

FATIMACOLLEGE (AUTONOMOUS)



**Re-Accredited with “A++”(CGPA 3.61) Grade by
NAAC (Cycle-IV)**

Maryland, Madurai- 625 018, Tamil Nadu, India

NAME OF THE DEPARTMENT: CHEMISTRY

NAME OF THE PROGRAMME : M.Sc.

PROGRAMME CODE : PSCH

ACADEMIC YEAR : 2023-2024

Fatima College (Autonomous) Madurai - 18

The Minutes of the Board of Studies
Department of Chemistry

(To be implemented from 2023-2024 onwards)

Convened on 3.4.2023

Convened at 2 p.m.

Venue : R3

Members Present

S.NO.	Name	Designation
1.	Dr. B. Medona, Head & Associate Professor, Dept. of Chemistry <i>B. Medona</i> 3/4/23.	Head of the Department
2.	Dr. P. Suresh, Assistant Professor Department of Natural Products Chemistry School of Chemistry, Madurai Kamaraj University, Madurai <i>P. Suresh</i> 3/4/23	University Nominee.
3.	Dr. N. Manimaran, Associate Professor, Department of Chemistry, Bharathidasan University, Trichy <i>N. Manimaran</i> 3/4/23	Subject Expert (Other than Parent University)
4.	Dr. A. Mary Imelda Jayaseeli, Head & Associate Professor, Jayaraj Annapackiam College for Women, Periyakulam. <i>A. Mary Imelda Jayaseeli</i> 3/4/2023	Subject Expert

5 S. Manikandan, Senior Research Associate, Par Pharma, R&D Department, Chengalpattu. Industrialist

6 Ms. B. Shobana, Research Scholar, Research Department, Thiagarajar College. Alumna
B. Shobana
(03/01/2023)

7 Dr. A. Rajeswari, Assistant Professor, Dept. of Chemistry, Fatima College. Dean of Academic Affairs.
31/4/2023

Staff Members

Dr. S. Sukumari

Dr. B. Vinodha

Dr. B. Suganthana

Dr. J. Arul Mary

Dr. V. Arul Deepa

Dr. M. Priyadharshani

Dr. K. R. Subimol

Dr. J. Belinda Asha

Dr. J. Jone Celestina

Sun. S

Rigodur
B. Sun

Dr. M. M. M. M.

V. Anil

Dr. Priyadharshani

Dr. J. Belinda Asha

J. Belinda Asha

For N. Vinodha Sundari

Minutes of the Board of Studies: UG

1. Presentation of the Action Taken Report

Action Taken Report for 2022-2023

S.No.	Common Suggestions offered in the previous Board	Action Taken for the Academic year 2022-2023
1.	No need to have External Exam for Self Learning Courses	As per the suggestion Question Paper Setting is done Internally.

Change of Course Title

S.No.	Old Course Code	New Course Code	Old Course Title	New Course Title	Need for Change
1.	19C4SB2	19C4SB2	Natural and Synthetic Dyes	Dyes and Pigments	As per Recommendation of Course Teacher
2.	19C5CC16	19C5CC16	Green Chemistry Practicals	Conventional and Green Synthesis	To include experiments of removed Lab Course

New Courses Introduced

S.No.	Course Code	Course Title	Relevance to				Scope for			Need for Introduction
			L	R	N	G	EMP	ENTRE	SD	
1	21N4SLC4	Textile Colomation			N		Emp	Entre		To make learners Entrepreneurs.

Revised Courses

S.No.	Course Code	Course Title	No. & Title of units Revised with Content	% of Revision	Need for Revision	Relevance to				Scope for		
						L	R	N	G	EMP	ENTRE	SD
1.	19C4SB2	Dyes & Pigments	Unit-IV Title can be changed as Pigments.	20	Course Teacher Recommendation			N		Emp		
2.	19C5CC16	Conventional and Green Synthesis	3 new Conventional Expts. were Included & Greener methods & Reagents were Increased.	50	To include removed Experiments				G	Emp		

2. updation of Open Educational Resources — Nil.

3. Revision of Courses.

S.No.	Course Code	Course Title	No. & Title of units Revised with the Revised Content Specified if it is not the whole unit.	% of Revision	Need for Revision	Relevance to				Scope for		
						L	R	N	G	EMP	ENTRE	SD
1.	19C4CC10	Inorganic	Unit I - Inclusion of Structural	10					G	Emp		

Chemistry
- III -

Isomerism (Ionisation, linkage, ligand, hydrate & Co-ordinate Position Isomerism) & in Unit - III - Reaction Mechanism in 6 coordinate complexes. SN^1 , SN^2 , Acid hydrolysis, Base Hydrolysis, SN^1 , SN^2 can be included.

2. 19CSME1 Spectroscopy

Unit - I - Basic Problems.
Unit - II - Problems involving small molecules.
Unit - V - Problems involving Simple fragmentation (150-200) with Nitrogen & Halogen functional groups

5

G₁ E₁ M₁ P₁ S₁

3. 19CBCC17 organic Chemistry

Deletion of the following
Unit I - Preparation & Properties of 1,2-, 1,4- & 2,6-Naphtha quinones, Naphthoic acids, 9,10-anthraquinone & phenanthraquinone
Unit - III - Stereochemistry of amino acids, Primary structure and denaturation of proteins - fibrous & Globular proteins.
Unit - IV - Structure and Synthesis of Camphor & Zingiberene & in Unit - V - Structure & Synthesis of Quinine

20% Since the course is found to be too heavy for students

G₁ E₁ M₁ P₁

4. 19CBME3 Advanced Organic Chemistry

Unit - III - Contents in organic Photochemistry - Elaborated
Unit - IV - In contents, only Name of the Rearrangements can be specified.
Unit - V - Title can be changed as Reagents & Rearrangements can be deleted in Title & Contents

15% As per the suggestions given by subject Experts & Course Teachers

G₁ E₁ M₁ P₁

4. New Courses Introduced.

III UG (COBE)

S.No	Course Code	Course Title	Relevance to				Scope for		Need for Introduction
			L	R	N	G ₁	EMP	ENTRE SP	
1	23UBSL ZC	Herbal Cosmetics			N		EMP	ENTRE SP	To develop Entrepreneurial Skill of Learners [Beautyician course]

I UG (TANSCHE SYLLABUS) CORE COURSES INTRODUCED (PART-III)

S.No	Course Code	Course Title & Semester	Relevance To				Scope for			Need for Introduction
			L	R	N	G	EMP	ENT Re	SD	
1	CC1	Inorganic Chemistry-I & I Semester				G	EMP			
2	CC2	Organic Chemistry-I & I Semester				G	EMP			
3	CC3	Volumetric Analysis-I & I Semester				G	EMP		SD	
4	CC4	Inorganic Chemistry-II & II Semester				G	EMP			
5	CC5	Organic Chemistry-II & II Semester				G	EMP			
6	CC6	Volumetric Analysis-II & II Semester				G	EMP		SD	

Elective Courses Introduced (Part-III)

S.No	Generic/Discipline Specific & Semester	Course Code	Course Title	Relevance to				Scope for		
				L	R	N	G	EMP	ENT Re	SD
1	Generic & I Semester	EC1	Basic concepts of Chemistry for Biological Sciences			N		EMP		
2	Generic & I Semester	EC2	Organic Qualitative & Volumetric Analysis			N		EMP		SD

Skill Enhancement/ Foundation/ Ability Enhancement Course (Part-III)

S No	SEC/FC/AEEC I Semester	Course Code	Course Title	Relevance to				Scope for			Need for Intro
				L	R	N	G	Emp	EN TR E	SD	
1.	SEC(NME) I Semester	SEC-1	Profitable Home Industries			N		Emp	EN TR E		
2.	FC I Semester	FC	Concepts of Chemistry to Beginners				G	Emp		SD	
3.	SEC(NME) II Semester	SEC-2	Profitable Home Industries			N		Emp	EN TR E		
4.	SEC (Discipline Specific) II Semester	SEC-3	Dyes & Pigments			N		Emp			

5. Introduction of Purely Skill Embedded Certificate/Diploma

Advanced Diploma Value added Course other than that already offered : NIL

6. Approval of Ph.D. Course work Syllabus

: NIL

7. Rubrics for Internship/Project

: NIL

*The Syllabus for all the above UG courses are framed & passed in the Board

Other Suggestions

Commendations

1. In FC, Problems can be included in Contents, Teaching and Testing can be focused on Problem Solving method
2. The title Volumetric Analysis - I can be renamed as Green Volumetric Analysis.
3. for Organic chemistry I & II - Morrison R.T. & Boyd R.N. - organic chemistry Book can be included as one of the Text Books.

Our UG Syllabus is Good & too heavy

Minutes of the Board of Studies: PG

1. Presentation of the Action Taken Report for 2022-2023

S.No.	Common Suggestions offered in the Previous Board	Action taken for the Academic year 2022-23
1.	19PG4C17 - Unit-I - Absorption, Emission, LASER, EMR Interaction and Einsteins Coefficient can be deleted.	The given Suggestion is incorporated in 19PG4C17.

Change of Course Title:

S.No.	Old Course Code	New Course Code	Old Course Title	New Course Title	Need for Change
1.	19PG1C5	19PG1C5	Organic Qualitative Analysis	Organic Qualitative Analysis & Preparation - I	Recommendation of course Teacher & subject Experts
2.	19PG2C10	19PG2C10	Organic Quantitative Analysis and Preparations	Organic Estimation & Preparation - II	Recommendation of Course Teachers & subject Experts

New Courses Introduced

S.No.	Course Code	Course Title	Relevance To				Scope for			Need for Introduction
			L	R	N	G	EMP	ENTRE	SD	
1.	22PGC4 SLCP	Batteries and its applications			N		EMP	Entre		To increase Employability & Entrepreneurship

Revised Courses

S. No	Course Code	Course Title	No. & Title of units Revised with the Revised content	% of Revision	Need for Revision	Relevance to				Scope for			
						L	R	N	G	E	EN	SD	
1.	19PG1C5	Organic Qualitative Analysis & Preparation-I	Spectral Analysis of compounds using IR and UV can be included	10%				N			E	EN	SD
2	19PG2 C10	Organic Estimation & Preparation-II	Inclusion of Estimation of Aniline & Phenol								E	EN	SD

			instead of Glucose by Eynon & Lane Method, Spectral Analysis of Compounds using IR & UV can be included	20%				N	Emp		
3	19PG4 C17	Physical Chemistry - IV	Title of Units I, II, III & IV changed as Rotational & Vibrational, Electronic & Resonance and Mossbauer Spectroscopy. In Unit - I - Inclusion of NMR Instrumentation Frequency & comparison with ESR frequency can be included.	15%					G	Emp	EN TRE
4	19PG4 CF4	Analytical Chemistry	Title of Unit I, II & V are changed as Error Analysis, Chromatography & Computers in Chemistry with minor changes in content and in unit. III - DTA can be included.	10%					G	Emp	EN TRE

2. Updation of Open Educational Resources in the : NIL

list of references of each courses

3. Revision of Courses

: NIL (for II PG - OBE Syllabus)

4. New Courses Introduced

: NIL (for II PG - OBE Syllabus)

I PG CTANSCHE SYLLABUS)

Core Courses Introduced (Part A)

S. No.	Course Code	Course Title & Semesters	Relevance to				Scope for			Need for
			L	R	N	G	Emp	EN TRE	SD	
1.	PG-CC1	Inorganic Chemistry - I & I Semester				G	Emp			
2	PG-CC2	Organic Chemistry - I & I Semester				G	Emp			
3.	PG-CC3	Physical Chemistry - I & I Semester				G	Emp			

4	PG- CC4	Inorganic chemistry-II & II Semester						G	E 3			
5	PG- CC5	Organic Chemistry - II & II Semester						G	E 3			
6	PG- CC6	Physical Chemistry - II & II Semester						G	E 3			

Elective Courses Introduced (Part-A)

S.No	Generic/ Discipline Specific Semester	Course Code	Course Title	Relevance to				Scope for			Need for Introduction
				L	R	N	G	E M P	E N T R E	SD	
1.	Discipline Specific I Semester	PG- EC1 Lab	Inorganic Qualitative Analysis				G	EMP		SD	
2.	Discipline Specific I Semester	PG- EC2 Lab	Organic Chemistry Practical				G	EMP		SD	
3.	Generic & II Semester	PG- EC3	Analysis of Soil, Water, Food, Cosmetics and Fertilizer			N		EMP	ENTRE		
4.	Discipline Specific & II Semester	PG- EC4	Inorganic Quantitative Analysis				G	EMP		SD	

Skill Enhancement/Ability Enhancement Course (Part-B)

S.No	SEC/AEC Semester	Course Code	Course Title	Relevance to				Scope for			Need for Introduction
				L	R	N	G	EMP	EN	TR	
1.	SEC I Semester	PGI- SEC-1	Computational Chemistry				N	EMP		SD	
2.	SEC II Semester	PGI- SEC-2	Preparation of Consumer Products.				N	EMP	EN	TR	E

5. Introduction of Purely Skill-Embedded Certificate/Diploma, Advanced Diploma, Value added Course Other than that is already being offered : NIL

6. Approval of Ph.D. Course work Syllabus : NIL

7. Rubrics for Internship/Project : NIL

8. Details of Proposed/Signed MoU :

Signed MoU with Material Research Centre, Coimbatore on 20.04.2022 for Three years.

The Syllabus for all the above I year PG Courses are reviewed and passed in the Board. The front page for II year courses are framed and reviewed.

Other Suggestions

1. Jerry March. A. - Advanced organic Chemistry - Book can be removed from Reference for organic chemistry I & II Courses.

2. NPTEL Study Material can be included under references.

Commendations.

1. The syllabus for all the courses are very Good.

3. Puri, Sharma & Pathania - Principles of Physical Chemistry Book can be included in PG-CC3.

1. Head of the Department OR B. Medona Signature
B. Medona
2. University Nominee. Dr. P. Suresh V. Suresh
3/4/23
3. Subject Expert. Dr. N. Marimaran N. Marimaran
3/4/23
4. Subject Expert Dr. A. Mary Imelda A. Mary Imelda
3/4/23
Jeyaseeli
5. Industrialist. S. Marikandan
6. Alumna M.B. Shobana M.B. Shobana
3/4/2023
7. Dean of Academic affairs. Dr. A. Rajeswari. A. Rajeswari
3/4/2023
8. Staff Members.

Dr. S. Sukumari

Dr. B. Vinodha

Dr. B. Sugantham

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V. Arul Deepa

Dr. Priyadharsani

K. R. Subimol

J. Berlinda Asha

For N. Vimala Sundari

VISION OF THE DEPARTMENT

To transform the students entrusted in our hands into competent chemists.

MISSION OF THE DEPARTMENT

- ♦ To transfer the knowledge of chemistry with values to create globally competent chemist.
- ♦ To promote scientific enquiry and inculcate research.
- ♦ To inculcate in students the skills of problem solving.
- ♦ To create in them the awareness about ecological concerns.
- ♦ To train to adopt cost effective and eco-friendly green chemistry methodologies.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

After five years,

PEO1	Our graduates will be academic, digital and information literates, creative, inquisitive, innovative and committed researchers who would be desirous for the “more” in all aspects
PEO2	They will be efficient individual and team performers who would deliver excellent professional service exhibiting progress, flexibility, transparency, accountability and in taking up initiatives in their professional work
PEO3	The graduates will be effective managers of all sorts of reallife and professional circumstances, making ethical decisions, pursuing excellence within the time framework and demonstrating apt leadership skills.

PEO4	They will engage locally and globally evincing social and environmental stewardship demonstrating civic responsibilities and employing right skills at the right moment.
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GRADUATE ATTRIBUTES (GA)

Fatima College empowers her women graduates holistically. A Fatimite achieves all-round empowerment by acquiring Social, Professional and Ethical competencies. A graduate would sustain and nurture the following attributes:

I. SOCIAL COMPETENCE	
GA1	Deep disciplinary expertise with a wide range of academic and digital literacy
GA2	Hone creativity, passion for innovation and aspire excellence
GA3	Enthusiasm towards emancipation and empowerment of humanity
GA4	Potentials of being independent
GA5	Intellectual competence and inquisitiveness with problem solving abilities be fitting the field of research.
GA6	Effectiveness in different forms of communications to be employed in personal and professional environments through varied platforms.
GA7	Communicative competence with civic, professional and cyber dignity and decorum.
GA8	Integrity respecting the diversity and pluralism in societies, cultures and religions.
GA9	All-inclusive skill sets to interpret, analyse and solve social and environmental issues in diverse environments.

GA10	Self awareness that would enable them to recognize their uniqueness through continuous self-assessment in order to face and make changes building on their strengths and improving their weaknesses.
GA11	Finesse to co-operate exhibiting team-spirit while working in groups to achieve goals
GA12	Dexterity in self-management to control their selves in attaining the kind of life that they dream for.
GA13	Resilience to rise up instantly from their intimidating set backs.
GA14	Virtuosity to use their personal and intellectual autonomy in being life-long learners
GA15	Digital learning and research attributes.
GA16	Cyber security competence reflecting compassion, care and concern towards the marginalised
GA17	Rectitude to use digital technology reflecting civic and social responsibilities in local, national and global scenario.
II. PROFESSIONAL COMPETENCE	
GA18	Optimism, flexibility and diligence that would make them professionally competent
GA19	Prowess to be successful entrepreneurs and become employees of trans-national societies
GA 20	Excellence in Local and Global Job Markets.
GA21	Effectiveness in Time Management.
GA 22	Efficiency in taking up Initiatives.
GA 23	Eagerness to deliver excellent service.
GA 24	Managerial Skills to Identify, Commend and tap Potentials.

III. ETHICALCOMPETENCE	
GA25	Integrity and be disciplined in bringing stability leading a systematic life promoting good human behaviour to build better society.
GA 26	Honesty in words and deeds.
GA27	Transparency revealing one's own character as well as self-esteem to lead a genuine and authentic life.
GA 28	Social and Environmental Stewardship
GA 29	Readiness to make ethical decisions consistently from the galore of conflicting choices paying heed to their conscience.
GA 30	Right life skills at the right moment.

PROGRAMME OUTCOMES (PO)

On completion of M.Sc Programme, The learners will be able to

PO1	<i>Apply acquired scientific knowledge to solve major and complex issues in the society/industry.</i>
PO2	<i>Attain research skills to solve complex cultural, societal and environmental issues</i>
PO3	<i>Employ latest and updated tools and technologies to solve complex issues.</i>
PO4	<i>Demonstrate Professional Ethics that foster Community, Nation and Environment Building Initiatives.</i>

PROGRAMME SPECIFIC OUTCOMES (PSO)

On completion of M.Sc. Chemistry programme, the learners would be able to

PSO1	Equip with an in-depth knowledge of varied fields namely Organic Chemistry, Inorganic Chemistry ,Physical and nanochemistry.
PSO2	Train in problem solving procedures enables to interpret the experimental data into structures and mechanisms.
PSO3	Provides a tremendous exposure and cultivates analytical and synthesising measures necessary to takeup project work in reputed institutions.
PSO4	Programme renders diversified thinking thereby promotes creative skills.
PSO5	To solve the problems that cause a negative impact on surroundings to pursue salient steps to safeguard environment.
PSO6	Application-oriented input sharpens the skill to undertake CSIR-NET exam.
PSO7	Knowledge with practical dimensions becomes a driving power to undertake research in different areas at a global level.
PSO8	Multi-layered input enables to avail opportunities at chemical, pharmaceutical industries.
PSO9	Becomes a contributing force and development agent in society.

FATIMA COLLEGE (AUTONOMOUS),
Affiliated to Madurai Kamaraj University
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 Mary Land, Madurai - 625018, Tamil Nadu

DEPARTMENT OF CHEMISTRY
(For the academic year 2023-2024)

PROGRAMME CODE : PSCH

COURSECODE	COURSE TITLE	HRS / WK	CREDIT	CIA Mk s	ES E Mk s	TOT . MKs
SEMESTER – I (TANSCH)						
23PG1C1	Organic Reaction Mechanism-I	6	5	40	60	100
23PG1C2	Structure and Bonding in Inorganic Compounds	6	5	40	60	100
23PG1C3	Organic Chemistry Practical	6	4	40	60	100
23PG1CE1/ 23PG1CE2	Pharmaceutical Chemistry/Nanomaterials and Nanotechnology	5	3	40	60	100
23PG1CE3/ 23PG1CE4	Electro chemistry/Molecular Spectroscopy	5	3	40	60	100
23PG1CAE	Chemistry in Consumer Products (EDC)	2	1	40	60	100
Total		30	21			

SEMESTER -II (TANSICHE)						
23PG2C4	Organic reaction mechanism-II	6	5	40	60	100
23PG2C5	Physical Chemistry-I	6	5	40	60	100
23PG2C6	Inorganic Chemistry Practicals	6	4	40	60	100
23PG2CE5/ 23PG2CE6	Medicinal Chemistry/Green Chemistry	4	3	40	60	100
23PG2CE7/ 23PG2CE8	Bio Inorganic Chemistry/Material Science	4	3	40	60	100
23PG2CSE1	Chemistry in every day life (EDC)	4	2	40	60	100
Total		30	22			
SEMESTER - III (OBE)						
19PG3C11	Organic Chemistry-III (Spectroscopy and Pericyclic reactions)	6	5	40	60	100
19PG3C12	Physical Chemistry-III (Group Theory, Surface Chemistry and Macromolecules)	6	5	40	60	100
19PG3C13	Green Chemistry	5	5	40	60	100
19PG3CE1 / 19PG3CE2	Material Chemistry / Bio Organic Chemistry	5	4	40	60	100
19PG3C14	Physical Chemistry Practicals-I (Electrical Experiments)	6	4	40	60	100
19PG3SIC1	Internship/Summer Project*	-	3	50	50	100
	Library	2				
Total		30	26			

SEMESTER – IV (OBE)						
19PG4C15	Inorganic Chemistry-III (Organometallics & Bio-inorganic chemistry)	6	5	40	60	100
19PG4C16	Organic Chemistry-1V (Retrosynthesis, Reactions and Reagents, Natural Products)	6	5	40	60	100
19PG4C17	Physical Chemistry-IV (Spectroscopy, Kinetic Theory of gases, Photochemistry And Radiation chemistry)	6	5	40	60	100
19PG4CE3/ 19PG4CE4	Analytical chemistry / Chemical engineering	4	4	40	60	100
19PG4C18	Physical Chemistry Practicals-II (Non-electrical experiments)	6	4	40	60	100
19PG4CPR	Project*& Viva Voce	-	3	40	60	100
	Library	2				
Total		30	26			

OFF-CLASS PROGRAMME

ADD-ON COURSES

Course Code	Courses	Hrs .	Credits	Semester in which the course is offered	CIA Marks	ESE Marks	Total Marks
	SOFT SKILLS	40	4	I	40	60	100
23PAD2CA	COMPUTER APPLICATIONS	40	4	II	40	60	100
19PAD4CV	COMPREHENSIVE VIVA (Question bank to be prepared for all the papers by the respective courseteachers)	-	2	IV	-	-	100
	READING CULTURE	15 / Semester	1	I-IV	-	-	-
	TOTAL		11 +				

EXTRA CREDIT COURSE**MOOC COURSES OR SELF LEARNING COURSE****MOOC COURSES:**

Course Code	Courses	Hrs.	Credits	Semester in which the course is offered	CIA Mks	ES E Mks	Total Marks
	MOOC COURSES (Department Specific Courses) * Students can opt other than the listed course from UGC-SWAYAM /UGC /CEC	-	Minimum 2 Credits	-	-	-	

SELF LEARNING COURSE: OFFERED BY DEPARTMENT OF CHEMISTRY

COURSE CODE	Course TITLE	Hrs.	Credits	Semester in which the course is offered	CI A Mks	ES E Mks	Total Marks
21PG2SLC	RESEARCH METHODOLOGY	-	2	II	40	60	100
22PG4SLCP	BATTERIES AND ITS APPLICATIONS	-	2	IV	40	60	100

I M.Sc.,CHEMISTRY

SEMESTER –I

For those who joined in 2023 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCH	23PG1C1	ORGANIC REACTION MECHANISM- I	PG Core	6	5

COURSE DESCRIPTION

This paper focuses on all the important aspects of organic chemistry like aromaticity, reaction intermediates and stereochemistry.

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.

UNITS

UNIT –I **Methods of Determination of Reaction Mechanism** (18HRS.)

Reaction intermediates, The transition state, Reaction coordinate diagrams, Thermodynamic and kinetic requirements of reactions: Hammond postulate. Methods of determining mechanism: non-kinetic methods - product analysis, determination of intermediates-isolation, detection, and trapping. Cross-over experiments, isotopic labelling, isotope 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** (18HRS.)

Aromaticity: Aromaticity in benzenoid, non-benzenoid, heterocyclic compounds and annulenes. Aromatic electrophilic substitution: Orientation and reactivity of di- and polysubstituted phenol, nitrobenzene and halobenzene. Reactions involving nitrogen electrophiles: nitration, nitrosation and diazonium coupling; Sulphur electrophiles: sulphonation; Halogen electrophiles: chlorination and bromination; Carbon electrophiles: Friedel-Crafts alkylation, acylation and arylation reactions. Aliphatic electrophilic substitution Mechanisms: SE_2 and SE_i , SE_1 - Mechanism and evidences.

UNIT –III **Aromatic and Aliphatic Nucleophilic Substitution** (18HRS.)

Aromatic nucleophilic substitution: Mechanisms - SN_{Ar} , SN_1 and Benzyne mechanisms - Evidences - Reactivity, Effect of structure, leaving group and attacking nucleophile. Reactions: Oxygen and Sulphur-nucleophiles, Bucherer and Rosenmund reactions, von Richter, Sommelet-Hauser and Smiles rearrangements. SN_1 , ion pair, SN_2 mechanisms and evidences. Aliphatic nucleophilic substitutions at an allylic carbon, aliphatic trigonal carbon and vinyl carbon. SN_1 , SN_2 , SN_i , and SE_1 mechanism and evidences, Swain- Scott, Grunwald-Winstein relationship - Ambident nucleophiles.

UNIT –IV Stereochemistry-I**(18HRS.)**

Introduction to molecular symmetry and chirality – axis, plane, center, alternating axis of symmetry. Optical isomerism due to asymmetric and dissymmetric molecules with C, N, S based chiral centers. Optical purity, prochirality, enantiotopic and diastereotopic atoms, groups, faces, axial and planar chirality, chirality 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, proR, proS, side phase and re phase Cahn-Ingold- Prelog rules, absolute and relative configurations. Configurations of allenes, spiranes, biphenyls, cyclooctene, helicene, binaphthyls, ansa and cyclophanic compounds, exo-cyclic alkylidene-cycloalkanes. Topicity 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**(18 HRS.)**

Conformation and reactivity of acyclic systems, intramolecular rearrangements, neighbouring group participation, chemical consequence 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.

REFERENCES:

1. J. March and M. Smith, Advanced Organic Chemistry, 5th edition, John-Wiley and Sons. 2001.
2. E. S. Gould, Mechanism and Structure in Organic Chemistry,

Holt, Rinehart and Winston Inc., 1959.

1. P.S.Kalsi, Stereochemistry of carbon compounds, 8th edition, New Age International Publishers, 2015.
2. P. Y. Bruice, Organic Chemistry, 7th edn, Prentice Hall, 2013.
3. J. Clayden, N. Greeves, S. Warren, Organic Compounds, 2nd edition, Oxford University Press, 2014.
4. F.A. Carey and R.J. Sundberg, Advanced Organic Chemistry Part-A and B, 5th edition, Kluwer Academic / Plenum Publishers, 2007.
5. D. G. Morris, Stereochemistry, RSC Tutorial Chemistry Text 1, 2001.
6. N.S. Isaacs, Physical Organic Chemistry, ELBS, Longman, UK, 1987.
7. E.L. Eliel, Stereochemistry of Carbon Compounds, Tata-McGraw Hill, 2000.
8. I.L. Finar, Organic chemistry, Vol-1 & 2, 6th edition, Pearson Education Asia, 2004.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 Methods of Determination of Reaction Mechanism				
1.1	Reaction intermediates, The transition state, Reaction coordinate diagrams,	2	Chalk & Talk	Black Board
1.2	Thermodynamic and kinetic requirements of reactions	2	Chalk & Talk	LCD
1.3	Hammond postulate. Methods of determining mechanism: non-	2	Lecture	PPT & White

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
	kinetic methods			board
1.4	product analysis, determination of intermediates-isolation, detection, and trapping	3	Lecture	Smart Board
1.5	Cross-over experiments, isotopic labelling, isotope effects and stereo chemical evidences	3	Lecture	Black Board
1.6	Kinetic methods - relation of rate and mechanism	3	Discussion	LCD
1.7	Effect of structure on reactivity: Hammett and Taft equations.	3	Lecture	Smart Board
1.8	Linear free energy relationship, partial rate factor, substituent and reaction constants.	3	Discussion	Black Board
UNIT -2 Aromatic and Aliphatic Electrophilic Substitution				
2.1	Aromaticity: Aromaticity in benzenoid, non-benzenoid, heterocyclic compounds and annulenes	2	Lecture	Green Board
2.2	Aromatic electrophilic substitution: Orientation and reactivity of di- and polysubstituted phenol	2	Chalk & Talk	Green Board
2.3	nitrobenzene and halobenzene.	2	Lecture	Smart

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
	Reactions involving nitrogen electrophiles: nitration, nitrosation and diazonium coupling			Room
2.4	Sulphur electrophiles: sulphonation; Halogen electrophiles	3	Chalk & Talk	Black Board
2.5	chlorination and bromination; Carbon electrophiles	2	Discussion	LCD
2.6	Friedel-Crafts alkylation, acylation and arylation reactions	2	Lecture	Black Board
2.7	Aliphatic electrophilic substitution Mechanisms	2	Lecture	Black Board
2.8	SE ₂ and SE _i , SE ₁ - Mechanism and evidences	3	Chalk & Talk	Black Board
UNIT -3Aromatic and Aliphatic Nucleophilic Substitution				
3.1	Aromatic nucleophilic substitution: Mechanisms - S _N Ar, S _N 1 and Benzyne mechanisms	2	Chalk & Talk	Green Board
3.2	Evidences - Reactivity, Effect of structure, leaving group and attacking nucleophile	2	Discussion	LCD
3.3	Reactions: Oxygen and Sulphur-	2	Chalk &	Black

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
	nucleophiles, Bucherer and Rosenmund reactions		Talk	Board
3.4	von Richter, Sommelet- Hauser and Smiles rearrangements	2	Discussion	LCD
3.5	SN1, ion pair, SN2 mechanisms and evidences	2	Lecture	Black Board
3.6	Aliphatic nucleophilic substitutions at an allylic carbon, aliphatic trigonal carbon and vinyl carbon	2	Lecture	Black Board
3.7	SN1, SN2, SNi, and SE1 mechanism and evidences	3	Chalk & Talk	Black Board
3.8	Swain- Scott, Grunwald-Winstein relationship - Ambident nucleophiles.	3	Chalk & Talk	Green Board
UNIT -4Stereochemistry-I				
4.1	Introduction to molecular symmetry and chirality – axis, plane, center, alternating axis of symmetry. Optical isomerism due to asymmetric and dissymmetric molecules with C, N, S based chiral centers	2	Chalk & Talk	Black Board
4.2	Optical purity, prochirality, enantiotopic and diastereotopic	2	Discussion	LCD

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
	atoms, groups, faces, axial and planar chirality			
4.3	chirality due to helical shape, methods of determining the configuration. Racemic modifications: Racemization by thermal, anion, cation, reversible formation, epimerization, mutarotation	2	Chalk & Talk	Black Board
4.4	D, L system, Cram's and Prelog's rules: R, S-notations, proR, proS, side phase and re phase Cahn-Ingold-Prelog rules, absolute and relative configurations.	2	Discussion	LCD
4.5	Configurations of allenes, spiranes, biphenyls, cyclooctene, helicene, binaphthyls, ansa and cyclophanic compounds, exo-cyclic alkylidene-cycloalkanes	2	Lecture	Black Board
4.6	Topicity and prostereoisomerism, chiral shift reagents and chiral solvating reagents	2	Lecture	Black Board
4.7	Criteria for optical purity: Resolution of racemic modifications, asymmetric transformations, asymmetric	3	Chalk & Talk	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
	synthesis,destruction.			
4.8	Stereoselectiveand stereospecific synthesis.	3	Chalk & Talk	Black Board
UNIT -5Stereochemistry-II				
5.1	Conformation and reactivity of acyclic systems, intramolecular rearrangements, neighbouring group participation, chemical consequence of conformational equilibrium	2	Chalk & Talk	Black Board
5.2	Curtin-Hammett Principle. Stability of five and six-membered rings	2	Lecture	Black Board
5.3	mono-, di- and polysubstitutedcyclohexanes, conformation and reactivity in cyclohexane systems	2	Chalk & Talk	Black Board
5.4	Fused and bridged rings: bicyclic, poly cyclic systems, decalins and Brett's rule.	2	Chalk & Talk	Black Board
5.5	Optical rotation and optical rotatory dispersion	2	Chalk & Talk	Black Board
5.6	conformational asymmetry, ORD curves, octant rule	2	Discussion	LCD

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
5.7	configuration and conformation, Cotton effect	3	Discussion	LCD
5.8	axial haloketone rule and determination of configuration.	3	Lecture	Black Board

CIA Evaluation Pattern

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Better of W1, W2	M1+M2	Mid-Sem. Test	Once in a Sem.			40	-
	5	5+5=10	15	5				
K1	-	-	-	-	-		-	-
K2	-	2	3	-	5		5	12.5 %
K3	5	3	4	-	12		12	30 %
K4	-	5	4	-	9		9	22.5 %
K5	-	-	4	5	9		9	22.5 %
Non-Scho.							5	12.5 %
Total	5	10	15	5	35	5	40 mks.	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

- ✓ All the course outcomes are to be assessed in the various CIA components.
- ✓ The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are :

K2-Understand, K3-Apply, K4-Analyse, K5 - Evaluate

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Best of Two Weekly Tests

C2 – Average of Two Monthly Tests

C3 - Mid Sem Test

C4 – Seminar (Once in a Sem.)

C5 – Non – Scholastic

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	To recall the basic principles of organic chemistry.	K1, K2, K3 &K4	PSO1& PSO2
CO 2	To understand the formation and detection of reaction intermediates of organic reactions.	K1, K2, K3 &K4	PSO3
CO 3	To predict the reaction mechanism of organic reactions and stereochemistry of organic compounds.	K1, K2, K3 &K4	PSO5
CO 4	To apply the principles of kinetic and non-kinetic methods to determine the mechanism of reactions.	K1, K2, K3 &K4	PSO2
CO 5	To design and synthesize new organic compound by correlating the stereochemistry of organic compounds.	K1, K2, K3 &K4	PSO3

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	3	3	2	1	1	1	1	1
CO2	2	3	3	1	1	1	1	1
CO3	2	2	3	1	3	1	1	1
CO4	2	1	3	1	3	1	1	1
CO5	2	1	1	1	3	1	3	1

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	3	2	2	2
CO3	3	3	3	3
CO4	3	2	3	3
CO5	3	2	2	3

Note: ♦ Strongly Correlated – 3 ♦ Moderately Correlated – 2
 ♦ Weakly Correlated – 1

COURSE DESIGNER:

Dr.M.Priyadharsani

Dr. V.Aruldeepa

Forwarded By



HOD's Signature

I M.Sc CHEMISTRY

SEMESTER –I

For those who joined in 2023 onwards

PROGRAMM E CODE	COURSE CODE	COURSE TITLE	CATE GORY	HRS/WEE K	CREDIT S
PSCH	23PG1C2	STRUCTURE AND BONDING IN INORGANIC COMPOUNDS	PG Core	6	5

COURSE DESCRIPTION:

It deals with theories, characterization with spectral studies and determination of structures of main group compounds.

COURSE OBJECTIVES:

- To determine the structural properties of main group compounds
- 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.

UNIT-I: Structure of main group compounds: (18 hrs)

VB theory – Effect of lone pair and electronegativity of atoms (Bent's rule)

on the geometry of the molecules; Covalent bonding-Concept of hybridization and resonance-MO theory-MO diagram of diatomic and linear triatomic molecules-bond properties-bond energy-bond order-comparison of VB and MO theories-polarizability-VSEPR theory-shape of molecules.

UNIT-II : Periodic properties-Acids and Bases (18 hrs)

Modern long form of periodic table - Periodic properties of elements - ionic radius ionisation potential - electron affinity -

electronegativity, scales- Bronsted & Lewis concepts Non aqueous solvent - liq.ammonia, anhydrous H₂SO₄. HSAB principle – Simbiosis – measure and theoretical basis - application.

UNIT-III: Solid state chemistry – I: (18 hrs)

Ionic crystals: Packing of ions in simple, hexagonal and cubic close packing, voids in crystal lattice, Radius ratio, Crystal systems Structural features of the crystal

systems: Rock salt, zinc blende & wurtzite, fluorite and anti-fluorite, rutile and anatase, cadmium iodide and nickel arsenide; and Bravais lattices, Symmetry operations in crystals, glide planes and screw axis; point group and space group; Solid state energetics: Lattice energy – Born-Landé equation -Kapustinski equation, Madelung constant. Spinel -normal and inverse types and perovskite structures. Crystal growth systems-From melt and solution (hydrothermal, sol-gel methods with principles.

UNIT-IV: Techniques in solid state chemistry: (18 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 (18 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

REFERENCES:

1. James.E.Huheey, *Inorganic Chemistry*, pearson publications, 4th edition,2008.

2. F.A.Cotton, G.Wilkinson, C.A. Murillo and M.Bochmann, *Advanced Inorganic Chemistry*;6th ed.; Wiley Interscience: New York,1988.
3. K.F.Purcell and J.C.Kotz, *Inorganic Chemistry*; Saunders: Philadelphia,1976.
4. D.F.Shriver,P.W.Atkins and C.H. Langford;*Inorganic Chemistry*; 3rd ed., Oxford University Press: London,2001.

R. S. Drago, *Physical Methods in Chemistry*; Saunders: Philadelphia,1977.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 STRUCTURE OF MAIN GROUP COMPOUNDS				
1.1	VB theory – Effect of lone pair and electronegativity of atoms	2	Chalk & Talk	Green Board
1.2	(Bent's rule) on the geometry of the molecules;	2	Chalk & Talk	Green Board
1.3	Covalent bonding-Concept of hybridization and resonance-MO theory-	2	Lecture	PPT & White board
1.4	MO diagram of diatomic and linear triatomic molecules	3	Chalk &Talk	Green Board
1.5	Bond properties-Bond energy-Bond order	3	Chalk &Talk	Black Board
1.6	Comparison of VB and MO theories	3	Discussion	Black Board
1.7	polarizability-VSEPR theory-shape of molecules.	3	Chalk &Talk	Black Board
UNIT -2 Periodic properties-Acids and Bases				
2.1	Modern long form of periodic table - Periodic properties of elements	2	Chalk &Talk	Green Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
2.2	Ionic radius ,Ionisation potential - electron affinity	2	Chalk & Talk	Green Board
2.3	Electronegativity scales	2	Lecture	Green Board
2.4	Bronsted & Lewis concepts	3	Chalk & Talk	Black Board
2.5	Non aqueous solvent - liq.ammonia	3	Discussion	LCD
2.6	Anhydrous H ₂ SO ₄ . HSAB principle	3	Chalk &Talk	Black Board
2.7	Simbiosis – measure and theoretical basis - application.	3	Chalk & Talk	Black Board
UNIT -3 Solid state chemistry – I				
3.1	Ionic crystals: Packing of ions in simple, hexagonal and cubic close packing, voids in crystal lattice.	2	Chalk & Talk	Green Board
3.2	Radius ratio, Crystal systems Structural features of the crystal systems:	2	Discussion	LCD
3.3	Rock salt, zinc blende & wurtzite, fluorite and anti-fluorite, rutile and anatase, cadmium iodide and nickel arsenide;	2	Chalk & Talk	Green Board
3.4	Bravis lattices, Symmetry operations in crystals, glide planes and screw axis; point group and space group	2	Discussion	LCD
3.5	Solid state energetics: Lattice energy – Born-Lande equation.	3	Lecture	Green Board
3.6	Kapustinski equation, Madelung constant.	2	Lecture	Black Board
3.7	Spinels -normal and inverse types	2	Chalk &	Black

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
	and perovskite structures.		Talk	Board
3.8	Crystal growth systems-From melt and solution (hydrothermal, sol-gel methods with principles.	3	Chalk & Talk	Green Board
UNIT -4 Techniques in solid state chemistry:				
4.1	X-ray diffraction technique: Bragg's law, Powder diffraction method.	2	Chalk & Talk	Black Board
4.2	Principle and Instrumentation; Interpretation of XRD data	2	Discussion	LCD
4.3	JCPDS files, Phase purity, Scherrer formula, lattice constants calculation;	2	Chalk & Talk	Black Board
4.4	Systematic absence of reflections; Electron diffraction technique	2	Discussion	LCD
4.5	principle, instrumentation and application of diffraction technique	2	Lecture	Green Board
4.6	Electron microscopy – difference between optical and electron microscopy,	2	Lecture	Green Board
4.7	Theory, principle, instrumentation,	3	Chalk & Talk	Green Board
4.8	Sampling methods and applications of SEM and TEM	3	Chalk & Talk	Green Board
UNIT -5 Band theory and defects in solids				
5.1	Band theory – features and its application.	3	Chalk & Talk	Green Board
5.2	Conductors, insulators and semiconductors, Intrinsic and extrinsic semiconductors;	2	Lecture	Green Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
5.3	Defects in crystals – point defects (Schottky, Frenkel, metal excess and metal deficient)	2	Chalk & Talk	Green Board
5.4	Effect on the electrical and optical property,	2	Chalk & Talk	Green Board
5.5	Effect on laser and phosphors	3	Chalk & Talk	Green Board
5.6	conformational asymmetry, ORD curves, octant rule	3	Discussion	Green Board
5.7	Linear defects and its effects due to dislocations	3	Discussion	Green Board

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Session - wise Average	Better of W1, W2	M1+M2	MID-SEM TEST				
	5 Mks.	5+5=10 Mks.	15 Mks	5 Mks	35 Mks.	5 Mks.	40Mks.	
K1	5	-	-	2 ½	-		-	-
K2	-	5	4	2 ½	5		5	12.5 %
K3	-	-	3	5	12		12	30 %

K4	-	-	3	5	9		9	22.5%
Non Scholastic	-	-	-	-	9		9	22.5 %
Total	5	5	10	15	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

- ✓ All the course outcomes are to be assessed in the various CIA components.
- ✓ The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are :

K1- Remember, **K2-**Understand, **K3-**Apply, **K4-**Analyse

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Average of Two Session Wise Tests

C2 – Average of Two Monthly Tests

C3 - Mid Sem Test

C4 – Best of Two Weekly Tests

C5 – Non - Scholastic

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Compare the stabilities various compounds	K2, K3, K4 &K5	PSO1& PSO2
CO 2	To describe the theories of compounds Of ionic crystals	K2, K3, K4 &K5	PSO3
CO 3	Investigate the structures of complexes using by XRD techniques	K2, K3, K4 &K5	PSO5
CO 4	Possess a thorough understanding of electronic spectra of complexes by SEM and TEM	K2, K3, K4 &K5	PSO3
CO 5	To gain knowledge of Defect in crystals	K2, K3, K4 &K5	PSO3

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

3 – Strong, 2 – Medium, 1 - Low

COURSE DESIGNER:

- 1. Dr.B.Medona**
- 2. Dr.J.Jone Celestina**

Forwarded By



HOD'S Signature

FATIMA COLLEGE (AUTONOMOUS), MADURAI-18

M.Sc. DEPARTMENT OF CHEMISTRY

6Hrs/ Week

No. of Credits: 2

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/W EEK	CREDITS
PSCH	23PG1C3	ORGANIC CHEMISTRY PRACTICALS	LAB	6	4

Course Descriptive: This course gives a hands on experience of qualitatively analyzing organic compounds and to synthesis simple organic compounds.

Course Objective: To develop the skills of students to separate binary organic mixtures into individual compounds, identifying functional groups, confirming it by preparing suitable derivatives.

Course Outcomes:

- To be skilled in the separation of binary organic mixtures
- To gain knowledge on the skills of doing micro level analysis
- . To know the methods of qualitative analysis of organic compounds
- To learn about the preparation of suitable derivative of the organic functional groups
- To prepare organic compounds.

Qualitative Analysis of an organic binary mixture

- ☐ Pilot separation
- ☐ Bulk separation

Analysis of organic compounds and preparation of derivatives using green reagents

(Instead of Bromo derivative, Benzoyl derivative is introduced).

(Instead of PCl_5 , Acid derivative is prepared for monoamide using NaOH and HCl)

The functional groups are combined in the following combinations.

- Acidic+ Phenolic compounds
- Basic+Phenoliccompounds
- Acidic+Neutralcompounds
- Basic+Neutralcompounds

The possible functional groups are

Carboxylic acids, Phenols, Amines, Amides, Nitrocompounds, Carbohydrates, Ester & Carbonyl compounds.

I.Double stage Organic preparations:

Preparation of

p-Bromo acetanilide from Acetanilide- Using Green reagent-CAN and KBr (Hazardous bromination is removed and usage of green reagent is introduced)

2-Naphthylbenzoate from 2-Naphthol

Dibenzalacetone from Benzaldehyde- can be used for starting material for Research work

Reference books:

1. Ganapragasam & Ramamurthy G, Organic Chemistry Lab Manual, 2nd Ed., S. Vishwanathan Printers and Publishers (P) Ltd., Chennai, 2007.
2. Furniss B S, Hannaford A J, Smith P W G and Tatchell A R, Vogel's
3. Textbook of Practical Organic Chemistry, 5th Ed., Pearson Publication.
4. Vengataswaran V et al., Basic Principle of Practical Chemistry, Sultan Chand and sons, New Delhi, 1997.
5. W. Kemp, Organic spectroscopy, McMillan, 1991.
6. R. M. Silverstein and F. X. Webster, Spectrometric Identification of organic compounds, John Wiley & Sons, Inc., 6th Ed. 2004
7. P.S.Kalsi, Spectroscopy of organic compounds, New age international publishers, 6th edition, 2009.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	PSOs ADDRESSED
CO 1	To be skilled in the separation of binary organic mixtures	PSO1 & PSO2
CO 2	To gain knowledge on the skills of doing micro level analysis	PSO3
CO 3	To know the methods of qualitative analysis of organic compounds	PSO5

CO 4	To learn about the preparation of suitable derivative of the organic functional groups	PSO2
CO 5	To prepare organic compounds.	PSO3

Mapping of COs with PSOs

CO/ PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	3	3	2	2	1	2	1	1	1
CO2	2	1	3	2	2	1	2	1	1
CO3	2	1	2	2	3	2	1	2	1
CO4	2	2	1	1	2	3	2	1	1
CO5	1	2	1	2	2	2	3	1	1

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	2	1	1
CO2	2	3	1	1
CO3	3	2	1	1
CO4	2	3	1	1
CO5	3	2	1	1

Note: ☐ **Strongly Correlated – 3** ☐ **Moderately
Correlated – 2**

♦ **Weakly Correlated -1**

COURSE DESIGNER:

1. Dr.V. Arul Deepa
2. Dr.M.Priyadharsani

Forwarded By



HOD'S Signature

I M.Sc.

SEMESTER –I

For those who joined in 2023 onwards

PROGRA MME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCH	23PG1CE1	Pharmaceutical Chemistry	MAJOR CORE	5Hrs.	3

COURSE DESCRIPTION

This paper focuses on all the important aspects of Physical concepts of Spectroscopy, Kinetic theory of gases and Photochemistry and Radiation Chemistry

COURSE OBJECTIVE:

- ❖ 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 and its structural activities.

UNIT-I Physical properties in Pharmaceuticals

15hrs

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

15hrs

Principle and applications, Neutron activation analysis: Principle, advantages and limitations, Scintillation counters: Body scanning. Introduction to radiopharmaceuticals. Properties of various types of radiopharmaceuticals, Radiopharmaceuticals as diagnostics, as therapeutics, for research and sterilization. Physico Chemical Properties and drug action. Physico chemical properties of drugs (a) Partition coefficient, (b) solubility (c) surface activity, (d) degree of ionization.

UNIT-III Drug dosage and product development

15hrs

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

15hrs

Introduction, procedure followed in drug design, the research for lead compounds, molecular modification of lead compounds. Structure-Activity Relationship (SAR): Factors effecting bioactivity, resonance, inductive effect,

isoterism, bioisosterism, spatial considerations, biological properties of simple functional groups, theories of drug activity, occupancy theory, rate theory, induced-fit theory, 4.3 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 15hrs

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.

Reference Books:

1. Physical Chemistry- Bahl and Tuli.
2. Text Book of Physical Pharmaceutics, IIInd edition, Vallabh Prakashan-. C.V.S. Subramanyam.
3. Medicinal Chemistry (Organic Pharmaceutical Chemistry), G.R Chatwal, Himalaya Publishing house.
4. Instrumental method of Analysis: Hubert H, Willard, 7th edition.
5. Textbook of Pharmaceutical Chemistry by, Jayshree Ghosh, S. Chand & company Ltd. Pharmaceutical Chemistry by Dr. S.Lakshmi, Sultan chand & Sons.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT –I Physical properties in Pharmaceuticals				
1.1	Physical properties of drug molecule	2	Chalk & Talk	Black Board
1.2	Refractive index- Definition, explanation, formula, importance, determination,	2	Chalk & Talk	Black Board
1.3	specific & molar refraction. Optical activity\rotation	2	Chalk & Talk	Black Board
1.4	monochromatic & polychromatic light	2	Chalk & Talk	Black Board
1.5	measurement of optical activity	2	Chalk & Talk	Black Board
1.6	Dielectric constant & Induced Polarization. concept of viscosity,	2	Chalk & Talk	Black Board
1.7	Newton's law of flow, Kinematic Relative, Specific, Reduced & Intrinsic viscosity.	2	Chalk & Talk	Black Board

1.8	Newtonian system, non-Newtonian system- Plastic flow, Pseudoplastic flow, Dilatent flow.	1	Chalk & Talk	Black Board
UNIT -2 Isotopic Dilution analysis				
2.1	Principle and applications, Neutron activation analysis	2	Chalk & Talk	Black Board
2.2	Principle, advantages and limitations, Scintillation counters.	2	Chalk & Talk	Black Board
2.3	Body scanning. Introduction to radiopharmaceuticals.	2	Chalk & Talk	Black Board
2.4	Properties of various types of radiopharmaceuticals.	1	Chalk & Talk	Black Board
2.5	Radiopharmaceuticals as diagnostics, as therapeutics, for research and sterilization.	2	Chalk & Talk	Black Board
2.6	Physico Chemical Properties and drug action.	2	Chalk & Talk	Black Board
2.7	Physico chemical properties of drugs (a) Partition coefficient, (b) solubility	2	Chalk & Talk	Black Board
2.8	surface activity, degree of	2	Chalk & Talk	Black Board

	ionization			
UNIT -3 Drug dosage and product development				
3.1	Introduction to drug dosage Forms & Drug.	2	Chalk & Talk	Black Board
3.2	Delivery system – Definition of Common terms. Drug Regulation and control, pharmacopoeias formularies,	2	Chalk & Talk	Black Board
3.3	sources of drug, drug nomenclature, routes of administration of drugs products.	2	Chalk & Talk	Black Board
3.4	need for a dosage form, classification of dosage forms. Drug dosage and product development.	1	Chalk & Talk	Black Board
3.5	Introduction to drug dosage Forms & Drug Delivery system.	2	Chalk & Talk	Black Board
3.6	Common terms. Drug Regulation and control, pharmacopoeias formularies.	1	Chalk & Talk	Black Board
3.7	sources of drug, drug nomenclature.	2	Chalk & Talk	Black Board
3.8	routes of administration of drugs products, need for a dosage form, classification of dosage forms.	2	Chalk & Talk	Black Board

UNIT -4 Development of new drugs

4.1	Introduction, procedure followed in drug design.	2	Chalk & Talk	Black Board
4.2	the research for lead compounds, molecular modification of lead compounds.	2	Chalk & Talk	Black Board
4.3	Structure-Activity Relationship (SAR): Factors effecting bioactivity, resonance, inductive effect, isoterism, bioisosterism, spatial considerations.	2	Chalk &Talk	Black Board
4.4	biological properties of simple functional groups, theories of drug activity, occupancy theory.	2	Chalk & Talk	Black Board
4.5	induced-fit theory,4.3 Quantitative structure activity relationship (QSAR):	1	Chalk & Talk	Black Board
4.6	Development of QSAR, drug receptor interactions, the additivity of group contributions, physico-chemical parameters.	2	Chalk & Talk	Black Board
4.7	lipophilicity parameters, electronic parameter, ionization constants.	2	Chalk & Talk	Black Board
4.8	steric parameters, chelation parameters, redox potential, indicator-variables.	2	Chalk & Talk	Black Board

UNIT -5 Computers in Pharmaceutical Chemistry				
5.1	Need of computers for chemistry. Computers for Analytical Chemists- Introduction to computers.	2	Chalk & Talk	Black Board
5.2	Organization of computers, CPU, Computer memory.	3	Chalk & Talk	Black Board
5.3	I/O devices, information storage, software components.	2	Chalk & Talk	Black Board
5.4	Application of computers in chemistry.	1	Chalk & Talk	Black Board
5.5	Programming in high level language (C+) to handle various numerical methods in chemistry.	1	Chalk & Talk	Black Board
5.6	least square fit, solution to simultaneous equations.	2	Chalk & Talk	Black Board
5.7	interpolation, extrapolation, data smoothing.	2	Chalk & Talk	Black Board
5.8	numerical differentiation and integrations.	2	Chalk & Talk	Black Board

CIA Evaluation Pattern

Levels	C1	C2	C3	C4	Total Scholast ic Marks	Non Scholast ic Marks C5	CIA Total	% of <u>Assess ment</u>
	Better of W1, W2 5	M1+M 2 5+5=1 0	Mid- Sem.Tes t 15	Onc e in a Sem. 5			40	-
K1	-	-	-	-	-		-	-
K2	-	2	3	-	5		5	12.5 %
K3	5	3	4	-	12		12	30 %
K4	-	5	4	-	9		9	22.5%
K5	-	-	4	5	9		9	22.5 %
Non- Scho.							5	12.5 %
Total	5	10	15	5	35	5	40 mks.	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

- ✓ All the course outcomes are to be assessed in the various CIA components.
- ✓ The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are :

K2-Understand, K3-Apply, K4-Analyse, K5 - Evaluate

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Best of Two Weekly Tests

C2 – Average of Two Monthly Tests

C3 - Mid Sem Test

C4 – Seminar (Once in a Sem.)

C5 – Non – Scholastic

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	To identify the suitable drugs for various diseases.	K2,K3, K4 & K5	PSO1, PSO2, PSO3, PSO4, PSO6,PS07& PS08
CO 2	To apply the principles of various drug action and drug design.	K2,K3, K4 & K5	PSO1, PSO2, PSO3, PSO4, PSO6,PS07& PS08
CO 3	To acquire the knowledge on product development based on SAR.	K2,K3, K4 & K5	PSO1, PSO2, PSO3, PSO4, PSO6,PS07& PS08
CO 4	To apply the knowledge on applications of computers in chemistry.	K2,K3, K4 & K5	PSO1, PSO2, PSO3, PSO4, PSO6& PS08

CO 5	To synthesize new drugs after understanding the concepts SAR.	K2, K3, K4& K5	PSO1, PSO2, PSO3, PSO4, PSO6,PS07& PS08
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Mapping of COs with PSOs

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9
CO1	3	3	3	3	1	3	3	3	1
CO2	3	3	3	3	1	3	3	3	1
CO3	3	3	3	3	1	3	3	3	1
CO4	3	3	3	3	1	3	1	3	1
CO5	3	3	3	3	1	3	3	3	1

Mapping of COs with POs

CO / PSO	PO1	PO2	PO3	PO4
CO1	3	2	3	1
CO2	3	2	3	1
CO3	3	2	3	1
CO4	3	2	3	1
CO5	3	3	3	1

Note: ☐ ~~Strongly Correlated~~ - 3

☐ ~~Moderately Correlated~~ - 2

♦ Weakly Correlated -1

COURSE DESIGNER:

1. Dr.K.R.SUBIMOL

Forwarded By

B-Tedona.

HOD'S Signature

PG CHEMISTRY

SEMESTER –I

For those who joined in 2023 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCH	23PG1CE2	NANO MATERIALS AND NANO TECHNOLOGY	ELECTIVE	5	3

COURSE DESCRIPTION: This paper provides an extensive study of the Nano materials, their methods of preparation, mechanical properties and their applications.

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 nanomaterials.
- To understand the importance of nanoelectronics and nano magnetic
- To design synthetic routes for synthetically used CNTs and Nanosensors.

UNITS

UNITI: INTRODUCTION OF NANOMATERIALS AND (15HRS.)

Introduction of nanomaterials and nanotechnologies, Introduction-role of size, classification-0D, 1D, 2D, 3D. Synthesis-Bottom –Up, Top–Down, Nano powders, consolidation of Nano powders- Cold Isostatic pressing, HotIsostatic pressing, sintering under pressure, Spark plasma sintering, Other nanomaterials- Fullerene and Dendrimers. Molecular mimics- Catenanes & rotaxanes and their synthesis.

UNIT-II: METALLIC NANO PARTICLES, SYNTHESIS AND PROPERTIES

(15HRS.)

Metallic nanoparticles, Magnetism and magnetic material, Magnetic Nanostructures, Magnetic nano sized materials, Applications of magnetic nano particles, Synthesis- Physical and chemical methods - inert gas condensation, Plasma arcing, sol-gel, Electro deposition, Ball milling, solvothermal and hydrothermal-CVD-types, Microwave assisted and electrochemical synthesis.

UNIT-III: NANO ELECTRONICS AND NANO MAGNETICS

(15HRS.)

Nano electronics, nanocircuiting, nanoelectronic devices (radio, computer, energy production, medical diagnostics), nanoelectronics applications- MRAM, PCM, MIM, PhC, Flip chip packing, active matrix display, OTFT, Super-RENS and biomedical. Application of semiconductor nanomaterials and devices-Injection laser, optical memories. Nanomagnetism classification of nanomagnetic materials-particulate nanomagnets, geometrical nanomagnets, magneto-resonance, nanomagnetism in technology.

UNIT-IV: NANOSENSORS AND CARBON NANOTUBES

(15HRS.)

Nanosensors, existing nanosensors, electronic tongue, electronic nose-pattern analysis, silicon nano wire as sensors, noise sensitive nanosensors, nanosensors in space, nanopressure sensors, physical and chemical sensors, biosensors, quantum dot sensors. Carbon nanotubes-types, synthesis, properties and applications of carbon nanotubes.

UNIT-V: NANOFILMS AND NANOCOMPOSITES

(15HRS.)

Application of nanoparticles in different fields (nanomedicine, nanobiosensors, nanocatalyst, filtration in energy sector, information and communication and opto-electronic devices). Nano thin films. Core-shell nanoparticles-types, synthesis (sol-gel method and electrochemical method) and properties. Nanocomposites-metal, ceramic and polymer

matrix composites and their applications. Characterization–SEM,TEM and AFM-principle, instrumentation and applications.

REFERENCES:

1. Rakesh Rathi, Nanotechnology, S.Chand&CompanyLtd, 2009
2. V.Rajendran,Material science, Tata Mc GrawHill EducationP.Ltd, 2013S.
3. T.Pradeep, A text book of Nanoscience and Nanotechnology, Tata Mc GrawHill EducationP.Ltd, 2012
4. Michael Wilson and Kamali Kannagara, Nanotechnology-Basics and emerging Technologies, Champan & Hall/CRC-Press company-Washington,D.C., 2002

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT-1 INTRODUCTION OF NANOMATERIALS AND NANOPOWDERS (12Hours)				
1.1	Introduction- role of size, classification of nanomaterials 0D, 1D, 2D, 3D	2	Chalk & Talk	Black Board
1.2	Synthesis-Bottom –Up, Top–Down	2	Chalk & Talk	LCD
1.3	Features of nanostructures	2	Chalk & Talk	PPT
1.4	Background of nanostructures	2	Lecture	PPT
1.5	consolidation of Nano powders	3	Lecture	Black Board

				d
1.6	Fullerene and Dendrimers	2	Chalk & Talk	Black Board
1.7	Fullerene and Dendrimers. Molecular mimics	2	Lecture	Black Board
UNIT-2 METALLIC NANO PARTICLES, SYNTHESIS AND PROPERTIES (12Hours)				
2.1	Metallic nanoparticles	2	Lecture	Black Board
2.2	Magnetism and magnetic material	2	Chalk & Talk	Black Board
2.3	Magnetic Nanostructures, Magnetic nano sized materials	3	Chalk & Talk	Black Board
2.4	Applications of magnetic nano particles	2	Chalk & Talk	Black Board
2.5	Synthesis- Physical and chemical methods	2	Chalk & Talk	Black Board
2.6	Synthesis- Physical and chemical methods	2	Chalk & Talk	Black Board

2.7	Synthesis- Physical and chemical methods	2	Chalk & Talk	Black Board
UNIT-3 NANO ELECTRONICS AND NANO MAGNETICS (12Hours)				
3.1	Nano electronics, nanocircuiting, nanoelectronic devices.	3	Chalk & Talk	Black Board
3.2	Nanoelectronics applications	3	Chalk & Talk	Black Board
3.3	Application of semiconductor nanomaterials and devices- Injection laser, optical memories.	3	Chalk & Talk	Black Board
3.4	Nanomagnetics classification of nanomagnetic materials- particulate nanomagnets, geometrical nanomagnets	2	Chalk & Talk	Black Board
3.5	Magneto-resonance	2	Chalk & Talk	Black Board
3.6	Nanomagnetism in technology	2	Chalk & Talk	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT-4 NANOSENSORS AND CARBON NANOTUBES (12Hrs)				
4.1	Nanosensors, existing nanosensors, electronic tongue	2	Chalk & Talk	PPT

4.2	Electronic nose-pattern analysis, silicon nano wire as sensors	3	Chalk & Talk	PPT
4.3	Noice sensitive nanosensors, nanosensors in space, nanopressure, sensors Physical and chemical sensors, biosensors, quantum dot sensors.	3	Chalk & Talk	PPT
4.4	Carbon nanotubes-types, synthesis.	3	Chalk & Talk	PPT
4.5	Properties and applications of carbon nanotubes.	4	Chalk & Talk	PPT
UNIT-5 NANOFILMS AND NANOCOMPOSITES (18 Hours)				
5.1	Application of nanoparticles in different fields. Nano thin films.	3	Chalk & Talk	Black Board
5.2	Core-shell nanoparticles-types, synthesis, and properties.	3	Chalk & Talk	Black Board
5.3	Nanocomposites-metal-, ceramic- and polymer-matrix composites.	3	Chalk & Talk	Black Board
5.4	SEM and TEM principle, instrumentation and applications.	3	Chalk & Talk	Black Board
5.5	AFM-principle, instrumentation and applications.	3	Chalk & Talk	Black Board

CIA Evaluation Pattern

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Better of W1, W2	M1+M2	Mid-Sem. Test	Once in a Sem.			40	-
	5	5+5=10	15	5				
K1	-	-	-	-	-		-	-
K2	-	2	3	-	5		5	12.5 %
K3	5	3	4	-	12		12	30 %
K4	-	5	4	-	9		9	22.5%
K5	-	-	4	5	9		9	22.5 %
Non-Scho.							5	12.5 %
Total	5	10	15	5	35	5	40 mks.	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

- ✓ All the course outcomes are to be assessed in the various CIA components.

- ✓ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are :**

K2-Understand, K3-Apply, K4-Analyse, K5 - Evaluate

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Best of Two Weekly Tests

C2 – Average of Two Monthly Tests

C3 - Mid Sem Test

C4 – Seminar (Once in a Sem.)

C5 – Non – Scholastic

COURSE OUTCOME

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
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CO 1	Explain methods of fabricating nanostructures	K2, K3, K4 &K5	PSO1& PSO2
CO 2	Relate the unique properties of metallic nanoparticles with other nanomaterials.	K2, K3, K4 &K5	PSO3
CO 3	Discuss the electrical and magnetic properties of nano materials.	K2, K3, K4 &K5	PSO5
CO 4	Distinguish various types of nanosensors and carbon nanotubes.	K2, K3, K4 &K5	PSO3
CO 5	Explain Nanocomposites and core/shell nanoparticles.	K2, K3, K4 &K5	PSO3

Mapping of COs with PSOs

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9
CO1	3	3	2	1	1	1	1	1	1
CO2	2	1	3	1	1	1	1	1	1
CO3	2	1	1	1	3	1	1	1	1
CO4	2	1	3	1	1	1	1	1	1
CO5	2	1	3	1	1	1	1	1	1

Mapping of COs with POs

CO / PSO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	2	3	2	2
CO3	2	2	3	2
CO4	3	2	2	2
CO5	3	2	2	2

Note: Strongly Correlated-**3** Moderately Correlated
Weakly Correlated-**1**

COURSE DESIGNER:

1. Dr. Sr. ARULMARY
2. Dr.K.R.SUBIMOL

Forwarded By



HOD's Signature

M.Sc., Chemistry

***For those who joined in 2023
onwards***

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCH	23PG1CE 3	Electro Chemistr y	Elective-II	5	3

COURSE DESCRIPTION: It deals with concepts of electrochemistry in various aspects like interionic effect, electrode kinetics, redox reactions batteries and fuel cells.

COURSEOBJECTIVES:

- 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

UNITS

UNIT-I: Ionics

(15 Hours)

Arrhenius theory -limitations, Van't Hoff factor and its relation to

colligative properties. specific, equivalent and Molar conductance and their variation on dilution, Kohlrausch's law and its applications, Ionic activity, mean ionic activity and concept of ionic strength, Debye Huckel theory of strong electrolytes, Determination of activity coefficient from conductance measurements, ion solvent and ion-ion interactions. . Debye-Huckel Bjerrum model for ion association, Debye-Huckel limiting law ,modifications and applications . Ion association and triple ion formations.

UNIT-II: Electrode-electrolyte interface

(15 Hours)

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 . Applications and limitations.

UNIT-III: Electrode Reactions: (15 Hours)

Thermodynamics of Reversible cells and reversible electrodes, EMF and equilibrium constant, Nernst equation. Liquid junction potential, applications of EMF measurements -Determination of solubility product constants, - & determination of pH. Polarographic cell Assembly, Ilkovic equation, Fick's law of diffusion, Half-wave potential, Applications of polarography.

Kinetics of electrode reactions – Butler-Volmer equation- significance of exchange current density, net current density and symmetry factor. Low and high field approximations. Tafel equations and Tafel plots.

UNIT-IV: Electrodictics of Multistep Multi Electron System:

(15 Hours)

Rates of multi-step electrode reactions, Butler - Volmer equation for a equilibrium and non equilibrium reaction. Rate determining step, electrode

polarization and depolarization. Transfer coefficients, its significance and determination. Corrosion-Electro-chemical reaction involving in corrosion-rate expressions, and surface coverage of corroded particles. Overvoltage - 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 Hours)

Modes of Transport of electro active species - Diffusion, migration and hydrodynamic modes. Role of supporting electrolytes. Cyclic voltammetry-anodic and cathodic stripping voltammetry and differential pulse voltammetry. Capacitors- mechanism of energy storage. Energy production systems: Fuel Cells: classification, alkaline fuel cells, phosphoric acid fuel cells, high temperature fuel cells Sodium and lithium-ion batteries and redox flow batteries.

Recommended Text Books:

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

Reference Books

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

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT-I Ionics (15 Hrs.)				
1.1	Arrhenius theory limitations, Van't Hoff factor and its relation to colligative properties.	2	Chalk & Talk	Black Board
1.2	Specific, equivalent and Molar conductance and their variation on dilution.	3	Chalk & Talk	Black Board
1.3	Kohlrausch's law and its applications, Ionic activity, mean ionic activity and concept of ionic	3	Chalk & Talk	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
	strength, Debye Huckel theory of strong electrolytes.			
1.4	Determination of activity coefficient from conductance measurements, ion solvent and ion-ion interactions.	2	Chalk & Talk	Black Board
1.5	Debye-Huckel Bjerrum model for ion association, Debye-Huckel limiting law, modifications and applications . Ion association and triple ion formations.	3	Chalk & Talk	Black Board
UNIT-II: Electrode-electrolyte interface				(15 Hours)
2.1	Interfacial phenomena - Evidences for electrical double layer, polarizable and non-polarizable interfaces, Electrocapillary phenomena.	3	Chalk & Talk	Black Board
2.2	Lippmann equation electro capillary curves. Electro-kinetic phenomena electro-osmosis, electrophoresis,	5	Chalk & Talk	Black Board
2.3	Streaming and sedimentation potentials, colloidal and poly	2	Chalk & Talk	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
	electrolytes. Structure of double layer: Helmholtz -Perrin,			
2.4	Guoy- Chapman and Stern models of electrical double layer. Zeta potential . Applications and limitations.	5	Chalk & Talk	Black Board
UNIT III - Stability and Magnetic property of the complexes (15 Hrs.)				
3.1	Thermodynamics of Reversible cells and reversible electrodes, EMF and equilibrium constant, Nernst equation.	3	Chalk & Talk	Black Board
3.2	Liquid junction potential, applications of EMF measurements –Determination of solubility product constants, - & determination of pH.	4	Chalk & Talk	Black Board
3.3	Polarographic cell Assembly, Ilkovic equation, Fick's law of diffusion, Half-wave potential, Applications of polarography.	4	Chalk & Talk	Black Board
3.4	Kinetics of electrode reactions – Butler-Volmer equation	2		

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
	significance of exchange current density.			
3.5	Net current density and symmetry factor. Low and high field approximations. Tafel equations and Tafel plots.	2	Chalk & Talk	Black Board
UNIT IV Electrodics of Multistep Multi Electron System (15 Hours)				
4.1	Rates of multi-step electrode reactions, Butler - Volmer equation for a equilibrium and non equilibrium reaction.	4	Chalk & Talk	Black Board
4.2	Rate determining step, electrode polarization and depolarization.	3	Chalk & Talk	Black Board
4.3	Transfer coefficients, its significance and determination. Corrosion-Electro-chemical reaction involving in corrosion	4	Chalk & Talk	Black Board
4.4	Rate expressions, and surface coverage of corroded particles. Overvoltage - and concentration over potentials. Evolution of oxygen and	4		

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
	hydrogen at different pH. Pourbiax and Evan's diagrams.			
UNIT V Concentration Polarization, Batteries and Fuel cells (15 Hours)				
5.1	Modes of Transport of electro active species. Diffusion, migration and hydrodynamic modes.	3	Chalk & Talk	Black Board
5.2	Role of supporting electrolytes. Cyclic voltammetry, anodic and cathodic stripping voltammetry	4	Chalk & Talk	Black Board
5.3	Differential pulse voltammetry. Capacitors. Mechanisms of energy storage. Energy production systems:	4	Chalk & Talk	Black Board
5.4	Photo-isomerisation reactions in complexes and their applications.	3	Chalk & Talk	Black Board

CIA Evaluation Pattern

Levels	C1	C2	C3	C4	Total Scholast i c Marks	Non Scholast i c Marks C5	CIA Total	<u>% of Assess ment</u>
	Better of W1, W2	M1+M 2	Mid- Sem.Tes t	Onc e in a Sem.			40	
	5	5+5=1 0	15	5				-
K1	-	-	-	-	-		-	-
K2	-	2	3	-	5		5	12.5 %
K3	5	3	4	-	12		12	30 %
K4	-	5	4	-	9		9	22.5%
K5	-	-	4	5	9		9	22.5 %
Non- Scho.							5	12.5 %
Total	5	10	15	5	35	5	40 mks.	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

- ✓ **All the course outcomes are to be assessed in the various CIA components.**
- ✓ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are :**

K2-Understand, K3-Apply, K4-Analyse, K5 - Evaluate

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Best of Two Weekly Tests

C2 – Average of Two Monthly Tests

C3 - Mid Sem Test

C4 – Seminar (Once in a Sem.)

C5 – Non – Scholastic

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	To understand the behaviour of electrolytes in solution and compare the structures of electrical double layer of different models.	K1,K3 & K4	PSO1& PSO2
CO 2	To predict the kinetics of electrode reactions applying Butler-Volmer and Tafel equations	K1 & K2	PSO2 &PSO7
CO 3	To study different thermodynamic mechanism of corrosion,	K1, K2 , K3& K4	PSO6
CO 4	To discuss the theories of electrolytes, electrical double layer, electrodic and activity coefficient of electrolytes	K1, K2 & K4	PSO1
CO 5	To have knowledge on storage devices and electrochemical reaction mechanism.	K1,K2&K3	PSO4 & PSO5

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO / PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 - Low

Course designer

Dr. A. Rajeswari and Dr. J. Belinda Asha



HOD'S Signature

PG CHEMISTRY

SEMESTER –II

For those who joined in 2023 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCH	23PG1CE4	MOLECULAR SPECTROSCOPY	ELECTIVE	4	3

- **COURSE DESCRIPTION:** This paper provides an extensive study of the rotational, vibrational spectroscopy, Raman spectroscopy, ESR spectroscopy, NMR spectroscopy and correlation techniques such as COSY, HETCOR, NOESY.

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.

UNITS

UNIT-I: Rotational and Raman Spectroscopy:

(12HRS.)

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:

(12HRS.)

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: UNIT-III: Electronic spectroscopy:

(12HRS.)

Electronic Spectroscopy: Electronic spectroscopy of diatomic molecules, Frank-Condon principle, dissociation and predissociation 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

UNIT-IV: NMR and ESR spectroscopy:**(12HRS.)**

Chemical shift, Factors influencing chemical shifts: electronegativity and electrostatic effects; Mechanism of shielding and deshielding. Spin systems: First order and second order coupling of AB systems, Simplification of complex spectra. Spin-spin interactions: Homonuclear coupling interactions - AX, AX₂, AB types. Vicinal, germinal and long-range coupling-spin decoupling. Nuclear Overhauser effect (NOE), Factors influencing coupling constants and Relative intensities. ¹³CNMR and structural correlations, Satellites. Brief introduction to 2D NMR – COSY, NOESY. Introduction to ³¹P, ¹⁹F 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: (12HRS.)

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

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REFERENCES:

1. C. N. Banwell and E. M. McCash, *Fundamentals of Molecular Spectroscopy*, 4th Ed., Tata McGraw Hill, New Delhi, 2000.
2. R. M. Silverstein and F. X. Webster, *Spectroscopic Identification of Organic Compounds*, 6th Ed., John Wiley & Sons, New York, 2003.
3. W. Kemp, *Applications of Spectroscopy*, English Language Book Society, 1987.
4. D. H. Williams and I. Fleming, *Spectroscopic Methods in Organic Chemistry*, 4th Ed., Tata McGraw-Hill Publishing Company, New Delhi, 1988.
R. S. Drago, *Physical Methods in Chemistry*; Saunders: Philadelphia, 199
5. P.W. Atkins and J. de Paula, *Physical Chemistry*, 7th Ed., Oxford University Press, Oxford, 2002.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT-1 Rotational and Raman Spectroscopy (12Hours)				
1.	Rotational spectra of diatomic and polyatomic molecules	1	Chalk &	Blac

1			Talk	k Boar d
1.2	Intensities of rotational spectral lines, effect of isotopic substitution. Non-rigid rotators.	2	Chalk & Talk	LCD
1.3	Classical theory of the Raman effect, polarizability as a tensor, polarizability ellipsoids	2	Chalk & Talk	PPT
1.4	quantum theory of the Raman effect, Pure rotational Raman spectra of linear and asymmetric top molecules, Stokes and anti-Stokes lines.	2	Lecture	PPT
1.5	Vibrational Raman spectra, Raman activity of vibrations	3	Lecture	Blac k Boar d
1.6	rule of mutual exclusion, rotational fine structure-O and S branches, Polarization of Raman scattered photons	2	Chalk & Talk	Blac k Boar d
UNIT-2 Vibrational Spectroscopy (12Hours)				
2.1	Vibrations of molecules, harmonic and anharmonic oscillators- vibrational energy expression, energy level diagram	2	Lecture	Blac k Boar d
2.2	vibrational wave functions and their symmetry, selection rules, expression for the energies of	1	Chalk & Talk	Blac k

	spectral lines			Boar d
2.3	computation of intensities, hot bands, effect of isotopic substitution.	1	Chalk & Talk	Blac k Boar d
2.4	Diatomic vibrating rotor, vibrational-rotational spectra of diatomic molecules, P, R branches	2	Chalk & Talk	Blac k Boar d
2.5	breakdown of the Born-Oppenheimer approximation. Vibrations of polyatomic molecules	2	Chalk & Talk	Blac k Boar d
2.6	symmetry properties, overtone and combination frequencies	2	Chalk & Talk	Blac k Boar d
2.7	Influence of rotation on vibrational spectra of polyatomic molecule, P, Q, R branches, parallel and perpendicular vibrations of linear and symmetric top molecules	2	Chalk & Talk	Blac k Boar d
UNIT-3 Electronic spectroscopy (12Hours)				
3.1	Electronic Spectroscopy: Electronic spectroscopy of diatomic molecules	2	Chalk & Talk	Blac k Boar

				d
3.2	Frank-Condon principle, dissociation and predissociation	2	Chalk & Talk	Black Board
3.3	spectra. $\pi \rightarrow \pi^*$, $n \rightarrow \pi^*$ transitions and their selection rules	2	Chalk & Talk	Black Board
3.4	Photoelectron Spectroscopy: Basic principles, photoelectron spectra of simple molecules	2	Chalk & Talk	Black Board
3.5	X-ray photoelectron spectroscopy (XPS).	2	Chalk & Talk	Black Board
3.6	Lasers: Laser action, population	2	Chalk & Talk	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT-4S NMR and ESR spectroscopy (12Hrs)				
4.1	Chemical shift, Factors influencing chemical shifts: electronegativity	1	Chalk & Talk	PPT

	and electrostatic effects; Mechanism of shielding and deshielding.			
4.2	Spin systems: First order and second order coupling of AB systems, Simplification of complex spectra. Spin-spin interactions	1	Chalk & Talk	PPT
4.3	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.	2	Chalk & Talk	PPT
4.4	¹³ CNMR and structural correlations, Satellites. Brief introduction to 2D NMR – COSY, NOESY	3	Chalk & Talk	PPT
4.5	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.	3	Chalk & Talk	PPT
4.6	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	2	Chalk & Talk	PPT

	to transition metal complexes			
UNIT-5 Mass Spectrometry, EPR and Mossbauer Spectroscopy (12 Hours)				
5.1	Ionization techniques- Electron ionization (EI), chemical ionization (CI), desorption ionization (FAB/MALDI)	2	Chalk & Talk	Black Board
5.2	electrospray ionization (ESI), isotope abundance, molecular ion, fragmentation processes of organic molecules, deduction of structure through mass spectral fragmentation, high resolution.	2	Chalk & Talk	Black Board
5.3	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.	3	Chalk & Talk	Black Board
5.4	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	3	Chalk & Talk	Black Board
5.5	Principle of Mossbauer spectroscopy: Doppler shift, recoil energy. Isomer shift, quadrupole	2	Chalk & Talk	Black Board

	splitting, magnetic interactions. Applications: Mossbauer spectra of high and low-spin Fe and Sn compounds			d
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CIA Evaluation Pattern

Levels	C1	C2	C3	C4	Total Scholast ic Marks	Non Scholast ic Marks C5	CIA Total	% of <u>Assess ment</u>
	Better of W1, W2 5	M1+ M 2 5+5=10	Mid- Sem.Te s t 15	Onc e in a Sem . 5			40	-
K1	-	-	-	-	-		-	-
K2	-	2	3	-	5		5	12.5 %
K3	5	3	4	-	12		12	30 %
K4	-	5	4	-	9		9	22.5%
K5	-	-	4	5	9		9	22.5 %
Non- Scho.							5	12.5 %
Total	5	10	15	5	35	5	40 mks.	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

- ✓ All the course outcomes are to be assessed in the various CIA components.
- ✓ The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are :

K2-Understand, K3-Apply, K4-Analyse, K5 - Evaluate

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Best of Two Weekly Tests

C2 – Average of Two Monthly Tests

C3 - Mid Sem Test

C4 – Seminar (Once in a Sem.)

C5 – Non – Scholastic

On the successful completion of the course, students will be able

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	To understand the importance of rotational and Raman spectroscopy	K2, K3, K4 &K5	PSO1& PSO2
CO 2	To apply the vibrational spectroscopic techniques to diatomic and polyatomic molecules	K2, K3, K4 &K5	PSO3
CO 3	To evaluate different electronic spectra of simple molecules using electronicspectroscopy	K2, K3, K4 &K5	PSO5
CO 4	To outline the NMR, ^{13}C NMR, 2D NMR – COSY, NOESY, Introduction to ^{31}P , ^{19}F NMR and ESR spectroscopic techniques.	K2, K3, K4 &K5	PSO3
CO 5	To develop the knowledge on principle, instrumentation and structural elucidation of simple molecules using Mass Spectrometry, EPR and Mossbauer Spectroscopy techniques	K2, K3, K4 &K5	PSO3

to:

Mapping of COs with PSOs

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9
CO1	3	3	2	1	1	1	1	1	1
CO2	2	1	3	1	1	1	1	1	1
CO3	2	1	1	1	3	1	1	1	1
CO4	2	1	3	1	1	1	1	1	1
CO5	2	1	3	1	1	1	1	1	1

Mapping of COs with POs

CO / PSO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	2	3	2	2
CO3	2	2	3	2
CO4	3	2	2	2
CO5	3	2	2	2

Note: Strongly ☐ Correlated-3 Moderately ☐ Correlated -Weakly
Correlated-1

COURSE DESIGNER:

1. Dr.K.R.SUBIMOL

Forwarded By

B. Tedona.

HOD's Signature

I M.SC CHEMISTRY

SEMESTER –I

For those who joined in 2023 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCH	23PG1CAE	Chemistry in Consumer Products	Ability Enhancement	2	2

COURSE DESCRIPTION: It deals with concepts of cosmetics, preparation of the house hold products and its importance

COURSEOBJECTIVES:

- To know the various ingredients in the preparation of cosmetics and house hold products
- Preparation of soaps, shampoos and other cosmetic items.
- To know the preparation of lipstics, body lotion
- To understand the preparation of other house hold products like sanitizers, sambrani, etc.

UNIT – 1 – Preparation of Cosmetics and stationeries (6 hrs.)

- a) Preparation of Talcum powder – Lipstick – varnishing creams – Hair dye, body lotion, sun screen
- b) Preparation of Chalk Piece, Inks, Soaps, Shampoos, Shaving Creams

UNIT 2– Personal Care Products and its Preparation**(6 hrs.)**

Preparation of shampoos, baby shampoo, anti-dandruff shampoo, anti-lice shampoo, Preparation of soaps, classification of soaps, washing soaps, bath soap, sanitizers – synthetic importance – Preparation of Antiseptics and disinfectants – uses.

UNIT 3 Basic Concepts Involved in the Preparation of House Hold Items (6 hrs.)

Preparation of Phenoyl – Black phenoyl – white phenoyl – synthetic importance – Preparation of Ink – Synthetic importance and Preparation of Detergent Powder – Cleaning powder -- Synthetic importance – Preparation of candles – Chalk crayons – Computer Sambrani.

UNIT 4 Hands-on Training on the Preparation of House Hold Products (6 hrs)

Candles, Black phenoyl, White phenoyl, Sanitizers, Computer sambrani, Detergent powder, Floor cleaning agents

Unit 5 Perfumes**(6 hrs)**

Classification - Natural – plant origin – parts of the plant used, chief constituents; animal origin – amber gries from whale, civetone from civet cat, musk from musk deer; synthetic – classification emphasizing characteristics – esters – alcohols – aldehydes – ketones

CONTENTS & LECTURE SCHEDULE

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT-1 Preparation of Cosmetics (6 hrs.)				
- - -				
1.1	Preparation of Talcum powder.	1	Chalk & Talk	Black Board
1.2	Lipstick	1	Chalk & Talk	Black Board
1.3	varnishing creams	2	Lecture	Black Board
1.4	Hair dye, body lotion, sun screening	2	Lecture	Black Board
UNIT-2 Personal Care Products and its Preparation (6 hrs.)				

2.1	Preparation of shampoos, baby shampoo,	1	Lecture	Black Board
2.2	Anti-dandruff shampoo, anti-lice shampoo, Preparation of soaps, classification of soaps	2	Chalk & Talk	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
2.3	washing soaps, bath soap, sanitizers – synthetic importance	2	Chalk & Talk	Black Board
2.4	Preparation of Antiseptics and disinfectants – uses.	1	Chalk & Talk	Black Board
UNIT-3 Basic Concepts Involved in the Preparation of House Hold Items (6 hrs.)				
3.1	Preparation of Phenoyl, Black phenoyl white phenoyl, synthetic importance	2	Chalk & Talk	Black Board
3.2	Preparation of Ink – Synthetic importance and Preparation of Detergent Powder – Cleaning powder	2	Chalk & Talk	Black Board
3.3	Synthetic importance – Preparation of candles	1	Chalk & Talk	Black Board
3.4	Chalk crayons – Computer Sambrani .	1	Chalk & Talk	Black Board
UNIT-4 Hands-on Training on the Preparation of House Hold Products (6 hrs)				
➤				

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
4.1	Candles, Black phenoyl	2	Chalk & Talk	Black Board
4.2	White phenoyl, Sanitizers	2	Chalk & Talk	Black Board
4.3	Computer sambrani, Detergent powder Floor cleaning agents	2	Chalk & Talk	Black Board
UNIT-5 Hands on Training to the Preparation of Common Products (6 hrs)				
5.1	Chalk Piece, Inks	3	LCD	LCD
5.2	Soaps, Shampoos	3	PPT	PPT
5.3	Shaving Creams , Lipstick	3	Chalk & Talk	Black Board

CIA Evaluation Pattern

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment	
	Better of W1, W2 5	M1+ M 2 5+5=10	Mid- Sem. Test 15	Once in a Sem. 5			40	-	
K1	-	-	-	-	-		-	-	
K2	-	2	3	-	5		5	12.5 %	
K3	5	3	4	-	12		12	30 %	
K4	-	5	4	-	9		9	22.5%	
K5	-	-	4	5	9		9	22.5 %	
Non-Scho.							5	12.5 %	
Total	5	10	15	5	35	5	40 mks.	100 %	

CIA	
Scholastic	35
Non Scholastic	5
	40

- ✓ **All the course outcomes are to be assessed in the various CIA components.**
- ✓ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are :**

K2-Understand, K3-Apply, K4-Analyse, K5 - Evaluate

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Best of Two Weekly Tests

C2 – Average of Two Monthly Tests

C3 - Mid Sem Test

C4 – Seminar (Once in a Sem.)

C5 – Non – Scholastic

Course Learning Outcomes (for Mapping with POs and PSOs)

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	To understanding the preparation of cosmetics	K2, K3, K4&K5	PSO1& PSO2
CO 2	To know the preparation of some personal care products like soap and shampoos	K2, K3, K4&K5	PSO3
CO 3	To explore the preparation methods of house hold products	K2, K3, K4&K5	PSO5
CO 4	Hands-on training on the preparation of the house hold products		PSO3
CO 5	Hands-on training on the preparation of some common products		PSO3

CO-PO Mapping (Course Articulation
Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO / PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 - Low

COURSE DESIGNER

1.Dr.J.Belinda Asha

2.Dr.J.Jone Celestina

Forwarded By

A handwritten signature in black ink, appearing to read "B-Tedona.", is positioned above the printed text "HOD's Signature".

HOD's Signature

I M.Sc.,CHEMISTRY

SEMESTER –II

For those who joined in 2023 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCH	23PG2C4	ORGANIC REACTION MECHANISM- II	PG Core	6	5

COURSE DESCRIPTION

This paper focuses on all the important aspects of organic chemistry like aromaticity, reaction intermediates and stereochemistry.

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.

UNITS

UNIT-I: Elimination and Free Radical Reactions:

(18 hrs)

Mechanisms: E2, E1, and E1cB 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 constants.

UNIT-II: Oxidation and Reduction Reactions:

(18hrs)

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:

(18hrs)

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:

(18hrs)

Lithium diisopropylamine (LDA), Azobisisobutyronitrile (AIBN), Sodium cyanoborohydride (NaBH_3CN), *meta*-Chloroperbenzoic acid (m-CPBA), Dimethyl aminopyridine (DMAP), $n\text{-Bu}_3\text{SnD}$, 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 ($\text{Cu}(\text{acac})_2$), TiCl_3 , NaIO_4 , Pyridinium chlorochromate (PCC), Pyridinium dichromate (PDC), Meisenheimer complex. Suzuki coupling, Heck reaction, Negishi reaction, Baylis-Hillman reaction.

REFERENCES:

1.J. March and M. Smith, Advanced Organic Chemistry,

- 5th edition, John-Wiley and Sons. 2001.
2. E. S. Gould, Mechanism and Structure in Organic Chemistry, Holt, Rinehart and Winston Inc., 1959.
3. P. S. Kalsi, Stereochemistry of carbon compounds, 8th edition, New Age International Publishers, 2015.
4. P. Y. Bruice, Organic Chemistry, 7th edn, Prentice Hall, 2013.
5. J. Clayden, N. Greeves, S. Warren, Organic Compounds, 2nd edition, Oxford University Press, 2014.
6. F. A. Carey and R. J. Sundberg, Advanced Organic Chemistry Part-A and B, 5th edition, Kluwer Academic / Plenum Publishers, 2007.
7. D. G. Morris, Stereochemistry, RSC Tutorial Chemistry Text 1, 2001.
8. N. S. Isaacs, Physical Organic Chemistry, ELBS, Longman, UK, 1987.
9. E. L. Eliel, Stereochemistry of Carbon Compounds, Tata-McGraw Hill, 2000.
10. I. L. Finar, Organic chemistry, Vol-1 & 2, 6th edition, Pearson Education Asia, 2004.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 Methods of Determination of Reaction Mechanism				
1.1	Reaction intermediates, The transition state, Reaction coordinate diagrams,	2	Chalk & Talk	Black Board
1.2	Thermodynamic and kinetic requirements of reactions	2	Chalk & Talk	LCD

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
1.3	Hammond postulate. Methods of determining mechanism: non-kinetic methods	2	Lecture	PPT & White board
1.4	product analysis, determination of intermediates-isolation, detection, and trapping	2	Lecture	Smart Board
1.5	Cross-over experiments, isotopic labelling, isotope effects and stereo chemical evidences	2	Lecture	Black Board
1.6	Kinetic methods - relation of rate and mechanism	2	Discussion	LCD
1.7	Effect of structure on reactivity: Hammett and Taft equations.	3	Lecture	Smart Board
1.8	Linear free energy relationship, partial rate factor, substituent and reaction constants.	3	Discussion	Black Board
UNIT -2 Aromatic and Aliphatic Electrophilic Substitution				
2.1	Aromaticity: Aromaticity in benzenoid, non-benzenoid, heterocyclic compounds and annulenes	2	Lecture	Green Board
2.2	Aromatic electrophilic substitution: Orientation and reactivity of di- and	2	Chalk & Talk	Green Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
	polysubstituted phenol			
2.3	nitrobenzene and halobenzene. Reactions involving nitrogen electrophiles: nitration, nitrosation and diazonium coupling	2	Lecture	Smart Room
2.4	Sulphur electrophiles: sulphonation; Halogen electrophiles	2	Chalk & Talk	Black Board
2.5	chlorination and bromination; Carbon electrophiles	2	Discussion	LCD
2.6	Friedel-Crafts alkylation, acylation and arylation reactions	2	Lecture	Black Board
2.7	Aliphatic electrophilic substitution Mechanisms	3	Lecture	Black Board
2.8	SE ₂ and SE _i , SE ₁ - Mechanism and evidences	3	Chalk & Talk	Black Board
UNIT -3Aromatic and Aliphatic Nucleophilic Substitution				
3.1	Aromatic nucleophilic substitution: Mechanisms - S _N Ar, S _N 1 and Benzyne mechanisms	2	Chalk & Talk	Green Board
3.2	Evidences - Reactivity, Effect of structure, leaving group and	2	Discussion	LCD

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
	attacking nucleophile			
3.3	Reactions: Oxygen and Sulphur-nucleophiles, Bucherer and Rosenmund reactions	2	Chalk & Talk	Black Board
3.4	von Richter, Sommelet- Hauser and Smiles rearrangements	3	Discussion	LCD
3.5	SN1, ion pair, SN2 mechanisms and evidences	2	Lecture	Black Board
3.6	Aliphatic nucleophilic substitutions at an allylic carbon, aliphatic trigonal carbon and vinyl carbon	2	Lecture	Black Board
3.7	SN1, SN2, SNi, and SE1 mechanism and evidences	2	Chalk & Talk	Black Board
3.8	Swain- Scott, Grunwald-Winstein relationship - Ambident nucleophiles.	3	Chalk & Talk	Green Board
UNIT -4Stereochemistry-I				
4.1	Introduction to molecular symmetry and chirality – axis, plane, center, alternating axis of symmetry. Optical isomerism due to asymmetric and dissymmetric molecules with C,	2	Chalk & Talk	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
	N, S based chiral centers			
4.2	Optical purity, prochirality, enantiotopic and diastereotopic atoms, groups, faces, axial and planar chirality	2	Discussion	LCD
4.3	chirality due to helical shape, methods of determining the configuration. Racemic modifications: Racemization by thermal, anion, cation, reversible formation, epimerization, mutarotation	2	Chalk & Talk	Black Board
4.4	D, L system, Cram's and Prelog's rules: R, S-notations, proR, proS, side phase and re phase Cahn-Ingold-Prelog rules, absolute and relative configurations.	2	Discussion	LCD
4.5	Configurations of allenes, spiranes, biphenyls, cyclooctene, helicene, binaphthyls, ansa and cyclophanic compounds, exo-cyclic alkylidene-cycloalkanes	2	Lecture	Black Board
4.6	Topicity and prostereoisomerism, chiral shift reagents and chiral solvating reagents	2	Lecture	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
4.7	Criteria for optical purity: Resolution of racemic modifications, asymmetric transformations, asymmetric synthesis,destruction.	3	Chalk & Talk	Black Board
4.8	Stereoselectiveand stereospecific synthesis.	3	Chalk & Talk	Black Board
UNIT -5Stereochemistry-II				
5.1	Conformation and reactivity of acyclic systems, intramolecular rearrangements, neighbouring group participation, chemical consequence of conformational equilibrium	2	Chalk & Talk	Black Board
5.2	Curtin-Hammett Principle. Stability of five and six-membered rings	2	Lecture	Black Board
5.3	mono-, di- and polysubstitutedcyclohexanes, conformation and reactivity in cyclohexane systems	2	Chalk & Talk	Black Board
5.4	Fused and bridged rings: bicyclic, poly cyclic systems, decalins and Brett's rule.	3	Chalk & Talk	Black Board
5.5	Optical rotation and optical	3	Chalk &	Black

Scho.								
Total	5	10	15	5	35	5	40 mks.	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

- ✓ **All the course outcomes are to be assessed in the various CIA components.**
- ✓ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are :**

K2-Understand, K3-Apply, K4-Analyse, K5 - Evaluate

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Best of Two Weekly Tests

C2 – Average of Two Monthly Tests

C3 - Mid Sem Test

C4 – Seminar (Once in a Sem.)

C5 – Non – Scholastic

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED	
CO 1	To understand the concept of aromaticity in benzenoid, non-benzenoid, heterocyclic and annulene compounds.	K1, K2, K3 &K4	PSO1&	PSO
CO 2	To understand the mechanism involved in various types of organic reactions with evidences.	K1, K2, K3 &K4	PSO3	
CO 3	To understand the applications of synthetically important reagents.	K1, K2, K3 &K4	PSO5	
CO 4	To correlate the reactivity between aliphatic and aromatic compounds.	K1, K2, K3 &K4	PSO2	
CO 5	To design synthetic routes for synthetically used organic reactions.	K1, K2, K3 &K4	PSO3	

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 - Low

COURSE DESIGNER:

Dr.M.Priyadharsani

Dr. V.Aruldeepa

Forwarded By

Forwarded By

B. Tedona.

HOD's Signature

PG CHEMISTRY

SEMESTER –II

For those who joined in 2023 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCH	23PG2C5	Physical chemistry-I (Chemical Kinetics & Thermodynamics)	MAJOR CORE	6	5

COURSE DESCRIPTION:

This paper provides an extensive study of the topics such as Chemical kinetics and Thermodynamics.

COURSE OBJECTIVES:

This course gives a detailed study of, chemical thermodynamics, statistical thermodynamics, reversible thermodynamics, kinetics of complex and fast reactions and theories of molecular reactions.

UNITS

UNIT-I: Classical thermodynamics (18HRS.)

Partial molar properties- Chemical potential, Gibb's-Duhem equation- binary and ternary systems. Determination of partial molar quantities-method of slope and method of intercept. Thermodynamics of real gases-Fugacity-determination of fugacity by graphical and equation of state methods-dependence of temperature and pressure. Thermodynamics of ideal and non-ideal binary mixtures, Duhem-Margulus equation applications of ideal and non-ideal mixtures. Activity and activity coefficients- standard states

determination- vapour pressure, EMF and freezing point methods

UNIT-II: Statistical thermodynamics

(18HRS.)

Introduction of statistical thermodynamics concepts of thermodynamic and mathematical probabilities- distribution of distinguishable and non-distinguishable particles. Assemblies, microstate and macrostate, ensembles- micro canonical, canonical and grand canonical ensembles. Maxwell-Boltzmann, Fermi Dirac & Bose-Einstein Statistics- comparison and applications. Partition functions- evaluation of translational, vibrational and rotational partition functions. Thermodynamic functions in terms of partition functions- Statistical approach to Thermodynamic properties- pressure, internal energy, entropy, enthalpy, Gibbs function, Helmholtz function, work function. Calculation of equilibrium constant from partition function.

UNIT-III: Statistical approach to heat capacity & irreversible thermodynamics:

(18HRS.)

Heat capacity of solids- Dulong and Petit law- Heat capacity of solids-Einstein and Debye models-Debye T Cubed law of heat capacity of crystals.

Theories of conservation of mass and energy entropy production in open systems by heat, matter. force and flux concepts. Onsager theory- validity and verification-Onsager reciprocal relationships. Electrokinetic and thermomechanical effects-Application of irreversible thermodynamics to biological systems.

UNIT-IV: Kinetics of reactions

(18HRS.)

Theories of reaction rate -effect of temperature on reaction rates, collision theory of reaction rates, Unimolecular reactions- Lindeman and Christiansen hypothesis- limitations of Lindemann theory. molecular beams, collision cross sections, effectiveness of collisions. Transition state theory-evaluation of thermodynamic parameters of activation-applications of ARRT to reactions between atoms and molecules, Hinshelwood theory. Factors determine the reaction rates in solution -influence of ionic strength on reaction rate- primary salt effect and secondary salt effect, Homogeneous catalysis-acid-base catalysis-mechanism of acid base catalyzed reactions- enzyme catalysis-Michelis-Menton catalysis.

UNIT-V: Kinetics of complex and fast reactions:**(18HRS.)**

Kinetics of complex reactions, reversible reactions, consecutive reactions, parallel reactions, chain 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-temperature and pressure jump methods -stopped flow flash photolysis methods and pulse radiolysis. Kinetics of polymerization- free radical, cationic, anionic polymerization -Poly-condensation.

REFERENCES:

1. J.Rajaram and J.C.Kuriacose, Thermodynamics for Students of Chemistry, 2nd edition, S.L.N.Chand and Co., Jalandhar, 1986.
2. I.M.Klotz and R.M.Rosenberg, Chemical thermodynamics, 6th edition, W.A. Benjamin Publishers, California, 1972.
3. M.C.Gupta, Statistical Thermodynamics, New Age International, Pvt. Ltd., New Delhi, 1995.
4. K.J.Laidler, Chemical Kinetics, 3rd edition, Pearson, Reprint-2013.
J.Rajaram and J.C. Kuriokose, Kinetics and Mechanisms of chemical transformation, Macmillan India Ltd, Reprint - 2011

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT-1 CLASSICAL THERMODYNAMICS (18Hours)				
1.1	Partial molar properties-Chemical potential	2	Chalk & Talk	Black Board
1.2	Gibb's-Duhem equation-binary and ternary systems	3	Chalk & Talk	LCD
1.3	Determination of partial molar quantities- method of slope and method of intercept.	2	Chalk & Talk	PPT
1.4	Thermodynamics of real gases Fugacity-determination of fugacity by graphical and equation of state methods-dependence of temperature and pressure.	2	Lecture	PPT
1.5	Thermodynamics of ideal and non-ideal binary mixtures,	2	Lecture	Black Board
1.6	Duhem-Margulus equation applications of ideal and non-ideal mixtures	2	Chalk & Talk	Black Board
1.7	Activity and activity coefficients-standard states	3	Lecture	Black Board
1.8	Determination of activity-vapour pressure and freezing point methods	2	Chalk & Talk	Black Board

UNIT-2 STATISTICAL THERMODYNAMICS (18Hours)				
2.1	Introduction of statistical thermodynamics concepts of thermodynamic and mathematical probabilities-distribution of distinguishable and non-distinguishable particles.	2	Lecture	Black Board
2.2	Assemblies, ensembles, canonical particles. Maxwell-Boltzmann, Statistics.	3	Chalk & Talk	Black Board
2.3	Fermi Dirac & Bose-Einstein Statistics comparison and applications	4	Chalk & Talk	Black Board
2.4	Partition functions-evaluation of translational, vibrational and rotational partition functions	3	Chalk & Talk	Black Board
2.5	Thermodynamic functions in terms of partition functions.	2	Chalk & Talk	Black Board
2.6	Statistical approach to thermodynamic properties: pressure, internal energy, entropy, enthalpy, Gibb's function, Helm holtz function.	2	Chalk & Talk	Black Board
2.7	Equilibrium constants calculation.	2	Chalk & Talk	Black Board
UNIT-3 STATISTICAL APPROACH TO HEAT CAPACITY & IRREVERSIBLE THERMODYNAMICS (18Hours)				
3.1	Heat capacity of solids- Dulong and Petit law.	2	Chalk & Talk	Black Board
3.2	Heat capacity of solids-Einstein and Debye models	3	Chalk & Talk	Black Board

3.3	Theories of conservation of mass and energy. Entropy production in open systems by heat and matter	3	Chalk & Talk	Black Board
3.4	Flow, force and flux concepts Onsager theory-validity and verification-Onsager reciprocal relationships	4	Chalk & Talk	Black Board
3.5	Electro kinetic and thermo mechanical effects	3	Chalk & Talk	Black Board
3.6	Application of irreversible thermodynamics to biological systems	3	Chalk & Talk	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT-4 KINETICS OF REACTIONS (18Hrs)				
4.1	Theories of reactions-effect of temperature on reaction rates	2	Chalk & Talk	PPT
4.2	Collision theory of reaction rates, uni-molecular reactions-Lindeman and Christiansen hypothesis	4	Chalk & Talk	PPT
4.3	Molecular beams, collision cross sections, effectiveness of collisions	3	Chalk & Talk	PPT
4.4	Transition state theory-evaluation of thermodynamic parameters of activation-applications of ARRT to reactions between atoms and molecules.	2	Chalk & Talk	PPT

4.5	Factors determine the reaction rates in solution -primary salt effect and secondary salt effect	3	Chalk & Talk	PPT
4.6	Homogeneous catalysis-acid-base catalysis-mechanism of acid base catalyzed reactions,	2	Chalk & Talk	PPT
4.7	Enzyme catalysis-Michelis-Menton catalysis.	2	Chalk & Talk	PPT
UNIT-5 KINETICS OF COMPLEX AND FAST REACTIONS (18 Hours)				
5.1	Kinetics of complex reactions, reversible reactions, consecutive reactions, parallel reactions, chain reactions. Chain reactions-chain length	4	Chalk & Talk	Black Board
5.2	Kinetics of $H_2 - Cl_2$ & $H_2 - Br_2$ reactions	3	Chalk & Talk	Black Board
5.3	Rice Herzfeld mechanism. Study of fast reactions-relaxation methods-temperature and pressure jump methods	3	Chalk & Talk	Black Board
5.4	Electric and magnetic field jump methods-stopped flow flash photolysis methods and pulse radiolysis	4	Chalk & Talk	Black Board
5.5	Kinetics of polymerization-free radical, cationic, anionic polymerization -Poly-condensation.	4	Chalk & Talk	Black Board

CIA COMPONENTS

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Session - wise Average 5 Mks.	Better of W1, W2 5+5=10 Mks.	M1+M2 15Mks	MID-SEM TEST 5Mks				
K1	5	-	-	2 ½	-		-	-
K2	-	5	4	2 ½	5		5	12.5 %
K3	-	-	3	5	12		12	30 %
K4	-	-	3	5	9		9	22.5%
Non Scholastic	-	-	-	-	9		9	22.5 %
Total	5	5	10	15	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

- ✓ All the course outcomes are to be assessed in the various CIA components.

- ✓ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for PG are:**

K1-Remember, **K2**-Understand, **K3**-Apply, **K4**-Analyse,
K5 - Evaluate

- ✓ **The I PG course teachers are requested to start conducting S1, W1,M1,**

EVALUATIONPATTERN

SCHOLASTIC				NON – SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Average of Two Session Wise Tests

C2 – Average of Two Monthly Tests

C3 - Mid Sem Test

C4 – Best of Two Weekly Tests

C5 – Non – Scholasti

COURSE OUTCOME

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
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CO 1	Determine partial molar quantities and assess partition functions.	K2, K3, K4 &K5	PSO1& PSO2
CO 2	Categorize and compare various partition functions - translational, rotational, vibrational and electronic partition functions and distinguish various Statistics	K2, K3, K4 &K5	PSO3
CO 3	Deduce Onsagar's theory and its validity.	K2, K3, K4 &K5	PSO5
CO 4	Deduce the rate of chemical reactions to understand mechanism involved in reactions.	K2, K3, K4 &K5	PSO3
CO 5	Examine the kinetics of complex and fast reactions.	K2, K3, K4 &K5	PSO3

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

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9
CO1	3	3	2	1	1	1	1	1	1
CO2	2	1	3	1	1	1	1	1	1
CO3	2	1	1	1	3	1	1	1	1
CO4	2	1	3	1	1	1	1	1	1
CO5	2	1	3	1	1	1	1	1	1

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	2	3	2	2
CO3	2	2	3	2
CO4	3	2	2	2
CO5	3	2	2	2

Note:

Strongly Correlated–**3** Moderately Correlated –2 Weakly Correlated–**1**

COURSE DESIGNER:

1. Dr.S.SUKUMARI

2. Dr.K.R.SUBIMOL

Forwarded By



HOD'S Signature

FATIMA COLLEGE (AUTONOMOUS), MADURAI-18

M.Sc. DEPARTMENT OF CHEMISTRY

6Hrs/ Week

No. of Credits:4

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/W EEK	CREDITS
PSCH	23PG2C6	INORGANIC CHEMISTRY PRACTICALS	LAB	6	4

Course Descriptive: This course gives a hands on experience of qualitatively analyzing inorganic compounds and to do complexometric titrations.

Course Objective: To understand and enhance the visual observation as an analytical tool for the qualitative and 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.

Course Outcomes:

- To identify the anions and cations present in a mixture of salts
- To apply the principles of semi micro qualitative analysis to categorize acid radicals and basic radicals.
- To acquire the qualitative analytical skills by selecting suitable confirmatory tests and spot tests.
- To choose the appropriate chemical reagents for the detection of cations.

- To synthesize coordination compounds in good quality.

Analysis of mixture of cations: Analysis of a mixture of four cations containing two common cations and two rare cations. Cations to be tested.

- Group-I : W, Tl and Pb.
- Group-II : Se, Te, Mo, Cu, Bi and Cd.
- Group-III : Tl, Ce, Th, Zr, V, Cr, Fe, Ti and U
- Group-IV : Zn, Ni, Co and Mn.
- Group-V : Ca, Ba and Sr.
- Group-VI : Li and Mg.

Preparation of metal complexes: Preparation of inorganic complexes:

- a. Preparation of trithiourea copper(I) sulphate
- b. Preparation of tetrammine copper(II) sulphate
- c. Preparation of hexathiourea copper(I) chloridedihydrate
- d. Preparation of hexathiourea lead(II) nitrate

Complexometric Titration:

1. Estimation of zinc.
2. Estimation of nickel.
3. Estimation of magnesium.

REFERENCE BOOKS:

1. Sundaram, Krishnan, Raghavan, Practical Chemistry (Part II), S. Viswanathan Co. Pvt., 1996.
2. G. Marr and B. W. Rockett, Practical Inorganic Chemistry, VonNostrand Reinhold Co., London (1972).
3. J. Bassett, G. H. Jeffery and J. Mendham, and R. C. Denny, Vogel's text book of Quantitative Chemical Analysis, 5th Edition, Longman Scientific and Technical (1999).

NO.	COURSE OUTCOMES	PSOs ADDRESSED
CO 1	Describe the principle and procedure of quantitative analysis	PSO1, PSO2, PSO3, PSO6&PSO7
CO 2	Identify the suitable complexing agents for the given metal ions	PSO1, PSO2, PSO3, PSO6&PSO7
CO 3	Draw the structure of various ligands and complexes	PSO1, PSO2, PSO3, PSO6&PSO7
CO 4	Distinguish volumetric analysis and gravimetric analysis	PSO1, PSO2, PSO3, PSO6&PSO7
CO 5	Apply the expressions of various terms in calculations	PSO1, PSO2, PSO3, PSO6&PSO7

Mapping of COs with PSOs

CO / PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	3	3	3	1	1	3	3	2	1
CO2	3	3	3	1	1	3	3	2	1
CO3	3	3	3	1	1	3	3	2	1
CO4	3	3	3	1	1	3	3	2	1
CO5	3	3	3	1	1	3	3	2	1

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	3	2	1
CO2	3	3	2	1
CO3	3	3	2	1
CO4	3	3	2	1
CO5	3	3	2	1

Note: ☐ ~~Strongly Correlated - 3~~ ☐ ~~Moderately Correlated - 2~~

2

♦ Weakly Correlated -1

COURSE DESIGNER:

1. Dr.V. Arul Deepa
2. Dr.M. Priyadharsani

Forwarded By



HOD'S Signature

IM.Sc.
SEMESTER –II
For those who joined in 2023 onwards

PROGRA MME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCH	23PG2CE5	Medicinal chemistry	Elective	4Hrs.	3

COURSE DESCRIPTION

This paper focuses on all the important aspects of Physical concepts of Spectroscopy, Kinetic theory of gases and Photochemistry and Radiation Chemistry

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.

UNIT-I Introduction to receptors 12hrs

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 penicillins and tetracyclins, clinical application of penicillins, cephalosporin. Current trends in antibiotic therapy.

UNIT-III Antihypertensive agents 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 **Diuretics**

12 hrs

Classification of diuretics, introduction to hypertension, etiology, types, classification of diuretics, mechanism of action of diuretics, Furosemide, Hydrochlorothiazide, Amiloride.

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, phenylbutazone 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.

Reference Books:

1. Wilson and Gisvold's textbook of organic medicinal and pharmaceutical chemistry,
2. Wilson, Charles Owens: Beale, John Marlowe; Block, John H, Lipincott William, 12th edition, 2011.
3. Graham L. Patrick, An Introduction to Medicinal Chemistry, 5th edition, Oxford University Press, 2013. Jayashree Ghosh, A text book of Pharmaceutical Chemistry, S. Chand and Co. Ltd, 1999, 1999 edn.
4. O. LeRoy, Natural and synthetic organic medicinal compounds, Ealemi, 1976.

S. Ashutosh Kar, Medicinal Chemistry, Wiley Eastern Limited, New Delhi, 1993, New edn

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -I Introduction to receptors				
1.1	Introduction, targets.	2	Chalk & Talk	Black Board
1.2	Agonist, antagonist.	2	Chalk & Talk	Black Board
1.3	partial agonist. Receptors, Receptor types.	2	Chalk & Talk	Black
1.4	Theories of Drug.	2	Chalk & Talk	Black Board
1.5	interaction, Drug synergism.	2	Chalk & Talk	Black Board
1.6	Drug resistance.	1	Chalk & Talk	Black Board
1.7	physicochemical factors influencing drug action	1	Chalk & Talk	Black Board
UNIT -2 Antibiotics				
2.1	Introduction.	2	Chalk & Talk	Black Board
2.2	Targets of antibiotics action.	2	Chalk & Talk	Black Board

2.3	classification of antibiotics, enzyme-based mechanism of action.	2	Chalk & Talk	Black Board
2.4	SAR of penicillins and tetracyclins.	2	Chalk & Talk	Black Board
2.5	clinical application of penicillins cephalosporin.	2	Chalk & Talk	Black Board
2.6	Current trends in antibiotic therapy.	2	Chalk & Talk	Black Board
UNIT -3 Antihypertensive agents				
3.1	Classification of cardiovascular agents.	2	Chalk & Talk	Black Board
3.2	introduction to hypertension.	2	Chalk & Talk	Black Board
3.3	etiology, types, classification of antihypertensive agents.	2	Chalk & Talk	Black Board
3.4	classification and mechanism of action of diuretics.	2	Chalk & Talk	Black Board
3.5	Furosemide, Hydrochlorothiazide.	2	Chalk & Talk	Black Board
3.6	Amiloride.	2	Chalk & Talk	Black Board
UNIT -4 Diuretics				

4.1	Classification of DIURETICS	2	Chalk & Talk	Black Board
4.2	Classification.	2	Chalk &	Black
			Talk	Board
4.3	mechanism of action of diuretics.	2	Chalk & Talk	Black Board
4.4	Furosemide.	2	Chalk & Talk	Black Board
4.5	Hydrochlorothiazide.	2	Chalk & Talk	Black Board
4.6	Amiloride.	2	Chalk & Talk	Black Board
UNIT -5 Analgesics, Antipyretics and Anti-inflammatory Drugs				
5.1	Introduction, Mechanism of inflammation.	2	Chalk & Talk	Black Board
5.2	classification and mechanism of action and paracetamol,.	2	Chalk & Talk	Black Board
5.3	Ibuprofen, Diclofenac, naproxen, indomethacin.	2	Chalk & Talk	Black Board
5.4	phenylbutazone and meperidine. Medicinal Chemistry of Antidiabetic Agents.	2	Chalk & Talk	Black Board
5.5	Types of diabetics, Drugs used for the treatment, chemical classification,	2	Chalk & Talk	Black Board

5.6	Mechanism of action, Treatment of diabetic mellitus. Chemistry of insulin, sulfonyl urea	2	Chalk & Talk	Black Board
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CIA Evaluation Pattern

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Better of W1, W2 5	M1+M2 5+5=10	Mid-Sem. Test 15	Once in a Sem. 5			40	-
K1	-	-	-	-	-		-	-
K2	-	2	3	-	5		5	12.5 %
K3	5	3	4	-	12		12	30 %
K4	-	5	4	-	9		9	22.5%
K5	-	-	4	5	9		9	22.5 %
Non-Scho.							5	12.5 %
Total	5	10	15	5	35	5	40 mks.	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

- ✓ **All the course outcomes are to be assessed in the various CIA components.**
- ✓ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for IPG are :**

K2-Understand, K3-Apply, K4-Analyse, K5 - Evaluate

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Best of Two Weekly Tests

C2 – Average of Two Monthly Tests

C3 - Mid Sem Test

C4 – Seminar (Once in a Sem.)

C5 – Non – Scholastic

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Predict a drugs properties based on its structure.	K2,K3, K4 & K5	PSO1, PSO2, PSO4, PSO6,PS07 & PS08
CO 2	Describe the factors that affect its absorption, distribution, metabolism, and excretion, and hence the considerations to be made in drug design.	K2,K3, K4 & K5	PSO1, PSO2, PSO3, PSO4, PSO6,PS07 & PS08
CO 3	Explain the relationship between drug's chemical structure and its therapeutic properties.	K2,K3, K4 & K5	PSO1, PSO2, PSO3, PSO4, PSO6,PS07 & PS08
CO 4	Designed to give the knowledge of different theories of drug actions at molecular level.	K2,K3, K4 & K5	PSO1, PSO2, PSO3, PSO4, PSO6& PS08
CO 5	To identify different targets for the development of new drugs for the treatment of infectious and GIT.	K2, K3, K4& K5	PSO1, PSO2, PSO3, PSO4, PSO6,PS07 & PS08

Mapping of COs with PSOs

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9
CO1	3	3	3	3	1	3	3	3	1
CO2	3	3	3	3	1	3	3	3	1
CO3	3	3	3	3	1	3	3	3	1
CO4	3	3	3	3	1	3	1	3	1
CO5	3	3	3	3	1	3	3	3	1

Mapping of COs with POs

CO / PSO	PO1	PO2	PO3	PO4
CO1	3	2	3	1
CO2	3	2	3	1
CO3	3	2	3	1
CO4	3	2	3	1
CO5	3	3	3	1

Note: ☐ Strongly Correlated - 3 ☐ Moderately Correlated - 2
☒ Weakly Correlated -1

COURSE DESIGNER:

1. Dr.K.R.Subimol

Forwarded By

B. Tedona.

HOD'S Signature

I PG CHEMISTRY

SEMESTER –II

(For those who joined in 2023 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/W EEK	CREDITS
PSCH	23PG2CE6	GREEN CHEMISTRY	ELECTIVE	4	3

COURSE DESCRIPTION: This paper provides an extensive study of the goals of green chemistry, principles of green chemistry, green reagents and green synthesis.

COURSE OBJECTIVES:

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

UNITS

UNIT-I: INTRODUCTION TO GREEN CHEMISTRY (12HRS.)

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**(12HRS.)**

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. Super critical carbon dioxide - properties, advantages, draw backs and a few examples of organic reactions in scCO₂. Green synthesis - adipic acid and catechol.

UNIT-III: GREEN CATALYSIS**(12HRS.)**

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**(12HRS.)**

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: SONO CHEMISTRY**(12HRS.)**

Microwave induced green synthesis - Introduction, Instrumentation, Principle and applications. Sono chemistry – Instrumentation, Cavitation theory – Ultra sound assisted green synthesis and Applications.

REFERENCES:

1. Ahluwalia, V.K. and Kidwai, M.R. New Trends in Green Chemistry, Anamalaya Publishers, 2005.
2. W.L.Mc Cabe, J.C. Smith and P.Harriott, Unit Operations of Chemical Engineering, 7th edition, McGraw-Hill, New Delhi, 2005.
3. J.M. Swan and D.St.C. Black, Organo metalics in Organic Synthesis, Chapman Hall, 1974.
4. V.K. Ahluwalia and R. Aggarwal, Organic Synthesis: Special Techniques, Narosa Publishing House, New Delhi, 2001.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT-1 INTRODUCTION TO GREEN CHEMISTRY(12Hours)				
1.1	Introduction- Need for Green Chemistry.	2	Chalk & Talk	Black Board
1.2	Goals of Green Chemistry. Limitations/ of green chemistry.	2	Chalk & Talk	LCD
1.3	Chemical accidents, terminologies,	3	Chalk & Talk	PPT
1.4	International green chemistry organizations	2	Lecture	PPT
1.5	Twelve principles of Green Chemistry with examples	3	Lecture	Black Board
UNIT-2 GREEN REAGENTS(12Hours)				
2.1	Choice of starting materials, reagents, catalysts and solvents	2	Lecture	Black Board
2.2	Green chemistry in day today life. Designing green synthesis.	1	Chalk & Talk	Black Board
2.3	Green reagents: dimethyl carbonate. Green solvents: Water and Ionic liquids	1	Chalk & Talk	Black Board
2.4	General methods of preparation, effect on organic reaction.	2	Chalk & Talk	Black Board
2.5	Super critical carbon dioxide - properties, advantages, drawbacks	2	Chalk & Talk	Black Board

2.6	Few examples of organic reactions in scCO ₂ .	2	Chalk & Talk	Black Board
2.7	Green synthesis-adipic acid and catechol	2	Chalk & Talk	Black Board
UNIT-3 GREEN CATALYSIS(12Hours)				
3.1	Environmental pollution	2	Chalk & Talk	Black Board
3.2	Green Catalysis –Acid catalysts, Oxidation catalysts, Basic catalysts	3	Chalk & Talk	Black Board
3.3	Polymer supported catalysts	1	Chalk & Talk	Black Board
3.4	Poly styrene aluminum chloride,	2	Chalk & Talk	Black Board
3.5	Polymeric super acid catalysts.	2	Chalk & Talk	Black Board
3.6	Poly supported photo sensitizers	2	Chalk & Talk	Black Board
UNIT-4GREEN SYNTHESIS (12Hrs)				
4.1	Phase transfer catalysis in green synthesis.	1	Chalk & Talk	PPT
4.2	Oxidation using hydrogen peroxide	1	Chalk & Talk	PPT
4.3	Crown ethers, esterification, saponification.	2	Chalk & Talk	PPT
4.4	Anhydride formation, Elimination reaction.	4	Chalk & Talk	PPT

4.5	Displacement reaction Applications in organic synthesis	4	Chalk & Talk	PPT
UNIT-5 SONO CHEMISTRY (18 Hours)				
5.1	Micro wave induced green synthesis-	2	Chalk & Talk	Black Board
5.2	Introduction, Instrumentation, Principle and applications. Sonochemistry.	4	Chalk & Talk	Black Board
5.3	Cavitation theory-	2	Chalk & Talk	Black Board
5.4	Ultra sound assisted green synthesis.	2	Chalk & Talk	Black Board
5.5	Applications of Ultrasound assisted green synthesis.	2	Chalk & Talk	Black Board

CIA Evaluation Pattern

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Better of W1, W2 5	M1+M2 5+5=10	Mid-Sem. Test 15	Once in a Sem. 5			40	-
K1	-	-	-	-	-		-	-

K2	-	2	3	-	5		5	12.5 %
K3	5	3	4	-	12		12	30 %
K4	-	5	4	-	9		9	22.5%
K5	-	-	4	5	9		9	22.5 %
Non-Scho.							5	12.5 %
Total	5	10	15	5	35	5	40 mks.	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

- ✓ **All the course outcomes are to be assessed in the various CIA components.**
- ✓ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are :**

K2-Understand, K3-Apply, K4-Analyse, K5 - Evaluate

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Best of Two Weekly Tests
C2 – Average of Two Monthly Tests
C3 - Mid Sem Test
C4 – Seminar (Once in a Sem.)
C5 – Non – Scholastic

COURSE OUTCOME

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Recall the basic chemical techniques used in conventional industrial preparations and in green innovations	K2, K3, K4 & K5	PSO1 & PSO2
CO 2	Understand the various techniques used in chemical industries and in laboratory	K2, K3, K4 & K5	PSO3
CO 3	Compare the advantages of organic reactions assisted by renewable energy sources and non-renewable energy sources	K2, K3, K4 & K5	PSO5
CO 4	Apply the principles of PTC, ionic liquid, microwave and ultrasonic assisted organic synthesis.	K2, K3, K4 & K5	PSO3
CO 5	Design and synthesize new organic compounds by green methods	K2, K3, K4 & K5	PSO3

Mapping of COs with PSOs

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9
CO1	3	3	2	1	1	1	1	1	1
CO2	2	1	3	1	1	1	1	1	1
CO3	2	1	1	1	3	1	1	1	1
CO4	2	1	3	1	1	1	1	1	1
CO5	2	1	3	1	1	1	1	1	1

Mapping of COs with POs

CO / PSO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	2	3	2	2
CO3	2	2	3	2
CO4	3	2	2	2
CO5	3	2	2	2

Note: Strongly ☐ Correlated-3 Moderately ☐ Correlated -Weakly
Correlated-1

COURSE DESIGNER:

1. Dr.S. Sukumari
2. Dr.M.Priyadharsani

Forwarded By

B-Tedona.

M.Sc., Chemistry

***For those who joined in 2023
onwards***

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCH	23PG2CE7	Bio- Inorganic Chemistry	Elective	4	3

COURSE DESCRIPTION: It deals with concepts of bioinorganic chemistry in various aspects like biological importance of metal ions, significance of haemoglobin, myoglobin, chlorophyll, metallo enzymes, nitrogen and toxicity of metals etc.

COURSE OBJECTIVES:

To understand the role of trace elements.

To understand the biological significance of iron, sulphur.

To study the toxicity of metals in medicines.

To have knowledge on diagnostic agents.

UNIT-I: Essential trace elements

(12hrs)

Essential elements in biology-macro nutrients, micronutrients - the role of metallic elements in biochemistry-the alkali and alkaline earth metals-sodium, potassium, calcium & magnesium-metalloporphyrins –chlorophyll - Hemeproteins-hemoglobin and myoglobin

UNIT-II: Transport Proteins

(12hrs)

Iron-sulphur proteins-Rubredoxins-Ferredoxins- Other Hemeproteins

-cytochromes -peroxidases and catalases - Iron supply and transport-metalloenzymes- copper metallo enzymes

UNIT-III: Nitrogen fixation (12hrs)

Introduction, types of nitrogen fixing microorganisms. Dinitrogen complexes and its activation. Nitrogenase in biological nitrogen fixation. Composition of nitrogenase Metal clusters in nitrogenase- Reduction of N_2 to ammonia.

UNIT-IV: Metals in medicine (12hrs)

Metal Toxicity of Hg, Cd, Pb, As. Therapeutic Compounds: Vanadium-Based Diabetes Drugs; Platinum-Containing Anticancer Agents. Chelation therapy; Cancer treatment. Diagnostic Agents: Technetium Imaging Agents; Gadolinium MRI Imaging Agents.

UNIT-V: Enzymes (12hrs)

Introduction and properties -nomenclature and classification. Enzyme kinetics, free energy of activation and the effects of catalysis. Michaelis - Menton equation - Effect of pH, temperature on enzyme reactions. Factors contributing to the efficiency of enzyme. Metallo coenzyme- Vitamine B12

Recommended Text Books:

1. F.A.Cotton, G.Wilkinson, C.A. Murillo and M.Bochmann, Advanced Inorganic Chemistry; GeoffreyWilinson& Carlos, 6th Edition'2003(unit-1 & 2)
2. Bioinorganic chemistry by Asim K. Das (unit-3 & 4)
3. Bioorganic, bioinorganic and Supramolecular chemistry, 3rd edition by P. S. Kalsi and J P Kalsi. (Unit 5)

Reference Books

1. K.F. Purcell and Kotz., Inorganic chemistry, WB Saunders Co., USA.
2. G.N. Mugherjea and Arabinda Das, Elements of Bioinorganic Chemistry - 1993.
3. R. Gopalan, V. Ramalingam, *Concise Coordination Chemistry*, S. Chand, 2001.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT-I: Essential trace elements (12hrs)				
1.1	Essential elements in biologymacro nutrients, micronutrients the role of metallic elements in biochemistry	2	Chalk & Talk	Black Board
1.2	The alkali and alkaline earth metals, sodium, potassium, calcium & magnesium	3	Chalk & Talk	Black Board
1.3	Metalophorphyrins, chlorophyll	3	Chalk & Talk	Black Board
1.4	Hemeproteins-hemoglobin	3	Chalk & Talk	Black Board
1.5	Myoglobin	3	Chalk & Talk	Black Board
UNIT-II: Transport Proteins (12hrs)				

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
2.1	Iron-sulphur proteins, Ruberdoxins	3	Chalk & Talk	Black Board
2.2	Ferredoxins, Other Hemeprotiens cytochromes.	3	Chalk & Talk	Black Board
2.3	Peroxidises and catalases.	3	Chalk & Talk	Black Board
2.4	Iron supply and transport. Metalloenzymes, copper metallo enzymes	3	Chalk & Talk	Black Board
UNIT-III: Nitrogen fixation				(12hrs)
3.1	Introduction, types of nitrogen fixing microorganisms.	3	Chalk & Talk	Black Board
3.2	Dinitrogen complexes and its activation. Nitrogenase in biological nitrogen fixation.	3	Chalk & Talk	Black Board
3.3	Composition of nitrogenase Metal clusters in nitrogenase	3	Chalk & Talk	Black Board
3.4	Reduction of N ₂ to ammonia.	3		
UNIT-IV: Metals in medicine				(12hrs)

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
4.1	Metal Toxicity of Hg, Cd, Pb, As. Therapeutic Compounds:	3	Chalk & Talk	Black Board
4.2	Vanadium-Based Diabetes Drugs, Platinum-Containing Anticancer Agents.	3	Chalk & Talk	Black Board
4.3	Chelation therapy, Cancer treatment. Diagnostic Agents.	3	Chalk & Talk	Black Board
4.4	Technetium Imaging Agents; Gadolinium MRI Imaging Agents.	3	Chalk & Talk	Black Board
UNIT-V Enzymes (12hrs)				
5.1	Introduction and properties - nomenclature and classification.	3	Chalk & Talk	Black Board
5.2	Enzyme kinetics, free energy of activation and the effects of catalysis.	3	Chalk & Talk	Black Board
5.3	Michelis - Menton equation - Effect of pH, temperature on enzyme reactions	3	Chalk & Talk	Black Board
5.4	Factors contributing to the efficiency of enzyme. Metallo coenzyme- Vitamine B12	3	Chalk & Talk	Black Board

CIA Evaluation Pattern

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Better of W1, W2 5	M1+M2 5+5=10	Mid-Sem. Test 15	Once in a Sem. 5			40	-
K1	-	-	-	-	-		-	-
K2	-	2	3	-	5		5	12.5 %
K3	5	3	4	-	12		12	30 %
K4	-	5	4	-	9		9	22.5%
K5	-	-	4	5	9		9	22.5 %
Non-Scho.							5	12.5 %
Total	5	10	15	5	35	5	40 mks.	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

- ✓ All the course outcomes are to be assessed in the various CIA components.
- ✓ The levels of CIA Assessment based on Revised Bloom's Taxonomy for IPG are :

K2-Understand, K3-Apply, K4-Analyse, K5 - Evaluate

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Best of Two Weekly Tests

C2 – Average of Two Monthly Tests

C3 - Mid Sem Test

C4 – Seminar (Once in a Sem.)

C5 – Non – Scholastic

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	The students will be able to analyses trace elements.	K1,K3 & K4	PSO1& PSO2
CO 2	Students will be able to explain the biological redox systems.	K1 & K2	PSO2

			&PSO7
CO 3	Students will gain skill in analyzing the toxicity in metals.	K1, K2 , K3& K4	PSO6
CO 4	Students will have experience in diagnosis.	K1, K2 & K4	PSO1
CO 5	Learn about the nitrogen fixation and photosynthetic mechanism.	K1,K2&K3	PSO4 & PSO5

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
WeightedpercentageofCourse Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 - Low

Course designer

Dr. A. Rajeswari and Dr. J. Belinda Asha



HOD'S Signature

CBCS Curriculum for M.Sc. Chemistry

SEMESTER –II

For those who joined in 2023 onwards

PROGR AMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS /WE EK	CRED ITS
PSCH	23PG2CE8	MATERIAL SCIENCE	ELECTIVE	4	3

OBJECTIVE: This course deals with study of synthesis, properties, structure and applications of nanoparticles.

COURSE DESCRIPTION

This paper deals with synthesis, properties and applications of nanomaterials. This paper also provides information about instrumentation techniques for characterising the nanomaterials.

Course outcome

After completion of the course the students should be able :

- To gain knowledge about the basic principles of nanochemistry and classification of nanomaterials.
- To describe several synthesis of inorganic nanoparticles, one-dimensional nanostructures (nanotubes, nanorods, nanowires), thin films, nanoporous materials, and nanostructured bulk materials,
- To criticize the importance of various instrumentation techniques such as NMR, IR, UV, X-ray diffraction, ESR etc., for elucidating the structures of nanomaterials.
- To depict the structure of carbon nanostructures, organic nanopolymers and supra molecular structures
- To recognize the important role of nanomaterials in various fields.

UNIT I: BASICS OF NANOMATERIALS

(12 HRS)

Introduction – Basic concepts-quantum confinement effect, surface properties of nanoparticles. Classification of nanomaterials-one dimensional, two dimensional and three dimensional nanostructures. Carbon nanostructures- carbon molecules-carbon nanotubes- nanopolymers- nanocrystals.

Self-study: supra molecular structures

UNIT II: SYNTHETIC METHODS OF NANOMATERIALS

(12HRS)

Synthesis of semiconductors – sol gel synthesis & sono chemical approach and synthesis of ceramics. synthesis of carbon nanotubes - by carbon arc method and laser ablation method. Synthesis of fullerenes- by Pyrolysis of hydrocarbons, partial combustion of hydrocarbons and arc discharge method.

Self-study: Purification carbon nanotubes

UNIT III: PROPERTIES OF NANOMATERIALS

(12 HRS)

Properties of carbon nanotubes, Thermal conductivity, Kinetic property, Electrical and electronic, mechanical and vibrational properties and tensile strength. Properties of fullerenes-physical and chemical properties. Metal nanoclusters, rare gas and molecular clusters.

Self-study: Properties of semi conducting nanoparticles

UNIT IV: CHARACTERIZATION TECHNIQUES

(12 HRS)

Microscopy, Atomic force microscope (AFM), scanning electron microscope (SEM), transmission electron microscope (TEM), scanning probe microscope (SPM), scanning tunneling microscope (STM). Spectroscopy-UV-visible spectroscopy, Infra-red spectroscopy, Nuclear magnetic resonance spectroscopy, Raman spectroscopy and Photoelectron spectroscopy.

Self-study: X-ray diffraction technique (XRD).

UNIT V: APPLICATIONS OF NANOMATERIALS

(12 HRS)

Nanosensors: Applications of optical nanosensors, chemical nanosensors,

electrochemical nanosensors, micro-electro mechanical sensors and biosensors

Nanocatalyst:

Applications Of platinum, palladium, silver, cobalt nanoparticles, CNTs and polymer nanomaterials as catalyst.

Nanomedicine: Nanomaterials in drug delivery, photodynamic therapy, molecular imaging, cancer treatment, molecular motors, neuro-electronic interfaces and tissue engineering

Self-study-Applications of nanodevices.

References

1. Charles P. Poole, Jr., Frank J. Owens, Introduction to nanotechnology, John Wiley & Sons-India, 2010.
2. T. Pradeep, Nano: The Essentials, Tata McGraw-Hill Publishing Company Limited, 2007.
3. A.S.Bhatia, Dr.S.M .Ishtiaque, Nanoscience and Carbon Nanotubes, Deep & Deep Publications Pvt.Ltd.
4. Mark Ratner, Daniel Ratner, Nanotechnology, A Gentle Introduction To The Next Big Idea, Pearson Education, 5th Edn, 2009.
5. Dr.S.Shanmugam, Nanotechnology, MJP Publishers, 2010.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT I : BASICS OF NANOMATERIALS				
1.1	Basic concepts	2	Chalk & Talk	Black Board
1.2	surface properties of nanoparticles	2	Chalk & Talk	Black Board
1.3	classification of nanomaterials - one dimensional, two dimensional and three dimensional nanostructures	2	Chalk & Talk	Black Board
1.4	Carbon nanostructures- carbon molecules	2	Chalk & Talk	PPT & White board
1.5	carbon nanotubes	2	Chalk & Talk	Black Board

1.6	Nanopolymers	1	Chalk & Talk	LCD
1.7	Nnocrystals	1	Chalk & Talk	Black Board
UNIT II : SYNTHETIC METHODS OF NANOMATERIALS				

2.1	Synthesis of semiconductors.	2	Chalk & Talk	Black Board
2.2	synthesis of ceramics.	3	Chalk & Talk	Black Board

2.3	synthesis of carbon nanotubes	3	Chalk & Talk	PPT& White board
2.4	Synthesis of fullerenes	4	Chalk & Talk	Black Board
UNIT III :PROPERTIES OF NANOMATERIALS				

3.1	Properties of carbon nanotubes –Thermal conductivity and Kineticproperty	2	Chalk & Talk	Black Board	
3.2	Electrical and electronical properties of CNT	2	Chalk & Talk	Black Board	
3.3	Mechanical properties of CNT	1	Chalk & Talk	LCD	
3.4	Electrical and electronic properties of CNT	1	Chalk & Talk	Black Board	
3.5	Vibrational properties and tensile strength	1	Chalk & Talk	Black Board	
3.6	Physical properties of fullerene	1	Chalk & Talk	Black Board	
3.7	Chemical properties of fullerenes	2	Chalk & Talk	Black Board	
3.8	Inert gas cluster and rare gasclusters.	2	Chalk & Talk	Black Board	

				d
UNITIV : CHARACTERIZATION TECHNIQUES				
4.1	Microscopy-Atomic force microscope(AFM), scannin g electronmicroscope(SEM)	3	Chalk & Talk	Black Board
4.2	Transmission electron microscope(TEM), scanning probe microscope(SPM), scanning tunnelling microscope (STM)	2	Chalk & Talk	Black Board
4.3	Spectroscopy-UV-visible	2	Chalk & Talk	Black Board
4.4	Nuclear magnetic resonance spectroscopy	1	Chalk & Talk	Black Board
4.5	Raman spectroscopy	1	Chalk & Talk	Black Board
4.6	Photo electron spectroscopy.	1	Chalk & Talk	Black Board
4.8	Infra-red spectroscopy,	2	Chalk & Talk	Black Board
UNITV : APPLICATIONS OF NANOMATERIALS				
5.1	Applications of optical nanosensors	2	Chalk & Talk	Black Board

	chemical nanosensors,			
5.2	Electrochemical nanosensors,	1	Chalk & Talk	Black Board
5.3	Biosensors	1	Chalk & Talk	PPT & White board
5.4	micro-electro mechanical sensors,	1	Chalk & Talk	Black Board
5.5	platinum,palladium,silver,cobalt nanoparticles as nanocatalyst	2	Chalk & Talk	Black Board
5.6	CNTs and polymeric nanomaterials as nanocatalyst	1	Chalk & Talk	Black Board
5.7	Nanomaterials in drug delivery,photodynamictherapy, molecular imaging	2	Chalk & Talk	PPT & White board
5.8	Cancer treatment,molecular motors,nano- electronic interfaces and tissue engineering	2	Chalk & Talk	Black Board

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Seminar	Better of W1, W2 5+5=10 Mks.	M1+M2 15Mks	MID- SEM TEST 5Mks	35 Mks.	5 Mks.	40Mks.	
K1	5	-	-	2 ½	-		-	-
K2	-	5	4	2 ½	5		5	12.5
								%
K3	-	-	3	5	12		12	30 %
K4	-	-	3	5	9		9	22.5%
Non Scholastic	-	-	-	-	9		9	22.5 %
Total	5	5	10	15	35	5	40	100 %

CIA

Scholastic 35

Non Scholastic 5

40

✓All the course outcomes are to be assessed in the various CIA components.

✓The levels of CIA Assessment based on Revised Bloom's

Taxonomy for I PG are :

K2-Understand, **K3**-Apply, **K4**-Analyse, **K4**-Evaluate

✓The I PG course teachers are requested to start conducting S1, W1, M1

EVALUATIONPATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C 1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Seminar

C2 – Average of Two Monthly Tests

C3 - Mid SemTest

C4 – Best of Two Weekly Tests

C5 – Non - Scholastic

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Distinguish between bulk material and nanomaterials	K2, K3, K4 &K5	PSO1& PSO2
CO 2	Choose the suitable synthetic methods to prepare particular nanomaterials	K2, K3, K4 &K5	PSO3
CO 3	Interpret the structure of nanomaterials using various characterisation techniques	K2, K3, K4 &K5	PSO5
CO 4	Categorize and identify the different types Carbon nano structures	K2, K3, K4 &K5	PSO4
CO 5	Summarise the uses of nanomaterials in various fields	K2, K3, K4 &K5	PSO5

Mapping of COs with PSOs

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9
CO1	3	3	2	1	1	1	1	1	1
CO2	2	1	3	1	1	1	1	1	1
CO3	2	1	1	1	3	1	1	1	1
CO4	2	1	1	3	1	1	1	1	1
CO5	2	1	1	1	3	1	1	1	1

Mapping of COs with POs

CO / PSO	PO1	PO2	PO3	PO4
CO 1	3	2	2	2
CO2	2	3	2	2
CO3	2	2	3	2
CO4	3	2	2	2
CO5	3	2	2	2

Note: ☐ Strongly Correlated-3 ☐ Moderately Correlated-2

♦ Weakly Correlated-1

♦ COURSE DESIGNER:

1. Mrs. RM.Nagalakshmi

2. Dr.B.SUGANTHANA

Forwarded By

B. Tedona.

HOD'S Signature

I PG Chemistry**SEMESTER – II**

For those who joined from 2023 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCH	23PG2CSE1	Chemistry in everyday life	Skill Enhancement	4	3

COURSE DESCRIPTION

This paper focuses on all the important aspects of theory about soil, water, food chemistry, cosmetics and oil.

COURSE OBJECTIVES

- To understand the concepts of soil texture, water analysis.
- To acquire the basic knowledge about food colour, food additives and food and adulterants.
- To learn sources of oil, analysis of oil and adulterant in oil.

UNITS**UNIT –I SOIL (9 HRS.)**

Composition of soil: Organic and Inorganic constituents. Soil acidity : buffering capacity of soils. Liming of soil. Absorption of cations and anions: availability of soil nutrients to plants.

UNIT –II WATER (9 HRS.)

Importance of water. Natural water. Sources of water. Drinking water – making water fit to drink – chlorination. Water pollution- Chemicals causing water contamination – contamination by fertilizers, soaps and detergents and their effect.

UNIT –III FOOD CHEMISTRY (9HRS.)

Food- composition of food -Color- Natural colouring matters – chlorophylls – carotenoids – Synthetic colours – permitted colours-banned colours - FPO, FSSAC, Agmark – Flavors - Food additives-Food adulterants and their detection in various food items.

UNIT –IV COSMETICS**(9HRS.)**

Dental preparations-Tooth paste-Ingredients, their characteristic functions-Soap-hard soap and soft soap- Hair care preparations-Shampoo Shampoos –different kinds of shampoos –anti dandruff, anti-lice, herbal and baby shampoos -Hair dye –manufacture of conditioners -skin preparation –skin powder, nail polish, lipsticks.

UNIT –V OIL**(9 HRS.)**

Natural sources of oils and fats, oils rich in palmitic acid and stearic acid- processing of fats and oils- analysis of oils- technical refining of oils for industrial uses- detoxification- shelf life prediction test- adulterants in oils.

REFERENCES:

1. G.T. Austin : Shreve's Chemical Process Industries, 5th edition, Mc-Graw-Hill, 1984
2. Lakshmi, S. Pharmaceutical Chemistry, S. Chand and Sons, New Delhi, 1995.
3. A.K. De, Environmental Chemistry, New Age International Publishers, 2018.
4. Jayashree Ghosh, Fundamental concepts of Applied chemistry, S.Chand publications, New Delhi (2013).
5. J.V.Simons, Science and Beauty Business Vol-1, Macmillan Education Ltd, 1989

COURSE CONTENTS & LECTURE SCHEDULE

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 TITLE - SOIL				
1.1	Composition of soil	1	Chalk & Talk	Black Board
1.2	Organic and Inorganic constituents	1	Chalk & Talk	Black Board
1.3	Soil acidity	1	Chalk & Talk	Black Board

1.4	buffering capacity of soils	1	Chalk & Talk	PPT & White board
1.5	Liming of soil	1	Chalk & Talk	Black Board
1.6	Absorption of cations	1	Chalk & Talk	Black Board
1.7	Absorption of anions:	2	Chalk & Talk	PPT & White board
1.8	availability of soil nutrients to plants.	1	Chalk & Talk	Black Board
UNIT - 2 TITLE -WATER				
2.1	Importance of water. -	1	Chalk & Talk	Black Board
2.2	Naturalwater	1	Chalk & Talk	Black Board
2.3	Sources of water	1	Chalk & Talk	Black Board
2.4	Drinking water	1	Chalk & Talk	Black Board
2.5	Making water fit to drink – chlorination	1	Chalk & Talk	PPT & White board
2.6	Water pollution	1	Chalk & Talk	Black Board
2.7	Chemicals causing water contamination –	1	Chalk & Talk	Black Board
2.8	contamination by fertilizers, soaps and detergents and their effect	2	Demonstration	Various raw materials
UNIT - 3 TITLE -FOOD CHEMISTRY				
3.1	Food- composition of food	1	Chalk & Talk	Black Board
3.2	Food colour	1	Chalk & Talk	Black Board
3.3	Natural colouring matters chlorophylls – carotenoids	1	Chalk & Talk	Black Board
3.4	Synthetic colours	1	Chalk & Talk	Black Board

3.5	permitted colours	1	Chalk & Talk	Black Board
3.6	banned colours - FPO, FSSAC, Agmark – Flavors	1	Chalk & Talk	Black Board
3.7	Food additives	1	Chalk & Talk	Black Board
3.8	Food adulterants and their detection in various food items.	2	Chalk & Talk	Black Board
UNIT -4 TITLE-COSMETICS				
4.1	Dental preparations-Tooth paste-Ingredients, their characteristic functions	1	Chalk & Talk	Black Board
4.2	Soap-hard soap and soft soap	1	Chalk & Talk	LCD
4.3	Hair care preparations-Shampoo different kinds of shampoos –anti dandruff and anti-lice	2	Chalk & Talk	Black Board
4.4	herbal and baby shampoos	1	Chalk & Talk	Black Board
4.5	Hair dye –manufacture of conditioners	1	Chalk & Talk	Black Board
4.6	skin preparation –skin powder	1	Chalk & Talk	Black Board
4.7	nail polish	1	Chalk & Talk	Black Board
4.8	lipsticks	1	Chalk & Talk	Black Board
UNIT - 5 TITLE -OILS				
5.1	Natural sources of oils and fats	1	Chalk & Talk	Black Board
5.2	oils rich in palmitic acid and stearic acid	1	Chalk & Talk	LCD

5.3	processing of fats and oils	1	Chalk & Talk	Black Board
5.4	analysis of oils	2	Chalk & Talk	Black Board
5.5	technical refining of oils for industrial uses	1	Chalk & Talk	Black Board
5.6	detoxification	1	Chalk & Talk	Black Board
5.7	shelf life prediction test	1	Chalk & Talk	Black Board
5.8	adulterants in oils	1	Chalk & Talk	Black Board

CIA Evaluation Pattern

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Better of W1, W2 5	M1+M2 5+5=10	Mid-Sem. Test 15	Once in a Sem. 5			40	-
K1	-	-	-	-	-		-	-
K2	-	2	3	-	5		5	12.5 %
K3	5	3	4	-	12		12	30 %
K4	-	5	4	-	9		9	22.5%
K5	-	-	4	5	9		9	22.5 %
Non-Scho.							5	12.5 %
Total	5	10	15	5	35	5	40 mks.	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

- ✓ All the course outcomes are to be assessed in the various CIA components.
- ✓ The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are **K2-Understand**, **K3-Apply**, **K4-Analyse**, **K5 - Evaluate**

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Best of Two Weekly Tests

C2 – Average of Two Monthly Tests

C3 - Mid Sem Test

C4 – Seminar (Once in a Sem.)

C5 – Non – Scholastic

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Analyse the buffering capacity of soil, p H, cation exchange capacity, nutrient availability of soil, fertility status of soil.	K1	PSO1
CO 2	Analyze the p H of water, hardness of water and acquire knowledge of advanced water purification techniques (and water treatment)	K1, K2	PSO2
CO 3	Identify different types of food colour,additives and food adulterants	K1	PSO2
CO 4	Learn the ingredients required for the preparation of the various types of shampoos,skin powder and nail polish	K2	PSO4
CO 5	Analyze and Detect the presence of adulterants in oils and to compare the physical and chemical refining of oils	K3	PSO5

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 - Low

COURSE DESIGNER

1.Dr.J.Jone Celestina

Forwarded By



HOD's Signature