FATIMA COLLEGE (AUTONOMOUS)

Re-Accredited with "A" Grade by NAAC (3rd Cycle)
74th Rank in India Ranking 2020 (NIRF) by MHRD
Maryland, Madurai- 625 018, Tamil Nadu, India

NAME OF THE DEPARTMENT: CHEMISTRY

NAME OF THE PROGRAMME : M.Sc.,

PROGRAMME CODE : PSCH

ACADEMIC YEAR : 2021-2022

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)

A graduate of M.Sc. Chemistry programme after five years will be

PEO 1	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
PEO 2	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
PEO 3	The graduates will be effective managers of all sorts of real – life and professional circumstances, making ethical decisions, pursuing excellence within the time framework and demonstrating apt leadership skills

PEO 4	They will engage locally and globally evincing social and environmental stewardship demonstrating civic responsibilities and employing right skills at the right moment.

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	
GA 1	Deep disciplinary expertise with a wide range of academic and digital literacy
GA 2	Hone creativity, passion for innovation and aspire excellence
GA 3	Enthusiasm towards emancipation and empowerment of humanity
GA 4	Potentials of being independent
GA 5	Intellectual competence and inquisitiveness with problem solving abilities befitting the field of research
GA 6	Effectiveness in different forms of communications to be employed in personal and professional environments through varied platforms
GA 7	Communicative competence with civic, professional and cyber dignity and decorum
GA 8	Integrity respecting the diversity and pluralism in societies, cultures and religions
GA 9	All – inclusive skill sets to interpret, analyse and solve social and environmental issues in diverse environments
GA 10	Self awareness that would enable them to recognise their uniqueness through continuous self-assessment in order to face and make changes building on their strengths and improving their weaknesses

GA 11	Finesse to co-operate exhibiting team-spirit while working in groups to achieve goals
GA 12	Dexterity in self-management to control their selves in attaining the kind of life that they dream for
GA 13	Resilience to rise up instantly from their intimidating setbacks
GA 14	Virtuosity to use their personal and intellectual autonomy in being life-long learners
GA 15	Digital learning and research attributes
GA 16	Cyber security competence reflecting compassion, care and concern towards the marginalised
GA 17	Rectitude to use digital technology reflecting civic and social responsibilities in local, national and global scenario
II. PROFESSIONAL COMPETENCE	
GA 18	Optimism, flexibility and diligence that would make them professionally competent
GA 19	Prowess to be successful entrepreuners and become employees of trans-national societies
GA 20	Excellence in Local and Global Job Markets
GA 21	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. ETHICAL COMPETENCE	
GA 25	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
GA 27	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

PO 1	Apply acquired scientific knowledge to solve major and complex issues in the society/industry.
PO 2	Attain research skills to solve complex cultural, societal and environmental issues
PO 3	Employ latest and updated tools and technologies to solve complex issues.
PO 4	Demonstrate Professional Ethics that foster Community, Nation and Environment Building Initiatives.

PROGRAMME SPECIFIC OUTCOMES (PSO)

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

PSO 1	Equip with an in-depth knowledge of varied fields namely Organic Chemistry, Inorganic Chemistry , Physical and nanochemistry.
PSO 2	Train in problem solving procedures enables to interpret the experimental data into structures and mechanisms.
PSO 3	Provides a tremendous exposure and cultivates analytical and synthesising measures necessary to take up project work in reputed institutions.
PSO 4	Programme renders diversified thinking thereby promotes creative skills.
PSO 5	to solve the problems that cause a negative impact on surroundings to pursue salient steps to safeguard environment
PSO 6	Application-oriented input sharpens the skill to undertake CSIR-NET exam.
PSO 7	Knowledge with practical dimensions becomes a driving power to undertake research in different areas at a global level.

PSO 8	Multi-layered input enables to avail opportunities at chemical, pharmaceutical industries.
PSO 9	Becomes a contributing force and development agent in society.

FATIMA COLLEGE (AUTONOMOUS),

Affiliated to Madurai Kamaraj University
Re-Accredited with 'A++' (CGPA 3.61) by NAAC (Cycle - IV)
Mary Land, Madurai - 625018, Tamil Nadu

DEPARTMENT OF CHEMISTRY

For those who joined in June 2019 onwards
(For the academic year 2021-2022)

PROGRAMME CODE : PSCH

COURSE CODE	COURSE TITLE	HRS / WK	CREDIT	CIA Mks	ESE Mks	TOT. MKs
SEMESTER – I						
19PG1C1	**INORGANIC CHEMISTRY-I** (Basic concepts, covalent and ionic bonding, solid state and crystallography, and Nuclear chemistry)	6	4	40	60	100
19PG1C2	**ORGANIC CHEMISTRY-I** (Reaction mechanism and stereochemistry)	6	4	40	60	100
19PG1C3	**PHYSICAL CHEMISTRY-I** (Applied electro chemistry & Statistical thermodynamics)	6	4	40	60	100
19PG1C4	**INORGANIC QUALITATIVE ANALYSIS**	4	2	40	60	100
19PG1C5	**ORGANIC QUALITATIVE ANALYSIS**	4	2	40	60	100
21C1EDC	**ANALYSIS OF SOIL, WATER, FOOD, COSMETICS AND OIL**	3	3	40	60	100
	LIBRARY	1	-	-	-	-
Total		**30**	**19**			

SEMESTER – II						
19PG2C6	**INORGANIC CHEMISTRY-II** (Advanced coordination chemistry)	6	4	40	60	100
19PG2C7	**ORGANIC CHEMISTRY-II** (Elimination and addition reactions, organic spectroscopy and conformational analysis)	6	4	40	60	100
19PG2C8	**PHYSICAL CHEMISTRY-II** (Chemical kinetics and Quantum mechanics)	6	4	40	60	100
19PG2C9	**INORGANIC QUANTITATIVE ANALYSIS**	4	2	40	60	100
19PG2C10	**ORGANIC QUANTITATIVE ANALYSIS**	4	2	40	60	100
21C2EDC	**ANALYSIS OF SOIL, WATER, FOOD, COSMETICS AND OIL**	3	3	40	60	100
	LIBRARY	1		-	-	-
Total		**30**	**19**			
SEMESTER - III						
19PG3SIC1	**INTERNSHIP/SUMMER PROJECT***	-	3	50	50	100
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**	6	5	40	60	100
19PG3CE1 / 19PG3CE2	**MATERIAL CHEMISTRY / BIO ORGANIC CHEMISTRY**	4	4	40	60	100
19PG3C14	**PHYSICAL CHEMISTRY PRACTICALS-I**	6	4	40	60	100

	(Electrical Experiments-I)					
	LIBRARY	2				
Total		**30**	**26**			
SEMESTER - IV						
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 / 19PG4CE 4	**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**			
	Total	**120**	**90**			

OFF-CLASS PROGRAMME

ADD-ON COURSES

Course Code	Courses	Hrs.	Credits	Semester in which the course is offered	CIA Mks	ESE Mks	Total Marks
	SOFT SKILLS	40	4	I	40	60	100
	COMPUTER APPLICATIONS	40	4	II	40	60	100
	MOOC COURSES (Department Specific Courses) * Students can opt other than the listed course from UGC-SWAYAM /UGC /CEC	-	Minimum 2 Credits	-	-	-	
	COMPREHENSIVE VIVA (Question bank to be prepared for all the papers by the respective course teachers)	-	2	IV	-	-	100
	READING CULTURE	15 / Semester	1	I-IV	-	-	-
	TOTAL		13 +				

- **EXTRA CREDIT COURSE**

- **Lab Courses :**
  - A range of 10-15 experiments per semester
- **Summer Internship:**

- Duration-1 month (2nd Week of May to 2nd week of June-before college reopens)

- **Project:**
  - Off class
  - Evaluation components-Report writing + Viva Voce (Internal marks-50) + External marks 50

- **EDC:**

  Syllabus should be offered for two different batches of students from other than the parent department inSem-I &Sem-II

SELF LEARNING COURSE : OFFERED BY DEPARTMENT OF CHEMISTRY

COURSE CODE	Course TITLE	Hrs.	Credits	Semester in which the course is offered	CIA Mks	ESE Mks	Total Marks
21PG2SLC	RESEARCH METHODOLOGY	-	2	II	40	60	100

SEMESTER –I

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCH	19PG1C1	INORGANIC CHEMISTRY-1	MAJOR CORE	6	4

OBJECTIVES:

- To acquire an in-depth knowledge about the fundamentals and bonding in Inorganic chemistry.
- To know more about more acids and bases with their theoretical background
- To acquire an extensive knowledge in nuclear Chemistry

COURSE OUTCOME

After the completion of the course the students will be able

- CO 1: To analyse all chemical species involved in organic and Inorganic reactions and to identify those as acid andbases
- CO 2: To classify the bonds as ionic and covalent and to compare thetheories
- CO 3: To categorize the solid systems, to calculate the lattice energy and draw conclusions on theirstability
- CO 4 : To predict the structures and magnetic properties of Inorganiccompounds
- CO 5 : To gain indepth knowledge of nuclear reactions, reactors and the applications of radio isotopes in allfields

Unit I : Basic concepts of Inorganic Chemistry

Unit II : Covalent Bonding

Unit III : Solid state and Crystallography

Unit IV : Ionic Bonding

Unit V : Nuclear Chemistry

Unit I : Basic concepts of Inorganic Chemistry **18 Hrs**

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

Acids and Bases – Bronsted & Lewis concepts - pH, pK_a, buffer - Acid, base concept in non aqueous solvent - liq.ammonia, HF, anhydrous H_2SO_4 and N_2O_4. Super acids - HSAB principle – Simbiosis – measure and theoretical basis - application.

Unit II : Covalent Bonding **18Hrs**

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 - shapes of molecules.

Unit III : Solid state and Crystallography **18 Hrs.**

Elements of crystallography – symmetry – point groups, space groups, lattices and crystal systems - x-ray diffraction, experimental methods of crystal structure determination, application to Bio-molecules (proteins),structure factor determination – Metallic bond – band theory of solids – electrical and mechanical properties of solids – semi conductors – super conductors.

Unit IV: Ionic Bonding **18 Hrs.**

Lattice type - Born Lande equation - Born Haber cycle - radius ratio rule-typical crystal structures - calcite, CsCl, CdI_2, zinc blende & Spirels. Defects in solids - non stoichiomerty, experimental methods of study of stoichiometry, solid state reactions.

Unit V: Nuclear Chemistry **18 Hrs**

Nuclear Chemistry – Radioactivity – decay constant – half life period – artificial transmutation – GM counter – scintillation counter – nuclear forces – nuclear fission and fusion reactions – nuclear models – nuclear accelerators – cyclotrons – synchro cyclotrons, betatrons, nuclear reactors – fast breeders – radio isotopes – their applications.

Reference books

(i) Inorganic chemistry - James.E.Huheey.
(ii) Inorganic chemistry - J.D. Lee
(iii) Introduction to solids - L. Azaroff,
(iv) Elements of Nuclear Chemistry - R. Gopalan
(v) Essentials of Nuclear Chemistry – H.J. Arnikar

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -I	**Basic concepts of Inorganic Chemistry**			**15 Hrs**
1.1	The Modern long form of periodic table	2	Chalk & Talk	Black Board
1.2	Periodic properties of elements	2	Lecture	LCD
1.3	ionic radius - ionisation potential	2	Lecture	PPT
1.4	Acids and Bases- Bronsted & Lewis concepts	3	Chalk & Talk	Black Board
1.5	pH , pK_a, buffer	2	Chalk & Talk	Black Board
1.6	Acid, base concept in non aqueous solvent - liq.ammonia, HF, anhydrous H_2SO_4 and N_2O_4.	4	Chalk & Talk	Black Board
1.7	Super acids - HSAB principle - Simbiosis - measure and theoretical basis - application.	3	Chalk & Talk	Black Board
UNIT -2 **15Hrs**	**Covalent Bonding**			

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
2.1	Covalent bonding - Introduction	3	Chalk & Talk	Black Board
2.2	Concept of hybridization and resonance	2	Chalk & Talk	Black Board
2.3	MO theory	2	Chalk & Talk	Black Board
2.4	MO diagram of diatomic and linear triatomic molecules	2	Chalk & Talk	Black Board
2.5	Bond properties - bond energy	3	Chalk & Talk	Black Board
2.6	Bond order - comparison of VB and MO theories	3	Chalk & Talk	Black Board
2.7	Polarizability - VSEPR theory - shapes of molecules.	3	Chalk & Talk	Black Board
UNIT -3	**Solid state and Crystallography**		**15 Hrs**	
3.1	Elements of crystallography	2	Chalk & Talk	PPT& Black Board
3.2	symmetry - point groups, space groups	2	Chalk & Talk	PPT & Black Board
3.3	lattices and crystal systems - x-ray diffraction	2	Chalk & Talk	PPT &Black Board
3.4	experimental methods of crystal structure determination	3	Chalk & Talk	PPT & Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
3.5	Application to Bio-molecules (proteins),structure factor determination	3	Chalk & Talk	PPT & Black Board
3.6	Metallic bond - bandtheory of solids	3	Chalk & Talk	PPT& Black Board
3.7	electrical and mechanical properties of solids	3	Chalk & Talk	PPT& Black Board
3.8	Semi conductors - super conductors.	2	Chalk & Talk	Black Board
UNIT -4	**Ionic Bonding**			**15 Hrs**
4.1	Lattice type -	2	Chalk & Talk	Black Board
4.2	Born Haber cycle	3	Chalk & Talk	Black Board
4.3	Radius ratio rule-typical crystal structures	2	Chalk & Talk	Black Board
4.4	Calcite, CsCl, CdI_2, zinc blende & Spirels.	2	Chalk & Talk	Black Board
4.5	Defects in solids	3	Chalk & Talk	Black Board
4.6	Non stoichiomerty, experimental methods of study of stoichiometry	3	Chalk & Talk	Black Board
4.7	Solid state reactions.	3	Chalk & Talk	Black Board
UNIT-5	**Nuclear Chemistry**			

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
15 Hrs				
5.1	Nuclear Chemistry - Radioactivity - Introduction	2	Chalk & Talk	Black Board
5.2	Decay constant - half life period	2	Chalk & Talk	Black Board
5.3	Artificial transmutation	2	Chalk & Talk	Black Board
5.4	GM counter, Scintillation counter	3	Chalk & Talk	Black Board
5.5	Nuclear forces - nuclear fission and fusion reactions	2	Chalk & Talk	Black Board
5.6	Nuclear models, nuclear accelerators - cyclotrons - synchro cyclotrons	2	Chalk & Talk	Black Board
5.7	Betatrons, nuclear reactors - fast breeders	3	Chalk & Talk	Black Board
5.8	Radio isotopes - their applications.	3	Chalk & Talk	Black Board

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 15 Mks	MID-SEM TEST 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 uccessful 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 analyse all chemical species involved in organic and Inorganic reactions and to identify those as acid and bases	K1	PSO1& PSO2
CO 2	To classify the bonds as ionic and covalent and to compare thetheories	K1, K2,	PSO3
CO 3	To categorize the solid systems, to calculate the lattice energy and draw conclusions on their stability	K1 & K3	PSO5
CO 4	To predict the structures and magnetic properties of Inorganic compounds	K1, K2, K3 &	PSO2
CO 5	To gain in depth knowledge of nuclear reactions, reactors and the applications of radio isotopes in all fields.	K2 & K4	PSO3

Mapping of C0s 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 C0s 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

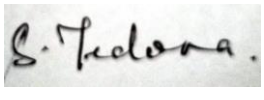
Note: ♦ **Strongly Correlated - 3** ♦ **Moderately Correlated - 2**

♦ Weakly Correlated **-1**

COURSE DESIGNER:

1. **Dr. B. Medona**
2. **Dr. P. Silviya Reeta**

Forwarded By



(Dr. B. Medona)

SEMESTER –I

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCH	19PG1C2	ORGANIC CHEMISTRY-I (REACTION MECHANISM AND STEREOCHEMISTRY)	Major Core	6 Hrs.	4

Objective: The course deals with reaction mechanism of aliphatic and aromatic subtitution reactions, bonding in organic molecules, stereochemistry and natural products chemistry.

Course outcome:

After completion of the course the students should be able :

- To interpret the concept of aromaticity and the main properties of aromatic compounds.
- To explore reactivity patterns of conjugated ,aromatic molecules and to evaluate the kinetics and thermodynamics controlledreactions.
- To define the fundamentals of chirality, prochirality, symmetry elements and applications ofatropisomers.
- To comprehend of nucleophiles, electrophiles, electronegativity, andresonance
- To sketch the preparation and properties of heterocycliccompounds.

UNIT I	a)Bonding in organic compounds b) structure and reactivity	18 Hrs
UNIT II	Introduction to reaction mechanism	18 Hrs
UNIT III	Stereochemistry	18 Hrs
UNIT IV	substitution reactions	18 Hrs
UNIT V	Natural products Chemistry a) Heterocyclic compounds b) Carbohydrate.	18 Hrs

UNIT- I **18 Hrs**

a) Bonding in organic compounds

Delocalised bonding, conjugation, cross conjugation, resonance, steric inhibition to resonance- hyperconjugation, tautomerism, concept of aromaticity, anti aromaticity, non aromaticity and homoaromaticity, Huckel's rule, alteranate and nonalternate hydrocarbons, aromaticity in nonbenzenoid compounds- fulvenes, azulenes and tropolones.

b) Structure and reactivity

Electronic effects, hydrogen bonding and steric effects.Factors influencing the dissociation constant of acids and bases, concept of HSAB.Quantitative correlations of structure and reactivity.Hammett equation and linear free energy relationship- Application and limitations.Substituent and reaction constants, Taft equation.

UNIT- II Introduction to reaction mechanism **18 Hrs**

Types of mechanisms, types of reactions, activation energy, transition state, intermediates, energy profile diagram for endergonic and exergonic reactions. Reaction intermediates-carbocations, carbanions, free radicals, carbenes, benzyne and nitrenes-their generation, stability and structure. Methods of determining reaction mechanism-kinetic and non kinetic methods.Kinetic and thermodynamic control of chemical reactions. Principle of microscopic reversibility, Hammond's postulate

UNIT- III Stereochemistry **18 Hrs**

Concept of chirality, recognition of symmetry elements and chiral structure. Molecules with more than one chiral center, threo and erythro nomenclature, Specification of (E,Z and R,S) configuration for compounds with chiral center, axis and planes by CIP notation. Interconversion of sawhorse, Newmann and Fischer formulae.The concept of prochirality, topicity, prostereoisomerism.Equivalent, enantiotopic and diastereotopic ligands and faces of molecules.Stereospecific and stereoselective reactions, optical purity.Atropisomerism-stereochemistry of allenes, spiranes biphenyls, ansa compounds and paracyclophanes.Assymetric synthesis, Crams rule, Prelogs rule.

UNIT IV **18 Hrs**

a) Nucleophilic substitution

S_N1, S_N2 and S_Ni mechanism and stereochemistry.Factors affecting the reactivity- effect of substrate structure, nucleophile, (nucleophilicity and basicity), nature of the leaving group and solvent. NGP-involving C=C bond, halogen, carboxylate group, phenyl group, nitrogen and sulphur. Nucleophilic substitution at an allylic carbon, trigonal carbon and vinylic

carbon.Ambident nucleophile and ambident substrate.Aromatic nucleophilic substitution- S_NAr, S_N1 and benzyne mechanism.

b) Electrophilic substitution

Arenium ion mechanism, orientation and reactivity in monosubstituted benzene, orientation in benzene rings with more than one substituents, orientation on other ring systems (naphthalene, furan, pyrrole, thiophene, quinoline and Isoquinoline)

UNIT V: Natural products chemistry **18 Hrs**

a) Preparation and reactions of pyrazole, oxazole, thiazole and indole Preparation and reactions of coumarine, flavones and anthocyanins-quercetin, caffeine and theobromine

b) Carbohydrates: Methods of determining the size of sugar rings, structural elucidation of sucrose, maltose, lactose and cellobiose. Aminosugars.

Reference books:

1. Jerry March, Advanced organic chemistry, Reactions, mechanisms and structure, John Wiley and sons 4th edition
2. Peter Sykes, A guide book to mechanism in organic chemistry, Longman
3. Peter Sykes, The search for organic reaction pathways, Longman
4. Carey and Sundberg, Advanced organic chemistry, Part A
5. Graham Soloman, Organic chemistry, John Wiley and sons 5th edition
6. S.M. Mukerjee and S.P. Singh, Reaction mechanism in organic chemistry
7. E.S. Gould, Mechanism and Structure in organic chemistry, 1960, Henry-Holtoo, Inc.
8. Ernest L. Eliel, Stereochemistry of carbon comounds, 1977, Tata McGraw Hill, New Delhi
9. D. Nasipuri, Stereochemistry of organic compounds, Wiley eastern limited, New Delhi
10. P.S. Kalsi, Stereochemistry (1990) 3rdEdn. New age International
11. I.L. Final, Organic chemistry, Vol.2,5thEdn. ELBS
12. R.M. Acheson, An introduction to heterocyclic compounds, John Wiley Editon
13. O.P. Agarwal, Chemistry of organic natural products, 15thEdn. Goel publishing house

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 BONDING INORGANICCOMPOUNDS, STRUCTURE ANDREACTIVITY				
11	Delocalised bonding, conjugation, cross conjugation, resonance, steric inhibition to resonance	2	Chalk & Talk	Black Board
12	hyperconjugation, tautomerism, concept of aromaticity, anti aromaticity, nonaromaticity and homoaromaticity, Huckel's rule	2	Chalk & Talk	LCD
1.	alteranate and nonalternate hydrocarbons, aromaticity in nonbenzenoid compounds	2	Lecture	PPT & White board
14	fulvenes, azulenes and tropolones.	2	Lecture	Smart Board
15	Electronic effects, hydrogen bonding and steric effects. Factors influencing the dissociation constant of acids and bases, concept of HSAB	3	Lecture	Black Board
16	Quantitative correlations of structure and reactivity	2	Discussion	LCD
17	Hammett equation and linear free energy relationship	3	Lecture	Smart Board
18	Application and limitations. Substituent and reaction constants, Taft equation.	2	Discussion	Black Board
UNIT -2 INTRODUCTION TOREACTIONMECHANISM				

21	Types of mechanisms, types of reactions, activation energy, transition state, intermediates	2	Lecture	Green Board
2.2	energy profile diagram for endergonic and exergonic reactions	2	Chalk & Talk	Green Board
23	Reaction intermediates- carbocations, carbanions	2	Lecture	Smart Room
2.4	free radicals, carbenes, benzyne and nitrenes-their generation, stability and structure	2	Chalk & Talk	Black Board
25	Methods of determining reaction mechanism	2	Discussion	LCD
2.6	Kinetic and thermodynamic control of chemical reactions	3	Lecture	Black Board
27	kinetic and non kinetic methods	2	Lecture	Black Board
2.8	Principle of microscopic reversibility, Hammond's postulate	3	Chalk & Talk	Black Board
UNIT -3STEREOCHEMISTRY				
31	Concept of chirality, recognition of symmetry elements and chiral structure.	2	Chalk & Talk	Green Board
32	Molecules with more than one chiral center, threo and erythro nomenclature, Specification of (E,Z and R,S) configuration for compounds with chiral center, axis and	2	Discussion	LCD

	planes by CIP notation			
33	Interconversion of sawhorse, Newmann and Fischer formulae.	2	Chalk & Talk	Black Board
3.4	The concept of prochirality, topicity, prostereoisomerism. Equivalent, enantiotopic and diastereotopic ligands and faces of molecules.	2	Discussion	LCD
35	Stereospecific and stereoselective reactions	3	Lecture	Black Board
3.6	optical purity, Atropisomerism- stereochemistry of allenes, spiranes	3	Lecture	Black Board
37	biphenyls, ansa compounds and paracyclophanes	2	Chalk & Talk	Black Board
3.8	Assymetric synthesis, Crams rule, Prelogsrule	2	Chalk & Talk	Green Board
UNIT -4NUCLEOPHILIC AND ELECTROPHILIC SUBSTITUTION				
41	S_N1, S_N2 and S_Ni mechanism and stereochemistry. Factors affecting the reactivity- effect of substrate structure, nucleophile, (nucleophilicity and basicity)	2	Chalk & Talk	Black Board
4.2	Nature of the leaving group and solvent.	2	Discussion	LCD

4.3	NGP-involving C=C bond, halogen, carboxylate group, phenyl group, nitrogen and sulphur. Nucleophilic substitution at an allylic carbon, trigonal carbon and vinylic carbon.	3	Chalk & Talk	Black Board
4.4	Ambident nucleophile and ambident substrate. Aromatic nucleophilicsubstitution- SNAr, SN1 and benzyne mechanism.	2	Discussion	LCD
45	Arenium ion mechanism, orientation and reactivity in monosubstituted benzene,	3	Lecture	Black Board
4.6	Orientation in benzene rings with more than one substituents,	2	Lecture	Black Board
4.7	orientation on other ring systems	2	Chalk & Talk	Black Board
4.8	Naphthalene, furan, pyrrole, thiophene, quinoline and Isoquinoline	2	Chalk & Talk	Black Board
UNIT -5NATURALPRODUCTSCHEMISTRY				
51	Preparation and reactions of pyrazole, oxazole, thiazole	2	Chalk & Talk	Black Board
52	Preparation and reactions of coumarine, flavones	2	Lecture	Black Board
53	Preparation and reactions of anthocyanins-quercetin	2	Chalk & Talk	Black Board
54	Preparation and reactions of caffeine	3	Chalk & Talk	Black Board

55	Preparation and reactions of theobromine	3	Chalk & Talk	Black Board
56	Methods of determining the size of sugar rings	2	Discussion	LCD
57	Structural elucidation of lactose	2	Discussion	LCD
5.8	Structural elucidation of cellobiose	2	Lecture	Black Board

COURSE CONTENTS & LECTURE SCHEDULE:

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 15 Mks	MID-SEM TEST 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		
C 1	**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	To interpret the concept of aromaticity and the main properties of aromatic compounds	K2, K3,K4 & K5	PSO1& PSO2
CO 2	To explore reactivity patterns of conjugated, aromatic molecules and to evaluate the kinetics and thermodynamics controlledreactions	K2, K3,K4 & K5	PSO3
CO 3	To define the fundamentals of chirality, prochirality, symmetry elements and applications of atropisomers	K2, K3,K4 & K5	PSO5
CO 4	To comprehend of nucleophiles, electrophiles, electronegativity, and resonance	K2, K3,K4 & K5	PSO2
CO 5	To sketch the preparation and properties of heterocycliccompounds	K2, K3,K4 & K5	PSO3

Mapping of C0s 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 C0s 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.M.Priyadharsani**
2. **Dr. V.Aruldeepa**

Forwarded By

HOD'S Signature

SEMESTER –I

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCH	**19PG1C3**	**Physical chemistry-I (Applied electro chemistry &statistical thermodynamics)**	**MAJOR CORE**	**6**	**4**

Objective: This course gives a detailed study of electrochemistry, chemical thermodynamicsandstatisticalthermodynamics

Course outcome:

After successful completion of the course, students will be able

CO1: To gain knowledge Kohlrausch's law and electrolytic conductance

CO2: To do calculation of conductance& Possess thorough understanding of Debye-Huckel equation

CO3: To apply the concept of electrochemistry & Gibbs phase rule

CO4: To categorize and compare various partition functions - translational, rotational, vibrational and electronic partition functions

CO5: To distinguish various Fermi-Dirac and Bose-Einstein statistics and Maxwell-Boltzmann statistics based on the nature of the particles

UnitI:Electrochemistry–I 18Hrs

UnitII:Electrochemistry–II 18Hrs

UnitII:ElectrochemistryandThermodynamics 18Hrs

UnitIV:ChemicalThermodynamics 18Hrs

UnitV:StatisticalThermodynamics 18Hrs

I. Electrochemistry–I **18Hrs**.

Introductiontoelectrolysis,Faraday'slaws–specific,equivalentandMolarconductanceandtheirvariationondilution,Kohlrausch'slawanditsapplications,Applicationsofconductancemeasurements.

The theory of electrolytic conductance – variation of ionic speeds, The degree ofdissociation, Interionic attractions, ion-ionandion-solvent interactions, the electrical potential in the vicinity of an ion, Debye-Huckel equation, Limiting and extended forms of theDebye-Huckel equation,Onsager equation and its validity-ionassociation. Electrochemicalcells–Typesofelectrodes, Electrochemicalseriesanditsapplications.

II. Electrochemistry–II **18Hrs**.

Thermodynamics of Reversible cells and reversible electrodes, EMF and equilibriumconstant, Nernst equation. EMF of concentration cells with and without transference, Liquidjunction potential, applications of EMF measurements and Fuelcells. Polarisation–Electrolyticpolarization, Dissolution and Deposition potentials,determination of anode and cathode potential, Evidence for existence of concentration polarization, polarographic cell Assembly, Ilkovic equation, Fick's law of diffusion, Half-wave potential, Applications of polarography. Kineticsofelectrodereactions–Butler-Volmerequation,Tafelequations, Thediffusion Over potential. Interfacial (double layer) phenomena – Types of interface, Electrokinetic phenomena-Electro–osmosis,Electro-phoresis,

III. Electrochemistry and Thermodynamics **18Hrs**

Amperometric titrations, consecutive electrode processes, Decomposition voltages,Over voltage – Influence of pH and temperature on over voltage, Oxygen over voltage,Applications of over voltage – Corrosion, corrosion inhibition – Galvanising and corrosion inhibitors, electrode position of metals in aqueous solution. Thebehaviourofcolloidalsystems-colloidalelectrolytes, polyelectrolytes, Membrane equilibria–Dialysis, Ion exchangeresins.ElectrocatalysisandElectrosynthesis.Biologicalapplicationsofelectrochemistry.

Gibbs phase rule andits application to three componentsystems.MicroscopicreversibilityandOnsager'sreciprocity relation,coupledreactions.

Translational, rotational, vibrational and electronic partition functions, partitionfunctionandequilibriumconstant.BoseEinsteincondensation,degeneracyand, application toliquidhelium, paramagnetism.

IV. ChemicalThermodynamics: 18**Hrs.**

A general review of enthalpy, entropy and Free energy concepts, Genesis of third lawand its limitations – Thermodynamics of systems of variable compositions – partial molarquantities and their determination – chemical potential – Gibbs-Duhem equation – Duhem –Margules equation – Fugacity and its determinations – choice of Std. state – Activity andactivity coefficients – determination – Electrolytes and non-electrolytes-– Introduction tonon-equilibrium thermodynamics – transformation of the generalized fluxes and forces, non-equilibrium – Stationary states, phenomenological equations, Electrokinetic phenomena– diffusion,electricconduction,Irreversiblethermodynamicsforbiologicalsystems

V. StatisticalThermodynamics 18**Hrs.**

Concept of distribution, Thermodynamic probability and most probable distribution.Microstate and Macrostate, Ensemble averaging,Postulates of ensemble averaging, canonical,Grand canonical and microcanonical ensembles, corresponding distribution laws. Maxwell-Boltzmann statistics – partition functions – thermodynamic properties from partition functionQuantum statistics – Fermi-Dirac and Bose-Einstein statistics – photon gas, Electrongasdegeneracy and electron gas (Fermi energy level). Heat capacitiesofdiatomicgases.Einstein&Debye'stheoryofheatcapacityofsolids-,population inversion-negative Kelvin temperature

ReferencebooksforElectrochemistry:

1. SamuelGlasstone,IntroductiontoElectrochemistry,
2. D.R.Crow, Principles& Applications of Electrochemistry, 3rdEdn, Chapman andHall.

3. B.Viswanathan,R.Venkataraman,Dr.K.Rengarajan,Dr.S.Sundaram,Dr.P. S.Raghavan, Electrochemistry Principles and applications, 1stEdn, S. ViswanathanPrintersLtd.,

ReferencebooksforThermodynamics:

1. J.RajaramandJ.C.Kuriacose,ThermodynamicsForStudentsofChemistry,2ndEdn.,S.L.N.ChandandCo.,Jalandhar,1986.
2. I.M.KlotzandR.M.Rosenberg,Chemicalthermodynamics,6thEdn.,W.A.BenjaminPublishers,California,1972.
3. M.C.Gupta,StatisticalThermodynamics,NewAgeInternational,Pvt.Ltd.,NewDelhi,1995.
4. D.A.McQurrieandJ.D.Simon,*PhysicalChemistry-AMolecularApproach*,VivaBooksPvt.Ltd.,NewDelhi,1999.
5. R.P. Rastogi and R.R. Misra, *Classical Thermodynamics*, Vikas Publishing, Pvt. Ltd.,New Delhi,1990.
6. F.W.Sears&G.L.Salinger,Thermodynamics,Kinetictheory&StatisticalThermodynamics,NewDelhi,NarosaPublishing House,3rdEdn.,1989.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1	**Electrochemistry – I**		**18 Hrs**	
1.1	Introduction to electrolysis, Faraday's laws – specific, equivalent and Molar conductance and their variation on dilution	1	Chalk & Talk	Black Board
1.2	Kohlrausch's law and its applications	2	Lecture	LCD

1.3	Applications of conductance measurements.	2	Lecture	PPT
1.4	The theory of electrolytic conductance – variation of ionic speeds	1	Chalk & Talk	Black Board
1.5	The degree of dissociation, Inter ionic attractions – ion-ion and ion-solvent interaction	2	Chalk & Talk	Black Board
1.6	The electrical potential in the vicinity of an ion, Debye-Huckel equation, Limiting and extended forms of the Debye-Huckel equation, Onsager equation and its validity	4	Chalk & Talk	Black Board
1.7	Electrochemical cells – Types of electrodes, Electrochemical series and its applications.	3	Chalk & Talk	Black Board
UNIT -2	**Electrochemistry – II**	**18 Hrs**		
2.1	Thermodynamics of Reversible cells and reversible electrodes	1	Chalk & Talk	Black Board
2.2	EMF and equilibrium constant, Nernst equation.	2	Chalk & Talk	Black Board
2.3	EMF of concentration cells with and without transference, Liquid junction potential	2	Chalk & Talk	Black Board
2.4	Applications of EMF measurements and Fuel cells.	2	Chalk & Talk	Black Board
2.5	Concentration polarization, polarographic cell Assembly, Ilkovic equation, Fick's law of diffusion, Half-wave potential, Applications of polarography	3	Chalk & Talk	Black Board

2.6	Kinetics of electrode reactions – Butler-Volmer equation, Tafel equations, The diffusion Over potential	3	Chalk & Talk	Black Board
2.7	Electro kinetic phenomena- Electro – osmosis, Electro- phoresis,	2	Chalk & Talk	Black Board
UNIT -3	**Electrochemistry and Thermodynamics**		**18 Hrs**	
3.1	Amperometric titrations, consecutive electrode processes, Decomposition voltages	2	Chalk & Talk	PPT&Black Board
3.2	Over voltage – Influence of pH and temperature on over voltage, Oxygen over voltage, Applications of over voltag	2	Chalk & Talk	PPT &Black Board
3.3	– Corrosion, corrosion inhibition – Galvanising and corrosion inhibitors, electro deposition of metals in aqueous solution	2	Chalk & Talk	PPT &Black Board
3.4	The behaviour of colloidal systems – colloidal electrolytes, polyelectrolytes, Membrane equilibria – Dialysis	2	Chalk & Talk	PPT &Black Board
3.5	Ion – exchange resins. Electrocatalysis and Electrosynthesis	2	Chalk & Talk	PPT &Black Board
3.6	Biological applications of electrochemistry	1	Chalk & Talk	PPT&Black Board
3.7	Gibbs phase rule and its application to three component systems, Microscopic reversibility and Onsager's reciprocity relation., coupled reactions	2	Chalk & Talk	PPT&Black Board

3.8	Translational, rotational, vibrational and electronic partition functions, partition function and equilibrium constant	**1**	Chalk & Talk	Black Board
3.9	Bose Einstein condensation, degeneracy and,applicatiion to liquid helium, paramagnetism	**1**	Chalk & Talk	Black Board
UNIT -4	**Chemical Thermodynamics**	**18 Hrs**		
4.1	A general review of enthalpy, entropy and Free energy concepts, Genesis of third law and its limitations		Chalk & Talk	Black Board
4.2	Thermodynamics of systems of variable compositions – partial		Chalk & Talk	Black Board
	molar quantities and their determination – chemical potential			
4.3	Gibbs-Duhem equation – Duhem – Margules equation – Fugacity and its determinations – choice of Std. state		Chalk & Talk	Black Board
4.4	Activity and activity coefficients – determination		Chalk & Talk	Black Board
4.5	Electrolytes and non-electrolytes-– Introduction to non-equilibrium thermodynamics		Chalk & Talk	Black Board
4.6	transformation of the generalized fluxes and forces, non-equilibrium – Stationary states, phenomenological equations		Chalk & Talk	Black Board

4.7	Electrokinetic phenomena – diffusion, electric conduction, Irreversible thermodynamics for biological systems		Chalk & Talk	Black Board
UNIT-5Statistical Thermodynamics 18 Hrs				
5.1	Concept of distribution, Thermodynamic probability and most probable distribution.		Chalk & Talk	Black Board
5.2	Microstate and Macrostate,		Chalk & Talk	Black Board
5.3	Ensemble averaging,Postulates of ensemble averaging, canonical,.		Chalk & Talk	Black Board
5.4	Grand canonical and microcanonical ensembles, corresponding distribution laws		Chalk & Talk	Black Board
5.5	Maxwell-Boltzmann statistics – partition functions – thermodynamic properties from partition function		Chalk & Talk	Black Board
5.6	Quantum statistics – Fermi-Dirac and Bose-Einstein statistics – photon gas		Chalk & Talk	Black Board
5.7	Electron gasdegeneracy and electron gas (Fermi energy level). Heat capacities of diatomic gases		Chalk & Talk	Black Board
5.8	Einstein & Debye's theory of heat capacity of solids- ,populationinversion-negative Kelvin temperature		Chalk & Talk	Black Board

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 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 gain knowledge Kohlrausch's law and electrolytic conductance	K2, K3, K4& K5	PSO1& PSO2
CO 2	Calculation of conductance & Possess thorough understanding of	K2, K3, K4& K5	PSO3

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
	Debye-Huckel equation		
CO 3	Apply the concept of electrochemistry & Gibbs phase rule	K2, K3, K4& K5	PSO5
CO 4	Categorize and compare various partition functions - translational, rotational, vibrational and electronic partition functions	K2, K3, K4& K5	PSO5
CO 5	Distinguish various Fermi-Dirac and Bose-Einstein statistics and Maxwell-Boltzmann statistics based on the nature of the particles	K2, K3, K4& K5	PSO4

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**	**1**	**3**	**1**	**1**	**1**	**1**
CO5	**2**	**1**	**1**	**3**	**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**	**1**
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. A. Rajeswari**
2. **Mrs. RM. Nagalakshmi**

Forwarded By

HOD'S Signature

SEMESTER-I

(For those who joined in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCH	19PG1C4	INORGANIC QUALITATIVE ANALYSIS	LAB	4	2

COURSE DESCRIPTION:

This paper gives a hands on experience of qualitatively analysing the inorganic salt mixtures containing common and rare earth metal cations by semimicro qualitative analysis

COURSE OBJECTIVE:

This paper deals with group separation and group analysis of the given inorganic mixtures.

COURSE OUTCOME

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

CO 1-Describe the principle and procedure of semimicro qualitative analysis

CO 2-identify the groups to which the given cations belong to

CO 3--distinguish between the familiar and less familiar cations.

CO 4-select the confirmatory tests for specific cations

CO 5-Apply the theory behind the practicals to write chemical equation

QUALITATIVE ANALYSIS

Analysis of inorganic mixtures containing two familiar and two less familiarcations.

FAMILIAR (COMMON) CATIONS:

Group I: Pb and Hg;

Group II: Hg, Cu, Cd, Bi, Sb, As, and Sn;

Group III: Al, Fe, and Cr;

Group IV: Mn,;Zn, Co, and Ni

Group V: Ca, Sr, and Ba;

Group VI: Mg, K, and NH4 + .**LESS**

FAMILIAR (RARECATIONS):

Group I: W and Tl;

Group IA: Se and Te;

Group II:Mo;

Group III: Be, Tl, Ce, Ti, Th,Zr, V, and U;

Group VI: Li

This analysis involves two steps

1. **Group separation**

. Classification of cations into groups by using group reagents

2. **Group Analysis**

Confirmatory test for cations

TEXT BOOK

V. V. Ramanujam, Inorganic Semimicro Qualitative Analysis; 3rd ed., The National Publishing Company, Chennai, 1974.

REFERENCEBOOK .

Vogel's Text book of Inorganic Qualitative Analysis, 4th Ed, ELBS, London, 1974.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	PSOs ADDRESSED
CO 1	Describe the principle and procedure of semimicro qualitative analysis	PSO1, PSO2, PSO3,
		PSO6&PSO7
CO 2	Identify the groups to which the given cations belong to	PSO1, PSO2, PSO3, PSO6&PSO7
CO 3	Distinguish between the familiar and less familiar cations.	PSO1, PSO2, PSO3, PSO6&PSO7
CO 4	Select the confirmatory tests for specific cations	PSO1, PSO2, PSO3, PSO6&PSO7
CO 5	Apply the theory behind the practicals to write chemical equations	PSO1, PSO2, PSO3, PSO6&PSO7

Mapping of C0s 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 C0s 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**

♦ Weakly Correlated -**1**

COURSE DESIGNER:

1. **Mrs. R. M. Nagalakshmi**
2. **Dr. Sr. J. Arul Mary**

Forwarded By

HOD'S Signature

SEMESTER –I

(For those who joined in 2017 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCH	19PG1C5	ORGANIC QUALITATIVE ANALYSIS	LAB	4 Hrs.	2

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

CourseObjective: 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 organicmixtures
- To gain knowledge on the skills of doing micro levelanalysis
- . To know the methods of qualitative analysis of organiccompounds
- To learn about the preparation of suitable derivative of the organic functionalgroups
- To prepare organiccompounds.

QualitativeAnalysisofanorganicbinarymixture

- Pilotseparation
- Bulkseparation

Analysisoforganiccompoundsand preparation of derivatives using green reagents

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

(Instead of PCl5, 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&Carbonylcompounds

I. SinglestepOrganicpreparations:

Preparationof

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

2-Naphthylbenzoate from2-Napthol

Dibenzalacetone fromBenzaldehyde- can be used for starting material for Research work

1. AcetylsalicylicacidfromSalicylicacid.

Reference books:

1. Ganapragasam& Ramamurthy G, Organic Chemistry LabManual , 2 nd Ed., S. Vishwanathan Printers and Publishers (P)Ltd.,Chennai,2007.

2. Furniss BS, Hannaford AJ, SmithP WGandTatchellAR,Vogel'sTextbookofPracticalOrganicChemistry,5thEd.,PearsonPublication.

3. Vengataswaran Vetal., Basic Principle of Practical Chemistry, Sultan Chandandsons,NewDelhi,1997.

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 C0s 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 C0s 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.M.Priyadharsani**
2. **Dr. V.Aruldeepa**

Forwarded By

HOD'S Signature

SEMESTER – II

For those who joined from 2021 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCH	21C1EDC	ANALYSIS OF SOIL, WATER, FOOD, COSMETICS AND OIL	EDC	3	3

COURSE DESCRIPTION

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

COURSE OUTCOME:

After completion of the course the students should be able to:

- Acquire the complete knowledge ofsoil and its texture
- Develop idea about water and its treatment
- Idetify different types of food colour, aditives and food adulterants
- Learn the ingredients required for the preparation of various types of shampoos, skin powder, nail polish.
- Understand the need of detoxification of oil and various adulterants present in 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.Naturalwater.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 functios- 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. JayashreeGhosh, Fundamental concepts of Applied chemistry, S.Chand publications, New Delhi (2013).
5. J.V.Simons, Science and Beauty Business Vol-1, Macmilan 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 functios	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 static 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

Levels	C1	C2	C3	Total Scholastic Marks	Non Scholastic Marks C4	CIA Total	% of Assessment
	Weekly 5Mks.	Monthly 10 Mks.	MID-SEM TEST 20 Mks.	35 Mks.	5 Mks.	40 Mks.	
K1	-	5 Mks.	5 Mks.	10	-	10	25 %
K2	-	5 Mks.	8 Mks.	13	-	13	32.5 %
K3	5 Mks.	-	7 Mks.	12	-	12	30 %
Non Scholastic	-	-	-	-	5	5	12.5 %
Total	5	10	20	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

S

- ✓ **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-Understand, **K2**-Apply, **K3**-Analyse

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

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

S

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	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 adulderants in oils and to compare the physical and chemical refining of oils	K3	PSO5

Mapping COs Consistency with PSOs

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

S

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	2
CO5	3	3	2	3

Note: ♦ Strongly Correlated – **3** ♦ ModeratelyCorrelated – **2**
♦ WeaklyCorrelated **-1**

COURSE DESIGNER:

1. **Mrs. RM. Nagalakshmi**
2. **Dr. B.SUGANTHANA**

Forwarded By

HOD'S Signature.

SEMESTER –II

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCH	19PG2C6	Inorganic chemistry-II (Advanced Coordination Chemistry)	MAJOR CORE	6	4

COURSEDESCRIPTION: It deals with theories, characterisationwithspectralstudiesand reaction mechanism of coordination compounds.

COURSE OBJECTIVES: This course provides the study of different aspects of coordination chemistry such as bonding, reaction mechanism and electronicspectraand otherspectral techniques

COURSE OUTCOME:

After the completion of the course the students will be able to

- Compare the stabilities of complexes using stability constants and to identify the types of isomers
- To describe the theories of co-ordination compounds to understand the colours and magnetic properties and their position in the spectrochemical series
- . Investigate the structures of complexes using IR,NMR ,E SR and other spectral techniques
- Possess a thorough understanding of electronic spectra of complexes
- To arrive at the mechanisms of substitution reactions in six and four coordinated complexes using kinetic studies

UNIT –IINTRODUCTION TOCO-ORDINATION CHEMISTRY– I **(18HRS.)**

Co-ordinationnumbers-Isomerism-Geometrical&Optical-ORD,CD-Chelateeffect,stabilityofcomplexes–determinationofstabilityconstant,Jobs

method- factors affecting stability constants, V.B.Theory –postulates, formation of complex ions on the basis of VB theory, limitations and Magnetic properties of complexes

UNIT–II BONDINGINCO-ORDINATION CHEMISTRY (18HRS.)

BondinginCo-ordinationcompounds,VBT,CFT,CFSE,CFTtotetrahedral,tetragonalandsquareplanarcomplexes,factorsaffectingΔ,applications of CFT, spectrochemical series-Nephelauxelic effect, M O theory toOctahedral, Jahn_teller effect-square planer complexes-Pi bonding and MOT,experimentalevidenceforPi-bonding,orbitalcontributiontomagneticmoments.

UNIT–III ELECTRONIC SPECTRA (18 HRS.)

Electronic spectra, selection rules, Term &Term symbol, term symbols derivation for p2 configuration, calculation of micro states, Orgel diagrams for octahedral and tetrahedral complexes of metal ions with $d^1$to d^9systems,Tanabe Sugano diagram for d^2,d^6 and d^7systems, Tetragonal distortions fromoctahedralsymmetry and chargetransfer spectra.

UNIT–IVOTHERSPECTRALTECHNIQUESFORCO-ORDINATIONCOMPOUNDS (18HRS.)

Applications of Mossbauer, NQR, NMR, EPR, IR Spectral Techniques to co-ordinationcomplexes.

UNIT –V: REACTION MECHANISMS (18HRS.)

Reaction Kinetics and mechanism, substitution reaction in square planar complexes, Thermodynamic and Kinetic Stability-Kinetics of Octahedralsubstitution, mechanisms of Redox reactions. Outer sphere-inner sphere E.Treactions

REFERENCES:

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

2. F.A.Cotton, G.Wilkinson, C.A. Murillo and M.Bochmann,

.*Advanced InorganicChemistry*;6thed.;WileyInterscience:New York,1988.

3. K.F.PurcellandJ.C.Kotz, *InorganicChemistry*;Saunders:Philadelphia,1976.

4. D.F.Shriver,P.W.Atkins and C.H. Langford;*Inorganic Chemistry*; 3rd ed., OxfordUniversityPress:London,2001.

5. R. S.Drago,*PhysicaI MethodsinChemistry*;Saunders:Philadelphia,1977.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1	**INTRODUCTION TO CO-ORDINATION CHEMISTRY (18 Hours)**			
1.1	Co-ordination numbers	2	Chalk & Talk	Black Board
1.2	Isomerism-Geometrical &Optical	3	Chalk & Talk	LCD
1.3	ORD, CD	1	Lecture	PPT
1.4	Chelate effect, stability of complexes – determination of stability constant,	2	Lecture	PPT
1.5	Factors affecting stability constants	2	Lecture	Black Board
1.6	V.B.Theory –postulates & limitations	1	Discussion	Black Board
1.7	Formation of complex ions on the basis of VB theory	3	Lecture	Black Board

1.8	Magnetic properties of complexes.	1	Discussion	Black Board
UNIT -2	**BONDING IN CO-ORDINATION CHEMISTRY (18 Hours)**			
2.1	Bonding in Co-ordination compounds	2	Lecture	Black Board
2.2	CFT, CFSE, CFT to tetrahedral,tetragonal and square planar complexes	3	Chalk & Talk	Black Board
2.3	Factors affecting Δ_0 ,applications of CFT	2	Chalk & Talk	Black Board
2.4	spectrochemical series-Nephelauxelic effect	2	Chalk & Talk	Black Board
2.5	Jahn_teller effect- M O theory to Octahedral	3	Chalk & Talk	Black Board
2.6	Pi bonding and MOT, experimental evidence for Pi-bonding,	2	Chalk & Talk	Black Board
2.7	Orbital contribution to magnetic moments	1	Chalk & Talk	Black Board
UNIT -3	**ELECTRONIC SPECTRA (18 Hours)**			
3.1	Electronic spectra, selection rules, Term &Term symbol	2	Chalk & Talk	Black Board
3.2	Derivation for p^2 configuration, calculation of micro states	3	Chalk & Talk	Black Board
3.3	Orgel diagrams for octahedral and tetrahedral complexes of metal ions with d^1 to d^9systems	5	Chalk & Talk	Black Board
3.4	Tanabe Sugano diagram for d^2,d^6 and d^7 systems	3	Chalk & Talk	Black Board

3.5	Tetragonal distortions from octahedral symmetry	1	Chalk & Talk	Black Board
3.6	Charge transfer spectra	1	Chalk & Talk	Black Board
UNIT -4	**OTHER SPECTRAL TECHNIQUES FORCO-ORDINATION COMPOUNDS**			
4.1	Principle and applications of Mossbauer to Iron complexes .	3	Chalk & Talk	PPT
4.2	Applications of NQR to co-ordination complexes.	3	Chalk & Talk	PPT
4.3	Applications of NMR to co-ordination complexes.	3	Chalk & Talk	PPT
4.4	Applications of EPR to co-ordination complexes.	3	Chalk & Talk	PPT
4.5	Applications of IR to co-ordination complexes.	3	Chalk & Talk	PPT
UNIT-5	**REACTION MECHANISMS (18 Hours)**			
5.1	Reaction Kinetics and mechanism	3	Chalk & Talk	Black Board
5.2	Substitution reactions in square planar complexes	3	Chalk & Talk	Black Board
5.3	Thermodynamic and Kinetic Stability	3	Chalk & Talk	Black Board
5.4	Kinetics of Octahedral substitution	3	Chalk & Talk	Black Board
5.5	Mechanisms of Redox reactions.Outer sphere-inner sphere E.T reactions	3	Chalk & Talk	Black Board

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Seminar 5 Mks.	Better of W1, W2 5Mks.	M1+M2 10 Mks	MID-SEM TEST 15 Mks	35 Mks.	5 Mks.	40Mks.	
K2	5	-	-	2 ½	-		-	-
K3	-	5	4	2 ½	5		5	12.5 %
K4	-	-	3	5	12		12	30 %
K5	-	-	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, 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	Compare the stabilities of complexes using stability constants and to identify the types of isomers	K2, K3, K4 &K5	PSO1& PSO2
CO 2	To describe the theories of co-ordination compounds to understand the colours and magnetic properties and their position in the spectrochemical series	K2, K3, K4 &K5	PSO3

CO 3	Investigate the structures of complexes using IR,NMR ,E SR and other spectral techniques	K2, K3, K4 &K5	PSO5
CO 4	Possess a thorough understanding of electronic spectra of complexes	K2, K3, K4 &K5	PSO3
CO 5	To arrive at the mechanisms of substitution reactions in six and four coordinated complexes using kinetic studies	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.B.Medona**
2. **Dr.A.Rajeswari**

Forwarded By

HOD'S Signature

. **SEMESTER –II**

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCH	**19PG2C7**	**Organic chemistry-II**	**MAJOR CORE**	**6 Hrs.**	**4**

Objective: This course deals with elimination and addition reactions, conformational analysis and selective organic name reactions and rearrangements. It also provides an elaborate study of organic spectroscopy and their applications in structural elucidation of organic compounds.

COURSE OUTCOME:

After completion of the course the students should be able :

- CO1- To comprehend the mechanism of elimination and substitution reactions and to apply the stereochemistry in E1, E2, ionic and pyrolytic eliminations.
- CO2- To interpret the concept of nucleophilic and free radical addition reactions and metal hydride reduction and to discriminate the reactivity of organometalic reagents.
- CO3-. To explore reactivity patterns of substituted cyclohexanes and to employ conformational reactivity in cis and trans decalins and to apply conformations in S_N1, S_N2, ionic, pyrolytic eliminations and NGP reactions.
- CO4- To acquire a complete knowledge of the principles of UV, IR spectroscopy and to examine the various functional groups present in organic molecules using λmax and IR frequency values .
- CO5- To differentiate the molecular rearrangements and to solve the simple problems and to recall the various naming reactions and to interpret the products.

Units

Unit-I- Elimination addition reaction	18 Hrs
Unit-II- Addition reaction	18Hrs
Unit-III-Conformational analysis	18 Hrs
Unit-IV-Organic Spectroscopy -IR, UV	18 Hrs
Unit-V- Selective Organic Name reactions	18Hrs

Unit-I- Elimination Reactions **18 Hrs**

Elimination- E2,E1 and E1CB mechanism . Orientation of the double bond. Hoffmann and Sayetzeff rules. Reactivity-effect of substrate, attacking base, the leaving group and medium. Competition between elimination and substitution. Orientation in pyrolytic elimination-Bredt's rule.

Unit-II- Addition Reactions **18 Hrs**

Addition to carbon-carbon multiple bonds-Electrophilic addition, Nucleophilic addition, Free radical addition, Addition to conjugated systems. Orientation and reactivity. Hydroboration, addition of bromine to E and Z-2-butene, Hydroxylation- OsO_4, alk.$KMnO_4$, Woodward method and Prevost reaction.

Addition to Carbon-Hetero multiple bonds-Mechanism and reactivity. Addition of alcohols and amines to aldehydes and ketones- mechanism of metal hydride reduction. -Addition of Grignard reagents, organozinc and organo lithium reagents to carbonyl and unsaturated carbonyl compounds.

Unit-III-Conformational Analysis **18 Hrs**

a) Introduction-Configuration and conformation-Conformation of molecules-acyclic molecules, ethane and n-butanes. Conformation of cyclohexane, mono and disubsituted cyclohexanes, Cyclohexanones. Fusedbicyclicmolecules, polycyclicmolecules, decalins, perhydrophenanthrenes.

b) Conformation and Reactivity:

Conformation and reactivity in acyclic systems – Ionic elimination – pyrolytic elimination, NGP by bromine.

Conformation and reactivity in cyclohexane system SN1, SN2, saponification, ionic elimination, pyrolytic elimination, NGP – 3^0 H and acetoxy group, epoxide ring formation and ring opening, Electrophilic addition, Molecular rearrangements, Curtin Hammett Principle.

Unit–IV-Organic Spectroscopy UV, IR spectra **18 Hrs**

i)UV-Visible Spectroscopy- Theory of electronic spectroscopy, Types of electronic transitions – Chromophore, Auxochrome, Bathochromic shifts, Hypsochromic shift, Hypochromic and hyperchromic shift – Factors affecting λ max – solvent effect, Conjugation and steric hindrance - Fieser woodward rules for calculating λ max in conjugated diene and carbonyl compounds, Applications of UV spectroscopy.

ii) IR Spectroscopy- Basic principles – Factors influencing vibrational frequencies – vibrational coupling and Fermi resonance, Electronic effects, Bond angles, field effect, physical state and solvent effect – Scanning of IR spectrum – Fingerprint regions - molecular vibrational frequency- characteristic frequencies of some important functional groups such as >C=O,- CN,-OH,-NH_2,-COOH,-C-H, -C=C-H, -CHO,-C=C-H etc.- Application of IR spectra.

Unit–V-Selective Organic Name reactions **18 Hrs**

Favorski reaction-Stork- enamine reaction, Ene reaction-shapiro reaction-Baeyer Villiger reaction-, Birch reduction, Mannich reaction, Wittig reaction, Stobbe reaction.

.Beckmann, Fries, Wagner-Meerwein rearrangement, Wolf rearrangement, Skraup synthesis, Steven's rearrangement, dienone-phenol rearrangement.

References:

1.Jerry march, Advanced Organic chemistry, Reaction mechanism and structure,Willey,4th edn,1992.

2.Peter Sykes.A,Aguide book to mechanism in organic chemistry,Longmann.

3.E.S.Gould(1960), Mechanism and structure in organic chemistry,Henry-Holtoo INC.

4.Ernest.L.Eliel, Stereo chemistry of carbon compounds, 1997.22nd reprint,Tata Mcgraw-Hill,NewDelhi.

5.D.Nasipuri,Stereochemistry of organic compounds,1994,2nd edn,Wiley eastern limited,NewDelhi.

6.Silverstein,Bassler and Morrel,Spectrometric identification of organic compounds,4th edn,John Wiley and Sons.

7.P.S. Kalsi,spectroscopy of organic compounds,1993,Wiley eastern.

8.WiliamKemp,(1991) organic spectroscopy,Macmilan,3rd edition.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 ELIMINATION REACTIONS				
1.1	Elimination- E2,E1 and E1CB mechanism	2	Chalk & Talk	Black Board
1.2	Orientation of the double bond	2	Chalk & Talk	LCD
1.3	Hoffmann and Sayetzeff rules	2	Lecture	PPT & White board
1.4	Reactivity-effect of substrate, attacking base	2	Lecture	Smart Board
1.5	Effect of the leaving group and medium	3	Lecture	Black Board
1.6	Competition between elimination and substitution	2	Discussion	
1.7	Orientation in pyrolytic elimination	3	Lecture	Smart Board
1.8	Bredt's rule	2	Discussion	Black Board

UNIT -2 ADDITION REACTIONS				
2.1	Addition to carbon-carbon multiple bonds-Electrophilic addition	3	Chalk & Talk	Black Board
2.2	Nucleophilic addition, Free radical addition	2	Chalk & Talk	LCD
2.3	Addition to conjugated systems	2	Lecture	PPT & White OARD
2.4	Orientation and reactivity	2	Lecture	Smart Board
2.5	Hydroboration, addition of bromine to E and Z-2-butene, Hydroxylation- OsO_4, alk.$KMnO_4$, Woodward method and Prevost reaction	3	Lecture	Black Board
2.6	Addition to Carbon-Hetero multiple bonds-Mechanism and reactivity	2	Discussion	
2.7	Addition of alcohols and amines to aldehydes and ketones-mechanism of metal hydride reduction	2	Lecture	Smart Board
2.8	Addition of Grignard reagents, organozinc and organo lithium reagents to carbonyl and unsaturated carbonyl compounds	2	Discussion	Black Board
UNIT -3 CONFORMATIONAL ANALYSIS				
3.1	Introduction-Configuration and conformation-Conformation of molecules-acyclic molecules, ethane and n-butanes	2	Chalk & Talk	Black Board
3.2	Conformation of cyclohexane, mono and disubsitutedcyclohexanes	3	Chalk & Talk	LCD

3.3	Cyclohexanones. Fusedbicyclicmolecules, polycyclicmolecules, decalins, perhydrophenanthrenes	2	Lecture	PPT & White board
3.4	Conformation and reactivity in acyclic systems – Ionic elimination	2	Lecture	Smart Board
3.5	pyrolytic elimination, NGP by bromine	2	Lecture	Black Board
3.6	Conformation and reactivity in cyclohexane system SN1, SN2	2	Discussion	
3.7	saponification, ionic elimination, pyrolytic elimination, NGP – 3^0 H and acetoxy group	3	Lecture	Smart Board
3.8	epoxide ring formation and ring opening, Electrophilic addition, Molecular rearrangements, Curtin Hammett Principle	2	Discussion	Black Board
UNIT -4 ORGANIC SPECTROSCOPY UV,IR SPECTRA				
4.1	UV-Visible Spectroscopy- Theory of electronic spectroscopy, Types of electronic transitions	2	Chalk & Talk	Black Board
4.2	Chromophore, Auxochrome, Bathochromic shifts, Hypsochromic shift, Hypochromic and hyperchromic shift	2	Chalk & Talk	LCD
4.3	Factors affecting λ max – solvent effect, Conjugation and steric hindrance	2	Lecture	PPT & White board
4.4	Fieserwoodward rules for calculating λ max in conjugated diene and carbonyl compounds, Applications of UV spectroscopy	3	Lecture	Smart Board
4.5	IR Spectroscopy- Basic principles – Factors influencing vibrational frequencies	2	Lecture	Black Board

4.6	vibrational coupling and Fermi resonance, Electronic effects, Bond angles, field effect, physical state and solvent effect	2	Discussion	
4.7	Scanning of IR spectrum – Fingerprint regions - molecular vibrational frequency	2	Lecture	Smart Board
4.8	characteristic frequencies of some important functional groups such as >C=O,- CN,-OH,-NH2,-COOH,-C-H, -C=C-H, -CHO,-C=C-H etc.- Application of IR	3	Discussion	Black Board
UNIT -5SELECTIVE ORGANIC NAME REACTIONS				
5.1	Favorski reaction-Stork-enamine reaction	2	Chalk & Talk	Black Board
5.2	Ene reaction-shapiro reaction-	2	Chalk & Talk	LCD
5.3	Baeyer Villiger reaction-, Birch reduction	2	Lecture	PPT & White board
5.4	Mannich reaction, Wittig reaction,	3	Lecture	Smart Board
5.5	Stobbe reaction, Beckmann, Fries, Wagner-Meerwein rearrangement	3	Lecture	Black Board
5.6	Wolf rearrangement, Skraup synthesis	2	Discussion	
5.7	Steven's rearrangement	2	Lecture	Smart Board
5.8	dienone-phenol rearrangement	2	Discussion	Black Board

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Session - wise Average 5 Mks.	Seminar 5 Mks.	M1+M2 15 Mks	MID-SEM TEST 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

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

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 – Seminar

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 comprehend the mechanism of elimination and substitution reactions and to apply the stereochemistry in E1, E2, ionic and pyrolytic eliminations.	K2, K3, K4 & K5	PSO1 &PSO2
CO 2	To interpret the concept of nucleophilic and free radical addition reactions and metal hydride reduction and to discriminate the reactivity of organometalic reagents.	K2, K3, K4 & K5	PSO1 &PSO2

CO 3	To explore reactivity patterns of substituted cyclohexanes and to employ conformational reactivity in cis and trans decalins and to apply conformations in SN1, SN2, ionic, pyrolytic eliminations and NGP reactions.	K2, K3, K4 & K5	PSO2& PS03
CO 4	To acquire a complete knowledge of the principles of UV, IR spectroscopy and to examine the various functional groups present in organic molecules using λmax and IR frequency values .	K2, K3, K4 & K5	PSO3 &PS04
CO 5	To differentiate the molecular rearrangements and to solve the simple problems and to recall the various naming reactions and to interpret the products.	K2, K3, K4 & K5	PSO1 PSO8

Mapping of C0s 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	3	3	1	1	1	1	1	1	1
CO3	2	3	3	1	1	1	1	1	1
CO4	2	1	3	3	1	1	1	1	1
CO5	3	1	1	1	1	1	1	3	1

Mapping of C0s 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	2
CO5	3	3	2	3

COURSE DESIGNER:

1. **Staff Name Dr.B.Vinosha**
2. **Staff Name Dr.V.Aruldeepa**

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HOD'S Signature

CBCS Curriculam for M.Sc. Chemistry

SEMESTER–II

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCH	**19PG2C8**	**Physical chemistry-II (Chemical Kinetics and Quantum Mechanics)**	**MAJOR CORE**	**6 Hrs.**	**4**

Objective: This paper provides an extensive study of the topics such as Chemical kinetics and Quantum mechanics.

Course Outcomes:

After studying this course, students should be able

- To Understand the concept of rate constants,ionic strength, Fast reactions, Catalysis, orthogonality and normalization and to solve the problems related to rate constants
- To explore and to evaluate the kinetics of complex, consecutive and chain reactions and Kinetics of reactions in solution and to learn the Influence of ionic strength on reaction rates.
- To compare the various Theories of reaction rates and explain the postulates of quantum mechanics and operators
- To determine solutions of Schrödinger equation to particle in a One Dimensional Box, Three Dimensional Box, The Simple Harmonic Oscillator, The Rigid rotator, The H-atom
- To apply the Variation method and perturbation method to He atom and HMO theory to conjugated systems

Unit I : Chemical Kinetics – I

Unit II : Chemical Kinetics – II

Unit III : Chemical Kinetics – III

Unit IV : Quantum Mechanics – I

Unit V : Quantum Mechanics –II

I. CHEMICAL KINETICS - I **18 Hrs**

a) Basics of Chemical Kinetics

b) Kinetics and mechanisms of complex, consecutive and chain reactions- Formation of HBr, Decomposition of acetaldehyde and Pyrolysis of methane, Catalysis by ions of variable valency, activation of molecular hydrogen. Kinetics of reactions in solution – Diffusion controlled reaction in solution, Influence of ionic strength on reaction rates – The salt effects, Influence of solvent on reaction rates and Isotope effect.

II. CHEMICAL KINETICS - II **18Hrs.**

a) Techniques for fast reactions – stopped flow technique, relaxation methods, temperature and pressure jump methods, shock tube methods, flash photolysis and pulse radiolysis, Influence of temperature on reaction rates and potential energy surfaces.

b) Introduction to catalysis – homogeneous catalysis – acid base catalysis – mechanism, catalytic activity and acid base strength, acidity function. Catalysis by enzymes – Michaelis – Menten mechanism, influence of pH and temperature on enzyme catalysed reactions. Heterogeneous catalysis – derivation of B.E.T isotherm.

III. CHEMICAL KINETICS - III **18 Hrs.**

Theories of reaction rates – Collision theory, Theory of absolute reaction rates (ARRT) – Thermodynamic treatment, Theory of Unimolecular reactions – Lindemann, Hinshelwood, RRK, RRKM, Slater's theory and Marcus theory of electron transfer reactions .

References:

1. Chemical Kinetics By Laidler

IV. QUANTUM MECHANICS - I **18 Hrs.**

The schrodinger wave equation, Postulates of Quantum mechanics, Operators – Linear operator, commuting operators, Hermitian operator. Eigen functions and Eigen values, Orthogonality and Normalisation. Discussion of solutions of Schrödinger equation to particle in a One Dimensional Box, Three Dimensional Box, The Simple

Harmonic Oscillator, The Rigid rotator, The H- atom, Probability Distribution curves, Angular momentum - Quantum mechanical definition of angular momentum, Commutation Relations, Physical significance of Commutation relations, Eigen functions and Eigen Values of angular momentum.

V. QUANTUM MECHANICS –II **18 hrs**

Approximation methods – The Variation theorem, Linear variation principle, Application of variation method to He – atom, Perturbation theory (only Time independent, First order and non-degenerate), Application of Perturbation Theory to He-atom. Hartree's and HartreeFock Self consistent Field Theory,

Symmetric and Antisymmetric Wave functions , Pauli's exclusion principle of Antisymmetric wave functions, Huckel Molecular orbital theory – Huckel theory of conjugated system-Delocalization Energy, Bond order and Charge density calculations, Application of HMO to ethylene, butadiene, cyclobutadiene and cyclopropenyl system .

References:

1. Introductory Quantum Chemistry by A. K. Chandra, TataMcgrawhill.
2. Quantum Chemistry by IRA – N. Levine, Printice hall.
3. Quantum Chemistry by Donald A. Mcquarrie.
4. Quantum chemistry by R.K. Prasad.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 CHEMICAL KINETICS - I				
1.1	Basics of Chemical Kinetics- Rate expression, order and molecularity, Examples, Half-life period, Zero order reactions	2	Chalk & Talk	Black Board

1.2	Derivation of Rate constant for first order, second order and thirdorderreactions	2	Chalk & Talk	LCD
1.3	Methods of determination of order of reaction and half life period, Factors affecting order of reactions	2	Lecture	PPT & White board
1.4	Kinetics and mechanisms of complex, consecutive and chain reactions- Formation of HBr	2	Lecture	Smart Board
1.5	Decomposition of acetaldehyde and Pyrolysis of methane,	3	Lecture	Black Board
1.6	Catalysisby ions of variable valency, activation of molecular hydrogen	2	Lecture	Black Board
1.7	Kinetics of reactions in solution – Diffusion controlled reaction in solution, Influence of ionic strength on reaction rates	3	Lecture	White board
1.8	The salt effects, Influence of solvent on reaction rates and Isotope effect.	2	Discussion	Black Board
UNIT -2	**CHEMICAL KINETICS - II**			
2.1	Techniques for fast reactions – stopped flow technique, relaxation methods,	2	Lecture	Green Board
2.2	temperature and pressure jump methods, shock tube methods,	2	Chalk & Talk	Green Board
2.3	flash photolysis and pulse radiolysis,	2	Lecture	LCD
2.4	Influence of temperature on reaction rates and potential energy surfaces.	2	Chalk & Talk	Black Board
2.5	Introduction to catalysis – homogeneous catalysis – acid base catalysis – mechanism,	2	Discussion	LCD

2.6	catalytic activity and acid base strength, acidity function. Catalysis by enzymes – Michaelis – Menten mechanism	3	Lecture	Black Board
2.7	influence of pH and temperature on enzyme catalysed reactions.	2	Lecture	Black Board
2.8	Heterogeneous catalysis – derivation of B.E.T isotherm	3	Chalk & Talk	Black Board
UNIT -3	**CHEMICAL KINETICS - IIIAND QUANTUM MECHANICS-I**			
3.1	Theories of reaction rates – Collision theory,	2	Chalk & Talk	Using Models
3.2	Theory of absolute reaction rates (ARRT) – Thermodynamic treatment, Theory of Unimolecular reactions – Lindemann,	2	Chalk & Talk	Black Board
3.3	Hinshelwood Theory, RRK Theory, RRKM Theory.	2	Chalk & Talk	Black Board
3.4	Slater's theory and Marcus theory of electron transfer reactions	2	Chalk & Talk	Black Board
3.5	Introduction to Quantum mechanics- Limitations of Classical mechanics,	3	Lecture	Black Board
3.6	Time dependent and time independent schrodinger wave equation	3	Lecture	Black Board
3.7	Postulates of Quantum mechanics, Operators – Linear operator, commuting operators, Hermitian operator	2	Discussion	LCD
3.8	Eigen functions and Eigen values, Orthogonality and Normalisation, Problems related to Eigen functions and commutative operators, Expressions for operators	2	Chalk & Talk	Green Board
UNIT -4	**QUANTUM MECHANICS-II**			

4.1	Discussion of solutions of Schrödinger equation to particle in a One Dimensional Box,Provblems related to particle in a One Dimensional Box	2	Chalk & Talk	Black Board
4.2	Particle in a Three Dimensional Box, The Simple Harmonic Oscillator,	2	Discussion	LCD
4.3	The Rigid rotator, The H-atom,	3	Chalk & Talk	Black Board
4.4	Problems related to enery , orthoganality and normalisation of wave functions of H- atom,	2	Discussion	LCD
4.5	Quantum mechanical definition of angular momentum, Commutation Relations, Physical significance of Commutation relations,	3	Lecture	Black Board
4.6	Symmetric and Antisymmetric Wave functions , Pauli's exclusion principle of Antisymmetric wave functions.	2	Lecture	Black Board
4.7	Probability Distribution curves,Eigen functions and Eigen Values of angular momentum.	2	Chalk & Talk	Black Board
4.8	Quantum numbers, Rules used for filling up of electrons in various shells and sub-shells and orbitals.	2	Discussion	LCD
UNIT -5	**QUANTUM MECHANICS-III**			
5.1	Approximation methods-Introduction, Hamiltonian operator for multi electron atoms,and molecules	2	Chalk & Talk	Black Board
5.2	The Variation theorem, Linear variation principle, Application of variation method to He	2	Lecture	Black Board

5.3	Perturbation theory (only Time independent, First order and non-degenerate), Application of Perturbation Theory to He-atom	3	Chalk & Talk	Black Board
5.4	Hartree's and HartreeFock Self consistent Field	2	Chalk & Talk	Black Board
5.5	Huckel Molecular orbital theory –Introduction, Huckel's approximations, Huckel theory of conjugated system-Formula	3	Chalk & Talk	Black Board
	for calculating Delocalization Energy, Bond order and Charge density			
5.6	Application of HMO to ethylene, andcyclo butadiene.	2	Discussion	LCD
5.7	Application of HMO to, butadiene	2	Discussion	LCD
5.8	Application of HMO to cyclopropenyl system	2	Lecture	Black Board

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Seminar 5 Mks.	Better of W1, W2 5+5=10 Mks.	M1+M2 15 Mks	MID-SEM TEST 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	To Understand the concept of rate constants,ionic strength, Fast reactions, Catalysis, orthogonality and normalization and to solve the problems related to rate constants	K2, K3 , K4 & K5	PSO1,PSO2PSO5 &PSO7
CO 2	To explore and to evaluate the kinetics of complex, consecutive and chain reactions and Kinetics of reactions in solution and to learn the Influence of ionic strength on reaction rates.	K2, K3 , K4 & K5	PSO3,PSO5, PSO6 & PSO7
CO 3	To compare the various Theories of reaction rates and explain the postulates of quantum mechanics and operators	K2, K3 , K4 & K5	PSO4 , PSO5& PSO6
CO 4	To determine solutions of Schrödinger equation to particle in a One Dimensional Box, Three Dimensional Box, The Simple Harmonic Oscillator, The Rigid rotator, The H-atom	K2, K3 , K4 & K5	PSO1, PSO2&PSO7
CO 5	To apply the Variation method and perturbation method to He atom and HMO theory to conjugated systems	K2, K3, K4& K5	PSO1& PSO2

Mapping COs Consistency with PSOs

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

Mapping of C0s with POs

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

COURSE DESIGNER:

1. **Dr.Sukumari**
2. **Dr. K.R. Subimol**

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CBCS Curriculum for M.Sc. Chemistry

SEMESTER-II

(For those who joined in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCH	19PG2C9	INORGANIC QUANTITATIVE ANALYSIS	LAB	4	2

COURSE DESCRIPTION:

This course gives training to prepare inorganic complexes in pure form and quantitative estimation of metal ions present in the solutions

COURSE OBJECTIVE:

This paper deals with the preparation of inorganic complexes from simple salts and also the estimation of amount of metal ions present in the given solution by using gravimetric and volumetic procedures

COURSE OUTCOMES

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

CO 1-Describe the principle and procedure of quantitative analysis

CO 2-identify thesuitable complexing agents for the given metal ions

CO 3-draw the structure of various ligands and complexes

CO 4-distinguish volumetric analysis and gravimetic analysis

CO 5-Apply the expressions of various terms in calculations

I.PREPARATION OF INORGANIC COMPLEXES:

1. Hexathioureaplumbusnitrate

2. Potassiumcupricsulphate

3. Trioxalatoaluminate(III).

4. Tristhioureacopper(I)sulphate

5. Sodiumnitroprusside

6. Tetramminecopper(II)sulphate

II.VOLUMETRIC ANALYSIS

1. Volumetric estimation of from Cu and Zn saltsolution mixture

2. Volumetric estimation of Cu from Cu and Ni salt solutionmixture

3. Volumetric estimation of Cafrom Ca and Mg salt solutionmixture

4. Volumetric estimation of Ba from Ba and Zn salt solutionmixture

III. GRAVIMETRIC ANALYSIS

1. Gravimetric estimation of Zn from Cu and Zn salt solution mixture

2. Gravimetric estimation of Ni from Cu and Ni salt solutionmixture

3. Gravimetric estimation of Mg from Ca and Mg salt solutionmixture

4. Gravimetric estimation of Zn from Ba and Zn salt solutionmixture

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 thesuitable 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 gravimetic analysis	PSO1, PSO2, PSO3, PSO6&PSO7
CO 5	Apply the expressions of various terms in calculations	PSO1, PSO2, PSO3, PSO6&PSO7

Mapping of C0s 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 C0s 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**

♦ Weakly Correlated -**1**

COURSE DESIGNER:

1. **Mrs. R. M. Nagalakshmi**
2. **Dr. Sr. J. Arul Mary**

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HOD'S Signature

CBCS Curriculum for M.Sc. Chemistry

SEMESTER –II

For those who joined in 2017 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCH	19PG2C10	ORGANIC QUANTITATIVE ANALYSIS	Lab	4	2

Course Descriptive:

This course gives a hands on experience of quantitatively analyzing organiccompound and to synthesis organic compounds using two stages.

Course Objective:

To make the students to estimate quantitatively the given substance using suitable procedure and also prepare organic compounds using single stage.

Course Outcomes:

- Students understand the quantitative analysis
- To develop the ability for synthesizing organic compounds by single stage.
- To develop the ability for synthesizing organic compounds by double stage.
- To study the reaction mechanism.

Organic Estimations

1. EstimationofGlucose(Laneand eynon'smethod)
2. EstimationofGlucose(Bertrand'smethod)
3. EstimationofGlycine
4. EstimationofEthylMethylKetone

Double stage Organic synthesis:

Synthesis of:

1. Benzanilide from benzophenoneoxime
2. p-bromoanilinefromp-bromoacetanilide UsageofGreenreagentCAN,KBrinstead ofBr2andGlacialaceticacid)
3. Tribromoanilinefromaniline (Usage of Green reagent CAN, KBrinstead of Br2 and Glacial acetic acid)

4.P-Nitroaniline fromacetanilide

References:

1. Ganapragasam& Ramamurthy G, *Organic Chemistry LabManual* 2 ndEd., S.Vishwanathan Printers and Publishers (P)Ltd., Chennai, 2007.

2. Furniss BS,HannafordAJ,SmithPWG and Tatchell AR, *Vogel's Text book of Practical Organic Chemistry*, 5th Ed., Pearson Publication. Vengataswaran V et al., *Basic Principle of Practical Chemistry*, Sultan Chand andsons,New Delhi, 1997

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	Acquire the knowledge of quantitative analysis	K2	PSO1& PSO3
CO 2	Synthesize organic compounds by double stage.	K2, K3	PSO3
CO 3	Synthesize organic compounds by double stage.	K3 & K4	PSO3, PSO5
CO 4	Describe the reaction mechanism.	K2, K3 & K4	PSO1,PSO5

CO 5	Analyse the prepared organic compounds by spectral techniques (UV and IR)	K2 & K4	PSO2,PSO5

Mapping of C0s with PSOs

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

Mapping of C0s with POs

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

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

COURSE DESIGNER:

1. Dr. ARUL DEEPA
2. Dr. K.R.SUBIMOL

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SEMESTER – II

For those who joined from 2021 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCH	21C2EDC	ANALYSIS OF SOIL, WATER, FOOD, COSMETICS AND OIL	EDC	3	3

COURSE DESCRIPTION

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

COURSE OUTCOME:

After completion of the course the students should be able to:

- Acquire the complete knowledge ofsoil and its texture
- Develop idea about water and its treatment
- Idetify different types of food colour, aditives and food adulterants
- Learn the ingredients required for the preparation of various types of shampoos, skin powder, nail polish.
- Understand the need of detoxification of oil and various adulterants present in 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.Naturalwater.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 functios- 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. JayashreeGhosh, Fundamental concepts of Applied chemistry, S.Chand publications, New Delhi (2013).
5. J.V.Simons, Science and Beauty Business Vol-1, Macmilan 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 functios	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 static 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

Levels	C1	C2	C3	Total Scholastic Marks	Non Scholastic Marks C4	CIA Total	% of Assessment
	Weekly 5Mks.	Monthly 10 Mks.	MID-SEM TEST 20 Mks.	35 Mks.	5 Mks.	40 Mks.	
K1	-	5 Mks.	5 Mks.	10	-	10	25 %
K2	-	5 Mks.	8 Mks.	13	-	13	32.5 %
K3	5 Mks.	-	7 Mks.	12	-	12	30 %
Non Scholastic	-	-	-	-	5	5	12.5 %
Total	5	10	20	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

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- ✓ **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-Understand, **K2**-Apply, **K3**-Analyse

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

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

S

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	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 adulderants in oils and to compare the physical and chemical refining of oils	K3	PSO5

Mapping COs Consistency with PSOs

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

CO/ PSO	PO1	PO2	PO3	PO4

S

CO1	**3**	**2**	**2**	**2**
CO2	**3**	**2**	**2**	**2**
CO3	**3**	**3**	**3**	**3**
CO4	**3**	**2**	**3**	**2**
CO5	**3**	**3**	**2**	**3**

Note: ♦ Strongly Correlated – **3** ♦ ModeratelyCorrelated – **2**
♦ WeaklyCorrelated **-1**

COURSE DESIGNER:

1. **Mrs. RM. Nagalakshmi**
2. **Dr. B.SUGANTHANA**

Forwarded By

HOD'S Signature.

FATIMA COLLEGE (AUTONOMOUS) MADURAI-18

INTERNSHIP-19PG3SICI

SEMESTER –III

(For those who joined from 2007 onwards)

RESEARCH WORK

All the second PG students are sent to internship in various reputed research institutions

CBCS Curriculum for M.Sc. Chemistry

SEMESTER –III

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCH	**19PG3C11**	**Organic chemistry-III (Spectroscopy and Pericyclic reactions)**	**MAJOR CORE**	**6**	**5**

COURSE DESCRIPTION: This course provides the study of different aspects of 1D and 2D NMR spectral techniques and mass spectroscopy. This paper enable the students to understand the concept and reactivity of organic reactions under photochemical conditions.

COURSE OBJECTIVES: This paper provides an elaborate study of organic spectroscopy and their applications in structural elucidation of organic compounds. This paper also deals with reactions that are taking place under photochemical conditions and pericyclic reactions.

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

- To acquire a complete knowledge of the basic principles of 1H-NMR, 13C-NMR and Mass spectroscopy
- To be acquainted with complete knowledge of photochemistry of ketone & cyclo addition reactions and to develop an understanding of the significance of the number, and splitting of signals in NMR
- To be competent to assign structures to simple molecules on the basis of nuclear magnetic resonance spectra
- To distinguish the similarities and differences of Pericyclic reactions and Cyclo addition and sigmatropic reactions
- To apply the Spectral concepts to solve the problems, to elucidate the structures of

simple organic compounds using the data from all the spectral techniques

UNITS

UNIT I-^{1}H -NMR SPECTROSCOPY (18 HRS)

i) Introduction – Relexation process – Instrumentation(not required) – Chemical shift – Factors influencing chemical shift – Inductive effect, Vanderwaalsdeshielding, anisotropic effects, Hydrogen bonding, solvent effects.

ii)H^{1}-NMR spectroscopy-coupling constant J-factors influencing coupling constant J-classification (ABX, AMX,& A2B2) Geminal,Vicinal and long range coupling- Shift reagents -NOE.

UNIT II-^{13}C- NMR SPECTROSCOPY & 2D-NMR SPECTROSCOPY (18 HRS)

C^{13}-Spectroscopy–introduction-chemical shifts(aliphatic, olefinic, alkyne, aromatic)-coupling constants. Broad band decoupling, Off-resonance decoupling.

2D NMR techniques such as HOMOCOR, HETEROCOR, NOESY, DEPT, INEPT, APT, INADEQUATE. Instrumentation(not required)

UNIT –III MASS SPECTROSCOPY (18 HRS.)

Mass Spectroscopy-Introduction –ion production-EI,CI, FD and FAB- factors affecting fragmentation, Fragmentation of organic compounds-molecular ion peak,meta stable peak-Mc Lafferty rearrangement-Nitrogen rule-Retro diels-Alder reaction.

UNIT –IV ORGANIC PHOTOCHEMISTY (18HRS.)

Photochemistry of alkenes, intramolecular reactions of olefinic bond- geometrical isomerism, cyclisation reactions, rearrangement of 1,4- and 1,5-dienes (di-pi-methane rearrangement)

Photochemistry of carbonyl compounds- dimerisation and Paterno-Buchi reaction-intramolecular reaction- saturated, cyclic and acyclic α,β-unsaturated compounds- Barton reaction, Norrish Type I and Type II reactions photoreduction of ketones

UNIT –V :PERICYCLIC REACTIONS (18HRS.)

Frontier orbitals of ethylene, 1,3-butadiene, 1,3,5-hexatrienes classification of pericyclic reactions- FMO and PMO approaches (excluding Correlation diagram method) –

Electrocyclicreactitons- conrotatory and disrotatory motions- 4n, 4n+2- Cycloaddition- suprafacial and antarafacial additions, (2+2) and (4+2) cycloadditions, Cheleotropicreactitons- Sigmatropic rearrangement- 3,3 and 5,5-sigmatropic rearrangements, Claisen, Cope rearrangements

REFERENCES:

1. R. E. Ireland, Organic synthesis, Prentice-Hall of India Privated Ltd., 1988.

2. Norman and J. M. Coxon, Principles of organic synthesis, ELBS, 3rd Ed., 1993.

3. Jagdamba Singh, Photochemistry and Pericyclic Reactions, New age international publishers, 2009.

4. K. K. Rohatgi-Mukherjee, fundamentals of photochemistry, New age international publishers, 2006.

5. lan Fleming, Pericyclic reactions, oxford Publishers, 2009.

6. W. Kemp, Organic spectroscopy, McMillan, 1991.

7. R. M. Silverstein and F. X. Webster, Spectrometric Identification of organic compounds, John Wiley & Sons, Inc., 6th Ed. 2004

8. P.S.Kalsi, Spectroscopy of organic compounds, New age international publishers, 6th edition, 2009.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1	**^{1}H -NMR SPECTROSCOPY**		**(15 Hours)**	
1.1	Introduction - Relexation process	2	Chalk & Talk	Black Board
1.2	Chemical shift - Factors influencing chemical shift	4	Chalk & Talk	LCD

1.3	Hydrogen bonding, solvent effects.	1	Lecture	PPT
1.4	coupling constant J-factors influencing coupling constant	2	Lecture	PPT
1.5	J-classification (ABX, AMX, ABC & A2B2)	3	Lecture	Black Board
1.6	Shift reagents	2	Discussion	Black Board
1.7	NOE.	1	Lecture	Black Board
UNIT -2 ^{13}C- NMR SPECTROSCOPY & 2D-NMR SPECTROSCOPY (15 Hours)				
2.1	C^{13}-Spectroscopy-introduction	1	Lecture	Black Board
2.2	Chemical shifts(aliphatic, olefinic, alkyne, aromatic)- coupling constants.	3	Chalk & Talk	Black Board
2.3	Broad band decoupling, Off-resonance decoupling.	2	Chalk &	Black
2.4	2D NMR techniques - HOMOCOR & HETEROCOR	3	Chalk & Talk	Black Board
2.5	NOESY&DEPT	3	Chalk & Talk	Black Board
2.6	INEPT, APT& INADEQUATE	3	Chalk & Talk	Black Board
UNIT -3 MASS SPECTROSCOPY (15 Hours)				
3.1	Mass Spectroscopy-Introduction	2	Chalk & Talk	Black Board
3.2	Ion production-EI,CI	2	Chalk & Talk	PPT

3.3	FD and FAB	2	Chalk & Talk	PPT
3.4	Factors affecting fragmentation	3	Chalk & Talk	PPT
3.5	Molecular ion peak & meta stable peak	2	Chalk & Talk	Black Board
3.6	Mc Lafferty rearrangement	2	Chalk & Talk	Black Board
3.7	Nitrogen rule-Retro diels-Alder reaction.	2	Chalk & Talk	Black Board
UNIT -4 ORGANIC PHOTOCHEMISTRY			**(15 Hours)**	
4.1	Photochemistry of alkenes	3	Chalk & Talk	Black Board
4.2	Intramolecular reactions of olefinic bond- geometrical isomerism	2	Chalk & Talk	Black Board
4.3	Cyclisation reactions, rearrangement of 1,4- and 1,5-dienes	3	Chalk & Talk	Black Board
4.4	Photochemistry of carbonyl compounds- dimerisation-Norrish Type I and Type II reactions	4	Chalk & Talk	PPT
4.5	Paterno-Buchi reaction	1	Chalk & Talk	Black Board
4.6	Barton reaction, photoreduction of ketones	2	Chalk & Talk	Black Board
UNIT-5-PERICYCLIC REACTIONS			**(15 Hours)**	
5.1	Frontier orbitals of ethylene, 1,3-butadiene, 1,3,5-hexatrienes and allyl systems	2	Chalk & Talk	PPT
5.2	FMO and PMO approaches	3	Chalk & Talk	Black Board

5.3	Electrocyclic reactitons- conrotatory and disrotatory motions	2	Chalk & Talk	Black Board
5.4	Electrocyclic reactitons- 4n & 4n+2	3	Chalk & Talk	Black Board
5.5	Cycloaddition- suprafacial and antarafacial additions	1	Chalk & Talk	PPT
5.6	Cycloaddition- (2+2) and (4+2) cycloadditions	1	Chalk & Talk	Black Board
5.7	Cheleotropic reactitons	1	Chalk & Talk	Black Board
5.8	Sigmatropic rearrangement- 3,3 and 5,5-sigmatropic rearrangements, Claisen, Cope rearrangements	2	Chalk & Talk	Black Board

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Seminar 5 Mks.	Better of W1, W2 5Mks.	M1+M2 10 Mks	MID-SEM TEST 15 Mks	35 Mks.	5 Mks.	40Mks.	
K2	5	-	-	2 ½	-		-	-
K3	-	5	4	2 ½	5		5	12.5 %
K4	-	-	3	5	12		12	30 %
K5	-	-	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, 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 acquire a complete knowledge of the basic principles of ^{1}H-NMR, ^{13}C-NMR and Mass spectroscopy	K2, K3, K4 &K5	PSO1& PSO2
CO 2	To be acquainted with complete knowledge of the significance of the number, and splitting of signals in NMR	K2, K3, K4 &K5	PSO1,PSO3& PSO6
CO 3	To be competent to assign structures to simple molecules on the basis of Mass spectra	K2, K3, K4 &K5	PSO5&PSO8
CO 4	To understand the concepts of photochemistry of ketone & alkenes and to enumerate the cyclo addition reactions of carbonyl compounds	K2, K3, K4 &K5	PSO1,PSO4&PSO6
CO 5	To distinguish the similarities and differences of Pericyclic reactions and Cyclo addition and sigmatropic reactions	K2, K3, K4 &K5	PSO5, PSO6

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	3	1	3	1	1	3	1	1	1
CO3	2	1	1	1	3	1	1	3	1
CO4	3	1	1	3	1	3	1	1	1
CO5	2	1	1	1	3	3	1	1	1

Mapping of Cos with POs

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

Note: ♦ Strongly Correlated - **3** ♦ Moderately Correlated - **2**

♦ Weakly Correlated -**1**

COURSE DESIGNER:

1. **Dr.A.Rajeswari**
2. **Dr.B.Vinosha**

Forwarded By

HOD'S Signatur

CBCS Curriculum for M.Sc. Chemistry

SEMESTER –III

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCH	19PG3C12	Physical chemistry-III (Group Theory, Surface Chemistry and Macromolecules)	MAJOR CORE	6Hrs.	5

Objective: This course covers the detailed study of group theory and its application and also covers the principles of surface chemistry, and a brief study of macromolecules.

COURSE OUTCOME

After successful completion of the course, the students are able

- To learn about symmetry elements and symmetry operations, the point groups and character table
- To Describe the selection rule for infrared-active and Raman active transitions, electronic transitions
- To analyse the hybridization of given compounds and to apply HMO theory to Ethylene and some conjugated systems
- To Classify of surface active agents, Polymers, and to derive Gibbs adsorption and BET isotherms
- To explain the kinetics of vinyl, cationic and anionic polymerizations and to determine the mass of polymers.

UNIT-I: Group Theory I 18 Hrs

UNIT-II: Group Theory II 18 Hrs

UNIT-III: Group Theory III 18 Hrs

UNIT-IV: Surface Chemistry 18 hrs

UNIT-V: Macromolecules 18 hrs

UNII: Group Theory I **18 Hrs.**

Symmetry elements and symmetry operations- Point groups – symmetry number from point groups- matrix representation of symmetry operations- Reducible and Irreducible representation – Statement of orthogonality theorem – Character tables and their constructions- C_{2v}, C_{3v}, D_{3h} and C_4 point groups.

UNIT: II Group Theory II **18 Hrs**

Application of group theory to spectroscopy and molecular problems - Symmetries of Normal modes of vibration- Application of group theory to normal mode of analysis (Water, ammonia and ethylene) - Symmetry integrals- Applications for spectral selection Rules of vibration spectra- IR and Raman fundamentals- Symmetries of molecular orbitals - Selection rules- electronic transitions.

UNIT: III Group Theory III **18 Hrs**

Group theory and Quantum mechanics- Wave function as a basis for irreducible representation – Hybridization- sp^2 and sp^3, HMO and HMO calculation- delocalization of ethylene, Butadiene and cyclopropenyl system.

References:

1) F.A.Cotton-Chemical application of group theory-wiley eastern Ltd-1971.
2) V.Ramakrishnan and M.S.Gopinathan-Group theory in Chemistry-Vishal -1988

UNIT– IV: Surface Chemistry **18 hrs**

Adsorption- surface tension, Capillary action, pressure difference across curved surface(laplace equations).Vapour pressure of droplets (Kelvine equation) Gibbs adsorbtion isotherm, estimatiom of surface area (BET equation) Surface films on liquids. (Electrokinetic phenomenon), catalytic activity at surfaces.

Micells:

Surface active agents, Classification of surface active agents, micelliyation, hydrophopic interactions, critical micellarconcentrartion (CMC) , factors affecting the CMC surfactants. Counter ion binding to micells, thermodynamics of micelliyation.phaseseperation and mass action models, solubilazation, micro emulsion reverse micells.

References:

Micelles, Theoretical and applied aspects .V. Aloroi, Plenum.

UNIT-V: Macromolecules: **20 Hrs**

Polymer-definition and types of polymer, kinetics of polymerization (Vinyl, Cationic and Anionic polymerization). Electrically conducting, fire resistant, liquid crystal polymers.

Molecular mass, number and mass average molecular mass, molecular mass determination (viscometer, light scattering and sedimentation methods).

Chain configuration of macro molecules, calculation of various dimensions of various chain structures.

References:

Introduction to polymer science-V.R. Gowarikar, N. V.Viswanathan and J.sridhar.willey eastern.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
	UNIT -1 Group Theory I			
1.1	Group Theory I -Symmetry elements and symmetry operations- Definition with examples	2	Chalk & Talk	Black Board

1.2	Group definition, Types of groups with examples, Sub-groups	2	Chalk & Talk	LCD
1.3	Class, conjugate elements- definition, examples, Number of classes and sub-groups	2	Lecture	PPT & White board
1.4	Point group introduction, how to arrive at the point group of molecules, Point group and geometry, Examples for various point groups	3	Lecture	Smart Board
1.5	Symmetry number from point groups- matrix representation of symmetry operations	2	Lecture	Black Board
1.6	Reducible and Irreducible representation – Statement and Consequences of the Great orthogonality theorem, Introduction to Character table	3	Lecture	Black Board
1.7	Construction of character table for C_{2V}, C_{3V} point groups	2	Lecture	White board
1.8	Construction of character table for D_{3h} and C_4 point groups	2	Discussion	Black Board
UNIT -2	**Group Theory - II**			
2.1	Application of group theory to spectroscopy and molecular problems- Introduction	2	Lecture	Green Board
2.2	Symmetries of Normal modes of vibration- Application of group theory to normal mode of analysis to Water,	2	Chalk & Talk	Green Board
2.3	Application of group theory to normal mode of analysis to ammonia	2	Lecture	LCD
2.4	Application of group theory to normal mode of analysis to ethylene	2	Chalk & Talk	Black Board

2.5	Application of group theory to normal mode of analysis to molecules having i and Pauli's mutual exclusion principle	2	Discussion	LCD
2.6	Symmetry integrals- Applications for spectral selection Rules of vibration spectra- IR and Raman fundamentals	2	Lecture	Black Board
2.7	Selection rules for electronic transitions	3	Lecture	Black Board
2.8	Application of group theory to find out the allowed and forbidden transitions of HCHO and Ethylene	3	Chalk & Talk	Black Board
UNIT -3	**Group Theory III**			
3.1	Group theory and Quantum mechanics, Wave function as a basis for irreducible representation	3	Chalk & Talk	Using Models
3.2	Using Group theory prediction of hybridisation of molecules with sp^2 and sp^3 hybridisation	2	Chalk & Talk	Black Board
3.3	Derivation of Expressions for sp^2 and sp^3 hybrid orbitals using group theory	2	Chalk & Talk	Black Board
3.4	Use of Group theory in HMO and HMO calculations, Huckel's appromiations and advantage of using group theory in HMO rtheory	2	Chalk & Talk	Black Board
3.5	Application of HMO theory to Ethylene molecule to calculate Delocalisation energy and derive expressions for HMO functions	3	Lecture	Black Board

3.6	Application of HMO theory to 1,3-butadiene molecule to calculate Delocalisation energy and derive expressions for HMO functions	3	Lecture	Black Board
3.7	Application of HMO theory to cyclopropeny system molecule to calculate Delocalisation energy and derive expressions for HMO functions	2	Discussion	LCD
3.8	Application of HMO theory to cyclobutadiene molecule to calculate Delocalisation energy and derive expressions for HMO functions	2	Chalk & Talk	Green Board
UNIT -4	**Surface Chemistry**			
4.1	Surface Chemistry- Adsorption-surface tension, Capillary action, pressure difference across curved surface(laplace equations)	3	Chalk & Talk	Black Board
4.2	Vapour pressure of droplets (Kelvine equation) Gibbs adsorbtion isotherm,	2	Discussion	LCD
4.3	Derivation of BET isotherm and estimatiom of surface area using BET equation	2	Chalk & Talk	Black Board
4.4	Surface films on liquids. (Electrokinetic phenomenon), catalytic activity at surfaces.	2	Discussion	LCD
4.5	**Micells:** Surface active agents, Classification of surface active agents, micelliyation	3	Lecture	Black Board
4.6	hydrophopic interactions, critical micellarconcentrartion(CMC) , factors affecting the CMC surfactants	2	Lecture	Black Board

4.7	Counter ion binding to micells, thermodynamics of micelliyation	2	Chalk & Talk	Black Board
4.8	Phase seperation and mass action models, solubilazation, micro emulsion reverse micells.	2	Discussion	LCD
UNIT -5	**Macromolecules**			
5.1	Macromolecules- Introduction to Polymers, Types of polymers with examples	3	Chalk & Talk	Black Board
5.2	Kinetics of polymerization Vinyl polymerization	2	Lecture	Black Board
5.3	Kinetics of polymerization cationic and anionic polymerization	3	Chalk & Talk	Black Board
5.4	Electrically conducting polymers- Introduction and examples	2	Chalk & Talk	Black Board
5.5	Fire resistant and liquid crystal polymers, Molecular mass, number and mass average molecular mass,	3	Chalk & Talk	Black Board
5.6	molecular mass determination (viscometer, light scattering	2	Discussion	LCD
5.7	molecular mass determination using sedimentation velocity and equilibrium methods.	2	Discussion	LCD
5.8	Chain configuration of macro molecules, calculation of various dimensions of various chain structures.	2	Lecture	Black Board

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assess ment -
	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 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	Explain symmetry elements and symmetry operations, analyze the point groups of molecules and construct character table	K2 , K3, K4& K5	PSO1, PSO2, PSO4& PSO6
CO 2	Classify the infrared-active and Raman active vibrational modes and list out the allowed and forbidden electronic transitions group theoretically and determine the normal modes	K2 , K3, K4& K5	PSO1, PSO2, PSO4 &PSO6

CO 3	Find out SALC's, apply group theory to find out the hybridization of given molecules and determine delocalization energyof Ethylene and some conjugated systems using HMO theory	K2 , K3, K4& K5	PSO1, PSO2, PSO4&PSO6
CO 4	Define surface tension, Capillary action, Classify of surface active agents, and to derive Gibbs adsorption and BET isotherms	K2 , K3, K4& K5	PSO1, PSO2, PSO3, PSO6& PSO7
CO 5	To explain the kinetics of vinyl, cationic and anionic polymerizations and determine the mass of polymers.	K2, K3 & K4	PSO1, PSO2, PSO4, PSO6, PSO7& PSO8

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	1	3	1	3	1	1	1
CO2	3	3	1	3	1	3	1	1	1
CO3	3	3	1	3	1	3	1	1	1
CO4	3	3	3	2	1	3	3	1	1
CO5	3	3	1	3	1	3	3	3	1

Mapping of Cos with POs

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

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

- Weakly Correlated -**1**

COURSE DESIGNER:

1. **Dr.S. Sukumari**
2. **Dr. Sr.J.Arul Mary**

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SEMESTER –III

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCH	19PG3C13	Green Chemistry	MAJOR CORE	6 Hrs.	5

Course Objectives:

To know eco-friendly methods of synthesis. This helps in planning the synthesis of any type of organic compounds with the revolution of Green Chemistry.

Course Outcome:

After successful completion of the course, the students are able

- To know about the alternative feedstock and to study about the process and advantages of alternative materials
- To get familiarise about the green chemistry technology
- To understand the need of alternative energy sources
- To learn different types of renewable energy sources
- To acquire knowledge about the greener techniques in industries

UNIT I: PRINCIPLES & CONCEPT OF GREEN CHEMISTRY

UNIT II: MEASURING AND CONTROLLING ENVIRONMENTAL PERFORMANCE

UNIT III:EMERGING GREEN TECHNOLOGY AND ALTERNATIVE ENERGY SOURCES

UNIT IV: RENEWABLE RESOURCES

UNIT V: INDUSTRIAL CASE STUDIES

UNIT I: PRINCIPLES & CONCEPT OF GREEN CHEMISTRY **18 Hrs**

Introduction –Concept and Principles-development of Green Chemistry- Atom economy reactions –rearrangement reactions , addition reactions- atom uneconomic-sublimation-elimination-Wittig reactions-toxicity measures- Need of Green Chemistry in our day to day life.

UNIT II:MEASURING AND CONTROLLING ENVIRONMENTAL PERFORMANCE

18 Hrs

Importance of measurement – lactic acid production-safer Gasoline – introduction to life cycle assessment-four stages of Life Cycle Assessment (LCA) – Carbon foot printing-green process Matrics-eco labels -Integrated Pollution and Prevention and Control(IPPC)-REACH (Registration, Evaluation, Authorization of Chemicals)

UNIT III: EMERGING GREEN TECHNOLOGY AND ALTERNATIVE ENERGY SOURCES **18 Hrs**

Design for Energy efficiency-Photochemical reactions- Advantages-Challenge faced by photochemical process. Microwave technology on Chemistry- Microwave heating –Microwave assisted reactions-Sono chemistry and Green Chemistry – Electrochemical Synthesis-Examples of Electrochemical synthesis.

UNIT IV: RENEWABLE RESOURCES **18 Hrs**

Biomass –Renewable energy – Fossil fuels-Energy from Biomass-Solar Power-Other forms of renewable energy-Fuel Cells-Alternative economics-Syngas economy-hydrogen economy-Bio refinery chemicals from fatty acids-Polymer from Renewable Resources –Some other natural chemical resources.

UNIT V: GREENER TECHNIQUES IN INDUSTRIES **18 Hrs**

Methyl Methacrylate (MMA)-Greening of Acetic acid manufacture-Vitamin C-Leather manufacture –Types of Leather –Difference between Hide and Skin-Tanning – Reverse tanning –Vegetable tanning –Chrome tanning-Fat liquoring –Dyeing – Application-Polyethylene- Ziegler Natta Catalysis-Metallocene Catalysis-Eco friendly Pesticides-Insecticides.

Reference Books:

1. Mike Lancaster , Green Chemistry and Introductory text, II Edition
2. P.T.Anastas and J.C Warner, Green Chemistry theory and Practice, Oxford University

press, Oxford (1988).

3. P.Tundo*et. al.*, Green Chemistry, Wiley –Blackwell, London (2007).

4. Protti D.Dondi*et.al.,*Green Chemistry

5. T.E Graedel, Streamlined Life cycle Assessment, Prentice Hall, NewJersey (1998).

6. V.K. Ahluwalia,Methods and Reagents of Green Chemistry: An Introduction by Green Chemistry.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1	**PRINCIPLES & CONCEPT OF GREEN CHEMISTRY**			
1.1	Introduction -Concept and Principles-development of Green Chemistry	2	Chalk & Talk	Black Board
1.2	Atom economy reactions	2	Chalk & Talk	LCD
1.3	Rearrangement reactions	3	Lecture	PPT & White board
1.4	Addition reactions	3	Lecture	Smart Board
1.5	Atom uneconomic-subtitution	2	Lecture	Black Board
1.6	Elimination-Wittig reactions	2	Discussion	Google classroom
1.7	toxicity measures	2	Discussion	Google classroom
1.8	Need of Green Chemistry in our day to day life.	2	Discussion	Black Board
UNIT -2	**MEASURING AND CONTROLLING ENVIRONMENTAL PERFORMANCE**			
2.1	Importance of measurement	2	Chalk & Talk	Black Board

2.2	lactic acid production-safer Gasoline	2	Chalk & Talk	LCD
2.3	introduction to life cycle assessment	3	Lecture	PPT & White board
2.4	Four stages of Life Cycle Assessment (LCA)	3	Lecture	Smart Board
2.5	Carbon foot printing-green process Matrics	2	Lecture	Black Board
2.6	Green process Matrics-eco labels	2	Discussion	Google classroom
2.7	Integrated Pollution and Prevention and Control(IPPC)	2	Discussion	Google classroom
2.8	REACH (Registration, Evaluation, Authorization of Chemicals)	2	Discussion	Black Board
UNIT -3EMERGING GREEN TECHNOLOGY AND ALTERNATIVE ENERGY SOURCES				
3.1	Design for Energy efficiency-Photochemical reactions	2	Chalk & Talk	Black Board
3.2	Advantages-Challenge faced by photochemical process.	2	Chalk & Talk	LCD
3.3	Microwave technology on Chemistry.	3	Lecture	PPT & White board
3.4	Microwave heating -Microwave assisted reactions.	3	Lecture	Smart Board
3.5	Sono chemistry.	2	Lecture	Black Board
3.6	Green Chemistry	2	Discussion	Google classroom
3.7	Electrochemical Synthesis	2	Discussion	Google classroom

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
3.8	Examples of Electrochemical synthesis.	2	Discussion	Black Board
UNIT -4RENEWABLE RESOURCES				
4.1	Biomass -Renewable energy	2	Chalk & Talk	Black Board
4.2	Fossil fuels-Energy from Biomass	2	Chalk & Talk	LCD
4.3	Solar Power- Other forms of renewable energy	3	Lecture	PPT & White board
4.4	Fuel Cells-Alternative economics	3	Lecture	Smart Board
4.5	Syngas economy- hydrogen economy	2	Lecture	Black Board
4.6	Bio refinery chemicals from fatty acids	2	Discussion	Google classroom
4.7	Polymer from Renewable Resources	2	Discussion	Google classroom
4.8	Some other natural chemical resources	2	Discussion	Black Board
UNIT V: GREENER TECHNIQUES IN INDUSTRIES				
5.1	Methyl Methacrylate (MMA)-Greening of Acetic acid manufacture	3	Chalk & Talk	Black Board
5.2	Vitamin C-Leather manufacture	3	Chalk & Talk	LCD

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
5.3	Types of Leather -Difference between Hide and SkinTanning	3	Lecture	PPT & White board
5.4	Reverse tanning -Vegetable tanning	3	Lecture	Smart Board
5.5	Chrome tanning-Fat liquoring	3	Lecture	Black Board
5.6	Dyeing -Application	3	Discussion	Google classroom

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 15 Mks	MID-SEM TEST 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 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,**

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	To know about the alternative feedstock and sustainable development	K2& K3	PSO1, PSO2, PSO5 &PSO7
CO 2	To get familiarise about the environmental performance	K2, K3 & K5	PSO2, PSO4,PSO5 & PSO8
CO 3	To understand about the various emerging green trends in synthetic chemistry	K2& K3	PSO1, PSO8 &PSO9
CO 4	To study the importance of renewable and natural chemical resources	K2& K4	PSO4 &PSO5
CO 5	To learn the different greener techniques used in industries.	K2, K4&K5	PSO9

Mapping COs Consistency with PSOs

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

Mapping of Cos with POs

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

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

COURSE TEACHERS

1. **Dr.A RAJESHWARI**
2. **Dr. K. R. SUBIMOL**

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SEMESTER –III

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS /WEEK	CREDITS
PSCH	19PG3CE1	MATERIAL CHEMISTRY	ELECTIVE	4	4

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

COURSE DESCRIPTION

Thispaperdealswithsynthesis,propertiesandapplicationsofnanomaterials.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 carnonnanoatructures, organic nanopolymers and supra molecular structures
- To recognize the important role of nanomaterials in various fields.

UNITI:BASICSOFNANOMATERIALS (12 HRS)

Introduction – Basic concepts-quantum confinement effect, surfacepropertiesofnanoparticles.Classificationofnanomaterials-onedimentional,twodimentionalandthreedimentionalnanostructures.Carbon

nanostructures- carbon molecules-carbon nanotubes- nanopolymers-nanocrystals.

Self-study: supramolecularstructures

UNITII:SYNTHETICMETHODS OFNANOMATERIALS (12HRS)

Synthesis of semiconductors – sol gel synthesis &sono chemicalapproachand 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: Purificationcarbonnanotubes

UNIT III:PROPERTIES OF NANOMATERIALS (12 HRS)

Propertiesofcarbonnanotubes,Thermalconductivity,Kineticproperty, Elecrical and electronic,mechanical and vibrational properties andtensilestrength.Propertiesoffullerenes-physicalandchemicalproperties.Metalnanoclusters, raregasandmolecularclusters.

Self-study-Propertiesofsemiconductingnanoparticles

UNITIV:CHARACTERIZATION TECHNIQUES (12 HRS)

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

Self-study: X-raydiffractiontechnique(XRD).

UNITV:APPLICATIONSOFNANOMATERIALS (12 HRS)

Nanosensors:

Applications of optical nanosensors,chemical nanosensors, electrochemical nanosensors, micro-electro mechanical sensors and biosensors

Nanocatalyst:

ApplicationsOf platinum,palladium,silver,cobaltnanoparticles,CNTsand polymer naomaterials as catalyst.

Nanomedicine: Nanomaterials in drug delivery, photodynamic therapy, molecular imaging, cancertreatment, molecularmotors, neuro-electronic interfaces and tissue engineering

Self-study-Applications of nano devices.

References

1. Charles P. Poole, Jr., Frank J. Owens, Introduction tonanotechnology,JohnWiley& Sons-India,2010.
2. T. Pradeep, Nano: The Essentials, Tata McGraw-Hill PublishingCompanyLimited, 2007.
3. A.S.Bhatia,Dr.S.M.Ishtiaque,NanoscienceandCarbonNanotubes,Deep&DeepPublicationsPvt.Ltd.
4. MarkRatner,DanielRatner,Nanotechnology,AGentleIntroductionToTheNext BigIdea,PearsonEducation,5th Edn,2009.
5. Dr.S.Shanmugam,Nanotechnology,MJPPublishers,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 dimentional,twodimentional and three dimentional 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 Kinetic property	2	Chalk & Talk	Black Board
3.2	Elecrical 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 gas clusters.	2	Chalk & Talk	Black Board
UNITIV : CHARACTERIZATION TECHNIQUES				
4.1	Microscopy-Atomic force microscope(AFM), scanning electronmicroscope(SEM)	3	Chalk & Talk	Black Board

4.2	Transmission electron microscope(TEM), scanning probe microscope(SPM), scanning tunelling 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 chemical nanosensors,	2	Chalk & Talk	Black Board
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 naomaterials as nanocatalyst	1	Chalk & Talk	Black Board

5.7	Nanomaterials in drug delivery,photodynamic therapy, molecular imaging	2	Chalk & Talk	PPT & White board
5.8	Cancer treatment,molecularmotors,neuro-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 5 Mks.	Better of W1, W2 5+5=10 Mks.	M1+M2 15 Mks	MID-SEM TEST 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 :**

  K2-Understand, **K3-**Apply, **K4-**Analyse, **K4-** Evaluate
- ✔ **The I PG course teachers are requested to start conducting S1, W1, M1**

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	**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 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	Distinguish between bulk material and nanomaterials	K2, K3, K4 &K5	PSO1& PSO2
CO 2	Choose the suitable synythetic 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	Catagorize 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
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. **Mrs. RM. Nagalakshmi**
2. **Dr. B.SUGANTHAN**

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SEMESTER –III

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS /WEEK	CREDITS
PSCH	19PG3CE2	BIO-ORGANIC CHEMISTRY	ELECTIVE	4	4

Objective: This course deals with Bio-Organic Chemistry, structure of Proteins, biological catalysis and Coenzymes.

COURSE OUTCOME

After completion of the course the students are able to

- Understand concepts of molecular recognition and drug design
- Remember the synthesis and structure of Proteins and amino acids.
- Know the extraction and purification of enzymes and their application in catalysis.
- Categorize and analyze enzyme mechanisms.
- Analyze the structure and biological functions of Coenzymes.

UNIT-I -Introduction to Bio-OrganicChemistry **12Hrs**

UNIT-II - Proteins **12Hrs**

UNIT -III- Enzymes **12Hrs**

UNIT -IV- Mechanisms of enzyme action **12Hrs**

UNIT-V- Coenzymes **12 Hrs**

Unit-I Introduction to Bio-OrganicChemistry 12Hrs

Introduction to Bio-OrganicChemistry- Chirality and molecular recognition-molecular asymmetry and prochirality -Proximity effect-molecular adaptation-molecular recognition and drug design.

Unit-II Proteins 12Hrs

Classifications-peptide linkage-primary structure of peptides-C-Terminal aminoacid determination- hydrazinolysis - N-terminal amino acid determination-Edmann method- Synthesis of Peptides-Solid-phase pepdite synthesis- Secondary structure of proteins-Tertiary structure of Proteins- Quaternary structure of proteins-An introduction to biosynthesis of α-aminoacids.

Unit-III Enzymes 12Hrs

Introduction and historical perspective - chemical and biological catalysis – Remarkable properties of enzymes like catalytic power, specificity and regulation-Nomenclature and classification-Extraction and purification-Fischer's lock and key and Koshland's induced fit hypothesis-concept and identification of active side by the use of inhibitors.

Unit-IV Mechanism of enzyme action 12Hrs

Transition state theory, Orientation and steric effect, acid– base catalysis-Covalent catalysis-Strain and distortion.Example of some typical enzyme mechanisms for chymotrypsin and ribonuclease.

Unit-V Coenzymes 12Hrs

Cofactors as derived from Vitamins, Coenzymes, Prosthetic groups, apo enzymes-Structure and biological functions of CoenzymeA, Thiamine pyrophosphate, Pyridoxal phosphate, NAD^+, $NADP^+$, FMN, FAD, Vitamin B_{12}.Mechanism of reactions catalysed by the above cofactors.

References:

1. Herman Dugas, (1988), Bioorganic chemistry, Springer-Verlag, 2nd edition.

2. Herman Dugas and C.Penny, BioorganicOrganic Chemistry, A Chemical approach to enzyme action, Springer-Verlag.
3. A. L. Lehninger, Principles of Biochemistry, ButterWorth publishers.
4. E. E. Corn and P.K. Stumpt, Outlines of Biochemistry.
5. AmbikaShanmugam, Biochemistry for medical students.
6. Trevor Palmer, Understanding enzymes, Prentice Hall.
7. Ed. Collin .J. Suckling, Enzyme Chemistry: Impact and application, Chapman and Hall.
8. Finar .I.L. Organic Chemistry Volume II.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT I : INTRODUCTION TO BIO-ORGANICCHEMISTRY				
1.1	Introduction to Bio-OrganicChemistry	2	Chalk & Talk	Black Board
1.2	Chirality	2	Chalk & Talk	Black Board
1.3	molecular recognition	2	Chalk &Talk	Black Board
1.4	molecular asymmetry and prochirality	2	Chalk & Talk	PPT & White board
1.5	Proximity effect	2	Chalk & Talk	Black Board
1.6	molecular adaptation	1	Chalk & Talk	LCD
1.7	molecular recognition and drug design.	1	Chalk & Talk	Black Board
UNIT-II PROTEINS				
2.1	Classifications	2	Chalk & Talk	Black Board

2.2	peptide linkage-primary structure of peptides	3	Chalk & Talk	Black Board
2.3	Synthesis of Peptides-Solid-phase pepdite synthesis	3	Chalk & Talk	PPT & White board
2.4	Secondary structure of proteins-Tertiary structure of Proteins-	4	Chalk & Talk	Black Board
UNIT-III ENZYMES				
3.1	Introduction and historical perspective	2	Chalk & Talk	Black Board
3.2	chemical and biological catalysis –.	2	Chalk & Talk	Black Board
3.3	Remarkable properties of enzymes like catalytic power,	1	Chalk & Talk	LCD
3.4	specificity and regulation- Nomenclature and classification-	1`	Chalk & Talk	Black Board
3.5	Extraction and purification-	1	Chalk & Talk	Black Board
3.6	Fischer's lock and key	1	Chalk & Talk	Black Board
3.7	Koshland's induced fit	2	Chalk & Talk	Black Board
3.8	hypothesisconcept and identification of active side by the use of inhibitors	2	Chalk & Talk	Black Board
UNIT-IV MECHANISM OF ENZYME ACTION				
4.1	Transition state theory	3	Chalk & Talk	Black Board
4.2	Orientation and steric effect	2	Chalk & Talk	Black Board
4.3	Acid– base catalysis-		Chalk & Talk	Black Board

4.4	Covalent catalysis		Chalk & Talk	Black Board
4.5	Strain and distortion.		Chalk & Talk	Black Board
4.6	Example of some typical enzyme mechanisms for chymotrypsin		Chalk & Talk	Black Board
4.8	Example of some typical enzyme mechanisms for ribonuclease.		Chalk & Talk	Black Board
UNIT-V COENZYMES				
5.1	Cofactors as derived from Vitamins	2	Chalk & Talk	Black Board
5.2	Coenzymes, Prosthetic groups,	1	Chalk & Talk	Black Board
5.3	Apo enzymes-	1	Chalk & Talk	PPT & White board
5.4	Structure and biological functions of CoenzymeA, Thiamine pyrophosphate,	1	Chalk & Talk	Black Board
5.5	Structure and biological functions of Pyridoxal phosphate,	2	Chalk & Talk	Black Board
5.6	Structure and biological functions of NAD^+, $NADP^+$	1	Chalk & Talk	Black Board
5.7	Structure and biological functions of FMN, FAD, Vitamin B_{12}.	2	Chalk & Talk	PPT & White board
5.8	Mechanism of reactions catalysed by the above cofactors.	2	Chalk & Talk	Black Board

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Seminar 5 Mks.	Better of W1, W2 5+5=10 Mks.	M1+M2 15 Mks	MID-SEM TEST 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 :**

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

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

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	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 Sem Test

C4 - Best of Two Weekly Tests

C5 - Non - Scholastic

1. 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	Understand concepts of molecular recognition and drug design	K2, K3, K4 &K5	PSO1& PSO2
CO 2	Remember the synthesis and structure of Proteins and amino acids	K2, K3, K4 &K5	PSO3
CO 3	Know the extraction and purification of enzymes and their application in catalysis	K2, K3, K4 &K5	PSO5

CO 4	Categorize and analyze enzyme mechanisms	K2, K3, K4 &K5	PSO4
CO 5	Analyze the structure and biological functions of Coenzymes	K2, K3, K4 &K5	PSO6

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	2	2	2	2	2	2
CO2	2	2	3	2	2	2	2	2	2
CO3	2	2	2	2	3	2	2	2	2
CO4	2	2	2	3	2	2	2	2	2
CO5	2	2	2	2	2	3	2	2	2

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	2	2	3	2
CO5	2	3	2	2

Note: ♦ Strongly Correlated - **3** ♦ Moderately Correlated - **2** Weakly Correlated - **1**

COURSE DESIGNER:

1. **Dr. ARUL DEEPA**
2. **Dr. K.R.SUBIMOL**

Forwarded By

S-Tedona.

HOD'S Signature

FATIMA COLLEGE (AUTONOMOUS) MADURAI-18
PHYSICAL CHEMISTRY PRACTICALS-I-19PG3C14
(Electrical experiments)
SEMESTER –III
(For those who joined from 2019 onwards)

HRS:6 **CREDIT:4**

Course Objective:

This course gives lab experience on physical experiments.

Course outcomes:

After completion of the course the students should be able to:

- Developed expertise relevant to the professional practice of chemistry
- Developed an understanding of the breadth and concepts of physical chemistry
- An appreciation of the role of physical chemistry in the chemical sciences and engineering
- Developed an understanding of the role of the chemist and chemical engineer in tasks employing physical chemistry
- An understanding of methods employed for problem solving in physical chemistry

PHYSICAL CHEMISTRY EXPERIMENTS

- Conductometric Titration of Strong acid with a Strong Base.
- Conductometric Titration of Mixture of Strong acid and Weak acid with a Strong Base.
- Verification of Ostwald's Dilution law and Determination of Dissociation Constant.
- Alkaline Hydrolysis of Ethylacetate by conductometrically.
- Determination of the strength of HCl using pH meter.
- Determination of strength of HCl and CH_3COOH by pH titration.
- Potentiometric Titration of FAS.
- Determination of solubility product by Potentiometrically.

Reference Book

B.Viswanathan, P.S. Raghavan, Practical Physical Chemistry, 2005.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	PSOs ADDRESSED
CO 1	Find out the strength of Acids by measuring conductivity	PSO1, PSO2, PSO3, PSO6&PSO7
CO 2	Verify Ostwalds dilution law and determine dissociation constant using conductivity values	PSO1, PSO2, PSO3, PSO6&PSO7
CO 3	Determine rate constant for Alkaline Hydrolysis of Ethylacetate by conductometrically	PSO1, PSO2, PSO3, PSO6&PSO7
CO 4	Find out the strength of Acids by measuring pH	PSO1, PSO2, PSO3, PSO6&PSO7
CO 5	Determine the strength of FAS and solubility product potentiometrically.	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**

♦ Weakly Correlated -**1**

COURSE DESIGNER:

1. **Dr. B.MEDONA**
2. **Dr. S.SUKUMARI**

Forwarded By

HOD'S Signature

SEMESTER –IV

(those who joined in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCH	**19PG4C15**	**INORGANIC CHEMISTRY-III (Organometallics & Bio-inorganic chemistry)**	**MAJOR CORE**	**6 Hrs.**	**5**

Objective:

Thispaperdealswithpreparation,reactionsandstructureofOrganometalliccompounds. This paper also provides information about organometallic catalysts and basicconcepts andstructuresofminerals andvitamins.

Course Outcome:

After completion of the course the students should be able to:

- Illustrate the structure and mode of bonding in organometallic complexes
- Apply the different electron counting procedures to predict the shape and stability of organometallic complexes
- Illustrate the mechanism of dioxygen binding in various oxygen carrier proteins
- Classify and identify the different types of metalloenzymes and metallo proteins based on their biological functions.
- Interpret the structure of borazines, boranes and carboranes.

UNIT–I:ORGANOMETALLICCHEMISTRY-I **18Hrs**

UNIT–II:ORGANOMETALLICCHEMISTRY-II **18 Hrs**

UNIT-III:BASICCONCEPTSFORBIO-INORGANICCHEMISTRY-I 18 Hrs

UNIT-IV:BASICCONCEPTSFORBIO-INORGANICCHEMISTRY-II 18 Hrs

UNIT-V;INORGANICCHAINS,RINGSANDCAGES. 18Hrs

UNIT–IORGANOMETALLICCHEMISTRY-I 18Hrs

Introduction,16 and 18electron rule,Metal carbonyl complexes, polynuclear carbonylcomplexes carbonyl hydride complexes,carbonylate anionic complexes, nitrosyl complexes,carbinecomplexes,non-aromaticalkenecomplexes,allylandpentadienylcomplexes.Metallocenes–Synthesis,strucutreandreactivity.

Selfstudy:carbyne complexes,non-aromaticalkynecomplexes,

UNIT–IIORGANOMETALLICCHEMISTRY-II 18Hrs

Reactionsoforganometalliccompounds,
Substitutionreactionsincarbonylcomplexes,oxidative addition and reductive elimination,carbonyl insertion,methyl migrationalkeneinsertionandβ-elimination.Catalysisbyorganometalliccompounds-alkenehydrogenation, , hydroformylation,Monsanto acetic acid process, Waker's process, ,syntheticgasoline-Fischer-Tropsch process.

Selfstudy: synthetic gas and Ziegler-Natta catalysis.

UNIT-IIIBASICCONCEPTSFORBIO-INORGANICCHEMISTRY-I 18Hrs

Essential elements in biology-the role of model system-the alkali and alkaline earthmetals-sodium,potassium,calcium & magnesium-metallophorphyrins-chlorophyll-hemeproteins-hemoglobin and myoglobin-Hill constant, cooperativity effect and Bohr effect, hemoglobin modeling-other heme protiens-cytochromes-peroxidases and catalases.

Self study:Triggering effect, carbommonoxide and cyanide poisoning.

UNIT-IV BASICCONCEPTSFORBIO-INORGANICCHEMISTRY-II 18Hrs

Iron-sulphur proteins, Ruberdoxins, Ferredoxins-Hemerythrin-Iron supply and transport-Vitamine B12, metalloenzymes-zinc metalloenzymes, carbonic anhydrase-copper metalloenzymes, ascorbic acid oxidase- blue copper proteins and biological nitrogen fixation.

Self study:biological role of carboxy peptidase enzyme, nitrogen cycle

UNIT-V INORGANICCHAINS,RINGSANDCAGES. 18Hrs

Chains, Catenation,intercalation chemistry. Rings- Borazine, Phosphazene, Phosphazenepolymers, Sulphur –Nitrogen ring systems, one dimensional conductors. Cages Phosphorus cagecompounds, Boron cage compounds. Boranes-Preparation,properties,structureandbondingindiborane,Wades ruleandStyxnumbers.Carboranesand metallocarboranes.

Self study: heterocatenation,silicateminerals andbondingintetraboranes,

TextBooks

1. James.E.Huheey, Inorganic Chemistry, Pearson publications, 4thedition, 2008.

2. Asim K.Das, Bioinorganic chemistry, Books &Allied(P)Ltd'2007

Reference Books

1. F.A.Cotton, G.Wilkinson, C.A. Murillo and M.Bochmann, Advanced Inorganic Chemistry; GeofreyWilinson &Carlos,6thEdition'2003

2. K.F.Purcell and J.C.Kotz, Inorganic Chemistry;Melbourne,Cenage learning'2010.3.J.D.Lee,ConciseInorganicChemistry,Oxford Black willScience,5thEdition,2005.

CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 TITLE - ORGANOMETALLIC CHEMISTRY-I				
1.1	Introduction, 16 and 18electron rule	2	Chalk & Talk	Black Board
1.2	Metal carbonyl complexes, polynuclear carbonyl complexes, Anionic carbonyl complexes	3	Chalk & Talk	Black Board
1.3	carbonyl hydrides, Nitrosyl complexes,	2	Chalk & Talk	Black Board
1.4	Carbene and Carbyne complexes,	3	Chalk & Talk	PPT & White board
1.5	Non Aromatic Alkene and Alkyne complexes	2	Chalk & Talk	Black Board
1.6	Allyl and pentadienyl complexes	2	Chalk & Talk	Black Board
1.7	Metallocenes - Synthesis	2	Chalk & Talk	PPT & White board
1.8	Strucutre and reactivity of Metallocenes	2	Chalk & Talk	Black Board
UNIT - 2 TITLE -ORGANOMETALLIC CHEMISTRY-II				
2.1	Reactions of organometallic compounds	2	Chalk & Talk	Black Board
2.2	Substitution reactions in carbonyl complexes,	2	Chalk & Talk	Black Board
2.3	Oxidative Addition and Reductive Elimination	2	Chalk & Talk	Black Board

2.4	Insertion and Elimination reactions	3	Chalk & Talk	Black Board
2.5	catalysis by organometallic compounds	2	Chalk & Talk	PPT & White board
2.6	Alkene hydrogenation, synthetic gas	2	Chalk & Talk	Black Board
2.7	Hydroformylation, Monsanto Acetic Acid process, The Waker process, Synthetic gasoline	3	Chalk & Talk	Black Board
2.8	Fischer Tropsch process, Ziegler-Natta catalysis.	2	Chalk & Talk	Black Board
UNIT - 3	**TITLE -BASIC CONCEPTS FOR BIO-INORGANIC CHEMISTY-I**			
3.1	**E**ssential elements in biology-the role of model system	2	Chalk & Talk	Black Board
3.2	The alkali and alkaline earth metals sodium,potassium,calcium	2	Chalk & Talk	LCD
3.3	magnesium-metalophorphyrins	2	Chalk & Talk	Black Board
3.4	Chlorophyll	2	Chalk & Talk	Black Board
3.5	Hemeproteins-hemoglobin, myoglobin-	2	Chalk & Talk	Black Board
3.6	Hill constant, cooperativity effect and Bohr effectHemoglobinmodeling	3	Chalk & Talk	Black Board
3.7	Hemeprotiens	3	Chalk & Talk	Black Board
3.8	cytochromes-peroxidases and catalases.	2	Chalk & Talk	Black Board
UNIT -4	**TITLE-BASIC CONCEPTS FOR BIO-INORGANIC CHEMISTY-II**			

4.1	Iron-sulphur proteins	2	Chalk & Talk	Black Board
4.2	Ruberdoxins, Ferridoxins	3	Chalk & Talk	Black Board
4.3	Hemerythrins	2	Chalk & Talk	Black Board
4.4	Iron supply and transport	3	Chalk & Talk	Black Board
4.5	Vitamine B12	2	Chalk & Talk	Black Board
4.6	metalloenzymes-zinc metalloenzymes,carbonic anhydrase	2	Chalk & Talk	Black Board
4.7	copper metallo enzymes, ascorbic acid oxidase	2	Chalk & Talk	Black Board
4.8	blue copper proteinsand biological Nitrogen fixation	2	Chalk & Talk	Black Board
UNIT - 5	**TITLE -INORGANIC CHAINS, RINGS AND CAGES**			
5.1	Chains - Catenation	2	Chalk & Talk	Black Board
5.2	Heterocatenation, Silicate minerals	2	Chalk & Talk	LCD
5.3	Intercalation Chemistry, Rings- Borazines,Phosphazenes	2	Chalk & Talk	Black Board
5.4	Phosphazene polymers, Sulphur - Nitrogen ring systems, One dimensional Conductors,	3	Chalk & Talk	Black Board
5.5	Cages -Phosphorus cage compounds	2	Chalk & Talk	Black Board
5.6	Boron cage compounds- Boranes-Preparation,	2	Chalk & Talk	Black Board
5.7	properties, structure and Bonding in Diborane and TetraBoranes,	2	Chalk & Talk	Black Board

5.8	Wades rule, and Styx numbers, Carboranes and Metallocarboranes.	3	Chalk & Talk	Black Board

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Seminar 5 Mks.	Better of W1, W2 5+5=10 Mks.	M1+M2 15 Mks	MID-SEM TEST 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 :**

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

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

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	Illustrate the structure and mode of bonding in organometallic complexes	K2,K3,K4&K5	PSO6& PSO7
CO 2	Apply the different electron counting procedures to predict the shape and stability of organometallic complexes	K2,K3,K4&K5	PSO6& PSO7
CO 3	Illustrate the mechanism of dioxygen binding in various oxygen carrier proteins	K2,K3,K4&K5	PSO6& PSO9
CO 4	Classify and identify the different types of metalloenzymes and metallo proteins based on their biological functions.	K2,K3,K4&K5	PSO4& PSO5
CO 5	Interpret the structure of borazines, boranes and carboranes.	K2,K3,K4&K5	PSO2& PSO7

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	3	1	3	1	1	3	1	1	1
CO3	2	1	1	1	3	1	1	3	1
CO4	3	1	1	3	1	3	1	1	1
CO5	2	1	1	1	3	3	1	1	1

Mapping of Cos with POs

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

Note: ♦ Strongly Correlated - **3** ♦ Moderately Correlated - **2**

♦ Weakly Correlated -**1**

COURSE DESIGNER:

1. **Mrs.RM.Nagalakshmi**
2. **Dr. Subimol**

Forwarded By

HOD'S Signature & Name

SEMESTER –IV

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCH	19PG4C16	ORGANIC CHEMISTRY-IV (RETROSYNTHESIS, REACTIONS AND REAGENTS, NATURAL PRODUCTS)	MAJOR CORE	6 Hrs.	5

Objective: This paper deals with types of Carbon-Carbon bond forming reactions, introduction to organic synthesis, preparation and synthetic applications of some organic reagents used for synthesis, structural elucidation of few alkaloids, terpenoids, steroids and nucleic acids. This paper also deals with disconnection approach for synthesis.

Course outcome:

After completion of the course the students should be able to:

- To differentiate the carbon –carbon bond forming reactions and to interpret the products and to explore reactivity patterns of various coupling reactions
- To elucidate the structural units of quinine, morphine, □-pinene and □-codinene
- To correlate the skeletal units of nucleotides and nucleosides- RNA and DNA
- To categorize the reducing and oxidizing agents and its applications.
- To Sketch the effective and logical synthetic route for the synthesis of new molecules

Unit I	Introduction to organic synthesis	**18 Hrs**
Unit II	Reagents in organic synthesis	**18 Hrs**
Unit III	Retrosynthesis	**18 Hrs**
Unit IV	Steroids and nucleic acids	**18 Hrs**
Unit V	Alkaloids and Terpenes	**18 Hrs**

Unit I: Introduction to organic synthesis **18 Hrs**

Carbon-carbon bond forming reactions using Grignard synthesis, Aldol condensation, Michael addition, Wittig reaction, Diels-alder reaction, Suzuki,Still and Heck coupling. Functional group modifications. Linear and convergent synthesis-stereoselectivity(Enantio and diastereoselectivity), chemoselectivity, regioselectivity, protecting groups.

Unit II : Reagents in organic synthesis **18 Hrs**

Use of the following reagents in organic synthesis and functional group transformation: Lithium dialkyl cuprate, lithium diisopropyl amide (LDA), dicyclohexylcarbodiimide (DCC), 1,3-dithiane, osmium tetroxide, dichloro dicyano benzoquinone (DDQ), phase-transfer catalyst (PTC), SeO_2, crown ethers.

Unit III: Retrosynthesis **18 Hrs**

Synthons and types- synthetic equivalent- target molecule- functional group interconversions- antithesis- Retrosynthesis of achiral open chain molecules and cyclic target molecules, one group and two group C-X disconnections and synthetic strategies- guidelines to a good disconnection, 1,2- 1,3- 1,4- 1,5- and 1,6- difunctional disconnections- retrosynthetic analysis of Z-Heneicos-6-en-11-one and Z-jasmone

Unit IV: Steroids and nucleic acids **18 Hrs**

(a) Steroids: Structural elucidation (including synthesis) of cholesterol, androsterone and oestrone.

(b) Nucleic acids- structure, nucleotides and nucleosides- RNA, Types of RNA- DNA, structure, replication of DNA.

Unit V : Alkaloids and Terpenes **18 Hrs**

Structural elucidation (including synthesis) of quinine and morphine

Terpenes

Structural elucidation (including synthesis) of α-pinene and α-codinene

References

1. S. Warren, Organic synthesis: The disconnection approach, John Wiley & Sons, Inc., 1992.
2. S. Warren, Designing Organic Syntheses: A Programmed Introduction to the Synthon Approach, John Wiley & Sons, Inc., 1978.
3. J-H. Fuhrhop, and G. Penzlin, Organic Synthesis: Concepts, Methods, Starting Materials,Verlag Chemie, Weinheim, 1983.
4. J. M. Coxon and B. Halton, Organic Photochemistry, Cambridge University Press, 2nd ed. 1987.
5. C. H. DePuy and O. L. Chapman, Molecular reactions and photochemistry, Tata-McGraw Hill, 1975.
6. S. Mukergi, Pericyclic reactions, Macmillan, India.
7. I. Fleming, Pericyclic reactions, Oxford university press, 1998.
8. F. A. Carey and R. J. Sundberg, Advanced organic chemistry, Part A: Structure and Mechanism, Plenum press, 3th Ed., 1990.
9. F. A. Carey and R. J. Sundberg, Advanced organic chemistry, Part B: Reactions and synthesis, Plenum press, 3th Ed., 1990.
10. R. B. Woodward and R. Hoffmann, The concervation of orbital symmetry, Academic press, 1970.
11. I. L. Finar, Organic chemistry, Volume II, ELBS, 5th Ed. 1975.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
	UNIT -1 INTRODUCTION TO ORGANIC SYNTHESIS			
1.1	Carbon-carbon bond forming reactions - introduction	1	Chalk & Talk	Black Board
1.2	Grignard synthesis, Aldol condensation	2	Chalk & Talk	LCD

1.3	Michael addition, Wittig reaction, Diels-alder reaction	3	Lecture	PPT & White board
1.4	Suzuki,Still and Heck coupling	3	Lecture	Smart Board
1.5	Functional group modifications	2	Lecture	Black Board
1.6	Linear and convergent synthesis	2	Discussio n	LCD
1.7	stereoselectivity(Enantio and diastereoselectivity), chemoselectivity, regioselectivity	3	Lecture	Smart Board
1.8	Protecting groups	2	Discussio n	Black Board
UNIT –II REAGENTS IN ORGANIC SYNTHESIS (18 HRS.)				
2.1	functional group transformation- introdcudtion	2	Chalk & Talk	Black Board
2.2	Lithium dialkylcuprate	2	Chalk & Talk	Black Board
2.3	lithium diisopropyl amide	2	Chalk & Talk	Black Board
2.4	dicyclohexylcarbodiimide	2	Chalk & Talk	PPT
2.5	1,3-dithiane, osmium tetroxide	3	Chalk & Talk	LCD
2.6	dichlorodicyano benzoquinone	2	Lecture	Black Board
2.7	phase-transfer catalyst (PTC)	2	Lecture	Black Board
2.8	SeO_2, & crown ethers	3	Chalk & Talk	Black Board

UNIT –III RETROSYNTHESIS				**(18 HRS.)**
3.1	Synthons and types- synthetic equivalent	2	Chalk & Talk	Green Board
3.2	Target molecule- functional group interconversions- antithesis	2	Discussion	LCD
3.3	Guidelines to a good disconnection	2	Chalk & Talk	Black Board
3.4	Retrosynthesis of achiral open chain molecules	1	Discussion	LCD
3.5	One group C-X disconnections	1	Lecture	Black Board
3.6	Two group C-X disconnections	1	Lecture	Black Board
3.7	Retrosynthesis of cyclic target molecules	2	Chalk & Talk	Black Board
3.8	1,2- 1,3- 1,4- 1,5- and 1,6- C_C difunctional disconnections	4	Chalk & Talk	Green Board
3.9	Retrosynthetic analysis of Z-Heneicos-6-en-11-one and Z-jasmone	3	Chalk & Talk	Green Board
UNIT –IV STEROIDS AND NUCLEIC ACIDS				**(18 HRS.)**
4.1	Structural elucidation of cholesterol	3	Chalk & Talk	Black Board
4.2	Structural elucidation of androsterone	3	Chalk & Talk	Black Board
4.3	Structural elucidation of oestrone	3	Chalk & Talk	Black Board
4.4	Nucleic acids- structure	2	Discussion	LCD

4.5	nucleotides and nucleosides	3	Lecture	Black Board
4.6	RNA, Types of RNA-	2	Lecture	Black Board
4.7	DNA, structure, replication of DNA.	2	Chalk & Talk	Black Board
UNIT –V ALKALOIDS AND TERPENES				**(18 HRS.)**
5.1	Introduction to alkaloids and terpenes	2	Chalk & Talk	Black Board
5.2	Structural elucidation of quinine	4	Chalk & Talk	Black Board
5.3	Structural elucidation of morphine	5	Chalk & Talk	Black Board
5.4	Structural elucidation of ⟨-pinene	4	Chalk & Talk	Black Board
5.5	Structural elucidation of ⟨-codinene	3	Chalk & Talk	Black 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	To differentiate the carbon -carbon bond forming reactions and to interpret the products and to explore reactivity patterns of various coupling reactions	K2,K3,K4 &K5	PSO1& PSO2
CO 2	To categorize the reducing and oxidizing agents and its applications.	K2,K3,K4 &K5	PSO6 &PSO7
CO 3	To Sketch the effective and logical synthetic route for the synthesis of new molecules	K2,K3,K4 &K5	PSO6 &PSO7
CO 4	To correlate the skeletal units of nucleotides and nucleosides- RNA and DNA	K2,K3,K4 &K5	PSO1&PSO5
CO 5	To elucidate the structural units of quinine, morphine, ⟨-pinene and ⟨-codinene	K2,K3,K4 &K5	PSO2 & PSO7

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	2	1
CO2	2	1	1	1	1	3	3	2	1
CO3	2	2	1	1	3	3	3	2	1

CO4	3	1	1	1	3	2	1	2	1
CO5	2	3	1	1	1	1	3	2	1

Mapping of Cos with POs

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

Note: Strongly Correlated – **3** ModeratelyCorrelated – **2**
WeaklyCorrelated -**1**

COURSE DESIGNER:

Staff Name Dr. M. Priyadharsani

Staff Name Dr.B.Vinosha

Forwarded By

HOD'S Signature

CBCS Curriculum for Chemistry

SEMESTER –IV

For those who joined in 2022 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCH	**19PG4C17**	**Physical chemistry-1V (Spectroscopy, Kinetic theory of Gases, Photochemistry and Radiation chemistry)**	**MAJOR CORE**	**6Hrs.**	**5**

Objective: This paper deals with many spectroscopic techniques like Microwave, IR, Raman and Photoelectron spectroscopies. This paper also deals with NQR and ESR.

Course outcome

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

- Describe the structure and mode of bonding in organometallic complexes containing carbonyls, nitrosyls, carbenes, carbynes, alkenes, alkynes and also metallocene complexes
- Apply different electron counting procedures to predict the shape and stability of organometallic complexes
- Illustrate the mechanism of dioxygen binding in various oxygen carrier proteins
- Classify different types of metalloenzymes and metallo proteins based on their biological functions.
- Distinguish whether the given compound belongs to chain or ring or cage or cluster

UNIT-I **18hrs**

Spectroscopy-I

Absorption and emission of EMR -LASER-Introduction of emr with matter-einstein coefficients, Microwave, IR and raman spectroscopy of diatomic molecules determination

of molecular parameters-Vibrational spectra of polyatomic molecules-IR and raman active modes- overtone and combination bands-fermi resonance-Group frequencies and coupling interaction.

UNIT-II **18hrs**

Spectroscopy-II

Electronic spectra of diatomic molecules-molecular Quantum numbers-dissociation energy calculations- BrigeSpener extrapolation technique- fortrat diagram-predissociationspectra of the electronic states of polyatomic molecules- absorption of light-oscillator strength- charge transfer spectra.

Photoelectron Spectroscopy- basic principles- spectrum, UV and X-ray (ESCA) photoelectron spectroscopy, vibrational structure PES of Ar and O_2 and N_2.

UNIT-III **18hrs**

Spectroscopy-III

ESR spectroscopy- principles of g-factor, experimental methods, spectrum –fine and hyperfine structures- applications.

NQR spectroscopy-Quadrapole moment. Coupling constant- quardrapole transition-electric field gradient and molecular structure.

Mossbauer spectroscopy - recoilless emission and resonant absorption-experimental methods. Isomer shifts- quadrapole and magnetic interactions. Applications.

References:

Spectroscopy by Banwell & Drago

UNIT-IV **18hrs**

Kinetic theory of gases

Equation of state –molecular speeds-distribution of molecular velocities- one, two and three dimensions-Maxwell Boltzmann distribution law- Principles of equipartition of energy- rotations and vibrations of molecules- the molecular collisions- mean free path-transport properties-thermal conductivity-viscosity and diffusion of gases.

UNIT-V **18hrs**

Photochemistry and Radiation chemistry

Physical properties of the electronically excited molecules-excited state dipole moments excited state pKa, excited state redox potential. Fluorescence, phosphorescence and other deactivation process- Stern –Volmer equation and its applications. Photosensitisation and chemiluminescence experimental techniques in photochemistry- flash photolysis technique.

Radiation chemistry- source of high energy- interaction of high energy radiation with matter, radiolysis of water- definition of G value. Primary and secondary process,

References:

1) PHYSICAL CHEMISTRY - ATKINS
2) PHYSICAL CHEMISTRY -CASTELLAN
3) PHYSICAL CHEMISTRY -WALTERJ.MOORE
4) Photo chemistry -Turo
5) photochemisty - RohatkajiMukerji.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
	UNIT -I Spectroscopy-I			
1.1	Microwave spectroscopy- theory, spectra of rigid diatomic rotators ,selection rules, determination of bond length,	2	Chalk & Talk	Black Board
1.2	spectra of polyatomic molecules	2	Chalk & Talk	Black Board
1.3	Effect of isotopic substitution	3	Chalk & Talk	Black
1.4	IR spectroscopy – simple harmonic and unharmonic oscillator, selection rules,	2	Chalk & Talk	Black Board
1.5	spectrum of diatomic vibrating rotator,	3	Chalk & Talk	Black Board

1.6	Raman spectroscopy, quantum theory of Raman scattering, Classical theory of Raman scattering,	2	Chalk & Talk	Black Board
1.7	Rotational Raman spectrum of diatomic molecules, IR and Raman active modes-overtone and combination bands	2	Chalk & Talk	Black Board
1.8	Fermi resonance-Group frequencies and coupling interaction.	2	Chalk & Talk	Black Board
UNIT -2 Spectroscopy-II				
2.1	Electronic spectra of diatomic molecules	2	Chalk & Talk	Black Board
2.2	molecular Quantum numbers-dissociation energy calculations-Birge Sponer extrapolation technique.	4	Chalk & Talk	Black Board
2.3	fortrat diagram-predissociation spectra of the electronic states of polyatomic molecules	2	Chalk & Talk	Black Board
2.4	Absorption of light- oscillator strength.	1	Chalk & Talk	Black Board
2.5	Photoelectron Spectroscopy- basic principle.	2	Chalk & Talk	Black Board
2.6	Instrumentation, UV spectroscopy, X-ray (ESCA) photoelectron spectroscopy	3	Chalk & Talk	Black Board
2.7	Applications of PES	2	Chalk & Talk	Black Board
2.8	PES of Ar, O_2 and N_2	2	Chalk & Talk	Black Board
UNIT -3Spectroscopy-III				
3.1	NMR Spectroscopy–Principles and instrumentation- ESR spectroscopy, Principle - Comparison of ESR and NMR	2	Chalk & Talk	Black Board

	frequencies,g-factor			
3.2	Experimental methods, spectrum- fine and hyperfine structures- applications	4	Chalk & Talk	Black Board
3.3	NQR spectroscopy-Quadrupole moment. Coupling constant, electric field gradient	2	Chalk & Talk	Black Board
3.4	Quadrupole transitions of some Nuclei.	3	Chalk & Talk	Black Board
3.5	molecular structure and Applications	2	Chalk & Talk	Black Board
3.6	Mossbauer spectroscopy- Introduction, recoilless emission and resonant absorption, experimental methods.	1	Chalk & Talk	Black Board
3.7	Isomer shifts, Quadrupole Interaction and Zeeman Splitting in Mossbauer spectroscopy	2	Chalk & Talk	Black Board
3.8	Applications of Mossbauer spectroscopy	2	Chalk & Talk	Black Board
UNIT -4 Kinetic theory of gases				
4.1	Equation of state –molecular speeds	2	Chalk & Talk	Black Board
4.2	distribution of molecular velocities- one, two and three	3	Chalk &	Black
	dimensions		Talk	Board
4.3	Maxwell Boltzmann distribution law-	2.5	Chalk &Talk	Black Board
4.4	Principles of equipartition of energy	2.5	Chalk & Talk	Black Board
4.5	- rotations and vibrations of molecules	2	Chalk & Talk	Black Board
4.6	the molecular collisions- mean free path	2	Chalk & Talk	Black Board

4.7	transport properties-thermal conductivity	2	Chalk & Talk	Black Board
4.8	viscosity and diffusion of gases.	2	Chalk & Talk	Black Board
UNIT -5 Photochemistry and Radiation chemistry				
5.1	Physical properties of the electronically excited molecules	2	Chalk & Talk	Black Board
5.2	excited state dipole moments excited state pKa, excited state redox potential	5	Chalk & Talk	Black Board
5.3	Fluorescence, phosphorescence and other deactivation process	2	Chalk & Talk	Black Board
5.4	Stern –Volmer equation and its applications	1	Chalk & Talk	Black Board
5.5	Photosensitisation and chemiluminescence.	1	Chalk & Talk	Black Board
5.6	Experimental techniques in photochemistry flash photolysis technique. Radiation chemistry-	3	Chalk & Talk	Black Board
	Introduction, source of high energy			
5.7	Interaction of high energy radiation with matter, radiolysis of water	2	Chalk & Talk	Black Board
5.8	G value, Primary and secondary processes.	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 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	To Outline the selection rules for rotational and vibrational spectra and rationalize the role of the molecular dipole moment in the selection rules.	K2,K3, K4 & K5	PSO1, PSO2, PSO3, PSO4, PSO6,PSO7& PSO8
CO 2	To apply knowledge to detailed understanding of electronic states of atoms, molecules, Franck-Condon Principle	K2,K3, K4 & K5	PSO1, PSO2, PSO3, PSO4, PSO6,PSO7& PSO8
CO 3	To predict the number of ESR signals of organic radical anions, Complexes and NQR transitions.	K2,K3, K4 & K5	PSO1, PSO2, PSO3, PSO4, PSO6,PSO7& PSO8
CO 4	To understand molecular velocities in one, two and three dimensions	K2,K3, K4 & K5	PSO1, PSO2, PSO3, PSO4, PSO6& PSO8

CO 5	To distinguish between between Fluorescence and Phosphorescence, Primary and secondary processes, radiative and non-radiative transitions,To compare Ground and excited state acidity, dipole moments and redox potentials	K2, K3, K4& K5	PSO1, PSO2, PSO3, PSO4, PSO6,PSO7& PSO8

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.S.Sukumari**
2. **Dr.K.R.Subimol**

Forwarded By

HOD'S Signature

II M.Sc.,CHEMISTRY

SEMESTER –IV

For those who joined in 2022 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCH	19PG4CE3	ANALYTICAL CHEMISTRY	PG Core	4 Hrs.	4

COURSE DESCRIPTION

This paper focuses on all the important aspects of Analytical chemistry techniques and applications of C-programming to solve problems in CHEMISTRY.

COURSE OBJECTIVES

This paper deals with analytical methods. It also deals with programming in C language and its applications to solve problems in chemistry.

UNITS

UNIT –I ERROR ANALYSIS (12HRS.)

Accuracy and Precision, Determinate and Indeterminate errors, Significant figures, Ways of expresssing accuracy – Absolute and relative error, Standard deviation, The confidence limit, Tests of significance – The F test and The student T test, Rejection of a result – The Q test, Linear least squares to plot the data, Correlation coefficient.

UNIT –II CHROMATOGRAPHY

Principles, Adsorption, Partition, ion exchange chromatography, Instrumentation – Applications of TLC, HPLC, Paper Chromatography and

Gas Chromatography.

UNIT –III ELECTROANALYTICAL AND THERMAL METHODS(12HRS.)

Coulometry and coulometric titrations, Cyclic Voltametry, Principles of DTA, TGA – Thermogravimetric curve, and DSC - Applications to simple salts – Oxysalts, Carbonates and complex salts.

UNIT –IV SPECTROPHOTOMETRIC AND RADIOCHEMICAL METHODS (12 HRS.)

Principles and applications of photometry, Flame emission spectrometry, Atomic absorption spectrophotometry – Principles, Instrumentation (Block diagram), Fluorimetry, and photometric titrations.

UNIT –V COMPUTERS IN CHEMISTRY (12HRS.)

Introduction, Character set in C, Style of C Language – Identifiers and Key words – Constants, Variables and Data types, Operators in C.

Input and Output in C, Control statements in C, Storage classes in C, Functions in C, Arrays and pointers, Preprocessors in C.

Writing the Program using the various features of C language – Determination of mass number of any atom-Determination of electronegativity of an atom from bond energy data using pauling's relation, Calculation of ionic strength, Determination of Shapes of molecules or ions using VSEPR Theory, Detemination of Normality, Molarity and Molality of solutions, Determination of half life of a radioactive nucleus.

REFERENCES:

1. Douglas A. Skoog, Donald M. West and F. James Holler, Fundamentals of analyticalChemistry, Harcourt Asia Pvt. Ltd., 2001.
2. R.A. Day, Jr. and A.L. Underwood, Analytical Chemistry,Prentice-Hall of India, 2001.
3. H. Kaur, Instrumental methods of chemical analysis, PragatiPrakashan, 2003.

4. G.H. Jeffery, J. Bassett, J. Mendham and R.C. Denney, Vogel's Textbook of QuantitativeChemical Analysis, Longman Scientific and Technical, 1989.
5. Balagurusamy E, Programming in ANSI C.
6. Raman KV, Computers in Chemistry.

OURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 ERROR ANALYSIS				
1.1	Accuracy and Precision	2	Discussion	PPT & White board
1.2	Determinate and Indeterminate errors	1	Discussion	PPT & White board
1.3	Significant figures, Ways of expressing accuracy	2	Discussion	Black Board
1.4	Absolute and relative error, Standard deviation, The confidence limit	1	Chalk & Talk	LCD
1.5	Tests of significance – The F test and	2	Discussion	PPT & White board
1.6	The student T test, Rejection of a result	2	Lecture	Smart Board
1.7	The Q test, Linear least squares to plot the data, Correlation coefficient.	2	Lecture	Black Board
UNIT -2 CHROMATOGRAPHY				

2.1	Principles, Adsorption	2	Lecture	Black Board
2.2	Partition chromatography	2	Chalk & Talk	Black Board
2.3	Ion exchange chromatography	2	Chalk & Talk	Black Board
2.4	HPLC	2	Chalk & Talk	Black Board
2.5	Paper Chromatography.	2	Chalk & Talk	Black Board
2.6	Gas Chromatography.	2	Chalk & Talk	PPT & White board
UNIT –III ELECTROANALYTICAL AND THERMAL METHODS				
3.1	Coulometry	2	Chalk & Talk	Green Board
3.2	Coulometric titrations	2	Discussion	LCD
3.3	Cyclic Voltametry	2	Chalk & Talk	Black Board
3.4	Principles of TGA	2	Discussion	LCD
3.5	Principles of DSC	2	Lecture	Black Board
3.6	Applications to simple salts	1	Lecture	Black Board
3.7	Applications to Oxysalts	2	Chalk & Talk	Black Board
3.8	Carbonates and complex salts.	2	Chalk & Talk	Green Board
UNIT -4 SPECTROPHOTOMETRIC AND RADIOCHEMICAL METHODS				

4.1	Principles of photometry	2	Chalk & Talk	Black Board
4.2	Applications of photometry	1	Lecture	Black Board
4.3	Flame emission spectrometry	2	Chalk & Talk	Black Board
4.4	Atomic absorption spectrophotometry	1	Chalk & Talk	Black Board
4.5	Principlesof Fluorimetry	2	Chalk &Talk	BlackBoard
4.6	Instrumentation (Block diagram) Fluorimetry	2	Discussion	LCD
4.7	Photometric titrations.	2	Lecture	Black Board
UNIT -5 COMPUTERS IN CHEMISTRY				
5.1	Introduction, Character set in C, Style of C Language	1	Chalk & Talk	Black Board
5.2	Identifiers and Key words – Constants, Variables and Data types, Operators in C	1	Lecture	Black Board
5.3	Input and Output in C, Control statements in C	1	Chalk & Talk	Black Board
5.4	Storage classes in C, Functions in C, Arrays and pointers, Preprocessors in C.	1	Chalk & Talk	Black Board
5.5	Writing the Program using the various features of C language – Determination of mass number of any atom	2	Chalk &Talk	BlackBoard

5.6	Determination of electronegativity of an atom from bond energy data using pauling's relation, Calculation of ionic strength	2	Chalk & Talk	Black Board
5.7	Determination of Shapes of molecules or ions using VSEPR Theory	2	Discussion	LCD
5.8	Detemination of Normality, Molarity and Molality of solutions, Determination of half life of a radioactive nucleus.	2	Lecture	Black Board

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Seminar 5 Mks.	Better of W1, W2 5+5=10 Mks.	M1+M2 15 Mks	MID-SEM TEST 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 II 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 – Seminar Marks

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	To explain the confidence level and confidence limit, the sources of random errors and effects of random errors on analytical results.	K2, K3, K4 & K5	PSO1& PSO2
CO 2	To illuminate the theoretical principles of various separation techniques inchromatography, and typical applications of chromatographic techniques	K2, K3, K4 & K5	PSO3
CO 3	To explicate the theoretical principles of electro analytical and spectrometric methods	K2, K3, K4 & K5	PSO5
CO 4	To illuminate the theoretical principles of selected instrumental methods and main components in such analytical instruments.	K2, K3, K4 & K5	PSO2
CO 5	To acquire the complete knowledge of C language AND To develop logics which will help them to create programs, applications ofchemistry problems in C.	K2, K3, K4 & K5	PSO3

Mapping of C0s 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**	**2**
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 C0s 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

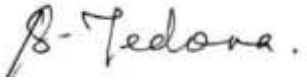
Note: ♦ Strongly Correlated – **3** ♦ Moderately Correlated – **2**

♦ Weakly Correlated -**1**

COURSE DESIGNER:

Dr.M.Priyadharsani

Forwarded By



CBCS Curriculum for M.Sc. Chemistry

SEMESTER –IV

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCH	19PG4CE4	CHEMICAL ENGINEERING	ELECTIVE	4 Hrs.	4

Objective: This paper deals with analytical methods. It also deals with programming in C language and its applications to solve problems in chemistry.

COURSE OUTCOME

After successful completion of the course, students will be able

- To write C- Program using various features of C- language
- To categorize the various conditioning methods in water treatment
- To apply the principles involved in spectrophotometric analysis.
- To compare the mechanism between dry corrosion and wet corrosion
- To synthesize some industrially important polymers

Unit-I **Programming in C Language and its applications in Chemistry (12Hrs)**

(a) Introduction, Character set in C, Style of C Language – Identifiers and Key words – Constants, Variables and Data types, Operators in C.

(b) Input and Output in C, Control statements in C, Storage classes in C, Functions in C, Arrays and pointers, Preprocessors in C, The type def statement and Files in C language. Writing the Program using the various features of C language -Determination of Mass number for an atom, Shapes of molecules using VSEPR Theory, Detemination of Normality.

Unit –II Water Technology (12Hrs)

Hardness of water- Estimation of hardness – Treatment of water for domestic supply –Boiler feed water and its requirements – softening and conditioning methods – External and internal conditioning-Desalination of Brackish water.

Unit –III Spectrophotometric methods and Radiochemical methods (12Hrs)

Principles and applications of photometry, Flame emission spectrometry, Atomic absorption spectrophotometry – Principles, Instrumentation (Block diagram), Fluorimetry.

Unit –IVNon conventional energy sources (12Hrs)

Nuclear energy – Light water nuclear power plant –Breeder Reactor- Solar energy – Solar hear collectors- solar water heater-Solar cells and its applications -Wind energy –Methods of harnessing wind energy-and Fuel Cells-Hydrogen oxygen fuel cells-Fuel battery-Merits and Demerits.

Unit-VPolymers (12Hrs)

Introduction-Types of polymerization, Mechanism, Plastics, Classification-Engineering plastics, Rubber or elastomers-Vulcanization of Rubber and important synthetic Rubbers-Composites-Types of composites.

References:

1. Programming in ANSI C by E.Balagurusamy
2. Computers in Chemistry by K.V.Raman
3. Instrumentalmethods of analysis by Willard merit Dean

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids

UNIT -1 TITLE: Programming in C Language and its applications in Chemistry				
1.1	Introduction, Character set in C	1	Chalk & Talk	Black Board
1.2	Style of C Language	3	Chalk & Talk	Black Board
1.3	Identifiers and Key words	1	Lecture	Black Board
1.4	Constants, Variables and Operators in C. Input and Output in C, Control statements in C, Storage classes in C,	3	Lecture	PPT & White board
1.5	Functions in C	2	Lecture	Black Board
1.6	Arrays and pointers	2	Chalk & Talk	Black Board
1.7	Writing the Program using the various features of C language	2	Chalk & Talk	PPT & White board
1.8	Determination of half life of a radio active nucleus	1	Lecture	Black Board
UNIT - 2 TITLE - Water Technology				
2.1	Hardness of water - introduction	2	Chalk & Talk	Black Board
2.2	Equivalents of calcium carbonate- units of hardness	2	Chalk & Talk	Black Board
2.3	Estimation of hardness	1	Chalk & Talk	Black Board
2.4	Treatment of water for domestic supply	1	Chalk & Talk	Black Board
2.5	Boiler feed water and its requirements	2	Chalk & Talk	PPT & White board

2.6	scale and sludge formation in boilersCaustic embrittlement-priming and foaming-	2	Lecture	Black Board
2.7	softening and conditioning methods External and internal conditioning.	3	Power point	Black Board
2.8	Desalination of Brackish water- Reverse osmosis	2	Power point	Black Board
UNIT - 3 TITLE - Spectrophotometric methods and Radiochemical methods				
3.1	Principles of photometry	1	Lecture	Black Board
3.2	Applications of photometry	2	Lecture	LCD
3.3	Atomic absorption spectrophotometry - Principles	2	Lecture	Black Board
3.4	Applications of AAS	2	Lecture	Black Board
3.5	Fluorimetry	2	Chalk & Talk	Black Board
3.6	Turbidimetry	2	Chalk & Talk	Black Board
3.7	Nephelometry	2	Chalk & Talk	Black Board
3.8	Photometric titrations	2	Chalk & Talk	Black Board
UNIT -4 TITLE- Corrosion and its control				
4.1	Introduction - dry or chemical corrosion	2	Chalk & Talk	Black Board
4.2	dry or chemical corrosion	3	Chalk & Talk	Black Board

4.3	Wet or electro chemical corrosion -	2	Chalk & Talk	Black Board
4.4	galvanic corrosion, concentration cell corrosion-passivity	3	Lecture	Power point
4.5	passivity- pitting corrosion-intergranular corrosion	2	Lecture	Power point
4.6	intergranular corrosion-water line corrosion	2	Chalk & Talk	Power point
4.7	stress corrosion- factors influencing corrosion-protection against corrosion	2	Chalk & Talk	Power point
4.8	corrosion inhibitors-applications of protective coatings	2	Chalk & Talk	Power point
UNIT - 5	**TITLE - Polymers**			
5.1	Introduction, Engineering plastic	1	Chalk & Talk	Black Board
5.2	Rubber or elastomers	2	Chalk & Talk	LCD
5.3	Vulcanization of Rubber	2	Chalk & Talk	Black Board
5.4	Poly methyl methacrylate ,poly esters-	3	Chalk & Talk	Black Board
5.5	poly sulphones-poly imides-poly vinyl acetate-poly butadiene-poly chloro prene	2	lecture	LCD
5.6	phenol-formaldehyde resin-urea-formaldehyde and melamine	2	lecture	LCD
5.7	melamine formaldehyde resin-epoxy polymers	1	lecture	LCD
5.8	silicone polymers.	2	Chalk & Talk	Black Board

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Seminar 5 Mks.	Better of W1, W2 5+5=10 Mks.	M1+M2 15 Mks	MID-SEM TEST 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 :**

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

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

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	To write C- Program using various features of C- language	K2, K3, K4 &K5	PSO1& PSO2
CO 2	To categorize the various conditioning methods in water treatment	K2, K3, K4 &K5	PSO3
CO 3	To apply the principles involved in spectrophotometric analysis.	K2, K3, K4 &K5	PSO5
CO 4	To compare the mechanism between dry corrosion and wet corrosion	K2, K3, K4 &K5	PSO4
CO 5	To synthesize some industrially important polymeres	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 C0s 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. B.SUGANTHANA**

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CBCS Curriculum for M.Sc. Chemistry

SEMESTER –IV

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCH	**19PG4C18**	**PHYSICAL** CHEMISTRY **PRACTICALS-II (Non-Electrical Experiments)**	**LAB**	**6**	**4**

Course Objective:

This course gives lab experience on physical experiments.

Course outcomes:

After completion of the course the students should be able to:

- Experience in some scientific methods employed in basic and applied physical chemistry
- Developed skills in procedures and instrumental methods applied in analytical and practical tasks of physical chemistry
- Developed skills in the scientific method of planning, developing, conducting, reviewing and reporting experiments
- Developed some understanding of the professional and safety responsibilities residing in working with chemical systems.
- **PHYSICAL CHEMISTRY EXPERIMENTS**
- Adsorption Characteristics of Oxalic acid and charcoal
- Adsorption Characteristics of Acetic acid and charcoal
- Acid catalysed hydrolysis of methyl acetate-Volumetry
- Activation energy of acid catalysed hydrolysis of methyl acetate
- Effect of ionic strength on the rate of persulphate iodide reaction
- Catalytic constant of an acid (Acetone and iodine in the presence of an acid)
- Kinetic of oxidation of alcohols by $K_2Cr_2O_7$ by spectrophotometry.
- Kinetics of iodination of acetone by spectrophotometry.

Reference Book

B.Viswanathan, P.S. Raghavan, Practical Physical Chemistry, 2005.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	PSOs ADDRESSED
CO 1	Study the Adsorption Characteristics of Oxalic acid/Acetic and charcoal	PSO1, PSO2, PSO3, PSO6&PSO7
CO 2	Determine rate constant for acid /alkali catalyzed Hydrolysis of Ethylacetate volumetrically	PSO1, PSO2, PSO3, PSO6&PSO7
CO 3	Determine activation energy	PSO1, PSO2, PSO3, PSO6&PSO7
CO 4	Study the Effect of ionic strength on the rate of persulphate iodide reaction	PSO1, PSO2, PSO3, PSO6&PSO7
CO 5	Study the kinetics of iodination of acetone.	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**

♦ Weakly Correlated -**1**

COURSE DESIGNER:

1. **Dr. B.MEDONA**
2. **Dr. S.SUKUMARI**

B-Medona.

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FATIMA COLLEGE (AUTONOMOUS) MADURAI-18
PROJECT-19PG4CPR
SEMESTER –III

(For those who joined from 2007 onwards)

PROJECT WORK

All the second PG students are sent to do three months project(MAY,JUNE AND JULY) in various reputed research institutions

Curriculum for M.Sc. Chemistry

I M.Sc., SEMESTER –1

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCH	21PG2SLC	Research Methodology	PG Self learning	-	2

COURSE DESCRIPTION

This paper focuses on all the important aspects of Research Methodology

COURSE OBJECTIVES

This course helps the students to study about all concepts related to Research problem, literature survey, Web and library resources for research and writing research papers and proposals.

Course Outcomes (COs)

CO1	Introduce the purpose and importance of research .
CO2	Understand the various sources of information for literature survey.
CO3	Illustrate the Web and library resources for research.
CO4	Understand the writing of research papers &know the methodology of writing thesis and journal articles.
CO5	Analyse the writing of research proposal.

UNIT - 1 : Introduction to Research

The search for knowledge, purpose of research, scientific method, characteristics of research, Types of research- fundamental or pure research, applied research, action research, historical research, experimental research.

Explanation of research problems, sources of research problems, selection of research problem characteristics of a good research problem, errors in selecting a research problem.

UNIT-II: Literature Survey

Sources of information, Primary, Secondary, Tertiary sources, Journals, Journal abbreviations, Abstracts, Current titles, Reviews, Monographs, Textbooks, Current contents, Introduction to Chemical Abstracts. Online searching, Database, *Scifinder*, *Scopus*, Citation Index, Impact Factor.

UNIT-III: Use of Web resources

The Internet and World Wide Web, internet resources for chemistry, internet search engines, using spreadsheets, word processors, databases and other packages, finding and citing information.

UNIT-IV: Scientific Writing

General aspects of scientific writing, reporting practical and project work, Format of the research report, style of writing the report, references and bibliography, Steps to publish a scientific article in a journal: types of publications- communications, articles, reviews; when to publish, where to publish, specific format required for submission, organization of the material, abbreviations used in scientific writing.

UNIT-V: Writing of Research Proposal:. Research Proposal: Format of research proposal, individual research proposal and institutional proposal.

Reference Books:

1. Ranjit kumar, Research Methodology: A Step by Step Guide for Beginners, Pearson Education; 2nd Ed., (2005).
2. Dr.C.R. Kothari, Research Methodology: Methods and Techniques, New Age International Publishers, 2nd Ed., New Delhi (2014.)
3. M.D. Barbara Gastel and Robert A. Day, How to Write and Publish a Scientific Paper, Greenwood Publishing Group Inc, 8th Ed., 2016.

4. Tanmoy Chakraborty and Lalita Ledwani, Research Methodology in Chemical Sciences: Experimental and Theoretical Approach, Apple Academic Press; 1st Ed.,, 2016.
5. R. L. Dominoswki, Research Methods, Prentice Hall, 1981.
6. H. F. Ebel, C. Bliefert and W. E. Russey, The Art of Scientific Writing, VCH, Weinheim, 1988.
7. H. M. Kanare, Writing the Laboratory Notebook; American Chemical Society: Washington, DC, 1985.
8. J. S. Dodd, Ed., The ACS Style Guide: A Manual for Authors and Editors; American Chemical Society: Washington, DC, 1985.
9. Gibaldi, J. Achtert, W. S. Handbook for writers of Research Papers; 2nd ed.; Wiley Eastern, 1987.
10. Joseph, A. Methodology for Research; Theological Publications: Bangalore, 1986

PSO

PSO 1	Equip with an in-depth knowledge of varied fields namely Organic Chemistry, Inorganic Chemistry, Physical and nanochemistry.
PSO 2	Train in problem solving procedures enables to interpret the experimental data into structures and mechanisms.
PSO 3	Provides a tremendous exposure and cultivates analytical and synthesising measures necessary to take up project work in reputed institutions.
PSO 4	Programme renders diversified thinking thereby promotes creative skills.
PSO 5	to solve the problems that cause a negative impact on surroundings to pursue salient steps to safeguard environment
PSO 6	Application-oriented input sharpens the skill to undertake CSIR-NET exam.
PSO 7	Knowledge with practical dimensions becomes a driving power to undertake research in different areas at a global level.
PSO 8	Multi-layered input enables to avail opportunities at chemical, pharmaceutical industries.
PSO 9	Becomes a contributing force and development agent in society.

Mapping of C0s with PSOs

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

Mapping of C0s with POs

CO/ PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1									
CO2									
CO3									
CO4									
CO5									

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

♦ Weakly Correlated -**1**

COURSE DESIGNER:

1. **Dr.S.Sukumari**

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HOD'S Signature

& Name