. https://youtu.be/7tt8jOC2nmc

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry
SEMESTER - III
CORE COURSE – VII: ORGANIC SYNTHESIS AND PHOTOCHEMISTRY
(23PCHC31)
(From 2023-2024 Batch onwards)

HOURS/WEEK: 6 (L-5, T-1) **INT. MARKS: 25**
CREDITS : 5 **EXT. MARKS: 75**
DURATION : 90 hrs **MAX. MARKS: 100**

Course Objectives

- To understand the molecular complexity of carbon skeletons and the presence of functional groups and their relative positions.
- To study various synthetically important reagents for any successful organic synthesis.
- To apply disconnection approach and identifying suitable synthons to effect successful organic synthesis.
- To learn the concepts of pericyclic reaction mechanisms.
- To gain the knowledge of photochemical organic reactions.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K2]: relate the concept of organic synthesis – methods, pericyclic reactions and organic photo chemistry

CO2[K3]: apply principles to understand the reagents and to correlate their reactivity with reaction conditions in organic and photochemistry

CO3[K4]: analyze the synthetic strategies, methodology of organic compounds and photochemistry

CO4[K5]: predict the suitability of reaction conditions in the preparation compounds, reaction, mechanism in organic and photochemistry

CO5[K6]: elaborate the design, synthesis, reaction, mechanism in organic and photochemistry.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	2	1	-	1	-
CO2[K3]	3	2	2	1	1	1	1
CO3[K4]	3	3	2	1	1	1	1
CO4[K5]	3	3	2	1	1	1	1
CO5[K6]	3	3	3	1	1	1	1
Weightage of the course	15	13	11	05	04	05	04
Weighted percentage of Course contribution to POs	**4.73**	**4.83**	**5.29**	**3.18**	**3.64**	**3.88**	**2.94**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I – PLANNING AN ORGANIC SYNTHESIS AMD CONTROL ELEMENTS (18 hrs)

Preliminary Planning – Known's and Unknowns of the Synthetic System Studied, Analysis of the Complex and Interrelated Carbon Framework into Simple Rational Precursors, Retrosynthetic Analysis, Alternate Synthetic Routes, Key Intermediates that Would be Formed, Available Starting Materials and Resulting Yield of Alternative Methods. Linear vs Convergent Synthesis, Synthesis Based on Umpolung Concepts of Seeback, Regio-specific, Control Elements. Use of Protective Groups, Activating Groups and Bridging Elements. Examples of Retrosynthetic approach, Calculation of Yield, Advantages of Convergent Synthesis, and Synthesis of Stereochemistry – Controlled Products.

UNIT II – ORGANIC SYNTHETIC METHODOLOGY (18 hrs)

Retrosynthetic Analysis; Alternate Synthetic Routes. Synthesis of Organic Mono and Bi-functional Compounds via Disconnection Approach. Key Intermediates, Available Starting Materials and resulting Yield of Alterntive Methods. Convergent and Divergent Synthesis. Synthesis Based on Umpolung Concept of Seebach. Protection of Hydroxyl, Carboxyl, Carbonyl, Thiol and Amino Groups. Illustration of Protection and Deprotection in Synthesis, Control Elements: Use of Protective Groups, Activating Groups, and Bridging Elements. Stereospecific Control Elements. Functional Group Alterations and Transposition.

UNIT III – PERICYCLIC REACTIONS (18 hrs)

Woodward Hoffmann Rules; the Mobius and Huckel Concept, FMO, PMO Method and Correlation Diagrams. Cycloaddition ns Retrocycloaddition

Reactions; [2+2], [2+4, [4+4], Cationic, Anionoic and 1, 3 – Dipolar Cycloadditons. Cheletropic Reactions. Electrocyclization and Ring Opening Reactions of Conjugated Dienes and Trienes. Sigmatropic Rearrangements: (1,3), (1,5), (3,3) and (5,5) – Carbon Migrations, Degenarate Rearrangements. Ionic Sigmatropic Rearrangements. Group Transfer Reactions. Regioselectivity, Stereoselectivity and Periselectivity in Pericyclic Reactions.

UNIT IV – ORGANIC PHOTOCHEMISTRY- I (18 hrs)

Photochemical Excitation: Experimental Techniques; Electronic Transition; Jablonskii Diagrams; Intersystem Crossings; Energy transfer Processes; Stern Volmer Equation. Reactions of Electronically Excited Ketones $\pi \rightarrow \pi^*$ Triplets; Norrish Type-I and Type-II Cleavage Reactions; Photo Reductions; Paterno-Buchi Reactions.

UNIT V – ORGANIC PHOTOCHEMISTRY- II (18 hrs)

Photochemistry of α, β-Unsaturated Ketones; Cis-Trans Isomerisation. Photon Energy Transfer Reactions, Photo Cycloadditions. Photochemistry of Aromatic Compounds; Photochemical Rearrangements; Photo-Stationery State; Di π- Methane Rearrangement Reaction of Conjugated Cyclohexadienone to 3,4-Diphenyl Phenols; Barton's Reactions.

TEXTBOOKS

1. Carey F. A and Sundberg, *Advanced Organic Chemistry*, 5th Edition, Tata McGraw Hill: New York, 2003.
2. March J and Smith M, *Advanced Organic Chemistry*, 5th Edition, John – Wiley and Sons, 2007.
3. Ireland R, *Organic Synthesis,* Prentice Hall: India, Goel Publishing House, 1990.
4. Clayden, Greeves, Warren, *Organic Chemistry,* 2nd Edition, Oxford University Press, 2016.
5. Smith M. B, *Organic Synthesis*, McGraw Hill International Edition, 2011.

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1. Gill and Wills, *Pericyclic Reactions,* Chapman Hall: London, 1974.
2. Joule J. A and Smith G. F, *Heterocyclic Chemistry,* Garden City Press: Great Britain, 2004.
3. Caruthers W, *Some Modern Methods of Organic Synthesis*, Cambridge University Press: Cambridge, 2007.
4. House H. O, *Modern Synthetic Reactions,* W A Benjamin Inc, 1972.
5. Jagdamba Singh and Jaya Singh, *Photochemisty and Pericyclic Reactions,* New Age International Publishers: New Delhi, 2012.

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2. https://youtu.be/Mjck01ao9Mw
3. https://youtu.be/_63HfATMzTo

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry
SEMESTER - III
CORE COURSE – VIII: COORDINATION CHEMISTRY – I (23PCHC32)
(From 2023-2024 Batch onwards)

HOURS/WEEK: 6 (L-5, T-1) **INT. MARKS: 25**
CREDITS : 5 **EXT. MARKS: 75**
DURATION : 90 hrs **MAX. MARKS: 100**

Course Objectives

- To gain insights into the modern theories of bonding in coordination compounds.
- To learn various methods to determine the stability constants of complexes.
- To understand and construct correlation diagrams and predict the electronic transitions that is taking place in the complexes.
- To describe various substitution and electron transfer mechanistic pathways of reactions in complexes.
- To evaluate the reactions of octahedral and square planar complexes.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K2]: illustrate the concept of coordination compounds, spectral characteristics, stability ,kinetics and mechanism of complexes.

CO2[K3]: determine the properties of coordination complexes, stability constants, kinetics and mechanism of electron transfer reactions.

CO3[K4]: explain the theories of coordination complexes, energy level diagrams, stability of complexes, substitution and electrode transfer reactions.

CO4[K5]: predict the electronic transitions in a complex based on correlation diagrams, crystal field stabilization energy, magnetic property of complexes, theories of trans effect and photo-redox reactions.

CO5[K6]: discuss the kinetics and mechanism of substitution reactions in octahedral and square planar complexes, transition of complexes, concept of weak and strong field complexes, factors affecting stability of complexes and application of electron transfer reactions.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	1	2	1	-	1
CO2[K3]	3	2	2	1	1	1	1
CO3[K4]	3	3	2	1	1	1	1
CO4[K5]	3	3	2	1	1	1	1
CO5[K6]	3	3	3	1	1	1	-
Weightage of the course	15	13	10	06	05	04	04
Weighted percentage of Course contribution to POs	**4.73**	**4.83**	**4.81**	**3.82**	**4.55**	**3.1**	**2.94**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I – MODERN THEORIES OF COORDINATION COMPOUNDS (18 hrs)

Crystal Field Theory – Splitting of D Orbitals in Octahedral – Tetrahedral and Square Planar Symmetries – Measurement of 10Dq – Factors Affecting 10Dq – Spectrochemical Series – Crystal Field Stabilization Energy for High Spin and Low Spin Complexes – Evidences for Crystal Field Splitting – Site Selections in Spinels And Antispinels – Jahn Teller Distortions and its Consequences – Molecular Orbital Theory and Energy Level Diagrams Concept of Weak and Strong Fields – Sigma and Pi Bonding in Octahedral – Square Planar and Tetrahedral Complexes.

UNIT II – SPECTRAL CHARACTERISTICS OF COMPLEXES (18 hrs)

Term States for d Ions – Characteristics of d-d Transitions – Charge Transfer Spectra – Selection Rules for Electronic Spectra – Orgel Correlation Diagrams – Sugano-Tanabe Energy Level Diagrams – Nephelauxetic Series – Racha Parameter and Calculation of Inter-Electronic Repulsion Parameter.

UNIT III – STABILITY AND MAGNETIC PROPERTY OF THE COMPLEXES (18 hrs)

Stability of Complexes – Factors Affecting Stability of Complexes – Thermodynamic Aspects of Complex Formation – Stepwise and Overall Formation Constants – Stability Correlations, Statistical Factors and Chelate Effect – Determination of Stability Constant and Composition of the Complexes- Formation Curves and Bjerrum's Half Method – Potentiometric Method – Spectrophotometric Method- Ion Exchange Method – Polorographic Method and Continuous Variation Method (Job's Method) Magnetic Property of Complexes:

Spin-Orbit Coupling – Effect of Spin-Orbit Coupling on Magnetic Moments-Quenching of Orbital Magnetic Moments.

UNIT IV – KINETICS AND MECHANISMS OF SUBSTITUTION REACTIONS OF OCTAHEDRAL AND SQUARE PLANAR COMPLEXES (18 hrs)

Inert And Labile Complexes – Associative – Dissociative and S_NCB Mechanistic Pathways For Substitution Reactions – Acid and Base Hydrolysis of Octahedral Complexes – Classification of Metal Ions Based on the Rate of Water Replacement Reaction and their Correlation to Crystal Field Activation Energy – Substitution Reactions in Square Planar Complexes – Trans Effect, Theories of Trans Effect and Applications of Trans Effect in Synthesis of Square Planar Compounds – Kurnakov Test.

UNIT V – ELECTRON TRANSFER REACTION (18 hrs)

Electron Transfer Reactions in Octahedral Complexes – Outer Sphere Electron Transfer Reactions and Marcus-Hush Theory – Inner Sphere Electron Transfer Reactions- Nature of the Bridging Ligand in Inner Sphere Electron Transfer Reactions- Photo-Redox – Photo-Substitution and Photo-Isomerisation Reactions in Complexes and their Applications.

TEXTBOOKS

1. Huheey J. E, Keiter E. A, Keiter R. L and Medhi O. K, *Inorganic Chemistry – Principles of structure and reactivity*, 4th Edition, Pearson Education Inc., 2006
2. Meissler G. L and Tarr D. A, *Inorganic Chemistry*, 3rd Edition, Pearson Education Inc., 2008
3. Bannerjea D, *Co-ordination Chemistry*, TATA Mcgraw Hill, 1993
4. Figgis B. N, Introduction to Ligand Fields, Wiley Eastern Ltd, 1976.
5. Cotton F. A, Wilkinson G, Murillo C. A, Bochmann M, *Advanced Inorganic Chemistry*, 6th Edition, Wiley Inter-science: New York, 1988.

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1. Keith F. Purcell and John C. Kotz, *Inorganic Chemistry*, Saunders Publications, USA, 1977.
2. Peter Atkins and Tina Overton, Shriver and Atkins, *Inorganic Chemistry*, 5th Edition, Oxford University Press, 2010.
3. Cotton F. A, Wilkinson G, Guas P. L, *Basic Inorganic Chemistry*, 3rd Edition, John Wiley, 2002.
4. Douglas B, McDanial B. D and Alexander J, *Concepts and Models of Inorganic Chemistry*, 3rd Edition, John Wiley, 1994.

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2. https://www.youtube.com/watch?v=1x9VRJLwEZI

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry
SEMESTER - III
CORE COURSE – IX: PRACTICAL: PHYSICAL CHEMISTRY (23PCHC3P)
(From 2023-2024 Batch onwards)

HOURS/WEEK: 6 (L-5, T-1) **INT. MARKS: 25**
CREDITS : 5 **EXT. MARKS: 75**
DURATION : 90 hrs **MAX. MARKS: 100**

Course Objectives

- To understand the principle of conductivity experiments through conductometric titrations.
- To evaluate the order of the reaction, temperature coefficient, and activation energy of the reaction by following pseudo first order kinetics.
- To construct the phase diagram of two component system forming congruent melting solid and find its eutectic temperatures and compositions.
- To determine the kinetics of adsorption of oxalic acid on charcoal.
- To develop the potential energy diagram of hydrogen ion, charge density distribution and Maxwell's speed distribution by computational calculation.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K2]: illustrate the principles associated with various physical chemistry experiments

CO2[K3]: apply scientifically, plan and perform all the experiments

CO3[K4]: analyze systematically and record the readings in all the experiments

CO4[K5]: evaluate and process the experimentally measured values and compare with graphical data

CO5[K6]: predict the experimental data scientifically to improve students' efficiency for societal developments

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	3	2	2	2	1
CO2[K3]	3	2	3	2	1	1	1
CO3[K4]	3	3	2	2	1	1	1
CO4[K5]	3	3	2	1	1	1	2
CO5[K6]	3	3	2	1	1	1	2
Weightage of the course	15	14	12	08	06	06	07
Weighted percentage of Course contribution to POs	**4.73**	**5.2**	**5.77**	**5.1**	**5.45**	**4.65**	**5.15**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I – CONDUCTOMETRIC EXPERIMENTS (50 hrs)

1. Determination of Equivalent Conductance of A Strong Electrolyte & The Verification of DHO Equation
2. Verification of Ostwald's Dilution Law & Determination of pKa of a Weak Acid.
3. Verification of Kohlrausch's Law for Weak Electrolytes
4. Determination of Solubility of a Sparingly Soluble Salt.
5. Acid-Base Titration (Strong Acid and Weak Acid vs Naoh)
6. Precipitation Titrations (Mixture of Halides Only).

UNIT II – KINETICS (15 hrs)

1. Study the Kinetics of Acid Hydrolysis of an Ester, Determine the Temperature Coefficient and also the Activation Energy of the Reaction
2. Study the Kinetics of the Reaction Between Acetone and Iodine in Acidic Medium by Half-Life Method and Determine the Order With Respect to Iodine and Acetone.

UNIT III – PHASE DIAGRAM (25 hrs)

Construction of phase diagram for a simple binary system

1. Naphthalene – Phenanthrene
2. Benzophenone – Diphenyl amine

ADSORPTION

3. Adsorption of Oxalic Acid on Charcoal & Determination of Surface Area (Freundlich Isotherm only)

TEXTBOOKS

1. Viswanathan B and Raghavan P. S, *Practical Physical Chemistry,* Viva Books: New Delhi, 2009.
2. Sundaram, Krishnan and Raghavan. *Practical Chemistry (Part II).* S. Viswanathan Co. Pvt, 1996.
3. Athawale V. D, and Parul Mathur, *Experimental Physical Chemistry,* Age International (P) Ltd: New Delhi, 2008.
4. Lewers E. G, *Computational Chemistry, Introduction to the Theory and Applications of Molecular and Quantum Mechanics*, 2nd Edition, Springer: New York, 2011.

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1. Yadav J. B, *Advanced Practical Physical Chemistry,* Goel Publishing House, 2001.
2. Garland G. W, Nibler J. W and Shoemaker D. P, *Experiments in Physical Chemistry,* 8th edition, McGraw Hill: Jalandhar, 2016.
3. Gurthu J. N and Kapoor R, *Advanced Experimental Chemistry,* S. Chand and Co, 1987
4. Shailendra K. Sinha, *Physical Chemistry: A laboratory Manual.* Narosa Publishing House Pvt, Ltd: New Delhi, 2014.
5. Jensen F, *Introduction to Computational Chemistry.* 3rd Edition, Wiley-Blackwell.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry
SEMESTER - III
CORE COURSE – X: PRACTICAL: ANALYTICAL INSTRUMENTATION TECHNIQUES (23PCHC3Q)
(From 2023-2024 Batch onwards)

HOURS/WEEK: 6 (L-5, T-1) **INT. MARKS: 25**
CREDITS : 4 **EXT. MARKS: 75**
DURATION : 90 hrs **MAX. MARKS: 100**

Course Objectives

- To design chromatographic methods for identification of species.
- To analyze different constituents through instrumental methods of analysis.
- To evaluate different contaminants in materials using turbidimetry and conductivity measurements.
- To design experiments for analysis of inorganic and organic materials.
- To analyze constituents in materials using emission and absorption techniques.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K2]: illustrate the principles associated with various inorganic organic and physical chemistry experiments

CO2[K3]: apply the basic principle plan and perform all the experiments

CO3[K4]: analyze and record systematically the readings in all the experiments

CO4[K5]: evaluate and process the experimentally measured values and compare with graphical data.

CO5[K6]: predict the experimental data scientifically to improve students efficiency for societal developments

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	3	2	2	2	1
CO2[K3]	3	2	3	2	1	1	1
CO3[K4]	3	3	2	2	1	1	1
CO4[K5]	3	3	2	1	1	1	2
CO5[K6]	3	3	2	1	1	2	2
Weightage of the course	15	14	12	08	06	07	07
Weighted percentage of Course contribution to POs	**4.73**	**5.2**	**5.77**	**5.1**	**5.45**	**5.43**	**5.15**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(40 hrs)**

1. 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.
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.
3. Conductometric Titration of a Mixture of HCl and CH_3COOH Vs NaOH.
4. Conductometric Titration of NH_4Cl Vs NaOH.
5. Conductometric Titration of CH_3COONa Vs HCl.
6. Potentiometric Titration of a Mixture of HCl and CH_3COOH Vs NaOH
7. Determination of pK_a of Weak Acid by EMF Method.
8. Potentiometric Titration of FAS Vs $K_2Cr_2O_7$
9. Potentiometric Titration of KI Vs $KMnO_4$.
10. Potentiometric Titration of a Mixture of Chloride and Iodide Vs $AgNO_3$.
11. Determination of the pH of Buffer Solution by EMF Method using Quinhydrone and Calomel Electrode.
12. Study of the Inversion of Cane Sugar in the Presence of Acid by Polarimetric Method.

UNIT II **(40 hrs)**

1. Estimation of Fe, Cu and Ni by Colorimetric Method
2. Estimation of Na and K by Flame Photometric Method

3. Determination of Spectrophotometrically the Mole Ratio of the Ferrithiocyanate Complex and Equilibrium Constant for the Complex Formation.
4. Determination of the Amount (mol/L) of Ferricyanide Present in the Given Solution using Cyclic Voltammetry.
5. Determination of the Diffusion Coefficient of Ferricyanide using Cyclic Voltammetry
6. Determination of the Standard Redox Potential of ferri-ferrocyanide Redox Couple using Cyclic Voltammetry
7. Estimation of the Amount of Sulphate Present in the Given Solution using Nephelometric Turbidimeter
8. Estimation of the Amount of Nitrate Present in the given solution using Spectrophotometric Method
9. Heavy Metal Analysis in Textiles and Textile Dyes by AAS
10. Determination of Caffeine in Soft Drinks by HPLC
11. Analysis of Water Quality Through COD, DO, BOD Measurements
12. Assay of Riboflavin and Iron in Tablet Formulations by spectrophotometry
13. Estimation of Chromium in Steel Sample by Spectrophotometry
14. Determination of Stern-Volmer Constant of Iodine Quenching by Fluorimetry
15. Determination of Ascorbic Acid in Real Samples using Differential Pulse Voltammetry and Comparing with Specifications
16. Separation of (a) Mixture of Azo Dyes by TLC (b) Mixture of Metal Ions by Paper Chromatography
17. Estimation of Chlorophyll in Leaves and Phosphate in Waste Water by Colorimetry
18. Estimation of Fe(II) by 1,10-phenonthroline using Spectrophotometry

UNIT III **(10 hrs)**

Interpretation and Identification of the Given Spectra of Various Organic Compounds Arrived at from the Following Instruments

1. UV-Visible
2. IR
3. Raman
4. NMR
5. ESR
6. Mass

TEXTBOOKS

1. *Vogel's Text book of Practical Organic Chemistry,* 5th Edition, ELBS/Longman: England, 2003.

2. Jeffery G. H, Bassett J, Mendham J and Denney R. C, *Vogel's Textbook of Quantitative Chemical Analysis,* 6th Edition, ELBS, 1989.
3. Woollins J. D, *Inorganic Experiments,* Weinheim: VCH, 1995.
4. Viswanathan B and Raghavan P. S, *Practical Physical Chemistry,* Viva Books: New Delhi, 2009.
5. Sundaram Krishnan and Raghavan, *Practical Chemistry (Part II).* Viswanathan Co. Pvt., 1996.

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1. Gnanapragasam N. S and Ramamurthy G. R, *Organic Chemistry – Labmanual.* Viswanathan Pvt. Ltd, 2009.
2. Gurtu J. N and Kapoor R, *Advanced Experimental Chemistry*, S. Chand and Co, 2001.
3. Yadav J. B, Advanced Practical *Physical Chemistry,* Goel Publishing House, 2001.
4. Garland G. W, Nibler J. W. and Shoemaker D. P. *Experiments in Physical Chemistry*, 8th Edition, McGraw Hill, 2009
5. Gurthu J. N and Kapoor R, *Advanced Experimental Chemistry,* S. Chand and Co, 1987.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry
SEMESTER - III
ELECTIVE COURSE GENERIC/ DISCIPLINE SPECIFIC – V: PHARMACOGNOSY AND PHYTOCHEMISTRY (23PCHO31)
(From 2023-2024 Batch onwards)

HOURS/WEEK: 3	**INT. MARKS: 25**
CREDITS : 3	**EXT. MARKS: 75**
DURATION : 45 hrs	**MAX. MARKS: 100**

Course Objectives

- To develop the knowledge of natural products, biological functions and pharmacological uses.
- To develop knowledge on primary and secondary metabolites and their sources.
- To understand the concepts of isolation methods and separation of bioactive compounds.
- To provide the knowledge on selected glycosides and marine drugs.
- To familiarize the guidelines of WHO and different sampling techniques.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K2]: explain the basic knowledge of extraction techniques of alkaloids, terpenoids and drugs containing volatile oils.

CO2[K3]: apply pharmacognosy and standardization of herbal drugs in phytochemistry

CO3[K4]: examine the structural features of alkaloids, terpenoids.

CO4[K5]: assess drugs containing terpenoids, alkaloids and volatile oils in chemical analysis

CO5[K6]: predict the suitable physical methods of characterization plant glycosides and marine drugs.

CO-PO Mapping table (Course Articulation Matrix)

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	1	1	-	-	1
CO2[K3]	3	2	1	1	1	1	1
CO3[K4]	2	2	2	1	1	1	2
CO4[K5]	2	2	2	1	1	-	1
CO5[K6]	2	2	1	2	1	1	2
Weightage of the course	12	10	07	06	04	03	07
Weighted percentage of Course contribution to POs	**3.79**	**3.72**	**3.37**	**3.82**	**3.64**	**2.33**	**5.15**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I – PHARMACOGNOSY AND STANDARDIZATION OF HERBAL DRUGS (9 hrs)

Introduction, Definition, Development Classification and Source of Drugs: Biological, Mineral, Marine, Plant Tissue Cultures. Study of Pharmacognostic of a Crude Drug. Biosynthesis: Shikimic Acid Pathway and Acetate Pathway. Systematic Analysis of Crude Drugs. Standardization of Herbal Drugs. WHO Guidelines, Sampling of Crude Drug, Methods of Drug Evaluation. Determination of Foreign Matter, Moisture Ash Value. Phytochemical Investigations-General Chemical Tests.

UNIT II – EXTRACTION TECHNIQUES (9 hrs)

General Methods of Extraction, Types – Maceration, Decoction, Percolation, Immersion and Soxhlet Extraction. Advanced Techniques- Counter Current, Steam Distillation, Supercritical Gases, Sonication, Micro Waves Assisted Extraction. Factors Affecting the Choice of Extraction Process.

UNIT III – DRUGS CONTAINING TERPENOIDS AND VOLSATILE OIL (9 hrs)

Terpenoids: Classification, Isoprene Rule, Isolation and Separation Techniques, General Properties Camphor, Menthol, Eucalyptol. Volatile Oils or Essential Oils: Method of Preparations, Classifications of Volatile Oils, Camphor Oil, Geranium Oil, Citral- Structure Uses. Pentacyclic Triterpenoids: Amyrines; Taraxasterol: Structure and Pharmacological Applications.

UNIT IV – DRUGS CONTAINING ALKALOIDS (9 hrs)

Occurrence, Function of Alkaloids in Plants, Pharmaceutical Applications. Isolation, Preliminary Qualitative Tests and General Properties. General Methods

of Structural Elucidation. Morphine, Reserpine, Papaverine – Chemical Properties, Structure and Uses. Papaverine – Structure, Chemical Properties and Uses.

UNIT V – PLANT GLYCOSIDES AND MARINE DRUGS (9 hrs)

Glycosides: Basic ring system, classification, isolation, properties, qualitative analysis. Pharmacological activity of Senna glycosides, Cardiac glycosides – Digoxin, digitoxin, Steroidal saponins glycosides – Diosgenin, hecogenin. Plant pigments: Occurrence and general methods of structure determination, isolation and synthesis of quercetin and cyanidin chloride. Marine drugs – Selected Drug Molecules: Cardiovascular active substances, Cytotoxic compounds, antimicrobial compounds, antibiotic compounds, Anti-inflammatory agents. Marine toxins

TEXTBOOKS

1. Gurdeep R Chatwal, *Organic chemistry of Natural products*, Volume I&II, 5th Edition, Himalaya publishing House, 2016.
2. Bhat S. V, Nagasampagi B. A, Sivakumar M, *Chemistry of Natural Products*, Revised Edition, Narosa Publishers, 2014.

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1. Jeffrey B. Harborne, *Phytochemical methods: A Guide to Modern Techniques of Plant Analysis,* 4th Edition, Indian reprint, Springer, 2012.
2. Ashutoshkar, *Pharmacognosy and Pharmacobiotechnology*, 2nd edition, New age international (P) limited: New Delhi, 2007.

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1. https://www.youtube.com/watch?v=aLfabuFo7qo
2. https://www.youtube.com/watch?v=GoUaeJDURrA
3. https://www.youtube.com/watch?v=FaqtUTGAyuw

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry
SEMESTER - III
ELECTIVE COURSE GENERIC/ DISCIPLINE SPECIFIC – V: BIOMOLECULES AND HETEROCYCLIC COMPOUNDS (23PCHO32)
(From 2023-2024 Batch onwards)

HOURS/WEEK: 3 **INT. MARKS: 25**
CREDITS : 3 **EXT. MARKS: 75**
DURATION : 45 hrs **MAX. MARKS: 100**

Course Objectives

- To learn the basic concepts and biological importance of biomolecules and natural heterocyclic compounds.
- To explain several of functions of carbohydrates, proteins, nucleic acids, steroids and hormones.
- To understand the hetero cycles with one and two heteroatoms.
- To elucidate the structure determination of biomolecules
- To know about the fused ring heterocyclic compounds

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K2]: explain the basic knowledge of carbohydrate metabolism, harmones, proteins and heterocyclic compounds

CO2[K3]: find out the different methods of preparation of biomolecules and heterocyclic compounds

CO3[K4]: examine the structural features of biomolecules and heterocyclic compounds.

CO4[K5]: assess reactions of biomolecules and heterocyclic compounds

CO5[K6]: discuss the application of biomolecules and their functions in metabolism.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	1	1	-	-	1
CO2[K3]	3	2	1	1	1	1	1
CO3[K4]	2	2	2	1	1	1	2
CO4[K5]	2	2	2	1	1	-	1
CO5[K6]	2	2	1	2	1	1	2
Weightage of the course	12	10	07	06	04	03	07
Weighted percentage of Course contribution to POs	**3.79**	**3.72**	**3.37**	**3.82**	**3.64**	**2.33**	**5.15**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I – CHEMISTRY AND METABOLISM OF CARBOHYDRATES (9 hrs)

Definition, Classification and Biological Role of Carbohydrates. Monosaccharides: Linear and Ring Structures (Haworth Formula) of Ribose, Glucose, Fructose and Mannose (Structure Determination not required), Physical and Chemical Properties of Glucose and Fructose. Disaccharides: Ring Structures (Haworth Formula) – Occurrence, Physical and Chemical Properties of Maltose, Lactose and Sucrose. Polysaccharides: Starch, Glycogen and Cellulose – Structure and Properties, Glycolysis of Carbohydrates.

UNIT II – STEROIDS AND HORMONES (9 hrs)

Steroids – Introduction, Occurrence, Nomenclature, Configuration of Substituents. Diels' Hydrocarbon, Stereochemistry, Classification, Diels' Hydrocarbon, Biological Importance, Colour Reactions of Sterols, Cholesterol-Occurrence, Tests, Physiological Activity, Biosynthesis of Cholesterol from Squalene. Hormones – Introduction, Classification, Functions of Sex Hormones-Androgens and Estrogens, Adrenocortical Hormones-Cortisone and Cortisol Structure and Functions of Non-Steroidal Hormones – Adrenaline and Thyroxin.

UNIT III – PROTEINS AND NUCLEICACIDS (9 hrs)

Separation and Purification of Proteins – Dialysis, Gel Filtration and Electrophoresis. Catabolism of Amino Acids – Transamination, Oxidative Deamination and Decarboxylation. Biosynthesis of Proteins: Role of Nucleic Acids. Amino Acid Metabolism and Urea Cycle. Structure, Methods for the Synthesis of Nucleosides – Direct Combination, Formation of Heterocyclic Base and Nucleoside Modification, Conversion of Nucleoside to Nucleotides. Primary and Secondary

Structure of RNA and DNA, Watson – Crick Model, Solid Phase Synthesis of Oligonucleotides.

UNIT IV – HETEROCYCLIC COMPOUNDS (9 hrs)

Five and Six Membered Heterocycles with One and Two Hetero Atoms: Synthesis, Reactivity, Aromatic Character and Importance of Following Heterocyclic Rings: Furan, Pyrrole, Thiophene, Pyrazole, Imidazole, Pyridine, Pyrimidine, Diazines Five and Six Membered Heterocycles with More Than Two Heteroatoms: Synthesis and Reactions of triazines, 1,2,3-triazole, 1,2,4-triazole, 1,2,4-oxadiazole, 1,3,4-oxadiazole, 1,2,5-oxadiazole.

UNIT V – FUSED RING HETEROCYCLIC COMPOUNDS (9 hrs)

Benzofused Five Membered Rings: Indole, Isoindole, Benzofuran and Benzothiophene, Preparation and Properties. Benzofused Six Membered Rings: Quinoline and Isoquinoline: Preparation by Ring Closure Reactions, Reactions: Mechanism of Electrophilic and Nucleophilic Substitutions, Oxidation and Reduction Reactions.

TEXTBOOKS

1. Lindhorst T. K, *Essentials of Carbohydrate Chemistry and Biochemistry*, Wiley VCH: North America, 2007.
2. Finar I. L, *Organic Chemistry Vol-2*, 5th Edition, Pearson Education: Asia, 1975.
3. Ahluwalia V. K and Goyal M, *Textbook of Heterocyclic compounds*, Narosa Publishing: New Delhi, 2000.
4. Jain M. K and Sharma S. C, *Modern Organic Chemistry*, Vishal Publishing Co: Jalandhar, Delhi, 2014.
5. Ahluwalia V. K, *Steroids and Hormones*, Ane books publication: New Delhi, 2009.

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1. Finar I. L, *Organic Chemistry Vol-1*, 6th Edition, Pearson Education: Asia, 2004.
2. Pelletier, *Chemistry of Alkaloids*, Van No strand Reinhold Co, 2000.
3. Khan A and Khanum A, *Role of Biotechnology in medicinal & aromatic plants, Vol 1 and Vol 10*, Ukkaz Publications, Hyderabad, 2004.
4. Singh M. P and Panda H, *Medicinal Herbs with their formulations*, Daya Publishing House: Delhi, 2005.

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2. https://www.studyorgo.com/summary.php

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry
SEMESTER - III
NON-MAJOR ELECTIVE COURSE – II: CHEMISTRY OF CONSUMER PRODUCTS (23PCHN31)
(From 2023-2024 Batch onwards)

HOURS/WEEK: 3 **INT. MARKS: 25**
CREDITS : 2 **EXT. MARKS: 75**
DURATION : 45 hrs **MAX. MARKS: 100**

Course Objectives

- To acquire knowledge on soap and its preparation.
- To understand the concept of detergents and its types.
- To compare soap and detergents.
- To study about the different kinds of shampoos.
- To be familiar with the skin products.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K2]: interpret the various concepts of soaps, detergents, shampoos and skin care products

CO2[K3]: determine manufacturing process of consumer products

CO3[K4]: compare the ingredients, types, manufacturing of various consumer products

CO4[K5]: interpret the principles of consumer products

CO5[K6]: predict the features and specification of consumer products.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	1	1	-	1	1
CO2[K3]	2	2	1	2	-	1	1
CO3[K4]	2	2	2	2	1	1	1
CO4[K5]	2	1	2	1	1	2	2
CO5[K6]	2	1	1	1	1	2	2
Weightage of the course	11	08	07	07	03	07	07
Weighted percentage of Course contribution to POs	**3.47**	**2.97**	**3.37**	**4.46**	**2.73**	**5.43**	**5.15**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I – SOAPS **(9 hrs)**

Saponification of Oils and Fats – Manufacture of Soaps – Formulation of Toilet Soaps – Different Ingredients Used and Their Functions – Medicated Soaps – Herbal Soaps – Mechanism of Action of Soap – Soft Soaps – Shaving Soaps and Creams – ISI Specifications – Testing Procedures / Limits.

UNIT II – DETERGENTS – I **(9 hrs)**

Anionic Detergents: Manufacture of LAB (Linear Alkyl Benzene) – Sulphonation of LAB– Preparation of Acid Slurry – Different Ingredients in the Formulation of Detergent Powders and Soaps – Liquid Detergents – Foam Boosters – AOS (Alpha Olefin Sulphonates).

UNIT III – DETERGENTS – II **(9 hrs)**

Cationic detergents: Examples – Manufacture and Applications – Non–Ionic Detergents: Examples – Manufacture of Ethylene Oxide Condensater–Mechanism of Action of Detergents – Comparison of Soaps and Detergents –Biodegradation – Environmental Effects – ISI Specifications / Limits.

UNIT IV – SHAMPOOS **(9 hrs)**

Manufacture of SLS and SLES – Ingredients – Functions – Different Kinds of Shampoos: Anti–Dandruff – Anti–Lice – Herbal and Baby Shampoos – Hair Dye – Manufacture of Conditioners – Cocobetains or Coco diethanolamides – ISI Specifications – Testing Procedures and Limits.

UNIT V – SKIN PREPARATIONS **(9 hrs)**

Face and Skin Powders – Ingredients – Functions – Different Types – Snows and Face Creams – Chemical Ingredients Used – Anti Perspirants – Sun Screen Preparations – UV Absorbers – Skin Bleaching Agents – Depilatories – Turmeric and Neem Preparation – Vitamin Oil – Nail Polishes: nail polish Preparation - Nail Polish Removers – Article Removers – Lipsticks – Roughes – Eyebrow Pencils – Ingredients and Functions – Hazards - ISI Specifications.

TEXTBOOKS

1. Gobala Rao S, *Outlines of Chemical Technology*, Affiliated East West press, 1998.
2. Sawyer W, *Experimental Cosmetics*, Dover publishers: New York, 2000.

REFERENCES

Book

1. Kafaro, *Wasteless Chemical Processing*, Mir publishers, 1995.

Web Sources

1. https://youtu.be/iipY_DDuAeg
2. https://youtu.be/8m3iXjEmzoA

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme – M.Sc. Chemistry
SEMESTER- III
INTERNSHIP/ INDUSTRIAL TRAINING (23PCHJ31)
(From 2023-2024 Batch onwards)

HOURS/WEEK: -	**INT. MARKS: 25**
CREDITS : 2	**EXT. MARKS: 75**
DURATION : 25 Days	**MAX. MARKS: 100**

Course Objectives

- To learn and develop new skills relevant to the field of study or career interests.
- To understand different departments, roles, and functions within the organization to broaden knowledge and explore potential career paths.
- To apply the knowledge gained in academic studies to real-world scenarios.
- To bridge the gap between classroom learning and professional life.
- To gain exposure to different tasks, projects, and challenges relevant to the chosen field.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1 [K2]: identify different career paths within the industry and gain insights into potential future roles.

CO2 [K3]: apply theoretical concepts and academic knowledge to real-world situations and challenges encountered during the internship.

CO3 [K4]: analyze problems, generate innovative solutions, and make informed decisions.

CO4 [K5]: evaluate how to manage time effectively and prioritize tasks to meet deadlines and deliver quality work.

CO5 [K6]: create a portfolio of the work, projects, and achievements during the internship.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1 [K2]	3	2	-	1	1	1	2
CO2 [K3]	2	3	-	1	-	1	2
CO3 [K4]	2	2	-	2	-	1	1
CO4 [K5]	-	2	1	-	-	1	1
CO5 [K6]	1	3	3	3	-	1	2
Weightage of the course	08	12	04	07	01	05	08
Weighted percentage of Course contribution to POs	**2.52**	**4.46**	**1.92**	**4.46**	**0.91**	**3.88**	**5.88**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

Rules and Regulations

1. Each Student has to undergo 25 days institutional/industry based training during the fourth second summer vacation.
2. Internships could be undertaken in different media organizations, industries and educational institutions which should be approved by the department.
3. Students should keep a deta iled record of activities performed and hours spent in training and report the same to the Faculty Coordinator/Mentor/Guide regularly about the progress of internship on weekly basis
4. At the end of the internship, the student must submit a full-fledged detailed internship report (not exceeding 20 pages) along with attendance certificate
5. The Internship carries 100 marks out of which 25 marks for Internal and 75 Marks for External.
6. The viva voce board shall consist of the Head of the Department and the Internal Examiner (Senior Faculty member)
7. The training programme shall be evaluated as per the following pattern

Internal (25 Marks)
Training Review: 15 Marks
Daily Log Report: 5 Marks
PPT Presentation :5 Marks

External (75 Marks)
Training Report :25 Marks
Viva Voce : 50 Marks

EACH INTERNSHIP REPORT WILL FOLLOW THE FORMAT DESCRIBED:

- Title Page
- College Certificate Page
- Internship Certificate provided by the internship institution
- Declaration Page
- Acknowledgement
- Company Profile
- Organizational structure of the concern
- Weekly work plan
- List of figures, List of Tables
- Index
- Chapters

List of Chapters

1. Introduction
2. Nature of work
3. Role in the organization
4. Questionnaires and Observations about work
5. Operating Environment
6. Detailed Description of Technology used
7. Implementation
8. Conclusion
9. Appendix

Text Format in the report: Times New Roman 12 with 1.5 line Margins 1.5" left and 1" all other

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry
SEMESTER - IV
CORE COURSE – XI: COORDINATION CHEMISTRY – II (23PCHC41)
(From 2023-2024 Batch onwards)

HOURS/WEEK: 6 (L-5, T-1)	**INT. MARKS: 25**
CREDITS : 5	**EXT. MARKS: 75**
DURATION : 90 hrs	**MAX. MARKS: 100**

Course Objectives

- To recognize the fundamental concepts and structural aspects of organometallic compounds.
- To learn reactions of organometallic compounds and their catalytic behaviour.
- To identify or predict the structure of coordination compounds using spectroscopic tools.
- To understand the structure and bonding in coordination complexes.
- To evaluate the spectral characteristics of selected complexes.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K2]: illustrate the fundamental concepts of organometallic compounds and inorganic spectroscopy.

CO2[K3]: apply the principles of inorganic spectroscopy for the structural elucidation of the complexes and understand the structure and bonding in organometallic compounds.

CO3[K4]: examine the reactions of organometallic compounds and the structure of complexes through different spectroscopic techniques.

CO4[K5]: discuss the catalytic cycles in organometallic compounds, structural identification of complexes using inorganic spectroscopy.

CO5[K6]: predict the structure of coordination complexes using spectroscopic tools such as IR, NMR, ESR, Mossbauer and optical rotatory dispersion studies and predict the structure and bonding in organometallic complexes.

CO-PO Mapping table (Course Articulation Matrix)

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	2	2	-	1	1
CO2[K3]	3	2	2	2	1	1	1
CO3[K4]	3	3	2	1	1	1	1
CO4[K5]	3	3	2	1	1	1	1
CO5[K6]	3	3	3	1	1	1	1
Weightage of the course	15	13	11	07	04	05	05
Weighted percentage of Course contribution to POs	**4.73**	**4.83**	**5.29**	**4.46**	**3.64**	**3.88**	**3.68**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I – CHEMISTRY OF ORGANOMETALLIC COMPOUNDS (18 hrs)

Classification of Organometallic Compounds Based on M-C Bond – 18 and 16 Electron Rule- Bonding in Metal-Olefin Complexes (Example: Ziese's Salt) – Metal-Acetylene and Metal-Allyl Complexes; Metal-Cyclopentadienyl Complexes – Examples and MO Approach to Bonding in Metallocenes- Fluxional Isomerism – Metal-Carbonyl Complexes: MO Diagram of CO – Structure And Bonding – Bonding Modes – MO Approach of M-CO Bonding – π-Acceptor Nature of Carbonyl Group – Synergistic Effect (Stabilization of Lower Oxidation States of Metals) – Carbonyl Clusters – Low Nuclearity And High Nuclearity Carbonyl Clusters – Structures Based on Polyhedral Skeleton Electron Pair Theory or Wade's Rule.

UNIT II – REACTIONS AND CATALYSIS OF ORGANOMETALLIC COMPOUNDS (18 hrs)

Reactions of Organometallic Compounds – Oxidative Addition – Reductive Elimination (α and β Eliminations), Migratory Insertion Reaction and Metathesis Reaction – Organo-Metallic Catalysis – Hydrogenation of Olefins (Wilkinson's Catalyst) – Hydroformylation of Olefins Using Cobalt or Rhodium Catalysts (Oxo Process) – Oxidation of Olefin (Wacker Process) – Olefin Isomerisation – Water Gas Shift Reaction – Cyclo-Oligomerisation of Acetylenes Using Reppe's Catalysts – Monsonto Process.

UNIT III – INORGANIC SPECTROSCOPY –I (18 hrs)

IR Spectroscopy: Effect of Coordination on the Stretching Frequency – Sulphato, Carbonato, Sulphito, Aqua, Nitro, Thiocyanato, Cyano, Thiourea, DMSO Complexes – IR Spectroscopy of Carbonyl Compounds – NMR Spectroscopy – Introduction, Applications of ^{1}H, ^{15}N, ^{19}F, ^{31}P-NMR Spectroscopy in Structural

Identification of Inorganic Complexes – Fluxional Molecules – Quadrupolar Nuclei – Effect in NMR Spectroscopy.

UNIT IV – INORGANIC SPECTROSCOPY-II (18 hrs)

Introductory Terminologies: g and A Parameters – Definition, Explanation And Factors Affecting g And A – Applications of ESR to Coordination Compounds With One and More than One Unpaired Electrons – Hyperfine and Secondary Hyperfine Splitting and Kramer's Doublets – ESR Spectra of V(II), Mn(II), Fe(II), Co(II), Ni(II), Cu(II) Complexes, Bis(Salicylaldimine)Copper(II) And $[(NH_3)_5Co\text{-}O_2\text{-}Co(NH_3)_5]^{5+}$ –Mossbauer Spectroscopy – Mossbauer Effect – Recoil Energy – Mossbauer Active Nuclei – Doppler Shift – Isomer Shift – Quadrupole Splitting And Magnetic Interactions. Applications of Mössbauer Spectra to Fe and Sn Compounds.

UNIT V – PHOTO ELECTRON SPECTROSCOPY (18 hrs)

Theory – Types, Origin of Fine Structures – Shapes of Vibrational Fine Structures – Adiabatic and Vertical Transitions – PES of Homonuclear Diatomic Molecules (N_2, O_2) and Heteronuclear Diatomic Molecules (CO, HCl) and Polyatomic Molecules (H_2O, CO_2, CH_4, NH_3) – Evaluation of Vibrational Constants of the above Molecules – Koopman's Theorem – Applications and Limitations. Optical Rotatory Dispersion – Principle of CD and ORD; Δ and λ Isomers in Complexes – Assignment of Absolute Configuration Using CD and ORD Techniques.

TEXTBOOKS

1. Meissler G. L and Tarr D. A, *Inorganic Chemistry*, 3rd Edition, Pearson Education Inc., 2008
2. Bannerjea D, *Co-ordination Chemistry*, TATA Mcgraw Hill, 1993.
3. Gupta B. D and Elias A. K, *Basic Organometallic Chemistry Concepts, Syntheses and Applications*, University Press, 2013.
4. Cotton F. A, Wilkinson G; Murillo C. A, Bochmann M, *Advanced Inorganic Chemistry*, 6th Edition, Wiley Inter-science: New York, 1988.

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1. Crabtree, Robert H. *The Organometallic Chemistry of the Transition Metals,* 3rd Edition, John Wiley: New York, 2000.
2. Gütlich P, Bill E, Trautwein A. X, *Mossbauer Spectroscopy and Transition Metal Chemistry: Fundamentals and Applications*, 1st Edition, Springer-Verlag Berlin Heidelberg, 2011.
3. Douglas B, McDaniel D, Alexander J, *Concepts and Models of Inorganic Chemistry,* 3rd Edition, John Wiley, 1994.
4. Purcell K. F, Kotz J. C, *Inorganic Chemistry,* Saunders: Philadelphia, 1976.

5. Drago R. S, *PhysicaI Methods in Chemistry,* Saunders: Philadelphia, 1977.

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1. https://www.youtube.com/watch?v= hH7zXyVvGQ
2. https://www.youtube.com/watch?v=JZcEb21_cVs
3. https://www.youtube.com/watch?v=Q2Fo5BAReGo

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry
SEMESTER - IV
CORE COURSE – XII: PHYSICAL CHEMISTRY – II (23PCHC42)
(From 2023-2024 Batch onwards)

HOURS/WEEK: 6 (L-5, T-1) **INT. MARKS: 25**
CREDITS : 5 **EXT. MARKS: 75**
DURATION : 90 hrs **MAX. MARKS: 100**

Course Objectives

- To understand the essential characteristics of wave functions and need for the quantum mechanics.
- To know the importance of quantum mechanical models of particle in a box, rigid rotor and harmonic oscillator.
- To apply the quantum mechanics to hydrogen and polyelectronic systems.
- To familiarize the symmetry in molecules and predict the point groups.
- To predict the vibrational modes, hybridization using he concepts of group theory

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K2]: illustrate the fundamentals involved in the group theory and quantum mechanics

CO2[K3]: identify the symmetry elements and operations in group theory and wave equations in quantum mechanics

CO3[K4]: explain the concept of quantum mechanics and group theory to predict the electronic structure.

CO4[K5]: discuss the applications of quantum mechanics and construct the character tables using group theory

CO5[K6]: elaborate the theories of quantum mechanics and group theory.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	2	1	1	1	1
CO2[K3]	3	2	2	1	1	1	-
CO3[K4]	3	3	2	1	1	1	1
CO4[K5]	3	3	2	1	1	1	1
CO5[K6]	3	3	2	2	1	-	1
Weightage of the course	15	13	10	06	05	04	04
Weighted percentage of Course contribution to POs	**4.73**	**4.83**	**4.81**	**3.82**	**4.55**	**3.1**	**2.94**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I – QUANTUM MECHANICS (18 hrs)

Wave Particle Duality – Uncertainty Principle – Particle Wave and Schrodinger Wave Equation – Wave Function – Properties of Wave Function – Normalized – Orthogonal – Orthonormal – Eigen Values – Eigen Function – Hermitian Properties of Operators – Introduction to Quantum Mechanics – Black Body Radiation – Photoelectric Effect Schrodinger Wave Equation Hydrogen Spectrum – Need for Quantum Mechanics – Postulates of Quantum Mechanics– Schrodinger Wave Equation – Time Independent And Time Dependent

UNIT II – QUANTUM MODELS (18 hrs)

Particle in a Box – 1D – Two Dimensional and Three Dimensional – Degeneracy Application to Linear Conjugated Molecular System – Free Particles – Ring Systems – Harmonic Oscillator – Wave Equation And Solution – Anharmonicity – Force Constant and its Significance – Rigid Rotator – Wave Equation And Solution – Calculation of Rotational Constants and Bond Length of Diatomic Molecules.

UNIT III – APPLICATION TO HYDROGEN AND POLY ELECTRON ATOMS (18 hrs)

Hydrogen Atom and Hydrogen Like Ions – Hamiltonian-Wave Equation And Solutions – Approximation Methods – Variation Methods: Trial Wave Function, Variation Integral and Application to Particle in 1D Box – Perturbation Method – First Order Applications – Hartee-Fock Self-Consistent Field Method – Hohenberg-Kohn Theorem and Kohn-Sham Equation – Helium Atom – Electron Spin – Paulis Exclusion Principle and Slater Determination

UNIT IV – GROUP THEORY (18 hrs)

Groups – Sub Groups – Symmetry Elements – Symmetry Operations – Classification – Axial and Non-Axial– Dihedral Point Groups – C_n, , C_{nh}, D_n, D_{nh}, $D_{6h,}$ Td and Oh – Matrix Representation and Classes Of Symmetry Operations – Reducible Irreducible And Direct Product Representation – The Great Orthogonality Theorem – Irreducible Representation and Reduction Formula – Characters – Construction of Character Table for C_{2v}, C_{2h}, C_{3v} and D_{nh} Point Groups.

UNIT V – APPLICATIONS OF QUANTUM AND GROUP THEORY (18 hrs)

Hydrogen Molecule – Molecular Orbital Theory and Heitler London (VB) Treatment – Energy Level Diagram – Hydrogen Molecule Ion – Use of Linear Variation Function and LCAO Methods – Electronic Conjugated System: Huckel Method to Ethylene Butadiene – Cyclopropenyl – Cyclo Butadiene and Benzene – Applications of Group Theory to Molecular Vibrations – Electronic Spectra of Ethylene.

TEXTBOOKS

1. Prasad R. K, *Quantum Chemistry*, 4th Revised Edition, New Age International Publishers*:* New Delhi, 2010.
2. Cotton F. A, *Chemical Applications of Group Theory,* 2nd Edition, John Wiley & Sons, 2003.
3. Vincent A, *Molecular Symmetry and Group Theory, A Programmed Introduction to Chemical Applications*, 2nd Edition, John and Willy & Sons Ltd, 2013.
4. Engel T and Philip Reid, *Quantum Chemistry and Spectroscopy*, 4th Edition, Pearson: New Delhi, 2018.
5. Vemulapalli G. K, *Physical Chemistry*, Prentice Hall of India Pvt. Ltd., 2001.
6. McQuarrie D. A, *Quantum Chemistry*, Viva Books PW. Ltd.*,* 2nd Edition.

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1. Levine N, *Quantum Chemistry*, 4th Edition, Allyn& Bacon Inc, 1983.
2. McQuarrie D. A and Simon J. D. *Physical Chemistry, A Molecular Approach,* Viva Books Pvt. Ltd: New Delhi, 2012.
3. Rastogi R. P and Srivastava V. K, *An Introduction to Quantum Mechanics of Chemical Systems,* Oxford & IBH Publishing Co: New Delhi, 2005.
4. Flurry J. R. Jr, *Symmetry Group Theory and Chemical applications,* Prentice Hall. Inc, 1980.
5. Hollas J. M, *Symmetry in Molecules*. Chapman and Hall: London, 2011.

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SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry
SEMESTER - IV
CORE COURSE – XIII: PROJECT WITH VIVA VOCE (23PCHJ41)
(From 2023-2024 Batch onwards)

HOURS/WEEK: 10 **INT. MARKS: 25**
CREDITS : 7 **EXT. MARKS: 75**
DURATION : 150 hrs **MAX. MARKS: 100**

Course Objectives:

- To familiarize the students with the objectives and stages in formulating a Research Project
- To enable the learners to identify the different stages of Research Methodology
- To adhere to the rules formulated in the latest edition of MLA hand book
- To employ the accurate documentation in executing Research project

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K2]: find the unexplored areas of research

CO2[K3]: apply the latest rules of documentation to cite Print, Non-print and Web Publications in a research paper

CO3[K4]: analyze the stages in writing a thesis – collecting and evaluating sources and drafting documentation

CO4[K5]: discuss the objectives in formulating a research paper

CO5[K6]: prepare a rightly documented research project with adequate discussion, interpretation and evaluation

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	1	2	1	1	1
CO2[K3]	3	2	2	2	1	1	1
CO3[K4]	3	2	2	2	1	1	1
CO4[K5]	3	2	3	3	1	1	1
CO5[K6]	2	2	3	3	2	1	1
Weightage of the course	14	10	11	12	06	05	05
Weighted percentage of Course contribution to POs	**4.42**	**3.72**	**5.29**	**7.64**	**5.45**	**3.88**	**3.68**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

Guidelines

1. Students are required to submit a project at the end of the IV semester. The student will work under a faculty member as the research guide.
2. Depending on the interest of the students, project research areas will be chosen.
3. Students must meet the guide periodically.
4. The project carries 100 marks of which 25 Marks for Internal Assessment and 75 Marks for External Examination.
5. There will be two project review sessions.
6. Each student must either present paper or participate in Conferences/Seminars related to his Project work.
7. A draft of the final project report should be submitted to the Project Guide for review at least three weeks prior to the end of the semester.
8. The project report should be of minimum 40 pages (excluding bibliography &appendices)
9. Three copies of the final project report should be submitted.
10. The Head of the department and the Project Guide will evaluate the final Project Report.
11. The viva voce board shall consist of the External Examiner, the Head of the Department and the Internal Examiner (Research Project Guide)

The following rubrics will be taken into account for the evaluation of Project work and viva-voce:

Internal Assessment (25 Marks)		**External Examination (75 Marks)**	
Project Report & Review	: 15 Marks	Project Report	: 25 Marks
PowerPoint Presentation	: 5 Marks	Viva Voce	: 50 Marks
Participation/Publications in Conferences or Seminars	: 5 Marks		

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry
SEMESTER - IV
ELECTIVE COURSE GENERIC/ DISCIPLINE SPECIFIC – VI: CHEMISTRY OF NATURAL PRODUCTS (23PCHO41)
(From 2023-2024 Batch onwards)

HOURS/WEEK: 4	**INT. MARKS: 25**
CREDITS : 3	**EXT. MARKS: 75**
DURATION : 60 hrs	**MAX. MARKS: 100**

Course Objectives

- To learn the basic concepts and biological importance of biomolecules and natural products.
- To explain various of functions of carbohydrates, proteins, nucleic acids, steroids and hormones.
- To understand the functions of alkaloids and terpenoids.
- To elucidate the structure determination of biomolecules and natural products.
- To extract and construct the structure of new alkaloids and terpenoids from different methods.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K2]: express the biological importance of natural products

CO2[K3]: plan and perform the isolation and characterization of synthesized natural products

CO3[K4]: determine the structural of photochemical constituents by chemical and physical methods.

CO4[K5]: interpret the experimental data scientifically to improve biological activity of active components in natural products

CO5[K6]: predict the structural features of alkaloids, terpenoids and anthocyanine, steroids and dyes.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	1	1	1	2	1
CO2[K3]	3	2	1	1	1	1	1
CO3[K4]	2	2	2	1	1	1	1
CO4[K5]	2	2	2	1	1	1	1
CO5[K6]	2	2	2	1	1	1	1
Weightage of the course	12	10	08	05	05	06	05
Weighted percentage of Course contribution to POs	**3.79**	**3.72**	**3.85**	**3.18**	**4.55**	**4.65**	**3.68**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I – ALKALOIDS (12 hrs)

Introduction, Occurrence, Classification, Isolation and Functions of Alkaloids. Classification, General Methods of Structuralelucidation. Chemical Methods of Structure Determination of Coniine, Piperine, Nicotine, Papaverine. Atropine, Quinine, Belladine, Cocaine, Heptaphylline, Papaverine and Morphine

UNIT II – TERPENOIDS (12 hrs)

Introduction, Occurrence, Isoprene Rule, Classification. General Methods of Determining Structure, Structure Determination of Camphor, Abietic Acid, Cadinene, Squalene, Zingiberine. **Carotenoids:** Introduction, Geometrical Isomerism, Structure, Functions and Synthesis of β-Carotene and Vitamin-A.

UNIT III – ANTHOCYANINE AND FLAVONES (12 hrs)

Anthocyanines: Introduction to Anthocyanines, Structure and General Methods of Synthesis of anthocyanines, Cyanidine Chloride: Structure and Determination. Flavones: Biological Importance of Flavones. Structure and Determination of Flavone Andflavonoids.Quercetin: Structure Determination and Importance.

UNIT IV – PURINES AND STEROIDS (12 hrs)

Purines: Introduction, Occurrence and Isolation of Purines. Classification and Spectral Properties of Steroids. Biological Importance, Structure and Synthesis of Uric Acid and Caffeine. Steroids: Steroids – Introduction, Occurrence, Nomenclature, Configuration of Substituents, Diels' Hydrocarbon, Stereochemistry, Classification, Diels' Hydrocarbon, Biological Importance, Colour

Reactions of Sterols, Cholesterol-Occurrence, Tests, Physiological Activity, Biosynthesis of Cholesterol from Squalene.

UNITIV – NATURAL DYES **(12 hrs)**

Occurrence, Classification, Isolation, Purification, Properties, Colour and Constitution. Structural Determination and Synthesis of Indigoitin Andalizarin.

TEXTBOOKS

1. Chatwal G. K, *Organic Chemistry on Natural Products, Vol. 1*, Himalaya Publishing House: Mumbai, 2009.
2. Chatwal G. K, *Organic Chemistry on Natural Products, Vol. 2*, Himalaya Publishing House: Mumbai, 2009.
3. Agarwal O. P, *Chemistry of Organic Natural Products, Vol. 1*, Goel Publishing House: Meerut, 1997.
4. Agarwal O. P, *Chemistry of Organic Natural Products, Vol. 2*, Goel Publishing House: Meerut, 1997.
5. Finar I. L, *Organic Chemistry Vol-2*, 5th Edition, Pearson Education: Asia, 1975.

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1. Finar I. L, *Organic Chemistry Vol-1*, 6th Edition, Pearson Education: Asia, 2004.
2. Pelletier, *Chemistry of Alkaloids*, Van No strand Reinhold Co, 2000.
3. Shoppe, *Chemistry of the steroids*, Butterworthes, 1994.
4. Khan I. A and Khanum A, *Role of Biotechnology in medicinal & aromatic plants, Vol 1 and Vol 10*, Ukkaz Publications: Hyderabad, 2004.

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2. https://www.youtube.com/watch?v=_sjIlpuBCQc&list=PLDjIJRH6sIC6FKUDAj1SjY35_VHgZffON
3. https://www.youtube.com/watch?v=gbpxfhtY0FQ&list=PLYkY3qkT69G7pW-8OEyrssSJ-ihk36y_P

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry
SEMESTER - IV
ELECTIVE COURSE GENERIC/ DISCIPLINE SPECIFIC – VI: POLYMER CHEMISTRY (23PCHO42)
(From 2023-2024 Batch onwards)

HOURS/WEEK: 4	**INT. MARKS: 25**
CREDITS : 3	**EXT. MARKS: 75**
DURATION : 60 hrs	**MAX. MARKS: 100**

Course Objectives

- To learn the basic concepts and bonding in polymers.
- To explain various types of polymerization reactions and kinetics.
- To understand the importance of industrial polymers and their synthetic uses.
- To determine the molecular weight of polymers.
- To predict the degradation of polymers and conductivities.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K2]: express the basic concepts of polymers

CO2[K3]: apply concepts of polymers, techniques, polymerization reaction, processing, preparation and uses

CO3[K4]: examine the determination, properties, techniques, various methods, preparation and applications of polymers

CO4[K5]: measure the molecular weight of polymers, techniques, processing applications

CO5[K5]: appraise the applications of polymeric techniques and interpret the experimental data scientifically to improve the quality of polymers.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	1	1	1	2	1
CO2[K3]	3	2	1	1	1	1	1
CO3[K4]	2	2	2	1	1	1	1
CO4[K5]	2	2	2	1	1	1	1
CO5[K6]	2	2	2	1	1	1	1
Weightage of the course	12	10	08	05	05	06	05
Weighted percentage of Course contribution to POs	**3.79**	**3.72**	**3.85**	**3.18**	**4.55**	**4.65**	**3.68**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I – CHARACTERISATION, MOLECULAR WEIGHT AND ITS DETERMINATION (12 hrs)

Primary and Secondary Bond Forces in Polymers; Cohesive Energy, Molecular Structure, Chemical Tests, Thermal Methods, Tg Molecular Distribution, Stability. Determination of Molecular Mass of Polymers: Number Average Molecular Mass (M_n) and Weight Average Molecular mass (M_w) of Polymers. Molecular Weight Determination of High Polymers by Physical and Methods.

UNIT II – MECHANISM AND KINETICS OF POLYMERIZATION (12 hrs)

Chain Growth Polymerization: Cationic, Anionic, Free Radical Polymerization, Stereoregular Polymers: Ziegler Natta Polymerization: Reaction Kinetics. Step Growth Polymerization, Degree of Polymerization.

UNIT III – TECHNIQUES OF POLYMERIZATION AND POLYMER DEGRADATION (12 hrs)

Bulk, Solution, Emulsion, Suspension, Solid, Interfacial and gas phase polymerization. Types of Polymer Degradation, Thermal Degradation, Mechanical Degradation, Photodegradation, Photo Stabilizers, Solid and Gas Phase Polymerizaion.

UNIT IV – INDUSTRIAL POLYMERS (12 hrs)

Preparation of Fibre Forming Polymers, Elastomeric Material. Thermoplastic: Polyethylene, Polypropylene, Polystyrene. Polyacrylonitrile, Poly Vinyl Chloride, Poly Tetrafluoroethylene, Nylon and Polyester. Thermosetting Plastics: Phenol Formaldehyde and Expoxide Resin. Elastomers: Natural Rubber

and Synthetic Rubber – Buna N, Buna S and Neoprene. Conducting Polymers: Elementary Ideas'; Examples: Poly Sulphur Nitriles, Poly Phenylene, Poly Pyrrole and Poly Acetylene. Polymethylmethcrylate, Polyimides, Polyamides, Polyurethanes, Polyureas, Polyethylene and Polypropylene, Glycols.

UNIT V – POLYMER PROCESSING (12 hrs)

Compounding: Polymer Additives: Fillers, Plasticizers, Antioxidants, Thermal Stabilizers, Fire Retardants and Colourants. Processing Techniques: Calendaring, Die Casting, Compression, Moulding, Injection Moulding, Blow Moulding and Reinforcing. Film Casting, Thermofoamimg, Foaming, Catalysis and Catalysts – Polymerization Catalysis, Catalyst Support, Clay Compounds, Basic Catalyst, Auto – Exhaust Catalysis, Vanadium, Heterogeneous Catalysis and Active Centres.

TEXTBOOKS

1. Gowariker V. R, *Polymer Science*, Wiley Eastern, 1995.
2. Misra G. S, *Introductory Polymer Chemistry,* New Age International Pvt, Limited, 1996.
3. Bhatnagar M. S, *A Textbook of Polymers*, Vol – I & II, S. Chand & Company: New Delhi, 2004.

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1. Billmeyer F. N, *Textbook of Polymer Science*. Wiley Interscience, 1971.
2. Kumar A and Gupta S. K, *Fundamentals and Polymer Science and Engineering.* Tata McGraw-Hill, 1978.

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2. https://youtu.be/-5xwKbtThzY
3. https://youtu.be/MV0MXWaxBv4

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
PG Programme - M.Sc. Chemistry
SEMESTER - IV
SKILL ENHANCEMENT COURSE: PROFESSIONAL COMPETENCY COURSE: CHEMISTRY FOR COMPETITIVE EXAMINATIONS (23PCHS41)
(From 2023-2024 Batch onwards)

HOURS/WEEK: 4	**INT. MARKS: 100**
CREDITS : 2	**EXT. MARKS: -**
DURATION : 60 hrs	**MAX. MARKS: 100**

Course Objectives

- To acquire knowledge in fundamentals of organic chemistry
- To gain knowledge in inorganic chemistry
- To know about concepts in physical chemistry
- To gain knowledge problem solving in chemistry
- To be aware of important competitive examination like CSIR, NET, SET, TRB, UPSC, TNPSC etc…

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K1]: describe the basic concepts in organic, inorganic and physical chemistry

CO2[K2]: express the various principles used in organic, inorganic and physical chemistry

CO3[K3]: apply those concepts in the problem solving in organic, inorganic and physical chemistry

CO4[K4]: analyze the various competitive exam question papers

CO5[K5]: evaluate the methodology behind problem solving and critical thinking

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	2	1	1	1	1	2
CO2[K2]	2	2	2	1	1	1	1
CO3[K3]	2	2	1	1	1	2	1
CO4[K4]	2	2	1	2	2	1	1
CO5[K5]	2	1	2	1	1	2	2
Weightage of the course	10	09	07	06	06	07	07
Weighted percentage of Course contribution to POs	**3.15**	**3.35**	**3.37**	**3.82**	**5.45**	**5.43**	**5.15**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I – ORGANIC CHEMISTRY (20 hrs)

IUPAC Nomenclature – Stereochemistry – Aromaticity – Organic Reactive Intermediates – Organic Reaction Mechanism – Common Name Reactions and Rearrangements – Organic Transformation Reactions – Organic Synthesis – Pericyclic Reactions – Heterocyclic Compounds – Natural Products – Spectroscopy –IR, UV-Vis – ^{1}H and ^{13}C NMR and Mass Spectroscopy.

UNIT II – INORGANIC CHEMISTRY (20 hrs)

Periodic Table – Structure and Bonding – Acids and Bases HSAB Principle – Non-aqueous Solvents – Main Group Elements and their Compounds – Transition elements – Inner Transition Elements – Coordination Compounds – Organometallic Compounds – Cages and Clusters – Bioinorganic Chemistry – Nuclear Chemistry – Spectroscopy – IR, Raman, NMR, ESR, Mossbauer, UV-Vis, NQR.

UNIT III – PHYSICAL CHEMISTRY (20 hrs)

Quantum Mechanics – Approximate methods of Quantum mechanics – Atomic Structure and Spectroscopy – Chemical bonding in Diatomics – Group Theory – Molecular Spectroscopy – Chemical and Statistical Thermodynamics – Electrochemistry – Chemical Kinetics – Colloids and Surface Chemistry – Solid State – Polymer Chemistry – Data Analysis

REFERENCES

Books

1. Atkins P.W, & Paula J, *Physical Chemistry*, 10th Edition, Oxford University Press: New York, 2014.
2. Huheey J. E, *Inorganic Chemistry: Principles of Structure and Reactivity,* 4th Edition, Addison, Wesley Publishing Company: India, 1993.

3. Finar I. L, *Organic Chemistry Vol. (1& 2*), 6th Edition, England: WesleyLongman Ltd., 2006.

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2. https://www.google.com/search?rlz=1C1CHBD_enIN840IN840&q=net+chemistry+video+lectures&tbm=vid&sa=X&ved=2ahUKEwjY5cW3ndv_AhXtXGwGHTmDDw0Q0pQJegQIDhAB&biw=606&bih=549&dpr=1.1#fpstate=ive&vld=cid:a5e282cc,vid:onCI7spJLqI

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
PG Programme
SEMESTER III & IV
PART V – EXTENSION
(From 2023 -2024 Batch Onwards)

HOURS/WEEK: -
CREDIT : 1
DURATION : - **INT. MARKS: 100**

Course Objectives

- To promote community involvement, encourage civic participation, and foster a sense of ownership and responsibility.
- To involve the learners in organizing campaigns, seminars, or public events to educate the public, promote understanding, and advocate for positive change.
- To create platforms for knowledge sharing, partnership development, and collective action.
- To encourage environmental conservation, promote responsible resource management, or foster sustainable livelihoods.
- To raise awareness about social issues, advocate for marginalized groups, or implement programs that promote inclusivity and equal opportunities.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to

CO1[K1]: recognize the importance of community service through training and education

CO2[K2]: interpret ecological concerns, consumer rights, gender issues & legal protection

CO3[K3]: develop team spirit, verbal/nonverbal communication and organizational ethics by participating in community service

CO4[K4]: examine the necessity of professional skills & community-oriented services for a holistic development

CO5[K6]: create awareness on human rights, legal rights, First Aid, Physical fitness and wellbeing

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1 [K1]	2	-	-	2	2	1	1
CO2 [K2]	2	1	-	2	1	1	1
CO3 [K3]	2	-	-	1	2	2	1
CO4 [K4]	1	1	1	1	2	2	1
CO5 [K6]	1	-	-	1	2	2	1
Weightage of the course	08	02	01	07	09	08	05
Weighted percentage of Course contribution to Pos	**2.52**	**0.74**	**0.48**	**4.46**	**8.18**	**6.2**	**3.68**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

Details of the Courses

1 Physical Education
2 Red Ribbon Club (RRC)
3 Youth Red Cross (YRC)
4 Fine Arts Club
5 Library and Information Service Club
6 Yoga Club
7 ECO Club
8 Consumer Club
9 Human Rights Club
10 Women Empowerment Cell
11 Legal Awareness League