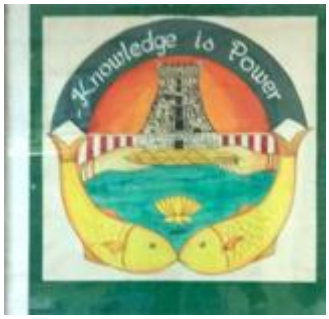
SRI MEENAKSHI GOVERNMENT ARTS COLLEGE FOR WOMEN(A),

MADURAI-02.



DEPARTMENT OF CHEMISTRY

CBCS SYLLABUS FOR
M.Sc CHEMISTRY
FROM
2019 ONWARDS

ABOUT THE DEPARTMENT OF CHEMISTRY

The department of chemistry was established in the year 1965 for the pre-university course. Bachelor degree of Chemistry was started in the year 1968 with a few staff members. The department has been upgraded to post graduate department in 2017.

FACULTY

The Department comprises of a goal oriented group of highly qualified, experienced and dynamic faculty members. The Department of Chemistry has 17 faculty members, of which 12 are Ph.D., holders. At present, 4 of our staff members are pursuing their Ph.D. degree. Their areas of expertise and research include organic, inorganic, physical, electrochemistry, phytochemistry, nanotechnology and supramolecular chemistry.

ACTIVITIES AND ACHIEVEMENTS

Most of the staff members are actively involved in research and various important decision making committees at the College level and act as expertise in Boards of studies at college as well as University level. The staff members have been serving as NSS & NCC coordinators, Science Forums coordinator, Autonomy-in-charge, remedial/ special coaching coordinators, Sports committee member, Thaatha-paatti kuzhu coordinator, Admission committee member, admission coordinator, Career guidance cell coordinator, Controller of examinations, additional controller of examinations, Deputy warden in college hostel, Youth welfare association coordinator, Parent Teacher Association treasurer, Old student's association, Course coordinators, syllabus committee representatives, question paper setters and external examiners at undergraduate as well as postgraduate levels. Faculty members have contributed to academics by publishing books, contributing research articles in journals, presenting papers in conferences and delivering guest lectures. Faculty members have been recognized by national agencies and Universities with awards for their contribution to research.

Four staff members (retired from service) were elevated to the cadre of Principal, Regional Joint Director and have served as efficient administrators at various colleges and regional offices. Some of the staff members are carrying out UGC funded minor research projects, received research awards, awards from All India Radio serial programme and have also served as editors in peer journals like Elsevier.

COURSE

At present our department caters to the needs of 282 (UG - 251 and PG - 31) major chemistry students and 222 Ancillary chemistry students. Our march towards the zeal will continue in the forth coming years also.

DEPARTMENT HIGHLIGHTS

The Department organizes National Conferences, workshops and faculty Development Programmes for the benefit of students. The Department, with a focus on enhancing the knowledge and skills of the students, has been conducting inter-Departmental and inter-collegiate activities, through the Chemistry Association, Science Forum and Chemistry Club. It has also been actively involved in various outreach programmes for the uplift of society. Equal opportunity centre program has been conducted by our department.

RESOURCES

The Department has three laboratories which are fully equipped with instruments for teaching and research activities. The instruments available in the laboratories include UV-visible spectrophotometer, Conductometer, Potentiometer, pH meter, Polarimeter, etc. The Government has recently sanctioned fund for setting up two new laboratories which are under construction.

The Department has an excellent library for the benefit of students, faculty members and research scholars. Library has a large collection of books covering various branches of Chemistry like organic, inorganic, physical, electrochemistry, green chemistry and nano chemistry. Internet facility is available in the department.

ALUMNI ACTIVITIES

During 55 years of successful journey our department has produced flourishing alumni who have occupied various positions in different sectors like academic, administrative, research, innovative scientists, overseas employment, banking and recent blooming fields like information technology.

The alumni of the department, had served as the Principal in Govt Arts College, HOD and eminent professor in the School of chemistry at MKU, Madurai. It is a privilege to specify that, 22 alumni of chemistry department are serving as Associate Professors and Assistant Professors in various esteemed institutions. Alumni meet for the 1991 – 94 batch of B.Sc., Chemistry was organized on 8th January, 2017.

We have further goals to enrich our department as research department for the benefits of the students.

COURSES OFFERED:

UG COURSES: **B.Sc CHEMISTRY**

PG COURSES: **M.Sc CHEMISTRY**

VISION

To create an academically sound environment that nurtures motivates and inspires excellence in teaching along with concern for society.

MISSION

To impart theoretical and practical training in different areas of chemistry, which encourages creativity, insight development and a passion for science.

SRI MEENAKSHI GOVERNMENT ARTS COLLEGE FOR WOMEN (A), MADURAI -2.

M.Sc CHEMISTRY : COURSE PATTERN

(For the candidates admitted from the academic year 2019-2020)

Sem	Code	Course	Title of the Paper	Cr.	Hrs/ Week	MARKS			Exam hrs
						Int	Ext	Total	
I	DA1	Core 1	Inorganic Chemistry I	4	5	25	75	100	3
	DA2	Core 2	Organic Chemistry I	4	5	25	75	100	3
	DA3	Core 3	Physical Chemistry I	4	5	25	75	100	3
	DL1	Core 4	*Inorganic Chemistry Practical	–	5	-	-	—	
	DL2	Core 5	*Organic Chemistry Practical	–	5	—	—	—	
	EDA1	Elective 1	Molecular Spectroscopy & Analytical Chemistry I	5	5	25	75	100	3
	EDA2	Elective 1	Industrial Chemistry						3
		TOTAL		17	30			400	
II	DB1	Core 6	Inorganic Chemistry II	4	5	25	75	100	3
	DB2	Core 7	Organic Chemistry II	4	5	25	75	100	3
	DB3	Core 8	Physical Chemistry II	4	5	25	75	100	3
	DL1	Core 4	*Inorganic Chemistry Practical	5*	5	40	60	100	6
	DL2	Core 5	*Organic Chemistry Practical	5*	5	40	60	100	6
	EDB1	Elective 2	Molecular Spectroscopy & Analytical Chemistry II	5	5	25	75	100	3
	EDB2	Elective 2	Polymer Chemistry						3
		TOTAL		27	30			600	

III	DC1	Core 9	Inorganic Chemistry III	4	5	25	75	100	3
	DC2	Core 10	Organic Chemistry III	4	5	25	75	100	3
	DC3	Core 11	Physical Chemistry III	4	5	25	75	100	3
	DL3	Core 12	* Physical Chemistry Practical	–	4	—	—	—	
	DL4	Core 13	* Inorganic & Organic quantitative Analysis Practical	–	4	—	—	—	
	EDC1	Elective 3	Nanoscience & Technology	5	5	25	75	100	3
	EDC2	Elective 3	Environmental Chemistry						3
	NMPC	NME	Cosmetology	2	2	25	75	100	3
		TOTAL		19	30			500	
IV	DD1	Core 14	Organic Chemistry IV	4	5	25	75	100	3
	DD2	Core 15	Selected Topics in Chemistry	5	5	25	75	100	3
	DPW	Core 16	Project	5	7	40	60	100	
	DL3	Core 12	*Physical Chemistry Practical	*4	4	40	60	100	6
	DL4	Core 13	* Inorganic & Organic quantitative Analysis Practical	*4	4	40	60	100	6
	EDD1	Elective 4	Green chemistry	5	5	25	75	100	3
	EDD2	Elective 4	Medicinal and Pharmaceutical Chemistry						3
		TOTAL		27	30			600	
	GRAND TOTAL			90	120			2100	

***Practical Examination for Organic Chemistry Practical and Inorganic Chemistry Practical will be conducted at the end of the second semester. Credits for Organic Chemistry Practical and Inorganic Chemistry Practical will be awarded at the end of the first Academic year.**

***Practical Examination for Physical Chemistry Practical and Inorganic & Organic quantitative Analysis Practical will be conducted at the end of the fourth semester. Credits for Physical Chemistry Practical and Inorganic & Organic quantitative Analysis Practical will be awarded at the end of the second Academic year.**

SRI MEENAKSHI GOVERNMENT ARTS COLLEGE FOR WOMEN (A), MADURAI -2.

BLUE PRINT (For Theory Paper)

For students admitted from June 2019

Course : M.Sc., Chemistry

Max Marks : 75(External) **Title of the Paper :**

Total Marks: 100 (Internal(25) +External(75))

Semester: **Paper Code:** **Exam Duration : 3 Hrs**

SECTION	UNIT					Question Paper Pattern	Marks
	I	II	III	IV	V		
Section A	2	2	2	2	2	10 Questions (Open choice : 6 out of 10)	6×5=30
Section B	1	1	1	1	1	5 Questions (Open Choice : 3 out of five)	3×15=45

PRACTICALS

Internal : 40
External : 60

PROJECT VIVA

Internal : 80
External : 20

M.Sc., CHEMISTRY : CREDIT DISTRIBUTION

(For the candidates admitted from June 2019)

SEMESTER	CREDITS
I	17
II	27
III	19
IV	27
TOTAL	90

PROGRAMME OUTCOME OF M.Sc., CHEMISTRY

After successful completion of the programme the student is able to

PO 1: Demonstrate the knowledge about the fundamentals of chemistry, advances in chemistry and multidisciplinary topics.

PO 2: Apply theoretical knowledge and think creatively

Approaching the chemical reactions with intellectual curiosity, identifying the mechanism involved in them and think creatively. Creative thinking in Retrosynthetic Analysis.

PO 3: Communicate effectively and work as an individual and as a team.

Communicating efficiently on the topic chosen for Discussion/Seminar by appropriate designing, making effective documentation & presentations and comprehending in an appropriate way.

PO 4: Recognize the Life-long Learning

Recognizing the need for life-long learning in the broadest view of changing advances in Chemistry.

PO 5: Realize the responsible role as a chemist in the society.

Realize the importance of green synthesis, environmental preservation.

Demonstrate the theory behind the experiment and able to handle the experiments independently, able to use modern instruments efficiently and sequentially recording the results of the experiment.

Able to review the literature, design a new problem, analyze and interpret the data and providing valid conclusions for the problem with a synthesis of new compound or summarizing the new findings and information.

PROGRAMME SPECIFIC OUTCOMES (PSO)

Curriculum of M.Sc., Chemistry is designed to prepare postgraduates to attain the following program specific outcomes:

PSO 1: Ability to appreciate the potential of Inorganic, Organic, Physical, Analytical, Nano and Green chemistry.

PSO 2: Ability to update with the current science and search for further higher studies, employment and research.

PSO 3: Ability to apply the gained knowledge and other concepts to new systems.

PSO 4: Ability to communicate effectively.

PSO 5 : Ability to create awareness to the society in maintaining the green environment and health aspects.

Programme : M.Sc Chemistry **CORE 1**
Semester : I **Hours : 5 P/W, 75 Hrs/S**
Sub. Code : DA1 **Credits : 4**

TITLE OF THE PAPER: INORGANIC CHEMISTRY I

Pedagogy	Hours	Lecture	Peer Teaching/Seminar//Discussion//Problem solving session/Quiz/videos/Library session.	ICT
	5	3	1	1

PREAMBLE: The objectives of the course is to understand the concepts and theories of acids and bases, Pearson and HSAB concepts and its applications, lattice energy, ionic bonds, symmetry in crystals, types of crystals, Molecular orbital theory, wave mechanical treatment of covalent bonds, characteristics of p-block elements, understand the principle of stability constant, chelate effects, atomic states and term symbols of coordination complexes, various theories like Werner, VBT, CFT, spectral and magnetic properties of coordination complexes.

COURSE OUTCOME : At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: discuss the theories of Bronsted, Lewis and Lux concepts of acids and bases, Pearson and HSAB concepts and its applications.	1	15
UNIT 2 CO2: explain the fundamental knowledge of lattice energy, radius ratio of different geometries, calculation of lattice energy, miller indices, symmetry in crystals and various types of crystals.	2	15
UNIT 3 CO3: draw the MO diagram of diatomic molecules, discuss the formation of hydrogen molecule by wave mechanical treatment and explain special characterictics of p- block elements.	3	15
UNIT 4 CO4: demonstrate various theories of coordination compounds , inferring various geometries of coordination compounds and their isomerism, explain the structure, realise the importance of electronic spectroscopy and magnetic properties of coordination compounds.	4	15
UNIT 5 CO5: demonstrate the principle of coordination compound, describe the stability of metal complexes by the use of different methods and parameters, and identify the atomic state and the term symbols.	5	15

UNIT I

ACIDS AND BASES

Bronsted and Lewis acid bases, pH, pK_a, acid base concept in non-aqueous media, buffer solution, Protonic acids- Proton Affinities –leveling solvents – acidic behaviour of the binary hydrides – strength of oxyacids – hydrolysis – Amphoteric oxides – Non protonic concept of acid-base reactions- Lux concept- Solvent Ion theory of acids and bases ammonia, acetic acid– Hard and Soft acid base concept – Pearson concept- Applications of HSAB principle.

UNIT II

SOLID STATE CHEMISTRY

Ionic bond – lattice energy – Radius ratio for tetrahedral, octahedral and cubic sites – applications of radius ratio – Calculations of lattice energies of ionic crystals – Born equation

– Born Haber Cycle – symmetry in crystals- Miller indices – Close packing – Crystal types – AX, AX_2.

UNIT III

STRUCTURE AND BONDING II

Molecular Orbital theory – LCAO method – MO diagrams of simple diatomic molecules, CO, HF, CO_2, O^{2-}, O_2^{2-}, NH_3 & NO_2^- Ion. Wave mechanical treatment of covalent bond – formation of hydrogen molecule – Linnet's Double quartet approach – Some special characteristics of p-Block elements – ionization energy - Electron affinity – inert pair effect.

UNIT IV

PRINCIPLES OF COORDINATION CHEMISTRY

Studies of coordination compounds in solution – detection of complex formation in solution – Stability constants – stepwise and over–all formation constants – simple methods (Potentiometric and photometric methods) of determining the formation constants – Factors affecting stability – Statistical and chelate effects –Atomic states and Term symbols (brief idea only).

UNIT V

CHEMISTRY OF COORDINATION COMPOUNDS

Werner′s coordination theory – Isomerism in coordination compounds –Types of ligands – VB theory and its limitations – Crystal field theory – splitting of d orbitals under different geometries – CFSE and evidences for CFSE (Structural and thermodynamic effects) – Spectrochemical series – Jahn Teller distortion – Spectral (explanation based on Orgel diagrams) and magnetic properties of complexes – Limitations of CFT – MO theory – sigma and pi-bonding in complexes – Nephelauxetic effect.

References

1. J.E.Huheey, Ellen A.Kaiter, Richard L. Kaiter & Okhil K. Medhi, Inorganic Chemistry Principles of Structure & Reactivity, 4th Ed., Pearson, 2011.
2. F.A.Cotton, G.Wilkinson, G.A.Murillo & M. Bochmann, Advanced Inorganic Chemistry, 1st Ed., Wiley Student Edn, 2007.
3. R.S.Drago, Physical Methods in Inorganic Chemistry, 1st Ed., Affiliated East-West Press Pvt. Ltd., 1971.
4. M.C.Day and J.Selbin, Theoretical Inorganic Chemistry, Affiliated East West Press Pvt. Ltd. 2nd Ed., 1985.
5. H.J.Emeleus & A.G.Sharpe, Modern aspects of Inorganic Chemistry, 4th Ed., ISBN, 1974.
6. Selected Topics in Inorganic Chemistry, Dr. Wahid U. Malik, Dr.G.D.Tuli, Dr. R.D.Madan, 8th edition.
7. B.R.Puri, L.R.Sharma & K.C.Kalia, Principles of Inorganic Chemistry, Vishal Pub.33 ed., 2017.
8. R. Gopalan & V.Ramalingam, Concise Coordination Chemistry, 1st Ed., Vikas Pub. House Pvt. Ltd., 2001.
9. Manas Chanda, Atomic Structure & Chemical Bond, 1st Ed., Tata McGraw Hill Pub. Co., 1992.
10. H.J.Emeleus & A.G.Sharpe, Modern aspects of Inorganic Chemistry, 4th Ed., ISBN, 1974.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1: ACIDS AND BASES			
	Bronsted and Lewis theories of acids and bases,pH and pKa acid base concepts	4	Lecture
	acidic behavior of oxyacids, binary hydrides, amphoteric oxides	3	Lecture
	Buffer solution and leveling solvents	2	Student Engagement with the support of the teacher. (Problem solving session)
	Non protonic concept of acid and base reactions, Lux concept, solvent ion theory,	4	ICT
	HSAB and Pearson concepts and applications of HSAB	2	Lecture and Group Discussion
UNIT 11: SOLID STATE CHEMISTRY			
	Ionic bond, lattice energy and radius ratio for tetrahedral, octahedral and cubic sites	4	Lecture
	calculation of lattice energy of ionic crystals- Born equation	4	Problem solving session with the help of the teacher.
	Born Haber cycle and symmetry in crystals	4	ICT
	Miller indices, closed packing and crystal types	3	Seminar
UNIT III STRUCTURE AND BONDING II			
	MO theory and LCAO method	2	Lecture
	wave mechanical treatment of covalent bonds , linnet double quartet approach	4	Lecture
	MO diagram of simple diatomic molecules	4	Lecture with Demo using charts
	Ionization energy and electron affinity of p- block elements	3	ICT
	Inert pair effect of p- block elements	2	Discussion
UNIT IV	PRINCIPLES OF COORDINATION CHEMISTRY		
	Detection of formation complex	4	Lecture
	determination of stability constant by potentiometric and photometric methods. derivation of step wise and overall formation constant for coordination complexes	5	Lecture
	Factors affecting stability constant	2	seminar
	Atomic state and Term symbols	4	ICT
UNIT V	CHEMISTRY OF COORDINATION COMPOUNDS		
	Theories of coordination chemistry – Werner and VB theories	4	Lecture
	Crystal field theory- splitting of d orbitals	4	Lecture

	under different geometry		
	Calculation of CFSE	1	Problem solving session
	Jahn Teller distortion, Orgel diagrams d^1 to d^{10}	4	ICT
	Molecular orbital theory- sigma and pi – bonding in coordination complexes	2	Seminar / peer teaching

Course Outcomes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO 1	PO 2	PO3	PO4	PO 5	PSO1	PSO 2	PSO3	PSO4	PSO 5	
CO1	5	4	4	3	4	4	4	3	4	4	3.9
CO2	5	4	4	4	4	4	4	4	4	3	4.0
CO3	4	4	4	4	4	4	4	4	4	3	3.9
CO4	5	4	4	3	4	4	4	3	4	4	3.9
CO5	5	4	3	4	4	4	4	4	4	3	3.9
Mean Overall Score											

Result: The Score for this Course is 3.92 (High Relationship)

Course Designer : Dr. R. PARIMALAM

Dr. A. JOSEPHINE VANITHA

Programme : M.Sc Chemistry **CORE 2**
Semester : I **Hours : 5 P/W, 75 Hrs/S**
Sub. Code : DA2 **Credits : 4**

TITLE OF THE PAPER: ORGANIC CHEMISTRY I

Pedagogy	Hours	Lecture	Peer Teaching/seminar/role play/discussion/ /problem solving session/quiz/lab session/videos/demonstration class/library session.	ICT
	5	3	1	1

PREAMBLE: The objective of the course is to make the student understand the concepts of electron displacement, resonance, H-bonding, Aromaticity and Stereochemistry, determination of reaction mechanisms by kinetic and non-kinetic methods and Aliphatic and aromatic substitution reactions.

COURSE OUTCOME: At the end of the Semester I, the Students will be able to	Unit	Hrs P/S
UNIT 1 **CO1:** discuss the concepts of electron displacement, resonance, H-bonding and aromaticity.	1	15
UNIT 2 **CO2:** describe optical activity of organic compounds, projection formulae-Newman, Sawhorse and Fischer, Configuration nomenclature, Geometrical isomerism-types and determination by physical and chemical methods.	2	15
UNIT 3 **CO3**: explain various organic reaction intermediates, types of reactions,collision theory and Transition state theory-Hammond postulate-microscopic reversibility, kinetic and non-kinetic methods of determining reaction mechanisms.	3	15
UNIT 4 **CO4:** explain aliphatic nucleophilic and electrophilic substitution reactions-their mechanisms, stereo chemistry of these reactions.	4	15
UNIT 5 **CO5**: explain aromatic electrophilic and nucleophilic substitution reactions and their mechanisms, effect of substrate structure, leaving group and attacking nucleophile.	5	15

UNIT I
CHEMICAL BONDING

Electron Displacement: Inductive and Field effects – Bond distances –Bond energies – Delocalized bonds – cross conjugation – Rules of Resonance – The resonance effect – Steric Inhibition of Resonance - Hyperconjugation – Hydrogen bonding – Bronsted and Lewis concepts – Factors affecting the strength of acids and bases.

Aromaticity: Aromaticity from NMR spectrum - Aromaticity in, six, five, and seven membered rings – Aromaticity in azulene, and heptalene – Alternant and Non alternant Hydrocarbons - Aromatic system with electron number other than six - Huckel's rule –

Systems of 2 electron, 4 electron (antiaromaticity) 8 electron, 10 electron, more than 10 electron ($4n+2e^-$) and $4ne^-$ - Meso Ionic Compounds - Homo Aromatic Compounds.

UNIT II

INTRODUCTION TO STEREOCHEMISTRY

Optical Isomerism: Optical Activity and Chirality- Classification of Optical active compounds - Newman, Sawhorse and Fischer Projection formulae – Configuration – Methods of determining configuration – Configurational Nomenclature – (Erythro and Threo – D & L, R & S Nomenclature)- Stereochemistry of allenes, spiranes, adamantoids and catenanes - Biphenyl derivatives and Atropisomerism - Stereochemistry of Ansa compounds and Cyclophanes - Concept of Prochirality, Topicity, Prostereo Isomerism, Equivalent, Enantiotopic and Diastereotopic Ligands - Stereospecific and Stereoselective Synthesis - Resolution, Racemisation and Asymmetric Synthesis - Cram's and Prelog rule.

Geometrical isomerism: Cis – Trans Isomerism E-Z nomenclature – determination of geometrical isomers using physical and chemical methods.

UNIT III

DETERMINATION OF REACTION MECHANISM:

Organic reactive Intermediates: Generation and stability and reactivity of carbocation, carbanion, free radical, carbenes and nitrenes.

Types of Mechanism – Types of Reaction - Energy profile (Collision and Transition State Theory) – Kinetic and Thermodynamic control– Hammond postulate - Microscopic reversibility – Methods of Determining Reaction Mechanism.

UNIT IV

ALIPHATIC SUBSTITUTION REACTION

Nucleophilic Substitution : S_N1 and S_N2 mixed S_N1 and S_N2 and SE^i mechanism – Stereochemistry of substitution reactions - Steric Orientation in S_N1 and S_N2 mechanism - Neighbouring group mechanism - Neighbouring group participation Effect of substrate structure, attacking nucleophile, leaving group and reaction mechanism – Effect of the solvent - Nucleophilic substitution at an allylic, vinylic and aliphatic trigonal carbons - Ambident nucleophiles and ambident substrates - Mechanism of esterification and hydrolysis.

Electrophilic Substitution Reaction: Electrophilic Substitution reaction at aliphatic saturated carbon - S_E1, S_E2 and S_Ei mechanism - Reactivity.

UNIT V

AROMATIC SUBSTITUTION REACTION

Electrophilic Substitution Reaction: π and Sigma complexes - S_E1 mechanism - Mechanism of Nitration, Halogenation, Sulphonation, Friedal Crafts Alkylation and Acylation reactions - Orientation and Reactivity in Monosubstituted rings.

Nucleophilic Substitution : S_NAr, S_N1 and Benzyne Mechanism - Reactivity - Effect of substrate structure, leaving group, attacking nucleophile.

References

1. Peter Sykes, A Guide book to Mechanisms in Organic Chemistry, 6th Ed., Longmans Scientific and Technical, Essex, 1986.
2. S.M. Mukerjee and S.P. Singh, Reaction Mechanism in Organic Chemistry, Mc Milan India Ltd., 1975.
3. E.L. Eliel, Stereochemistry of Carbon Compounds, McGraw Hill, 1962.
4. D. Nasipuri, Stereochemistry of Organic compounds, 2nd Ed, New Age International, New Delhi, 1972.
5. E.L. Eliel, N.C. Allinger, S.J. Angyal and G.A. Morrison, Conformational Analysis, Interscience, New York, 1965.
6. Jerry March, Advanced Organic Chemistry, 4th Ed., John Wiley, New York, 1992.
7. V.M. Potapov, Stereochemistry, MIR Publishers, Moscow 1979.

UNITS	TOPICS	LECTURE HOURS	MODE OF TEACHING
UNIT I: CHEMICAL BONDING AND AROMATICITY			
	Inductive effect, Field effect, hyperconjugation, hydrogen bonding, Definition- Huckel's rule-systems of 2 electron, 4 electron,8 electron,10 electron, more than 10 electron.	3	ICT
	Inductive and Field effects – Bond distances –Bond energies – Delocalized bonds – cross conjugation – Rules of Resonance – The resonance effect – Steric Inhibition of Resonance - Hyperconjugation – Hydrogen bonding – Bronsted and Lewis concepts – Factors affecting the strength of acids and bases. Aromaticity from NMR spectrum, Alternant and Non-alternant hydro carbons, Meso Ionic Compounds and Homo Aromatic Compounds.	10	Lecture
	Steric inhibition of resonance, Hydrogen bonding, Classifying compounds as aromatic, non-aromatic and anti aromatic.	2	Seminar/Assignment/Quiz
Unit II : INTRODUCTION TO STEREOCHEMISTRY			
	Definition of stereoisomerism, classification, explanation with suitable examples, Cram's and Prelog rule.	2	ICT
	Concepts of optical activity, methods of determining configuration, resolution, racemization, asymmetric synthesis, stereochemistry of allenes, spiranes, adamantoids, catenanes, cyclophanes, biphenyl derivatives and Atropisomerism, concepts of prochirality, topicity, prostereoisomerism, equivalent enantiotopic and diastereotopic ligands, stereospecific and stereoselective synthesis.	9	Lecture

	Assigning Erythro and Threo, R,S-configuration, E,Z configuration for alkenes, syn-anti configuration for oximes, classification of homotopic, enantiotopic and diastereotopic ligands.	2	seminar/assignment/quiz
	Ball and stick model for projection formula-Sawhorse for organic compounds, Cram's and prelog rule	2	Animation videos
Unit III: DETERMINATION OF REACTION MECHANISMS			
	Energy profile diagram-collision and transition state theory	2	ICT
	Generation and stability of reactive intermediates, their reactivity, types of reactions-kinetic and thermodynamic controlled, Hammond postulate, microscopic reversibility, kinetic and non-kinetic methods of determining reaction mechanisms	11	Lecture
	Identifying the kind of intermediates involved in the reactions, generation, stability and reactivity of carbocation, carbanion, free radicals , carbenes and nitrenes	2	Quiz/Seminar /Assignment
Unit IV: ALIPHATIC SUBSTITUTION REACTION			
	S_N1 and S_N2 mixed S_N1 and S_N2 and S_Ei mechanism, Stereochemistry of substitution reactions - Steric Orientation in S_N1 and S_N2 mechanism. Neighbouring group mechanism - Neighbouring group participation	4	ICT
	Concepts, mechanism, stereochemistry and factors influencing nucleophilic Substitution and Electrophilic Substitution Reaction	9	Lecture
	Neighbouring group participation, Ambident nucleophiles and ambident substrates - Mechanism of esterification and hydrolysis.	2	Seminar
Unit V: AROMATIC SUBSTITUTION REACTION			
	S_E1 mechanism, S_NAr, S_N1 and Benzyne Mechanism	3	ICT
	Electrophilic Substitution Reaction: π and Sigma complexes - S_E1 mechanism - Mechanism of Nitration, Halogenation, Sulphonation, Friedal Crafts Alkylation and Acylation reactions, Orientation and Reactivity in Monosubstituted rings, Nucleophilic Substitution : S_NAr, S_N1 and Benzyne Mechanism - Reactivity - Effect of substrate structure, leaving group, attacking nucleophile.	9	Lecture
	Orientation and Reactivity in Monosubstituted rings, Effect of substrate structure, leaving group, attacking nucleophile.	2	Seminar

Course Outcomes (Cos)	Mean scores of Cos										
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	
CO1	4	5	4	3	4	4	4	4	4	3	3.9
CO2	4	5	4	3	3	4	4	4	4	3	3.8
CO3	4	5	3	4	3	4	4	4	4	3	3.8
CO4	4	5	3	4	3	4	4	4	4	3	3.8
CO5	4	5	3	4	4	4	4	4	4	3	3.9
Mean Score 3.84											

Result: The Score for this Course is 3.84 (High Relationship)

Course Designer: Mrs. P. ROOPAKALYANI,
Mrs. B. MARIAMMAL.

Programme : M.Sc Chemistry **CORE 3**
Semester : I **Hours : 5 P/W, 75 Hrs/S**
Sub. Code : DA3 **Credits : 4**

TITLE OF THE PAPER: PHYSICAL CHEMISTRY I

Pedagogy	Hours	Lecture	Peer Teaching/Seminar/Role play/Discussion/Tutorial/Problem solving session/Quiz/Lab session/videos/Demonstration class/Library session.	ICT
	5	3	1	1

PREAMBLE: The objective of the course is to emphasize the concepts of Quantum Chemistry, Group Theory, Thermodynamics and Electrochemistry.

COURSE OUTCOME : At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: explain Black body radiation , Planck′s quantum theory , photoelectric effect, Compton effect, Study and derive Planck′s radiation law Schrodinger time-independent wave equation- derivation and demonstrate Davisson and Germer experiment, Heisenberg Uncertainty principle, Eigen functions and Eigen values, Significance of operators	1	15
UNIT 2 CO2: derive group multiplication table, explain Symmetry elements, symmetry operators and Types of groups, acquire ability to identify symmetry operators and point groups of molecules based on their geometry and formulae.	2	15
UNIT 3 CO3: explain General laws of enthalpy, entropy, free energy concepts, Partial molar quantities, chemical potential, fugacity, activity coefficients and Third law of thermodynamics.	3	15
UNIT 4 CO4: derive Debye Huckel Onsager equation, Wein Effect, Debye Falkenhagen effect and discuss Conductometric titrations and its applications, solubility product, Degree of dissociation of weak acid, equilibrium constants and dissociation constants, Concentration cells with and without transference.	4	15
UNIT 5 CO5: explain Overvoltage, Explain Corrosion, Prevention of Corrosion, Butler Volmer and Tafel equation & Different types of Storage batteries.	5	15

UNIT I

QUANTUM CHEMISTRY I

Inadequacy of classical mechanics: Black body radiation - Planck′s quantum theory postulates - derivation of Planck′s radiation law to explain cavity radiation – photoelectric effect, explanation by quantum theory - Compton effect - explanation by quantum theory and derivation of Compton shift in wavelength. Wave - particle dualism : De Broglie′s concept of matter waves - experimental verification - Davisson and Germer - Heisenberg Uncertainty principle. Wave nature of electron, Interpretation of the wave function, Normalized and

orthogonal wave function, Eigen functions and Eigen values - Significance- Linear and Hermitian operators - Significance - Schrodinger time-independent wave equation- derivation.

UNIT II

GROUP THORY I

Symmetry elements and symmetry operators - Types of groups - group multiplication table (C_2V, C_3V) - Sub groups, similarity transformation and classes - Identification of symmetry operators. Identification of the point groups of molecules based on their geometry and formulae.

UNIT III

THERMODYNAMICS I

General laws of enthalpy, entropy and free energy concepts - Systems of variable compositions - Partial molar quantities- definitions- physical significance - chemical potential- variation of chemical potential with temperature and pressure. Determination of partial molar properties - Gibbs Duhem equation - fugacity - Definition- determination of fugacity of real gases - variation of fugacity with temperature and pressure-activity coefficient- Determination of activity and activity coefficients of non-electrolytes. Third law of thermodynamics - Nernst heat theorem - Planck, Lewis and Randall statement- Determination of absolute entropy- Unattainability of absolute zero - Exceptions of third law.

UNIT IV

ELECTROCHEMISTRY I

Debye - Huckel theory - Derivation of Debye Huckel Onsager equation- Experimental verification - Wein Effect, Debye Falkenhagen effect - Debye Huckel limiting law- Conductometry - Conductometric titrations and its applications.

Determination of solubility product, Degree of dissociation of weak acid - Standard electrode potential and EMF - Concentration cells with and without transference- Determination of equilibrium constants, dissociation constants and solubility product.

UNIT V

ELECTROCHEMISTRY II

Hydrogen oxygen overvoltage - Theories of overvoltage – Corrosion - Types of corrosion - Dry and Electrochemical - Factors influencing corrosion – Prevention of Corrosion : Sacrificial anodic method, impressed current cathodic protection, protective coatings, deaeration, dehumidification, inhibitors, passivation - Butler Volmer equation- Tafel equation- Storage battery- Lead acid storage battery - Nickel Cadmium cell- Fuel cells - Classification of fuel cells H_2-O_2 fuel cell – Hydrocarbon - O_2 cell - Solar Cell.

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3. Puri, Sharma and Pathania, Principles of Physical Chemistry, Vishal publishers, 2014
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5. K.V.Raman, Group Theory and its Applications to Chemistry, 1st Ed., Tata McGraw Hill

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11. S.Glasstone, Thermodynamics for chemists, East - West Press private Ltd.,
12. D.A.Mc Quarrie and J.D.Simon, Physical chemistry-A molecular Approach, Viva Books (p) Ltd.,
13. John O.M. Bockris & Amulya K.N.Reddy, Modern Electrochemistry Vol.2, 1st Ed., Plenum & Rosetta, Reprint 1977.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1: Quantum Chemistry I			
	Black body radiation, Planck′s quantum theory , photoelectric effect, Davisson and Germer experiment.	3	ICT
	Compton effect, Planck′s radiation law Schrodinger time-independent wave equation, Heisenberg Uncertainty principle Eigen functions and Eigen values, Significance of operators.	9	Lecture
	Eigen functions and Eigen values, Significance of operators.	3	Problem solving
UNIT II: Group Theory I			
	Group multiplication table (C_2V, C_3V)	3	ICT
	Symmetry elements, symmetry operators and Types of groups.	6	Lecture
	symmetry operators and point groups of molecules based on their geometry and formulae.	6	Problem solving
UNIT III Thermodynamics –I			
	laws of enthalpy, entropy and free energy concepts, Partial molar quantities and chemical potential.	8	Lecture
	Gibbs Duhem equation, fugacity, activity coefficients and absolute entropy.	3	ICT
	Third law of thermodynamics, Nernst heat theorem, Planck, Lewis and Randall statement.	4	Seminar

UNIT 1V	**ELECTROCHEMISTRY I** Debye - Huckel theory - Derivation of Debye Huckel Onsager equation- Experimental verification - Wein Effect, Debye Falkenhagen effect - Debye Huckel limiting law Conductometry - Conductometric titrations and its applications. Determination of equilibrium constants, dissociation constants and solubility product. Measurement of EMF Determination of solubility product, Degree of dissociation of weak acid - Standard electrode potential and EMF - Concentration cells with and without transference.	12 2 1	Lecture Demo in Lab Seminar/ Assignment
UNIT V	**ELECTROCHEMISTRY II** Hydrogen oxygen overvoltage - Theories of overvoltage – Butler Volmer equation- Tafel equation- Corrosion - Types of corrosion - Dry and Electrochemical - Factors influencing corrosion – Prevention of Corrosion : Sacrificial anodic method, impressed current cathodic protection, protective coatings, deaeration, dehumidification, inhibitors, passivation - Storage battery- Lead acid storage battery - Nickel Cadmium cell- Fuel cells - Classification of fuel cells H_2-O_2 fuel cell – Hydrocarbon - O_2 cell - Solar Cell.	10 3 2	Lecture Videos Seminar/ Assignment

Course Outcomes(COs)	PO1	PO 2	PO3	PO4	PO5	PSO 1	PSO 2	PSO 3	PSO4	PSO5	Mean scores of COs
CO1	5	4	4	4	4	5	4	4	3	3	4.00
CO2	5	3	3	5	5	5	4	4	3	3	3.9
CO3	5	4	4	4	4	5	4	4	3	3	3.9
CO4	5	3	3	5	5	5	4	4	3	3	4.00
CO5	5	3	3	5	5	5	4	4	3	3	3.9
								Mean			3.94

Result: The Score for this Course is 3.94 (High Relationship)

Course Designer: Dr. N. MANONMANI,
Dr. P. SHANTHY.

Programme : M.Sc Chemistry **ELECTIVE: 1**
Semester : I **Hours : 5 P/W, 75 Hrs/S**
Sub. Code : EDA1 **Credits : 5**

TITLE OF THE PAPER: MOLECULAR SPECTROSCOPY & ANALYTICAL CHEMISTRY I

Pedagogy	Hours	Lecture	Peer Teaching/Seminar//Discussion//Problem solving session/Quiz/videos/Library session.	ICT
	5	3	1	1

PREAMBLE: The objective of the course is to make the student to comprehend the principle, instrumentation and applications of various spectra such as UV, IR, Raman, Mass and Chromatographic techniques.

COURSE OUTCOME: At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: demonstrate the fundamentals of molecular spectroscopy and UV spectroscopy	1	15
UNIT 2 CO2: demonstrate the fundamentals of vibrational spectroscopy, the selection rules , Instrumentation and the interpretation of IR spectra.	2	15
UNIT 3 CO3: explain the underlying principle of Rayleigh and Raman scattering,, differentiate stokes and antistokes lines, Raman and IR spectra and its applications in the structural determination of compounds .	3	15
UNIT 4 CO4: demonstrate the fundamentals of mass spectrometry and mass spectra of important functional groups.	4	15
UNIT 5 CO5: explain the principle, instrumentation and applications of Gas liquid chromatography, HPLC and Electrophoresis.	5	15

UNIT I
FUNDAMENTALS OF SPECTROSCOPY & UV SPECTROSCOPY

Interaction of molecules with electromagnetic radiation – types of regions and representation of spectra. Resolution and intensity of spectral transition signal to noise ratio, width of spectral lines- collision broadening, Doppler broadening, and Heisenberg uncertainty principle - Intensity of spectral lines brief idea of selection rules and transition probability, Boltzmann distribution. Enhancing sensitivity of spectral lines: Fourier transform (FT) and computer averaging techniques (CAT).

Electronic spectra of molecules: Frank–Condon Principle, selection rules (brief idea), types of electronic transitions – Chromophore, auxochrome, bathochromic and hypsochromic shift- hyperchromic and hypochromic shift- Factors affecting absorbance, Woodward Fieser rules (only for conjugated dienes)- steric inhibition of resonance- Applications. A few examples of natural conjugated systems absorbing in visible region – instrumentation of double beam UV spectrophotometer

UNIT II
VIBRATIONAL SPECTROSCOPY

IR spectroscopy – Bonds as anharmonic oscillator - Morse curve - Oscillation frequency (only equation) – explaining fundamental absorptions, first and second overtones with respect to Boltzmann distribution - selection rules – fundamental vibrations of polyatomic molecules, combination and difference bands- Instrumentation and sampling techniques in IR

spectroscopy. Fermi resonance, finger print region, characteristic vibrational frequencies of alkanes, alkenes, alkynes, aromatic compounds, esters, amides, ethers, phenols, amines, carbonyl compounds, acids. Effect of solvent and hydrogen bonding on vibrational frequencies, uses of group frequencies in the structural elucidation of metal complexes containing cyanide, nitro, ammine, thiocyanate and halogens as ligands – metal carbonyls.

UNIT III

RAMAN SPECTROSCOPY & ROTATIONAL SPECTROSCOPY

Raman effect- Rayleigh and Raman scattering, Stokes and anti-Stokes radiation, molecular polarizability, Raman selection rules, rule of mutual exclusion, Depolarization ratio, instrumentation. Combined uses of IR and Raman spectroscopy in the structural elucidation of simple molecules like H_2O, ClF_3, SO_2, CO_2, N_2O. Advantages of Raman spectroscopy over IR spectroscopy. Differences between Raman and IR spectroscopy.

Microwave Spectroscopy: Rotational spectra of diatomic molecules, frequency separation – determination of moment of inertia and bond length.

UNIT IV

MASS SPECTROMETRY

Mass spectrometry, ion production – electron impact and chemical ionization, field desorption, electrospray ionization, MALDI ion analysis- quadrupole mass spectrometry, time of flight. Determination of molecular formula: molecular ion peak, base peak, metastable peaks and isotope peaks, nitrogen rule, ring rule, fragmentation, retro Diels-Alder fragmentation- McLafferty rearrangement – Mass spectra of various functional groups containing compounds to be studied: aromatic, aliphatic hydrocarbons, ketones, acids, esters, amides, ethers, alcohols, amine and nitriles.

UNIT V

CHROMATOGRAPHY

Chromatography: Gas- Liquid chromatography, Principles, retention volume, retention time, instrumentation- Column, Stationary phase, carrier gas, Detectors- Thermal conductivity, Flame Ionisation, electron capture, Applications of GLC. High performance liquid chromatography - Ion exchange chromatography – applications.

Electrophoresis - principles and applications.

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UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1: FUNDAMENTALS OF SPECTROSCOPY & UV SPECTROSCOPY			
	Instrumentation of UV, Steric inhibition of resonance	3	ICT
	Fundamentals of molecular spectroscopy, Resolution, intensity, and width, selection rules, transition probability of spectral transitions, Fourier transform and CAT techniques Fundamentals of UV spectroscopy, Steric inhibition of resonance, Frank Condon principle, Factors affecting absorbance.	10	Lecture
	Natural conjugated systems, Bathochromic shift and hypsochromic shifts with examples	2	Seminar
UNIT II VIBRATIONAL SPECTROSCOPY			
	Anharmonic oscillator, Overtones, Selection rules, Fermi resonance, and Group frequencies	9	Lecture
	Calculation of fundamental vibration, Finger print region, Effect of solvent and hydrogen bonding.	3	Problem solving, Quiz, Seminar
	Instrumentation and sampling techniques, and Examples of IR spectral interpretation.	3	ICT
UNIT III RAMAN SPECTROSCOPY AND ROTATIONAL SPECTROSCOPY			
	Rayleigh and Raman Scattering, Stokes and Anti stokes lines, Rule of mutual exclusion, Combined uses of IR and Raman spectroscopy in the structural elucidation. Microwave spectroscopy, Rotational spectra of diatomic molecules, Determination of moment of Inertia.	9	Lecture
	Difference between Raman and IR, Advantages uses of Raman spectroscopy.	3	Peer teaching, seminar
	Instrumentation and Structural elucidation of simple molecules.	3	ICT
UNIT IV MASS SPECTROMETRY			
	Instrumentation of Mass spectrometry, MALDI ion	3	ICT

	Analysis, Quadrupole mass spectrometry, Time of flight		
	Identifying the compounds using mass spectra.	2	Problem solving
	Fundamentals of mass spectrometry, Different ionization techniques, Determination of molecular formula using natural abundance, Discussing different peaks involved, McLafferty rearrangement, Mass spectra of various functional groups.	10	Lecture
UNIT V CHROMATOGRAPHY			
	Principles of Chromatography, GC, HPLC, Ion exchange chromatography and Electrophoresis.	9	Lecture
	Applications of GC, HPLC and Electrophoresis.	3	Group discussion, Seminar.
	Instrumentation and working of GC, HPLC and Electrophoresis.	3	ICT

Course Outcomes (COs)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	4	5	4	4	3	4	4	4	4	3	3.9
CO2	4	5	4	4	3	4	4	3	4	3	3.8
CO3	3	4	4	4	3	4	3	4	4	3	3.6
CO4	4	4	4	4	3	4	4	4	4	3	3.8
CO5	4	4	4	4	4	4	4	3	5	3	3.9
Mean Overall Score											3.8

Result: The Score for this Course is 3.8 (High Relationship)

Course Designer : Dr. J. ARUL MOLI & Dr. K. VIGNESWARI

Programme : M.Sc Chemistry **ELECTIVE: 1**
Semester : I **Hours : 5 P/W, 75 Hrs/S**
Sub. Code : EDA2 **Credits : 5**

TITLE OF THE PAPER: INDUSTRIAL CHEMISTRY

Pedagogy	Hours	Lecture	Peer Teaching/Seminar//Discussion//Problem solving session/Quiz/videos/Library session.	ICT
	5	3	1	1

PREAMBLE: The objective of the course is to make the student understand principles of chemical technology and to know about raw materials and energy for chemical industry, cement, ceramics, glass and fertilizers, small scale chemical industries & sugar and agro chemicals.

COURSE OUTCOME: At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: gain knowledge on basics of Commercial manufacturing process technology of various chemicals.	1	15
UNIT 2 CO2: identify and analyze the raw materials and source of energy for chemical industries.	2	15
UNIT 3 CO3: appreciate the chemistry of selected industrial processes including cement, ceramics glass and fertilizers.	3	15
UNIT 4 CO4: recognize employment opportunities in areas of small chemical enterprisers which manufactures goods of personal or household services with the help of relatively smaller machines and a few workers and employees.	4	15
UNIT 5 CO5: identify and discuss the basics of sugar and agrochemicals like insecticides, fungicides, herbicides and various pesticides.	5	15

UNIT I
PRINCIPLES OF CHEMICAL TECHNOLOGY

Introduction: Basic principles – importance – classification – designing and modeling of chemical plants – unit process and unit operations.

Basic requirements of industrial reactors – choice and selectivity of reactor – basic principles of homogeneous and heterogeneous processes and reactors with examples.

UNIT II
RAW MATERIALS AND ENERGY FOR CHEMICAL INDUSTRY

Raw materials – Characteristics of raw materials and their resources – methods of raw material concentrations – integral utilization of raw materials.

Energy for chemical industry – Fuels – classification of fuels – coal – fuel gases and liquid fuels – petroleum – cracking – Octane number – cetane number – composition and uses of coal gas, water gas, producer gas, oil gas and gobar gas.

UNIT III
CEMENT, CERAMICS, GLASS AND FERTILIZERS

Cement: Manufacture – Wet Process and Dry process. Types, Analysis of major constituents, setting of cement, reinforced concrete. Cement industries in India.

Ceramics: Important clays and feldspar, glazing and verification.

Glass: Types, Composition, manufacture of Optical glass, colored glasses, lead glass and neutron absorbing glass.

Fertilizers: Fertilizer industries in India, Manufacture of ammonia, ammonium salts, urea, superphosphate, triple superphosphate and nitrate salts.

UNIT IV
SMALL SCALE CHEMICAL INDUSTRIES

Electrothermal and electrochemical industries: electroplating – surface coating industries – oils, fats and waxes – soaps and detergents – cosmetics. Match industries and fire works: manufacture of some industrially important chemicals like potassium chlorate, and red phosphorus – metal powders.

UNIT V
SUGAR AND AGRO CHEMICALS

Sugar: Cane sugar manufacture, recovery of sugar from molasses, sugar estimation, sugar industries in India.

Agrochemical industries: Important categories of insecticides, fungicides, herbicides. Mode of action and synthesis of common pesticides like Gammexane, DDT, alathrin, Parathion, Malathion, Baygon, DDVP, Warfarin.

References

1. I.Mukhlyonov, Chemical Technology, Vol.1, Mir publication, Moscow, III edn., 1979.
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UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT I: **PRINCIPLES OF CHEMICAL TECHNOLOGY**			
	Basic principles, importance classification of chemical industries	5	Seminar/ peer teaching
	designing and modeling of chemical plants – unit process and unit operations.	5	Lecture
	Basic requirements of industrial reactors – choice and selectivity of reactor – basic principles of homogeneous and heterogeneous processes and reactors with examples.	5	ICT
UNIT II: **RAW MATERIALS AND ENERGY FOR CHEMICAL INDUSTRY**			
	Characteristics of raw materials and their resources – methods of raw material concentrations – integral utilization of raw materials.	5	Lecture
	Fuels – classification of fuels – coal – fuel gases and liquid fuels – petroleum – cracking – Octane number – cetane number.	5	ICT

	composition and uses of coal gas, water gas, producer gas, oil gas and gobar gas.	5	Seminar / assignment
UNIT III: **CEMENT, CERAMICS, GLASS AND FERTILIZERS**			
	Manufacture of cement by Wet Process and Dry process, Types and Analysis of major constituents, setting of cement, reinforced concrete	5	Lecture
	Cement and fertilizer industries in India. Ceramics: Important clays and feldspar, glazing and verification	2	Assignment/ discussion/ Library session
	Glass: Types, Composition, manufacture of Optical glass, colored glasses, lead glass and neutron absorbing glass.	3	ICT
	Fertilizers- Manufacture of ammonia, ammonium salts, urea, superphosphate, triple superphosphate and nitrate salts	5	Seminar
UNIT IV : **SMALL SCALE CHEMICAL INDUSTRIES**			
	Electrothermal and electrochemical industries: electroplating – surface coating industries	5	Lecture
	oils, fats and waxes – soaps and detergents – cosmetics. Match industries and fire works	5	ICT
	manufacture of some industrially important chemicals like potassium chlorate, and red phosphorus – metal powders	5	Seminar
UNIT V: **SUGAR AND AGRO CHEMICALS**			
	Sugar: Cane sugar manufacture, recovery of sugar from molasses, sugar estimation, sugar industries in India	5	Lecture
	Important categories of insecticides, fungicides, herbicides	5	ICT
	Mode of action and synthesis of common pesticides like Gammexane, DDT, alathrin, Parathion, Malathion, Baygon, DDVP, Warfarin.	5	Seminar / peer teaching/ quiz

Result: The Score for this Course is 3.74 (High Relationship)

Course Outcomes (COs)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	4	5	4	4	3	4	4	4	3	3	3.8
CO2	4	5	4	4	3	4	4	3	3	3	3.7
CO3	3	4	4	4	3	4	3	4	4	3	3.6
CO4	4	4	4	4	3	4	4	4	4	3	3.8
CO5	4	4	4	4	4	4	4	3	4	3	3.8
Mean Overall Score											

Course Designer : Dr. J. ARUL MOLI
Mrs. D.RENUGA

Programme : M.Sc Chemistry **CORE 6**
Semester : II **Hours : 5 P/W, 75 Hrs/S**
Sub. Code : DB1 **Credits : 4**

TITLE OF THE PAPER: INORGANIC CHEMISTRY II

Pedagogy	Hours	Lecture	Peer Teaching/Seminar//Discussion//Problem solving session/Quiz/videos/Library session.	ICT
	5	3	1	1

PREAMBLE: The objective of the course is to make the student understand the basics of nuclear chemistry, modes of radioactive decay , types of nuclear reaction and artificial transportation, disposal of radioactive wastes.

COURSE OUTCOME: At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: discuss various types of ligand substitution reactions and mechanisms in different geometries and its applications	1	15
UNIT 2 CO2: acquire the knowledge on various types of Electron transfer reactions and mechanisms, complexometric titrations, masking and demasking agents.	2	15
UNIT 3 CO3: identify the structure and bonding aspects of simple organo metallic compounds, apply the Eighteen electron rule to predict the geometry of metal carbonyls, explain the different catalytic reactions	3	15
UNIT 4 CO4: discuss nuclear spin and movements, modes of radioactive decay, nuclear stability, detection and determination of radioactivity, nuclear reactions.	4	15
UNIT 5 CO5: discuss artificial transportation, methods of producing projectiles, activation, analyses and radiometric titration, radio isotopes and disposal of radioactive wastes.	5	15

UNIT I

SUBSTITUTION REACTIONS OF COORDINATION COMPLEXES

Labile and inert complexes- VBT explanation and Taube′s explanation of lability and inertness - Ligand substitution reactions in octahedral complexes - S_N1 mechanism (dissociative mechanism) - S_N2 Mechanisms (Associative mechanism) - S_N^1CB - substitution, Nucleophilic, Unimolecular conjugate Base mechanism- Anation reaction – Substitution in square planar complexes - trans effect - theories of trans effect - Applications of trans effect - Cis effect - Aquation reactions.

UNIT II

ELECTRON TRANSFER REACTIONS AND APPLICATIONS OF COORDINATION COMPLEXES

Electron transfer reactions - Outer sphere mechanism- Inner sphere mechanism- OSM Vs ISM - two electron transfers - Non complementary electron transfer reactions- Marcus theory - complexometric titrations - chelating agents - Types of EDTA titrations direct and back titrations- replacement titration, Masking and demasking agents.

UNIT III

ORGANOMETALLIC CHEMISTRY

Carbon donors : Eighteen electron rule - Structure and bonding in carbonyls, nitrosyls, olefins and ferrocene. Electrophilic and nucleophilic attack on ligands, carbonylation and decarboxylation, oxidative addition.

Catalysis- Hydrogenation of olefins (Wilkinson´s catalyst), hydroformylation of olefins using Cobalt or Rhodium catalyst (OXO Process), Oxidation of olefins to aldehydes and ketones (Wacker process): polymerization (Ziegler - Natta catalyst), Cyclo oligomerisation of acetylene using nickel catalyst (Reppe′s catalyst).

UNIT IV

NUCLEAR CHEMISTRY I

Fundamental particles-Nuclear spin and moments - n/p ratio –Binding energy and stability-Origin of nuclear forces - modes of radioactive decay-orbital electron capture-Nuclear isomerism - Internal conversion- Auger effect. Nuclear structure and stability- packing fraction- Mass defect-Binding energy - salient features of the liquid drop and shell model-Detection and determination of activity by Geiger-Muller and Scintillation counters- Wilson-Cloud chamber. Nuclear reactions - Types - Nuclear cross section - Q value, threshold energy - compound nuclear theory - Nuclear fission, fusion and spallation reaction - Thermo nuclear reactions - stellar energy.

UNIT V

NUCLEAR CHEMISTRY II

Artificial transmutation - methods of producing projectiles - Types of Accelerators - linear & cyclic – cyclotron - synchrotron- Betatron -Van de Graaff Accelerator. Activation analysis and Radiometric titrations- Applications of radio isotopes –Nuclear pollution- Disposal of radioactive wastes - Dilute and Disperse method - Delay and Decay method- Concentrate and Contain method - reprocessing of spent Uranium fuel and its disposal- Recent method to dispose critically dangerous radio wastes- chemical methods of disposal- other methods-reprocessing, immobilization and by Vitrification.

References

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UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1:			
	Labile and inert complexes- VBT explanation- Ligand substitution reactions in octahedral complexes S_N^1 mechanism (dissociative mechanism) – S_N^2 Mechanisms (Associative mechanism)	5	Lecture
	S_N^1CB substitution, Nucleophilic, Unimolecular conjugate base mechanism- Substitution in square planar complexes	3	Lecture
	trans effect- theories of trans effect – Applications of trans effect	3	ICT
	Cis effect and Taube's explanation of lability and inertness	2	Seminar
UNIT II; **ELECTRON TRANSFER REACTIONS AND APPLICATIONS OF COORDINATION COMPLEXES**			
	Electron transfer reactions – Outer sphere mechanism- Inner sphere mechanism- OSM vs ISM	5	Lecture
	two electron transfers – Non complementary electron transfer reactions	3	Lecture
	complexometric titrations – chelating agents – Types of EDTA titrations direct and back titrations- replacement titration	3	Seminar
	Masking and demasking agents.	1	Group discussion
UNIT III: **ORGANOMETALLIC CHEMISTRY**			
	Eighteen electron rule- Structure and bonding in carbonyls, nitrosyls, olefins and ferrocene.	4	Lecture
	Electrophilic and nucleophilic attack on ligands, carbonylation and decarboxylation, oxidative addition.	4	Lecture

UNIT IV **NUCLEAR CHEMISTRY I**			
	Nuclear spin and movements, origin of nuclear forces, modes of radioactive decay and nuclear stability	5	Lecture
	Liquid drop and shell model of nucleus	5	ICT
	Detection and determination of radioactivity	5	Lecture
	Nuclear reactions	5	Lecture
UNIT V **NUCLEAR CHEMISTRY II**			
	Methods of producing projectiles, types of accelerators	2	ICT
	Activation, analyses and radiometric titration, application of radio isotopes.	3	Lecture
	Disposal of radioactive wastes	10	Seminar

Course Outcomes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO 1	PO 2	PO3	PO4	PO 5	PSO1	PSO 2	PSO3	PSO4	PSO 5	
CO1	5	3	4	4	4	4	3	4	4	4	3.9
CO2	4	5	4	4	4	4	4	4	3	3	3.9
CO3	4	4	4	4	4	4	4	4	4	3	3.9
CO4	5	4	4	3	4	4	3	4	4	4	3.9
CO5	5	4	4	3	4	4	4	4	4	3	3.9
Mean Overall Score											3.9

Result: The Score for this Course is 3.9 (High Relationship)

Course Designer: Dr. R. PARIMALAM
Dr. A. JOSEPHINE VANITHA

Programme : M.Sc Chemistry **CORE 7**
Semester : II **Hours : 5 P/W, 75 Hrs/S**
Sub. Code : DB2 **Credits : 4**

TITLE OF THE PAPER: ORGANIC CHEMISTRY II

Pedagogy	Hours	Lecture	Peer Teaching/seminar/role play/discussion/tutorial/problem solving session/quiz/lab session/videos/demonstration class/library session.	ICT
	5	3	1	1

PREAMBLE: The objective of the course is to make the student recognize and analyze electrophilic, nucleophilic addition reactions, additions to carbonyl compounds, stereochemical requirement for α,β and cis elimination and their mechanisms, Bredt's rule, various free radical reactions with their mechanisms, various electrophilic and nucleophilic rearrangement with their mechanisms, difference between configuration and conformation, conformation of acyclic compounds- ethane, propane, n-butane, halo alcohols and diols, physical methods of conformational analysis, reactivity of acycliccompounds, conformational analysis of cyclohexane, mono and disubstituted cyclohexanes, reactivity of cyclohexyl systems towards E_2 and cis-elimination, NGP, oxidation, intramolecular rearrangement, ester hydrolysis, substitution reactions, preparation and properties of compounds with two hetero atoms in ring and synthesis of heterocyclic compounds containing two hetero atoms in a sex-membered ring.

COURSE OUTCOME: At the end of the Semester II, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: explain various reactions of addition to c-c multiple bond and c– hetero multiple bond (carbonyls only).	1	15
UNIT 2 CO2: ELIMINATION AND FREE RADICAL REACTIONS; explain elimination and free radical reactions with their detailed mechanism, stereochemistry and Bredt's rule.	2	15
UNIT 3 CO3: MOLECULAR REARRANGEMENTS classify the rearrangements into electrophilic and nucleophilic with suitable examples and to identify the rearrangements involving C-C and C-N migrations	3	15
UNIT 4 CO4: CONFORMATIONAL ANALYSIS OF ACYCLIC & CYCLOHEXYL SYSTEMS: Draw the conformations of ethane, propane, n-butane halo alcohols, glycols, butane-2,3-diols and explain the physical methods of conformational analysis, reactivity of acyclic compounds and conformational analysis and reactivity of cyclohexyl systems.	4	15
UNIT 5 CO5:HETEROCYCLIC RINGS discuss the preparation, properties of pyrazole, oxazole, thiazole, synthesis of benzofuran, thianaphthene, pyridazine, barbituric acid, pyrimidine, thymine and cytosine	5	15

UNIT-I

ADDITION TO C-C MULTIPLE BOND AND C– HETERO MULTIPLE BOND (CARBONYLS ONLY)

Electrophilic addition: Formation of π complexes - Stereochemical Consequences - addition to cyclic Alkenes - Effect of substituent on the rate of addition - Addition to hydrogen halide. Alkyne-Hydroboration, Epoxidation and hydroxylation, Ozonolysis - Addition to conjugated diene- Diel′s Alder reaction

Nueleophilic addition : Addition to acrylonitrile - unsaturated carbonyl compounds (Michael addition)

Addition to carbonyl compounds: Mechanism of Aldol, Benzoin, Claisen, Dieckmann condensation - Perkin, Knoevenagal, Mannich, Cannizaro, Darzen′s and Reformatsky reaction - Wittig Reaction and its modification.

UNIT-II

ELIMINATION AND FREE RADICAL REACTION

α,β eliminations - E_2, E_1, E_1CB Mechanism - Stereochemical preferences-orientation of the double bond - Effect of substrate, base, leaving group and reaction medium - elimination Vs substitution - Pyrolytic cis elimination and their stereochemistry - Bredt′s rule.

α – Elimination –Carbenes – Singlet and triplet – generation – Reactions.

Free radical reaction : Halogenation, Addition, Oxidation, Reduction and Rearrangement reaction - Barton, Sandmeyer, Gomberg-Bechmann, Ullmann, Pschorr and Hunsdiecker reaction.

UNIT-III

MOLECULAR REARRANGEMENT

Nucleophilic rearrangement - Nature of Migration - Migratory Aptitude - Memory effects – Longer Nucleophilic Rearrangements - Electrophilic Rearrangement - Mechanism of Wagner Meervain, Pinacol-Pinacolone, Benzil-benzilic acid, Schmidt, Hoffmann, Wolff, Curtius, Fries, Favorskii, Stevens, Lossen, Beckmann, Neber, Demjanov, Dienone - Phenol, Bayer-Villiger, Claisen and Cope rearrangement.

UNIT-IV

CONFORMATIONAL ANALYSIS

Configuration and conformation – conformation of acyclic compounds (Ethane, Propane, dimethyl propane, n-butane, 2,3-dimethyl butane, halo alcohols, glycols, 2,3 - dibromo Butane, Butane–2,3-diol) - Physical methods for conformational Analysis – Conformation and Intra molecular Hydrogen Bonding - Reactivity.

Conformation of Monosubstituted and Disubstituted cyclohexanes. Conformation of cyclohexane - Monosubstituted cyclohexane - Disubstituted cyclohexane (1, 1, 1,2, 1,3 & 1,4) - Reactivity - Examples of E_2 and Cis elimination, Neighbouring group participation, Oxidation, Intramolecular rearrangement, Ester-hydrolysis, S_N1, S_N2 and S_Ni reactions - Conformation of Decalins.

UNIT – V

HETEROCYCLES

Compounds with two Heteroatoms in ring - Preparation and properties of Pyrazole, Imidazole, Isoxazole, Oxazole, Thiazole, Isothiazole. Synthesis of Benzofuran, Thianaphthene, Isobenzofuran, Isothianaphthene.

Two Heteroatoms in a Six membered ring - Synthesis of Pyridazine, Barbituric acid, Pyrimidine, Thymine, Cytosine.

References

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4 S.M. Mukerjee and S.P. Singh, Pericyclic Reactions, Macmillan, 1976.
5 E.L. Eliel, Stereochemistry of Carbon Compounds, McGraw Hill, 1962.
6 V.M. Potapov, Stereochemistry, MIR Publishers, Moscow 1979.
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UNITS	TOPICS	LECTURE HOURS	MODE OF TEACHING
UNIT I: ADDITION TO C-C MULTIPLE BOND AND C− HETERO MULTIPLE BOND (CARBONYLS ONLY)			
	Stereochemical Consequences - addition to cyclic Alkenes - Effect of substituent on the rate of addition - Addition to hydrogen halide.	3	ICT
	Concepts of Electrophilic addition and Nueleophilic addition	10	Lecture
	Ozonolysis - Addition to conjugated diene- Diel′s Alder reaction	2	Seminar
UNIT II: ELIMINATION AND FREE RADICAL REACTION			
	α,β eliminations - E2, E1, E1CB Mechanism - Stereochemical preferences in elimination reactions, Bredt′s rule.	3	ICT
	α,β eliminations - E2, E1, E1CB Mechanism - Stereochemical preferences-orientation of the double bond - Effect of substrate, base, leaving group and reaction medium - elimination Vs substitution - Pyrolytic cis elimination and their stereochemistry - Bredt′s rule. α – Elimination –Carbenes – Singlet and triplet – generation – Reactions. **Free radical reaction :** Halogenation, Addition, Oxidation, Reduction and Rearrangement reaction - Barton, Sandmeyer, Gomberg-Bechmann, Ullmann, Pschorr and Hunsdiecker reaction	10	Lecture
	Carbenes – Singlet and triplet – generation – Free radical reactions	2	Seminar
Unit III: MOLECULAR REARRANGEMENT:			
	Classification into electrophilic, nucleophilic, C-C & C-N migrations	4	ICT
	Various rearrangements with their detailed mechanism, suitable examples and synthetic utility.	11	Lecture
UNIT IV: CONFORMATIONAL ANALYSIS OF ACYCLIC AND CYCLOHEXYL SYSTEMS			
	Conformations of ethane, propane, n-butane halo alcohols, glycols, butane-2,3-diols, chair and boat conformations of cyclohexane, mono and di substituted cyclohexyl systems and decalins.	3	ICT
	Conformational analysis of of ethane, propane, n-butane halo	10	Lecture

	alcohols, glycols, butane-2,3-diols, reactivity of acyclic compounds such as elimination, addition and substitution reactions with their stereo-electronic requirements. Conformational analysis of cyclo hexyl systems and their reactivity in elimination, NGP, oxidation, intramolecular rearrangement, ester hydrolysis, substitution reactions, conformational analysis of decalins.		
	Ball and stick model for conformations of acyclic and cyclohexyl systems	2	Demonstration with discussion
UNIT V:HETEROCYCLES			
	Biological importance of benzofuran, thianaphthene, isobenzofuran, isothianaphthene, pyradizinebarbituric acid, pyrimidine, thymine	4	ICT
	Preparative methods and explainations for the chemical properties of pyrazole, imidazole, isoxazole, thiazole, isotiazole, synthesis of benzofuran, thianaphthene, isobenzofuran, isothianaphthene, pyradizinebarbituric acid, pyrimidine, thymine	11	Lecture

Course Outcomes (COs)	Mean scores of Cos										
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	4	4	3	3	3	4	4	4	4	4	3.7
CO2	4	4	4	4	3	4	4	4	4	4	3.9
CO3	4	4	3	3	3	4	4	4	4	4	3.7
CO4	4	4	4	3	3	4	4	4	4	3	3.7
CO5	4	4	4	4	4	4	4	4	4	4	4.0
Mean score 3.8											

Result: The Score for this Course is 3.8 (High Relationship)

Course Designer: Mrs. P. ROOPAKALYANI, Mrs. B. MARIAMMAL.

Programme : M.Sc Chemistry **CORE 8**
Semester : II **Hours : 5 P/W, 75 Hrs/S**
Sub. Code : DB3 **Credits : 4**

TITLE OF THE PAPER: PHYSICAL CHEMISTRY II

Pedagogy	Hours	Lecture	Peer Teaching/Seminar/Role play/Discussion/Tutorial/Problem solving session/Quiz/Lab session/videos/Demonstration class/Library session.	ICT
	5	3	1	1

PREAMBLE: The objective of the course is to make the student to enlighten Quantum Chemistry,Group Theory, Thermodynamics, Phase rule, Chemical Kinetics, and Electrochemistry.

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: **QUANTUM CHEMISTRY II** describe Schrodinger wave equation to Particle in one dimensional and three dimensional box, Tunneling Degeneracy removal of degeneracy, Radial and angular wave functions and quantum numbers & assign wave function to Rigid Rotor, Simple Harmonic Oscillator and Hydrogen atom .	1	15
UNIT 2 CO2: **GROUP THEORY II** discuss Orthogonality theorem , properties of irreducible representation , relationship between reducible and irreducible representations, hybrid orbitals in nonlinear molecules, hybridisation of atomic orbitals in CH_4 and $[PtCl_4]^{-2}$, representations of vibrational modes in non-linear molecules H_2O, NH_3 and BF_3 molecules, Selection rules for vibrational IR and Raman spectra. construct the character table for point groups C_2V and C_3V.	2	15
UNIT 3 CO3: **THERMODYNAMICS AND PHASE RULE** explain Law of mass action ,Van′t Hoff Reaction isotherm Temperature dependence of equilibrium constant, The Van′t Hoff equation and Pressure dependence of equilibrium consatant. apply phase rule to Fe-C system, three component system Roozeboom plots acetic acid - chloroform - water system, plait point system involving two solids and a liquid NaCl, discuss Crystallization of pure components, formation of hydrates, formation of double salts with examples, salting out phenomenon.	3	15
UNIT 4 CO4: **CHEMICAL KINETICS I** explain Collision theory of Bimolecular reactions ARR theory, the theories of unimolecular and Bimolecular gaseous reactions, Kinetics in solution, comparison between gas phase and solution, ARR theory between ions in solution primary & secondary salt effect and isotope effects.	4	15

UNIT 5 CO5: **ELECTROCHEMISTRY III** describe Bjerrum treatment of ion association, factors influencing ion association, explain Electrodics, electrolyte interface, formation of double layer Helmholtz and stern model explain and derive Electrocapillarity , electrocapillary curves , Lipmann equation , Measurement of interfacial tension using Lipmann capillary electrometer, Lipmann potential. describe Electrokinetic phenomena, electrosmosis, Streaming potential, Electrophoresis Zeta potential.	5	15

UNIT I
QUANTUM CHEMISTRY II
Particle in one dimensional and three dimensional box – tunneling – Degeneracy – removal of degeneracy.

Rigid Rotor, Simple Harmonic Oscillator – Hydrogen atom – separation of variables – Radial and angular wave functions - quantum numbers.

UNIT II
GROUP THEORY II
Orthogonality theorem – Properties of irreducible representations – Relationship between reducible and irreducible representations - Construction of character table for point groups C_2V and C_3V. Hybrid orbitals in nonlinear molecules – Hybridisation of atomic orbitals in CH_4 and $[PtCl_4]^{2-}$. Determination of representations of vibrational modes in non-linear molecules H_2O, NH_3 and BF_3 molecules. Selection rules for vibrational IR and Raman spectra.

UNIT III
THERMODYNAMICS AND PHASE RULE
3.1. Law of mass action - Van′t Hoff Reaction isotherm - Temperature - dependence of equilibrium constant - The Van′t Hoff equation - Pressure dependence of equilibrium consatant

3.2. Applications of phase rule to Fe-C system. Three component system Roozeboom plots acetic acid - chloroform - water system - plait point - system involving two solids and a liquid NaCl - Crystallization of pure components, formation of hydrates, formation of double salts with examples, salting out phenomenon.

UNIT IV
CHEMICAL KINETICS I
Collision theory of Bimolecular reactions : ARR theory. Theories of unimolecular gaseous reactions – Hinshelwood theory, RRK theory, RRKM theory.
Kinetics in solution - Comparison between gas phase and solution - Collision in solution - ARR theory applicable to reactions between ions in solution - salt effect, primary & secondary and isotope effects.

UNIT V

ELECTROCHEMISTRY III

Ion association - Bjerrum treatment of ion association - factors influencing ion association. Electrodics: electrode - electrolyte interface - formation of double layer- Helmholtz and stern model - Electrocapillarity - electrocapillary curves - Lipmann equation - Measurement of interfacial tension using Lipmann capillary electrometer - Lipmann potential. Electrokinetic phenomena - electrosmosis - Streaming potential – Electrophoresis -Zeta potential.

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17.Subash and Satish, Chemical kinetics and Catalysis, Jeyaprakash & Co.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1 : QUANTUM CHEMISTRY II			
	Schrodinger wave equation to Particle in one dimensional and three dimensional box ,Tunneling Degeneracy removal of degeneracy.	4	ICT
	Radial and angular wave functions and quantum numbers.	7	Lecture
	Solution for wave function to Rigid Rotor, Simple	4	Problem

	Harmonic Oscillator and Hydrogen atom.		solving
UNIT 2 : **GROUP THEORY II**			
	Orthogonality theorem , Properties of irreducible representation , Relationship between reducible and irreducible representations.	8	Lecture
	Character table for point groups C_2V and C_3V. Hybrid orbitals in nonlinear molecules, Hybridisation of atomic orbitals in CH_4 and $[PtCl_4]^{-2}$.	4	ICT
	Representations of vibrational modes in non-linear molecules H_2O, NH_3 and BF_3 molecules. Selection rules for vibrational IR and Raman spectra.	3	Seminar
UNIT 3 : **THERMODYNAMICS AND PHASE RULE**			
	Law of mass action ,Van't Hoff Reaction isotherm, Temperature dependence of equilibrium constant, TheVan't Hoff equation, Pressure dependence of equilibrium constant Phase rule to Fe-C system.,Three component system Crystallization of pure components, formation of hydrates, formation of double salts with examples, salting out phenomenon	9	Lecture
	Roozeboom plots acetic acid - chloroform - water system,plait point system involving two solids and a liquid NaCl.	4	ICT
	Crystallization of pure components, formation of hydrates, formation of double salts with examples, salting out phenomenon.	2	Seminar
UNIT 4 : **CHEMICAL KINETICS I**			
	Collision theory of Bimolecular reactions ARR theory. Theories of unimolecular and Bimolecular gaseous reactionsKinetics in solution,Comparison between gas phase and solution ARR theory between ions in solution . primary & secondary salt effect and isotope effects.	12	Lecture
	Collision theory of Bimolecular reactions ARR theory. Theories of unimolecular and Bimolecular gaseous reactions	3	ICT
UNIT 5 : **ELECTROCHEMISTRY III**			

	Bjerrum treatment of ion association,factors influencing ion association. Electrodics, electrolyte interface, formation of double layer Helmholtz and stern model Electrokinetic phenomena, electrosmosis, Streaming potential Electrophoresis Zeta potential. Electrocapillarity, electrocapillary curves, Lipmann equation, Measurement of interfacial tension using Lipmann capillary electrometer , Lipmann potential.	12	Lecture
	formation of double layer Helmholtz and stern model Electrokinetic phenomena, electrosmosis.	3	ICT

Course Outcomes (Cos)	Programme Specific Outcomes (PSOs)										Mean scores of Cos
	PO 1	PO2	PO3	PO4	PO5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	
CO1	4	5	4	4	4	3	4	4	4	5	4.1
CO2	4	5	4	3	3	4	5	4	3	4	3.9
CO3	4	4	3	4	3	4	5	4	3	4	3.8
CO4	4	5	4	3	3	4	5	4	3	4	3.9
CO5	5	4	3	3	4	4	5	4	4	4	4.0
											3.94

Result: The Score for this Course is 3.94 (High Relationship)

Course Designer: Dr. N. MANONMANI,
Dr. P. SHANTHY.

Programme : M.Sc Chemistry **ELECTIVE: 2**
Semester : II **Hours : 5 P/W, 75 Hrs/S**
Sub. Code : EDB1 **Credits : 5**

TITLE OF THE PAPER: MOLECULAR SPECTROSCOPY & ANALYTICAL CHEMISTRY II

Pedagogy	Hours	Lecture	Peer Teaching/Seminar//Discussion//Problem solving session/Quiz/videos/Library session.	ICT
	5	3	1	1

PREAMBLE: The objective of the course is to make the student to comprehend the principle, instrumentation and applications of various spectra such as UV, IR, Raman, Mass and Chromatographic techniques.

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: demonstrate the fundamentals of molecular spectroscopy and UV spectroscopy.	1	15
UNIT 2 CO2: demonstrate the fundamentals of vibrational spectroscopy, the selection rules , Instrumentation and the interpretation of IR spectra.	2	15
UNIT 3 CO3: explain the underlying principle of Rayleigh and Raman scattering,, differentiate stokes and antistokes lines, Raman and IR spectra and its applications in the structural determination of compounds.	3	15
UNIT 4 CO4: demonstrate the fundamentals of mass spectrometry and mass spectra of important functional groups.	4	15
UNIT 5 CO5: explain the principle, instrumentation and applications of Gas liquid chromatography, HPLC and Electrophoresis.	5	15

UNIT I NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY

Theory of Magnetic Resonance spectroscopy - population of energy levels - equation of motion of spin in magnetic fields - relaxation times – instrumentation - chemical shift- spin-spin coupling – ^{1}H NMR of simple AX and AMX type molecules- chemical shift, spin-spin coupling, coupling constants, factors influencing proton chemical shift - vicinal proton-proton coupling constant- spin decoupling - improving the NMR spectrum - shift reagents. Effect of changing magnetic field. Nuclear Overhauser effect - Applications to organic structures, a brief qualitative discussion of Fourier transform spectroscopy. Simple problems involving UV, IR and NMR to be solved.

UNIT II

^{13}C NMR, 2D NMR AND ESR SPECTROSCOPY

^{13}C resonance spectroscopy - Comparison of ^{13}C NMR and ^{1}H NMR - Chemical shift - Factors affecting chemical shift - Chemical shifts of aliphatic, olefinic, alkynic, aromatic, carbonyl carbons. 2D NMR spectroscopy (only elementary idea) about COSY. ESR spectroscopy - differences between ESR and NMR - Hyperfine splitting - relation between hyperfine splitting and unpaired electron density- McConnel equation. Applications of ESR spectroscopy - ESR instrumentation - ENDOR- ELDOR .

UNIT III

MOSSBAUER & PHOTOELECTRON SPECTROSCOPY

Principles of Mossbauer spectroscopy, Doppler shift, recoil energy, experimental techniques

Isomer shift, quadrupole splitting, magnetic hyperfine interaction- chemical applications - isomer shift and quadrupole splitting in iron complexes.

Photoelectron spectroscopy (PES): Principle - Auger electron - Applications of ultraviolet PES, X-ray PES.

UNIT IV

THERMOANALYTICAL & SPECTROANALYTICAL TECHNIQUES

Thermoanalytical techniques: Instrumentation (Block diagram only) and applications of thermogravimetry - Differential thermal analysis and Differential scanning colorimetry - Factors affecting TGA and DTA curves.Flame photometry - Atomic absorption spectrometry and Atomic emission spectrometry.

UNIT V

POLARIMETRY

Principles - Optical rotatory dispersion and circular dichroism in organic chemistry. Definition of Rotatory dispersion, circular dichroism, Cotton effect, Dispersion curves - Recognition and location of a carbonyl group in an asymmetric environment. The octant rule and the haloketone rule.

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UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1: FUNDEMENTALS OF SPECTROSCOPY & UV SPECTROSCOPY			
	Instrumentation of UV, Steric inhibition of resonance	3	ICT
	Fundamentals of molecular spectroscopy, Resolution, intensity, and width, selection rules, transition probability of spectral transitions, Fourier transform and CAT techniques Fundamentals of UV spectroscopy, Steric inhibition of resonance, Frank Condon principle, Factors affecting absorbance.	10	LECTURE
	Natural conjugated systems, Bathochromic shift and hypsochromic shifts with examples	2	Seminar
	TOTAL	15	
UNIT 11 Vibrational spectroscopy			
	Anharmonic oscillator, Overtones, Selection rules, Fermi resonance, and Group frequencies	9	Lecture
	Calculation of fundamental vibration, Finger print region, Effect of solvent and hydrogen bonding.	3	Problem solving, Quiz &Seminar
	Instrumentation and sampling techniques, and Examples of IR spectral interpretation .	3	ICT
	TOTAL	15	
UNIT III Raman spectroscopy and rotational spectroscopy			
	Rayleigh and Raman Scattering, Stokes and Anti stokes lines, Rule of mutual exclusion, Combined uses of IR and Raman spectroscopy in the structural elucidation. Microwave spectroscopy Rotational spectra of diatomic molecules, Determination of moment of Inertia	9	Lecture
	Difference between Raman and IR, Advantages uses of Raman spectroscopy	3	Peer teaching/ seminar
	Instrumentation and Structural elucidation of simple molecules	3	ICT
	TOTAL	15	
UNIT IV Mass spectrometry			
	Instrumentation of Mass spectrometry, MALDI ion Analysis, Quadrupole mass spectrometry, Time of flight	3	ICT
	Identifying the compounds using mass spectra	2	Problem session
	Fundamentals of mass spectrometry, Different ionization techniques, Determination of molecular formula using natural abundance, Discussing different peaks involved, McLafferty	10	Lecture

	rearrangement, Mass spectra of various functional groups		
UNIT V Chromatography			
	Principles of Chromatography, GC, HPLC, Ion exchange chromatography and Electrophoresis	9	Lecture
	Applications of GC, HPLC and Electrophoresis.	3	Group discussion Seminar
	Instrumentation and working of GC, HPLC and Electrophoresis	3	ICT

Course Outcomes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO 1	PO 2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	4	5	4	4	3	4	4	4	4	3	3.9
CO2	4	5	4	4	3	4	4	3	4	3	3.8
CO3	3	4	4	4	3	4	3	4	4	3	3.6
CO4	4	4	4	4	3	4	4	4	4	3	3.8
CO5	4	4	4	4	4	4	4	3	5	3	3.9
Mean Overall Score											3.8

Result: The Score for this Course is 3.8 (High Relationship)

Course Designer : Dr. J. ARUL MOLI
Dr. K. VIGNESWARI

Programme : M.Sc Chemistry **ELECTIVE: 2**
Semester : II **Hours : 5 P/W, 75 Hrs/S**
Sub. Code : EDB2 **Credits : 5**

TITLE OF THE PAPER: POLYMER CEMISTRY

Pedagogy	Hours	Lecture	Peer Teaching/Seminar//Discussion//Problem solving session/Quiz/videos/Library session.	ICT
	5	3	1	1

PREAMBLE: The objective of the course is to make the student understand the general structure and types of polymers, their mechanism, preparation properties and uses of various polymers, determine the molecular weight of the polymers, the chemistry behind various methods of polymer processing.

COURSE OUTCOME: At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: identify the repeat units of particular polymers and specify the isomeric structures which can exist for those repeat units and account for reaction mechanisms during radical, ionic and condensation polymerization.	1	15
UNIT 2 CO2: describe the general method of preparation and uses of various industrially important polymers.	2	15
UNIT 3 CO3: indicate how the properties of polymeric materials can be exploited and estimate the number- and weight-average molecular masses of polymer samples given the degree of polymerisation and mass fraction of chains present..	3	15
UNIT 4 CO4: place emphasis on how the various synthetic techniques that are used to control structural features of polymer along with methods of degradation of polymers.	4	15
UNIT 5 CO5: describe various processing methods of polymers.	5	15

UNIT I
CLASSIFICATION OF POLYMERS AND CHEMISTRY OF POLYMERISATION

Classification of Polymers, linear polymers, non-linear or branched polymers, cross – linked polymers, homopolymers, co-polymers, block polymers and graft polymers.
Chemistry of polymerization: Types of polymerization – mechanism – chain, Ionic, co-ordination, ring opening, metathetical, group transfer, polyaddition and polycondensation polymerizations.

UNIT II
INDIVIDUAL POLYMERS

Individual Polymers: Monomers required general methods of preparation, repeat units and uses of the following polymers and resins, polystyrene, polyacrylonitrile, polymethyl, methacrylate, Polytetra–fluoroethylene, polybutadienes and polychloroprene, polyesters, polycarbonates, polyimides, polyamides (Kevlar), polyurethanes, polyethylene, glycols, phenol – formaldehyde, urea–formaldehyde, melamine–formaldehyde and epoxy resins.

UNIT III
PROPERTIES OF POLYMERS

Intrinsic properties – processing properties – basic idea of isomerism of polymers – configuration of polymer chain – geometrical structure – syndiotatic, isotatic and atatic polymers.

Glass transition temperature: Definition – factors affecting glass transition temperature – relationships between glass transition temperature and (a) molecular weight, (b) melting point and (c) plasticizer – importance of glass transition temperature – heat distortion temperature.

Molecular weight and size of polymers: Number average, weight average, sedimentation and viscosity - average molecular weights – molecular weights and degree of polymerization – poly dispersity – molecular weight distribution in polymers – size of polymer molecules – kinetics of polymerization.

UNIT IV
POLYMERISATION TECHNIQUES, DEGRADATION AND USES OF POLYMERS

Polymerisation Techniques: Bulk, solution, suspension, emulsion, melt condensation and interfacial polycondensation polymerizations, Degradation: Types of degradation – thermal, mechanical, ultrasonic and photodegradation – photo stabilizers – oxidative degradation – antioxidants – hydrolytic degradation. Uses of polymers in electronics and biomedicine

UNIT V
POLYMER PROCESSING

Polymer processing: Plastics (thermo and thermosetting), elastomers, fibres, compounding, plasticizers, colorants, flame retardants. Compression and injection mouldings – film extrusion and calendaring – die casting and rotational casting – thermofoaming – reinforcing.

References

1. V.R.Gowarikar, N.V. Viswanathan and Jayadev Sreedher, "Polymer Science", Wiley Eastern Ltd., New Delhi, 1986.
2. B.K.Sharma, "Polymer Chemistry", Goel Pub., House, Meerut 1989.
3. F.W.Billmeyer, "Text Book of Polymer Science", 3rd edn., John Wiley and sons, New York, 1984.
4. P.Bahadur, N.V.Sastry, Principles of Polymer Science, II nd Edn., Narosa Pub. House Pvt. Ltd., New Delhi, 2005.
5. G.S.Misra, Introductory Polymer Chemistry, New Age International Pub., New Delhi, 2005.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT I: **CLASSIFICATION OF POLYMERS AND CHEMISTRY OF POLYMERISATION**			
	Classification of Polymers, linear polymers, non-linear or branched, cross linked polymers, homopolymers, co-polymers, block polymers and graft polymers.	5	Discussion / seminar/ peer teaching

	Types of polymerization – mechanism – chain, Ionic, co-ordination	5	Lecture
	ring opening, metathetical, group transfer, polyaddition and polycondensation polymerizations.	5	ICT
UNIT II: **INDIVIDUAL POLYMERS**			
	Preparation and uses of polystyrene, polyacrylonitrile, polymethyl, methacrylate	4	Lecture
	Preparation and uses of Polytetra–fluoroethylene, polybutadienes and polychloroprene, polyesters, polycarbonates, polyimides, polyamides	6	Library session followed by discussion/ seminar/ tutorial
	Preparation and uses of polyurethanes, polyethylene, glycols, phenol – formaldehyde, urea–formaldehyde, melamine–formaldehyde and epoxy resins	5	ICT
UNIT III: **PROPERTIES OF POLYMERS**			
	Intrinsic properties – processing properties, isomerism of polymers, configuration of polymer chain, geometrical structure, syndiotatic, isotatic and atatic polymers	4	Lecture
	Glass transition temperature: Definition – factors affecting glass transition temperature, importance of glass transition temperature, heat distortion temperature	4	Seminar / assignment
	relationships between glass transition temperature and (a) molecular weight, (b) melting point and (c) plasticizer	2	Discussion / library session
	Molecular weight of polymers: Number average, weight average, sedimentation and viscosity - average molecular weights, molecular weights and degree of polymerization, poly dispersity , molecular weight distribution in polymers	3	Problem solving session/ quiz
	size of polymer molecules, kinetics of polymerization.	2	ICT
UNIT IV : **POLYMERISATION TECHNIQUES DEGRADATION AND USES OF POLYMERS**			

	Polymerisation Techniques: Bulk, solution, suspension, emulsion, melt condensation and interfacial polycondensation polymerizations	6	Lecture
	Degradation: Types of degradation – thermal, mechanical, ultrasonic and photodegradation – photo stabilizers	5	Seminar / peer teaching
	oxidative degradation – antioxidants – hydrolytic degradation. Uses of polymers in electronics and biomedicine.	4	ICT
UNIT V: **POLYMER PROCESSING**			
	Plastics (thermo and thermosetting), elastomers, fibres, compounding, plasticizers, colorants, flame retardants.	7	Lecture
	Compression and injection mouldings, film extrusion and calendaring	4	Videos
	die casting and rotational casting, thermofoaming, reinforcing.	4	ICT

Course Outcomes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO 2	PSO3	PSO4	PSO5	
CO1	5	4	3	3	4	4	3	3	3	4	3.6
CO2	4	4	3	4	4	4	4	3	3	4	3.7
CO3	4	4	4	4	4	4	4	3	4	3	3.0
CO4	5	5	4	4	5	4	4	4	4	4	4.3
CO5	4	4	4	4	5	4	5	4	4	3	4.1
Mean Overall Score											3.74

Result: The Score for this Course is 3.74 (High Relationship)

COURSE DESIGNER : Mrs. D. RENUGA
Dr. K. ANURADHA

Programme : M.Sc Chemistry | **CORE 4**
Semester : I & II | **Hours : 5 P/W, 75 Hrs/S**
Sub. Code : DL1 | **Credits : 5**

TITLE OF THE PAPER : INORGANIC CHEMISTRY PRACTICAL

Pedagogy	Hours	Lab session//Demonstration class/Viva voce
	5	5

PREAMBLE: The objective of the course is to make the student understand the importance of semi micro Qualitative analysis of given inorganic mixture of basic radicals containing two common radicals and two rare radicals and prepare few inorganic complexes.

COURSE OUTCOME: At the end of the Semester, the Students will be able to	Unit	Hrs
UNIT 1 CO1: demonstrate the method of analyzing a mixture of basic radicals	1	100
UNIT II CO2: prepare crude and recrystallised samples of few inorganic complexes.	2	50

INORGANIC CHEMISTRY PRACTICAL

I : INORGANIC PREPARATION

1. Preparation of potassium tris(oxalato)chromate(III) trihydrate
2. Hexathiourea lead(II) nitrate
3. Tris thioureacopper(I) sulphate complex
4. Tetramminecopper(II) sulphate
5. Preparation of microcosmic salt

II. SEMIMICRO QUALITATIVE ANALYSIS

Semimicro qualitative analysis of mixtures containing two common and two rare cations. The following are the rare cations to be included: W, Mo, Ti, Te, Se, Ce, Th, V and Li.

References

1. J. Bassett *et al,* Text Book of Quantitative Chemical Analysis", 5th Edition, ELBS, Longmann, U.K., 1989.
2. V.V. Ramanujam, "Inorganic Semimicro Qualitative Analysis", The National Publishing Co,Ed.3, 2007
3. V.Venkatesan, R. Veerasamy, A.R.Kulandaivelu, Basic Principles of Practical Chemistry, S.Chand and Sons, 2004.
4. S.Sundaram, P.Krishnan and P.S.Ragavan, Practical Chemistry, Viswanathan Printers and Publishers.,1993.
5. Subash-Satish, Advanced Inorganic Analysis.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
Unit 1 : Analysis of a mixture of inorganic radicals			
	Two Common Cations and two rare cations from Group I to Group VI and Zeroth group	85	Lab Session
	Two Common Cations and two rare cations	10	Demonstration
	Two Common Cations and two rare cations	5	Viva
Unit 1 : Synthesis of inorganic complex ofcertain transition metals			
	Chromium, Lead, Copper(I), Copper(II), and microcosmic salt	35	Lab Session
	Crude and recrystallised sample	10	Demonstration
	Chromium, Lead, Copper(I), Copper(II), and microcosmic salt	5	Viva

Course Outcomes (COs)	Programme Specific Outcomes (PSOs)										Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	4	4	4	4	5	4	4	4	4	4	4.1
CO2	4	4	4	4	5	4	4	4	5	4	4.2
											4.15

The Score for this Course is 4.15 (Very High Relationship)

Course Designer: Dr. R. MUTHUSELVI.

Programme : M.Sc Chemistry **CORE 5**

Semester : I & II **Hours : 5 P/W, 75 Hrs/S**
Sub. Code : DL2 **Credits : 5**

TITLE OF THE PAPER : ORGANIC CHEMISTRY PRACTICAL

Pedagogy	Hours	Lab session//Demonstration class/Viva voce	
	4	4	
PREAMBLE: The objective of the course is to make the student to analyse the given mixture of organic compounds, synthesize organic compounds (double Stage) and to separate the mixture into components by paper/ TLC techniques.			
COURSE OUTCOME At the end of the Semester, the Students will be able to		Unit	Hrs
UNIT 1 CO1: analyse the given mixture of organic compounds		1	90
UNIT II CO2: synthesize organic compounds(double Stage) & separate the mixture of organic compounds into individual components by paper/ TLC techniques .		2	60

I . ANALYSIS OF MIXTURE OF ORGANIC COMPOUNDS

Qualitative Organic analysis – Separation and characterization of the compounds in two component mixture.

II. SYNTHESIS OF ORGANIC COMPOUNDS (involving double stage , any three)

1. p-Nitroaniline from acetanilide
2. Preparation of aspirin from methyl salicylate.
3. p-bromoaniline from acetanilide
4. m-nitrobenzoic acid from methylbenzoate

IV : Separation of mixture of organic compounds by paper/TLC chromatographic technique (Demonstration)

References

1. Arthur I Vogel, A text book of Practical Organic Chemistry including Qualitative Organic Analysis, 3rd Ed., English language book society and Longman Group Ltd, 1975.
2. B.B. Dey and M.V. Sitaraman, Laboratory manual of organic chemistry.
3. N.S.Gnanaprakasam, organic chemistry Lab Manual, 1st Ed., S.Viswanathan (Printers and Publishers), 2013.
4. G.Svehla, Vogel′s Quantitative Inorganic Analysis, 7th Ed., Pearson Education, 2003.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1 : ANALYSIS OF MIXTURE OF ORGANIC COMPOUNDS			
	analyse the given mixture of organic compounds – Separation and functional group detection	70	Lab Session
	analyse the given mixture of organic compounds – Separation and functional group detection	10	Demonstration
	analyse the given mixture of organic compounds – Separation and functional group detection	10	Viva
UNIT 1 : SYNTHESIS OF ORGANIC COMPOUNDS(Double stage) & SEPARATION OF MIXTURE OF ORGANIC COMPOUNDS			
	synthesis of organic compounds(double stage)	50	Lab Session
	synthesis of organic compounds(double stage) separation of mixture of organic compounds	5	Demonstration
		5	Viva

Course Outcomes (Cos)	Programme Specific Outcomes (PSOs)										Mean scores of COs
	PO 1	PO2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	
CO1	4	5	4	4	4	5	5	4	4	4	4.3
CO2	5	4	4	4	5	4	5	4	4	4	4.3
									Mean Score		4.3

Result: The Score for this Course is 4.3 (Very High Relationship)

Course Designer: Dr. C. MEENAKSHI,
Dr. P. SHANTHY

Programme : M.Sc Chemistry **CORE 9**
Semester : III **Hours : 5 P/W, 75 Hrs/S**
Sub. Code : DC1 **Credits : 4**

TITLE OF THE PAPER: INORGANIC CHEMISTRY-III

Pedagogy	Hours	Lecture	Peer Teaching/Seminar//Discussion//Problem solving session/Quiz/videos/Library session.	ICT
	5	3	1	1

PREAMBLE: The objective of the course is to make the student understand the importance of polyacids, inorganic polymers, structure and applications of metal clusters and hydrides, the chemistry behind lanthanides and actinides and functions of bioinorganic compounds

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: identify the structural features, properties, correlation and applications of inorganic polymers, polyacids of Vanadium, Chromium, Molybdenum and Tungsten.	1	15
UNIT 2 CO2: appreciate the chemistry of low molecularity metal clusters, examine the synthesis, structures, bonding and chemistry of specific boron hydrides.	2	15
UNIT 3 CO3: demonstrate an understanding of chemistry of f block elements their properties and separation of lanthanides and actinides.	3	15
UNIT 4 CO4: develop an appreciation for the structure and function of metal ions in the biological systems and explain how metal ions functions as catalytic and structural centers in biological systems.	4	15
UNIT 5 CO5: describe the flow and transformation of nitrogen through biological and physical process, gains insight into cutting edge developments that utilizes metal ions for medical purposes.	5	15

UNIT I
POLYACIDS AND INORGANIC POLYMERS

1.1. Poly acids: Isopoly acids and heteropolyacids of Vanadium, Chromium, Molybdenum and Tungsten.

1.2. Inorganic Polymers: Silicates, Structure, properties - correlation and applications- molecular sieves – polysulphur - nitrogen compounds and polyorganophosphazenes- polycarbonates.

UNIT II
HYDRIDES AND METAL CLUSTERS

Boron hydrides: Polyhedral boranes, hydroborate ions, carbonates and metallocarboranes, Metal clusters: Chemistry of low molecularity metal clusters (upto) trinuclear metal clusters; metal-metal multiple bonds.

UNIT III

LANTHANIDES AND ACTINIDES

Lanthanides - Electronic configuration - oxidation states - separation of lanthanides - chemical properties of +3 states - lanthanide contraction- colour and spectra - magnetic property- complexes, Lanthanide chelates.

Actinides - Electronic configuration- oxidation states - separation- magnetic property - Extraction of Thorium.

UNIT I V

BIO-INORGANIC CHEMISTRY I

Transport proteins, Porphyrin ring system -Oxygen carriers- Haemoglobin- Myoglobin- structure and functions- Oxygenation- Biological redox systems- Cytochromes- classification, Cytochrome a,b,c, Cytochrome P450- structure and functions - Iron-sulphur proteins- Rubredoxin and ferredoxin, Chlorophylls and photosynthesis. Copper containing proteins- Classification – blue copper proteins –plastocyanin - Ascorbic acid oxidase -Structure and functions- Ceruloplasmin and serum Albumin: Transport and storage of copper. Similarities between Iron and Copper in biological processes.

UNIT V

BIO-INORGANIC CHEMISTRY II

5.1. Nitrogen fixation – Introduction - Thermodynamic and kinetic aspects of N_2 fixation , types of nitrogen fixing microorganisms- Role and composition of nitrogenase in nitrogen fixation- structural representation of metal clusters in nitrogenase- redox property- dinitrogen complexes- Nitrogen fixation via nitride formation and reduction of dinitrogen to ammonia.

5.2. Vitamin B_{12} –Chemistry of cobalamin, biochemical functions.

5.3. Antimicrobial activity of metal chelates – Antiarthritic Gold drugs and chrysotherapy- Anti-inflammatory effects of zinc and copper compounds.

5.4. Anti cancer agents, role of metal ion, Radio isotopes- Diagnosis and treatment.

References

1. J.E.Huheey, Ellen A.Kaiter, Richard L. Kaiter & Okhil K. Medhi, Inorganic Chemistry Principles of Structure & Reactivity, 4th Ed., Pearson, 2011.
2. F.A.Cotton, G.Wilkinson, G.A.Murillo & M. Bochmann, Advanced Inorganic Chemistry, 1st Ed., Wiley Student Edn, 2007.
3. H.J. Emeleus & A.G.Sharpe, Modern aspects of Inorganic Chemistry, 4th Ed., ISBN, 1974.
4. K.F.Purcell and J.C.Koltz, Inorganic Chemistry, Holt Saunders, 1977.
5. B.R.Puri, L.R.Sharma & K.C.Kalia, Principles of Inorganic Chemistry, Vishal Pub.33 ed., 2017.
6. U.Malik, G.D.Tuli and R.D.Madan, Selected topics in Inorganic Chemistry, 1992.
7. R.D.Madan & Satya Prakash, Modern Inorganic Chemistry(Revised), S.Chand.
8. Gurtu, Subash and Satish, Chemistry of Rarer elements, Vol I & Vol II, Pragati Prakashan.
9. G.N.Mukherjee and Arabindadas, Elements of Bio-Inorganic Chemistry.
10. Asim K.Das, Bioinorganic Chemistry, Books and Allied P Ltd.,

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1: **POLYACIDS AND INORGANIC POLYMERS**			
	Isopoly and heteropoly acids of Vanadium, Chromium, Molybdenum and Tungsten.	6	Lecture
	Silicates, Structure, properties correlation and applications.	3	ICT
	molecular sieves, polysulphur nitrogen compounds	3	library session/ quiz
	polyorganophosphazenes- polycarbonates	3	Seminar
UNIT II: **HYDRIDES AND METAL CLUSTERS**			
	Boron hydrides: Polyhedral boranes	5	Lecture
	hydroborate ions, carbonates and metallocarboranes	4	Seminar/ Peer teaching
	Metal clusters: Chemistry of low molecularity metal clusters (upto) trinuclear metal clusters;	4	ICT
	metal-metal multiple bonds.	2	Discussion / role play
UNIT III: **LANTHANIDES AND ACTINIDES**			
	Lanthanides- Electronic configuration , oxidation states, separation of lanthanides .	3	Lecture
	chemical properties of +3 states, lanthanide contraction, colour and spectra.	3	ICT
	magnetic property- complexes, Lanthanide chelates.	3	Seminar/ assignment
	Actinides - Electronic configuration- oxidation states - Extraction of Thorium.	4	Lecture
	Separation and magnetic property of actinides.	2	Group discussion
UNIT IV : **BIO-INORGANIC CHEMISTRY I**			
	Transport proteins, Porphyrin ring system Oxygen carriers- Haemoglobin-Myoglobin-structure and functions- Oxygenation- Biological redox systems.	4	Lecture
	Cytochromes-classification, Cytochrome a,b,c, Cytochrome P450- structure and functions. Chlorophylls and photosynthesis.	4	Lecture
	Iron-sulphur proteins- Rubredoxin and ferredoxin,	2	Seminar/ assignment
	Copper containing proteins- Classification – blue copper proteins –plastocyanin - Ascorbic acid oxidase -Structure and functions.	3	ICT
	Ceruloplasmin and serum Albumin.	2	Group

	Transport and storage of copper. Similarities between Iron and Copper in biological processes.		discussion
UNIT V: **BIO-INORGANIC CHEMISTRY II**			
	Nitrogen fixation – Introduction - Thermodynamic and kinetic aspects of N_2 fixation , types of nitrogen fixing microorganisms- Role and composition of nitrogenase in nitrogen fixation-	4	Lecture
	Structural representation of metal clusters in nitrogenase- redox property dinitrogen complexes- Nitrogen fixation via nitride formation and reduction of dinitrogen to ammonia.	4	Lecture
	Vitamin B_{12} –Chemistry of cobalamin, biochemical functions	2	ICT
	Antimicrobial activity of metal chelates – Antiarthritic Gold drugs and chrysotherapy- Anti-inflammatory effects of zinc and copper compounds	3	Seminar/ Peer teaching
	Anti cancer agents, role of metal ion, Radio isotopes- Diagnosis and treatment.	2	library session/ assignment

Course Outcomes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of COs
	PO 1	PO 2	PO3	PO4	PO 5	PSO1	PSO 2	PSO3	PSO4	PSO 5	
CO1	5	3	4	4	4	4	4	4	4	4	4.0
CO2	4	3	4	4	4	4	4	3	4	4	3.8
CO3	4	4	4	4	4	4	4	3	4	4	3.9
CO4	5	4	4	4	4	4	4	4	3	4	4.0
CO5	5	4	4	4	4	4	4	3	4	4	4.0
Mean Overall Score											3.94

Result: The Score for this Course is 3.94 (Very High Relationship)

Course Designer: Dr. D. RENUGA,
Dr. T. UMAMATHI

Programme : M.Sc Chemistry **CORE 10**
Semester : III **Hours : 5 P/W, 75 Hrs/S**
Sub. Code : DC2 **Credits : 4**

TITLE OF THE PAPER: ORGANIC CHEMISTRY-III

Pedagogy	Hours	Lecture	Peer Teaching/Seminar/roleplay/ Discussion/Tutorial/Problem solving session/Quiz/Lab session/Videos/ Demonstration Class/Library session.	ICT
	5	3	1	1

PREAMBLE:

The objective of the course is to make the students acquire a sound and in-depth knowledge of the basic fundamental areas of Oxidation and Reduction, have thorough understanding of the important reagents used in Organic Synthesis, awareness of important organic name reactions and their mechanisms and develop a creative and critical thinking mind by learning retrosynthesis.

COURSE OUTCOME **At the end of Semester III, the students will be able to**	**Unit**	**Hrs P/S**
Unit 1 CO1: discuss the methods of oxidation in different environmental conditions	1	15
Unit 2 CO2: explain reduction reactions using different reducing agents.	2	15
Unit 3 CO3: select types of reagents used in various organic synthesis	3	15
Unit 4 CO4: identify organic name reactions and their mechanisms	4	15
Unit 5 CO5: plan new organic synthesis and carry out effectively.	5	15

UNIT I
OXIDATION

Formation of C=C, C-C bonds by dehydrogenation (Thermal elimination, using Quinones, SeO_2, Ferricyanide); C-C bond in phenol coupling, Acetylenic coupling; Oxidation of alcohols(Jones reagent, Sarett's reagent, Pfitzer – Moffatt reagent), Allyl alcohols (MnO_2, SeO_2 , Ag_2CO_3,); Oxidation of Amines; Oxidation of olefinic double bond(Prevost reagent, Chromyl chloride); Bayer villiger oxidation, Dakin reaction ; cleavage of Acyloin; ozonolysis; oxidation of Alkyl group (Etards reagent) ; Oxidation of aldehyde (Chromic acid)

UNIT II
REDUCTION

Catalytic reduction, Reduction by Hydrazins, Photochemical reduction, Homogeneous Hydrogenation, Reduction by Metal hydrides, Meerwein–Pondorff-Verley reduction – Hydrogen Transfer (Cannizaro reaction) - by dissolving metal.

UNIT III

REAGENTS IN ORGANIC SYNTHESIS

Use of the following reagents in Organic synthesis – Metal hydrides, Raney Ni, Gilmann reagent, Lithium diisopropylamide, Trimethyl silyl iodide, tri n-butyl tin hydride, OsO_4, DDQ, SeO_2, Woodward Prevost hydroxylation, Peterson′s synthesis, 1,3-dithiane, Willkinson′s catalyst.

UNIT IV

NAME REACTIONS

Arndt Eistert, Hoffmann – Loftler reaction Sharpless asymmetric epoxidation – Baylin Hillman, Biginelli, Mitsunobu, Friedlaendar, Hiyama coupling, Passerini, Petasis, Stille coupling, Suzuki coupling, Japp – Klingmann reaction, Heck, Buchwald Hartwig Cross coupling.

UNIT V

RETROSYNTHESIS

Disconnection and FGI – Synthon and synthetic equivalent – Retron, Supra retron, Partial retron, Chiron, Umpolung – Protection and deprotection – order of events – one group C-X disconnection - Two one group C-X disconnection – 1,2, 1,3, 1,4, 1,5, and 1,6 difunctional compounds.

References

1. F.S. Gould, Mechanism and Structure in Organic Chemistry, Holt, New York, 1959.
2. Principles of Organic Synthesis – R.O.C. Norman
3. R.E. Ireland, Organic Synthesis, Prentice Hall, 1969.
4. H.O. House, Modern Synthetic reactions, W.A. Benjamin Inc. California, 2nd Ed., 1972.
5. S. Warren, Designing Organic Synthesis – A programmed introduction to synthon approach, Wiley, New York, 1978.
6. S.M. Muherjee & S.P. Singh, Reaction Mechanism in Organic Chemistry, Mc Milan Ltd.,

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT I : OXIDATION			
	Formation of C=C, C-C bonds by dehydrogenation(Thermal elimination using Quinones, SeO_2& Ferricyanide)	3	Lecture, Tutorial, library session
	C-C bond in phenol coupling, Acetylenic coupling	2	Lecture and assignment
	Oxidation of alcohols(Jones reagent, Sarett's reagent, Pfitzer – Moffatt reagent), Allyl alcohols (MnO_2, SeO_2, Ag_2CO_3), Oxidation of Amines.	4	Lecture and ICT
	Oxidation of Olefinic double bond (Prevost reagent, Chromyl chloride)	2	Lecture and seminar

	Bayer villiger oxidation, Dakin reaction	1	Lecture and assignment
	cleavage of Acyloin, ozonolysis	1	lecture
	oxidation of Alkyl group (Etards reagent)	1	Lecture and Problem solving
	Oxidation of aldehyde (Chromic acid)	1	Lecture and discussion
UNIT II: REDUCTION			
	Catalytic reduction	2	ICT
	Various reducing agents	10	LECTURE
	Hydrogen transfer and by dissolving metals	3	SEMINAR
UNIT III: REAGENTS IN ORGANIC SYNTHESIS			
	1. Metal hydrides 2. Raney Ni 3. Gilmann reagent 4. Lithium diisopropylamide 5. Trimethyl silyl iodide 6. tri n-butyl tinhydride 7. OsO_4 8. DDQ 9. SeO_2 10. Woodward Prevost hydroxylation 11. Peterson′s synthesis 12. 1,3-dithiane 13. Willkinson′s catalyst.	15	Lecture, video, ICT, Discussion , Seminar, Assignment, Library session, Tutorial and Problem Solving
UNIT IV: NAME REACTIONS			
	Sharpless asymmetric epoxidation	2	ICT
	Various named reactions	6	Lecture
Name Reactions	1. Passerini 2.Petasis 3. Stille coupling 4. Suzuki coupling 5.Japp - Klingmann reaction 6. Heck 7. Buchwald Hartwig Cross coupling	7	Lecture, ICT, Seminar, Assignment, Problem Solving
Unit V: Retrosynthesis			
	Disconnection and FGI-synthon and synthetic equivalent -retron supra retiring, partial retron, Charon, umpolung	2	ICT
	One group and two one group C-X disconnection	10	LECTURE
	Protection de protection	3	SEMINAR

Course Outcomes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	
CO1	4	3	4	3	3	4	4	3	4	3	3.5
CO2	4	3	4	4	3	4	4	3	4	3	3.6
CO3	4	3	4	3	3	4	3	4	4	3	3.5
CO4	4	4	3	4	4	4	4	3	4	4	3.8
CO5	4	3	4	4	3	4	4	4	3	4	3.7
Mean Overall Score											3.62

Result: The Score for this Course is 3.62 (High Relationship)

Course Designer: Dr. C. MEENAKSHI,
Dr. R. MUTHUSELVI.

Programme : M.Sc Chemistry **CORE 11**
Semester : III **Hours : 5 P/W, 75 Hrs/S**
Sub. Code : DC3 **Credits : 4**

TITLE OF THE PAPER: PHYSICAL CHEMISTRY-III

Pedagogy	Hours	Lecture	Peer Teaching/Seminar/Role play/Discussion/Tutorial/Problem solving session/Quiz/Lab session/videos/Demonstration class/Library session.	ICT
	5	3	1	1

PREAMBLE: The objective of the Physical course is to make the student understand, learn and have an in-depth idea about the advanced concepts of Quantum Chemistry, Chemical Kinetics, Statistical Thermodynamics, Polymer Science and Surface phenomena.

COURSE OUTCOME: At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: discuss the advance concepts of Quantum Chemistry	1	15
UNIT 2 CO2: explain the Kinetics of fast reactions	2	15
UNIT 3 CO3: express the objective of Statistical Thermodynamics	3	15
UNIT 4 CO4: explain the properties of Polymers	4	15
UNIT 5 CO5: discuss Surface phenomena applying adsorption method	5	15

UNIT I

QUANTUM CHEMISTRY III

Approximation methods – Variation method and perturbation theory – Application to the helium atom, Slater determinable wave functions, Pauli′s exclusion principle - Born-Oppenheimer approximation – LCAO – MO and VB treatments of hydrogen molecules. Huckel π- electron theory and its application to ethylene and butadiene.

UNIT II

CHEMICAL KINETICS II

Kinetics of fast reactions – Flow methods : Stopped flow method- continuous and quenched flow methods – Pulse method – flash photolysis – Pulse radiolysis – Microscopic kinetics – molecular beam method – Marcus theory of electron transfer processes.

UNIT III

STATISTICAL THERMODYNAMICS

Objective of Statistical thermodynamics- Distinguishable and indistinguishable particles-ensemble and interactive systems – Microstates and macrostates - Maxwell - Boltzmann Bose-Einstein and Fermi-Dirac Statistics and their respective distribution functions.

Partition function, Evaluation of translational, Vibrational and rotational partition functions for mono, diatomic molecules - Calculation of thermodynamic functions – U,H,S and G – equilibrium constant and heat capacities from partition functions.

UNIT IV
POLYMER SCIENCE

Properties of polymers - Glass transition temperature - factors influencing the glass transition temperature - crystallinity in polymers - degree of crystallinity - effect of crystallinity in the properties of polymers. Molecular weight and size of polymers, Number average and weight average molecular weight, degree of polymerization. Determination of molecular weight of polymers, Osmometry - viscometry, Gel permeation chromatography, Electropolymerization & photopolymerisation. Conducting polymers.

UNIT V SURFACE PHENOMENA

Surface phenomena: Physisorption and Chemisorption - Adsorption of gases by solids - Factors influencing adsorption - Desorption activation energy - Langmuir theory of adsorption - BET theory of multilayer adsorption - Determination of Surface area - Determination of area of cross section of a molecule - Derivation of BET equation -Types of adsorption isotherms - Adsorption from solution - Gibbs adsorption isotherm - Insoluble surface films on liquids.Surfactants - Classification - Biosurfactants - Hydrophile - Lipophile Balance - Micelles formation - Shape and structure of micelle - Micellar aggregation number - Critical micelle concentration.

References

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3. Puri, Sharma and Pathania, Principles of Physical Chemistry, Vishal publishers, 2014
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6. Gurdeep Raj, Chemical Kinetics, 1st Ed., Goel Pub. House, 1985.
7. S.P. Singh , Chemical Kinetics, Goel Pub.
8. Subash and Satish, Chemical kinetics and Catalysis, Jeyaprakash & Co.
9. Ahluwalia, Polymer Chemistry, Anes Books, 2010.
10. V.R. Gowrikar et al., Polymer Science, 1st Ed., Wiley Eastern Ltd.,
11.Gurdeep Raj, Surface Chemistry, Goel Pub.
12. Keith J. Laidler, Chemical Kinetics, 2nd Ed., Tata McGraw Hill Pub. Reprint 1986.
13.D.A.Mc Quarrie and J.D.Simon, Physical chemistry A molecular Approach, Viva Books (p) Ltd.,.
14. D. Attwood and A.T. Florence, surfactant systems – Their chemistry, Pharmacy and Biology, Chapmann and Hall, New-York (1983).

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT I: **QUANTUM CHEMISTRY III**			
	Chemistry of Approximation methods	2	Lecture, Discussion
	Variation method and perturbation theory- Application to the helium atom	3	Lecture, ICT, Assignment

	Slater detrimental wave functions	2	Lecture, Seminar
	Pauli's exclusion principle , Born- Oppenheimer approximation, LCAO, MO and VB treatments of Hydrogen molecules	1 1 3	Lecture, ICT, Tutorial and Problem Solving
	Huckel π- electron theory and its application to ethylene and butadiene	3	Lecture, Videos
UNIT II : **CHEMICAL KINETICS II ; Kinetics of fast reactions**			
	Flow methods : Stopped flow method, continuous and quenched flow methods, Pulse method	6	Lecture, ICT, Discussion and Problem Solving
	Flash photolysis, Pulse radiolysis	3	Lecture, Seminar
	Microscopic kinetics, molecular beam method, Marcus theory of electron transfer processes	6	Lecture, ICT, Assignment, Tutorial
UNIT III : **STATISTICAL THERMODYNAMICS**			
	Objective of Statistical thermodynamics, Distinguishable and indistinguishable particles, ensemble and interactive systems, Microstates and macrostates, Maxwell - Boltzmann	5	Lecture, ICT, Tutorial
	Bose-Einstein and Fermi-Dirac Statistics and their respective distribution functions	3	Lecture, Assignment
	Partition function, Evaluation of translational, Vibrational and rotational partition functions for mono, diatomic molecules	4	Lecture, ICT, Seminar
	Calculation of thermodynamic functions, U,H,S and G, equilibrium constant and heat capacities from partition functions	3	Lecture, Seminar, Videos
UNIT IV : **POLYMER SCIENCE ; Properties of polymers**			
	Glass transition temperature, factors influencing the glass transition temperature	3	Lecture, Tutorial
	Crystallinity in polymers - degree of crystallinity, effect of crystallinity in the properties of polymers	3	Lecture, Discussion, ICT
	Molecular weight and size of polymers, Number average and weight average molecular weight, degree of polymerization	3	Lecture, Video, Seminar

	Determination of molecular weight of polymers, Osmometry, Viscometry, Gel permeation chromatography	3	Lecture, Lab Session
	Electropolymerization , Photopolymerisation	2	Seminar
	Conducting polymers	1	Lecture
UNIT V : **SURFACE PHENOMENA**			
	Physisorption and Chemisorption, Adsorption of gases by solids, Factors influencing adsorption, Desorption, activation energy	3	Lecture, Discussion
	Langmuir theory of adsorption, BET theory of multilayer adsorption, Determination of Surface area	3	Lecture, Seminar
	Determination of area of cross section of a molecule, Derivation of BET equation	3	Lecture, Assignment
	Types of adsorption isotherms Adsorption from solution - Gibbs adsorption isotherm	3	Lecture, Library Class, Quiz
	Insoluble surface films on liquids. Surfactants	2	Lecture, Seminar
	Classification - Biosurfactants, Hydrophile, Lipophile Balance , Micelles formation , Shape and structure of micelle, Micellar aggregation number , Critical micelle concentration.	1	Lecture, Video, Discussion

Course Outcomes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of COs
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	
CO1	4	3	3	4	3	4	3	3	4	4	3.5
CO2	4	4	3	3	4	4	4	3	3	4	3.6
CO3	4	3	4	4	3	4	3	3	4	4	3.6
CO4	4	4	4	4	4	4	4	4	4	4	4.0
CO5	4	4	4	4	4	4	4	4	4	4	4.0
Mean Overall Score											3.74

Result: The Score for this Course is 3.62 (High Relationship)

Course Designer: Dr. R. MUTHUSELVI
Dr. T. UMAMATHI

Programme : M.Sc Chemistry **ELECTIVE 3**
Semester : III **Hours : 5 P/W, 75 Hrs/S**
Sub. Code : EDC1 **Credits : 5**

TITLE OF THE PAPER: NANOSCIENCE AND TECHNOLOGY

Pedagogy	Hours	Lecture	Peer Teaching/Seminar//Discussion//Problem solving session/Quiz/videos/Library session.	ICT
	5	3	1	1

PREAMBLE: The objective of the course is to make the student understand, learn and have an in depth idea about the advanced concepts of nanoscience and few nanomaterials

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: discuss the fundamentals of nanoscience and able to update the fundamentals to new nanomaterials	1	15
UNIT 2 CO2: discuss the methods for the synthesis of nanomaterials to new systems	2	15
UNIT 3 CO3: demonstrate the properties of new nanomaterials with a help of acquired knowledge	3	15
UNIT 4 CO4: explain characterization of nanomaterials by various techniques.	4	15
UNIT 5 CO5: practice implication of nanotechnology to help the society and environment.	5	15

UNIT – I

INTRODUCTION TO NANOSCIENCE

Nanorevolution – nanoscale – prime materials of nanotechnology – size to volume ratio – carbon based nanomaterials – fullerenes – carbon nanotubes – types – single walled CNTs – multi walled CNTs. Synthesis and applications of fullerenes.

UNIT – II

SYNTHESIS OF NANOMATERIALS

Nano structured materials – types – physical and chemical synthesis – top down approach – arc discharge, ball milling and inert gas condensation – bottom up approach – Laser ablation, chemical vapour deposition, sol gel method, hydrothermal synthesis – particles of various shapes and films

UNIT – III

PROPERTIES OF NANOMATERIALS

Optical Properties, electrical Properties, magnetic Properties, surface and mechanical properties – semiconductor nanoparticles – energy band structure of nanoparticles – quantum dots – quantization effects – Molecular machines.

UNIT – IV

CHARACTERIZATION OF NANOMATERIALS

Theories and techniques – characterization using UV – Visible, XRD, SEM, TEM, AFM, STM, XPS, SPM and XANES in relation with nanoparticles (only brief idea).

UNIT –V

APPLICATIONS OF NANOSCIENCE

Nanomedicines – diagnosis and therapeutics of various diseases – drug delivery – functional drug carriers – Bio compatibility and toxicity of nanoparticles. Nanotechnology and environment – pollution control – nuclear waste – green products – application of nanoscience in catalysis, cosmetics – sensors – nanotechnology in agriculture – implication of nanotechnology – health, society & environment.

References

1. S.Shanmugam, Nanotechnology, 1st Ed., MJP Publishers, 2011.
2. T.Pradeep, Nano The Essentials, 1st Ed., McGraw Hill Companies, 2007.
3. Charles P. Poole, Introduction to Nanotechnology, 1st Ed., Wiley Eastern Pvt. Ltd., 2014.
4. K.P.Mathur, Nanotechnology & Applications, Rajah Publications, New Delhi.
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7. B.S.Murthy et. al., Text Book of Nanoscience and Nanotechnology, 1st Ed., Universities Press 2012.
8. G.B.Sergeev, Nanochemistry, 1st Ed., Elsevier, 2012.
9. Patrick Salomon, A Hand Book to Nanochemistry, 1st Ed., Dominant Publishers, New Delhi, 2010.
10. M.A. Shah and Tokeer Ahmad, Principles of Nanoscience and Nanotechnology, 2nd ed., 2013.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1:			
	3D images of fullerene and carbon nanotubes	2	ICT
	Fundamentals of nanoscience, Introduction to carbon-based nanomaterials	10	Lecture
	Prime nanomaterials and intercalation	3	Seminar
UNIT 11			
	Top down and bottom up approaches.	2	ICT
	Methods for the synthesis of nanomaterials	10	Lecture

	Arcdischarge and sol-gel methods	3	Seminar
UNIT III			
	Energy band structure and molecular machines	2	ICT
	Optical, electrical and magnetic properties	10	Lecture
	Surface and mechanical properties	3	Seminar
UNIT IV			
	TEM and AFM	2	ICT
	Theories and techniques	10	Lecture
	XRD, SEM and UV	3	Seminar
UNIT V			
	Drug delivery and drug carriers	2	ICT
	Applications	10	Lecture
	Implication of nanotechnology to health and environment.	3	Seminar

Course Outcomes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO 1	PO 2	PO3	PO4	PO 5	PSO 1	PSO2	PSO3	PSO4	PSO 5	
CO1	3	4	3	4	3	4	3	3	4	4	3.5
CO2	4	3	4	4	4	4	4	3	4	3	3.7
CO3	4	4	4	3	4	3	4	4	4	4	3.8
CO4	4	4	3	4	4	4	4	3	4	4	3.8
CO5	4	3	4	4	3	4	4	4	3	4	3.7
Mean Overall Score											3.7

Result: The Score for this Course is 3.7 (High Relationship)

Course Designer: Dr. C. MEENAKSHI
Dr. A. MARY REMONA

Programme : M.Sc Chemistry **ELECTIVE 3**
Semester : III **Hours : 5 P/W, 75 Hrs/S**
Sub. Code : EDC2 **Credits : 5**

TITLE OF THE PAPER: ENVIRONMENTAL SCIENCE

Pedagogy	Hours	Lecture	Peer Teaching/Seminar//Discussion//Problem solving session/Quiz/videos/Library session.	ICT
	5	3	1	1

PREAMBLE: The objective of the course is to make the student understand, learn and have an in depth idea about the advanced concepts of environmental science.

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: Gain the knowledge about the toxic chemicals in the environment.	1	15
UNIT 2 CO2: discuss about causes, effects and control measures of pollution	2	15
UNIT 3 CO3: Demonstrate the air monitoring techniques.	3	15
UNIT 4 CO4: define various methods of managing and recycling of solid wates	4	15
UNIT 5 CO5: explain the instrumental techniques in environmental chemical analysis	5	15

UNIT I
CHEMICAL TOXICOLOGY
Toxic chemicals in the environment- biochemical effects of trace elements - Ar, Pb,Cd, Cr,Hg, Mn, Sb, Be, Co,Cu, Zn, Se, F- Carcinogens.

UNIT II
POLLUTION
Air pollution - Green House effect - Ozone layer depletion-photochemical smog-Effect of pollution on human beings and animals- (CO, SO_2, (NO)x, HF)-causes-automobiles and industries-methods and equipments used for controlling particulate emission.
Water pollution-types of pollutants-organic and inorganic- Acid rain- Eutropication-Effect of pollutants on human beings and animals- alkalinity and acidity- chloride, fluoride, cyanide, sulphate, nitrate, nitrite, sulphide.
Soil pollution-Effect of pollution on human beings and animals-pesticides, insecticides, fungicides, herbicides, algicides, rodenticides. Radioactive pollution-pollutants.

UNIT III

MONITORING TECHNIQUES AND METHODOLOGY

Air monitoring-atmospheric sampling and analysis-techniques-gravity filtration, precipitation-absorption, adsorption and great sampling. Estimation of atmospheric pollution-Dust fall jar Determination of suspended particles with a high volume sampler- determination of sulphation rate-estimation of hydogn sulphide and sulphur dioxide-analysis of hydrocarbons(brief idea) Water monitoring- water quality parameters and standard-oxygen demand- BOD, COD –method Winkler- membrane electrode method.

UNIT IV

WASTE MANAGEMENT AND RECYCLING

Waste management and recycling- classification of waste water treatment- preliminary-primary-sedimentation-coagulation-secondary-aerobic-trickling filters-activated sludge-anerobic.

Solid waste disposal- solid waste management by biotechnology- municipal solid waste-sanitary land fill, composting, vermicomposting, incineration, e-waste management.

Radioactive waste- disposal methods- reprocessing of spent fuel- ocean dumping.

Polymer recycling- use of virgin plastics.

UNIT V

INSTRUMENTAL TECHNIQUES IN ENVIRONMENTAL CHEMICAL ANALYSIS

Spectroscopic techniques: Basic principle and applications of Neutron activation analysis-anodic stripping voltametry- atomic absorption spectroscopy- inductively coupled plasma emission spectroscopy- X-ray fluorescence- nondispersive infrared spectrometry-fourier transform infrared spectroscopy.

Electrochemical techniques: Basic principles and applications of conductometry, polarimetry, voltametry, polarography and coulometry.

References

1. K. Bhagavathi Sundari, Applied chemistry, 1st edn, MJP Publishers,2006
2. B.K.Sharma, Industrial chemistry, 16th edn, Goel publishing house,2011
3. S.S.Dara, Text book of Environmental chemistry and pollution control, 7th edn, S.Chand and company – 2004
4. A.K.De, Environmental chemistry,1st edn, New age International Pvt Ltd, 2004
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UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT I: **CHEMICAL TOXICOLOGY**			
	Toxic chemicals in the environment	3	Discussion
	- biochemical effects of trace elements - Ar, Pb,Cd, Cr,Hg	5	Lecture
	biochemical effects of trace elements -		

	Mn, Sb, Be, Co,Cu, Zn, Se, F	4	Seminar / peer teaching
	Carcinogens.	2	ICT
UNIT II: **POLLUTION**			
	Air pollution - Green House effect - Ozone layer depletion-photochemical smog, causes-automobiles and industries	4	Discussion/ peer teaching
	Effect of pollution air, water and soil pollution on human beings and animals	2	ICT
	methods and equipments used for controlling particulate emission.	2	Lecture
	Water pollution-types of pollutants-organic and inorganic- Acid rain-Eutropication, alkalinity and acidity-chloride, fluoride, cyanide, sulphate, nitrate, nitrite, sulphide	4	Seminar / quiz
	Soil pollution, pesticides, insecticides, fungicides, herbicides, algicides, rodenticides. Radioactive pollution-pollutants	3	Activity based learning (role play/ quiz/assignment)
UNIT III: **MONITORING TECHNIQUES AND METHODOLOGY**			
	Air monitoring-atmospheric sampling and analysis-techniques-gravity filtration, precipitation-absorption, adsorption and great sampling	4	Seminar /assignment
	Estimation of atmospheric pollution-Dust fall jar Determination of suspended particles with a high volume sampler	3	ICT
	determination of sulphation rate-estimation of hydogn sulphide and sulphur dioxide-analysis of hydrocarbons	3	Lecture
	Water monitoring- water quality parameters and standard –method Winkler- membrane electrode method	3	Library session followed by discussion
	oxygen demand- BOD, COD	2	Demonstration
UNIT IV : **WASTE MANAGEMENT AND RECYCLING**			
	Waste management and recycling-classification of waste water treatment, sedimentation-coagulation, aerobic-trickling filters, activated sludge-anerobic.	5	Lecture

	Solid waste disposal- solid waste management by biotechnology- municipal solid waste- sanitary land fill, composting, vermicomposting, incineration,	5	Seminar /Peer teaching
	e-waste management, Radioactive waste-disposal methods- reprocessing of spent fuel- ocean dumping. Polymer recycling- use of virgin plastics	5	ICT
UNIT V: **INSTRUMENTAL TECHNIQUES IN ENVIRONMENTAL CHEMICAL ANALYSIS**			
	Spectroscopic techniques: Basic principle and applications of Neutron activation analysis- anodic stripping voltametry- - inductively coupled plasma emission spectroscopy	5	Lecture
	atomic absorption spectroscopy, X-ray fluorescence- nondispersive infrared spectrometry-fourier transform infrared spectroscopy	5	Seminar / assignment
	Electrochemical techniques: Basic principles and applications of conductometry, polarimetry, voltametry, polarography and coulometry	5	ICT

Course Outcomes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO 1	PO 2	PO3	PO4	PO 5	PSO1	PSO 2	PSO3	PSO4	PSO 5	
CO1	4	4	3	3	4	5	4	3	3	4	3.7
CO2	3	3	5	4	4	4	3	3	5	5	3.9
CO3	5	4	4	3	5	4	4	4	4	4	4.1
CO4	4	4	5	3	4	4	3	4	5	5	4.1
CO5	5	4	4	4	4	4	4	4	4	4	4.1
Mean Overall Score											3.98

Result: The Score for this Course is 3.98 (High Relationship)

Course Designer : Dr. D. RENUGA

Programme : M.Sc/M.A **NON MAJOR ELECTIVE**
Semester : III **Hours : 2 P/W, 30 Hrs/S**
Sub. Code : NMPC **Credits : 2**

TITLE OF THE PAPER: COSMETOLOGY

Pedagogy	Hours	Lecture	Peer Teaching/Seminar/Role play/Discussion/Tutorial/Problem solving session/Quiz/Lab session/videos/Demonstration class/Library session.	ICT
	2	1		1

PREAMBLE: The objective of the course is to give the knowledge about skin types, skin aging, skin irritation, cosmetic products and cosmetology careers, ethics and regulations

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: **INTRODUCTION** describe the types of cosmetics, skin types, skin care products and role of calcium in the regulation of skin barrier homeostasis skin pH and skin flora.	1	6
UNIT 2 CO2: **SKIN AGING AND SKIN IRRITATION** explain skin aging, new trends in anti-aging cosmetic ingredients and treatments and skin tolerance principles of skin irritation.	2	6
UNIT 3 CO3: **UNIT III** **COSMETIC PRODUCTS FOR SKIN AND BODY** discuss the skin base materials, baby care products, antiperspirants, deodorants and perfumes.	3	6
UNIT 4 CO4: **COSMETIC PRODUCTS FOR HAIR, NAILS, LIPS AND EYES** discuss the hair Conditioners, nail cosmetics, lips cosmetics and eye cosmetics.	4	6
UNIT 5 CO5: **COSMETOLOGY CAREERS, ETHICS AND REGULATIONS** discuss Cosmetology occupations, training and licensing requirements, General concepts of Ethics in human testing, Safety and Trends in cosmetic regulations in the U.S.A. and European Union.	5	6

UNIT I

INTRODUCTION

1.1 Cosmetics-Types – liquid or emulsions, anhydrous creams or sticks – Ingredients – Natural and mineral .

1.2. Skin types – Sensitive skin – Hydrating substances –skin care products - Role of calcium in the regulation of skin barrier homeostasis- skin pH and skin flora.

UNIT II

SKIN AGING AND SKIN IRRITATION

2.1. Skin aging – New trends in anti-aging cosmetic ingredients and treatments – antioxidants, UV filters, sun protection and sunscreens, after sun products- skin organ culture models (brief idea only) – cosmetics for the elderly.

2.2. skin tolerance – principles of skin irritation – sodium lauryl sulphate induced irritation in the human face– anti-irritants – allergy and hypoallergenic products.

UNIT III
COSMETIC PRODUCTS FOR SKIN AND BODY
(Definition and main ingredients only)
Skin- base materials - whitening agents – Moisturizers –Facial masks – sunscreens – Exfoliants – facial masks .
Baby care products .
Antiperspirants, Deodorants and perfumes. Cooling ingredients and their mechanism of action.

UNIT IV
COSMETIC PRODUCTS FOR HAIR, NAILS, LIPS AND EYES

(Definition and main ingredients only)

Hair Conditioners, Shampoos, Hair dyes and Hair gels.

Nail cosmetics - The normal nail – Handle of nail care.

Lips cosmetics – Lip stick, Lip gloss, Lip balm.

Eye cosmetics – Eye liner and kajal, Eye shadow and Muskara.

UNIT V
COSMETOLOGY CAREERS, ETHICS AND REGULATIONS
5.1. Cosmetology occupations: Training and licensing requirements - Hair Stylist, Theatrical and Performance Makeup Artist, Esthetician and Manicurist and Pedicurist.
5.2. General concepts of Ethics in human testing – Safety – Trends in cosmetic regulations in the U.S.A. and European Union.

References
1. AU COPS , Hand book of Cosmetic Science and Technology , 3rd edition edited by Andre O.Barel, Marc Paye and Howard I. Maibach.
2. www.making**cosmetics.**com/Formulas_ep_5.html
3. study.com**/cosmetologist.**html
4. https://en.wikipedia.org/wiki/**Cosmetics**

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1: **INTRODUCTION**			
	Cosmetics-Types, liquid or emulsions, anhydrous creams or sticks, Ingredients, Natural and mineral, Skin types, Sensitive skin, Hydrating substances and skin care products.	4	Lecture
	Role of calcium in the regulation of skin barrier homeostasis- skin pH and skin flora.	2	ICT

UNIT II:	**SKIN AGING AND SKIN IRRITATION**		
	sun protection and sunscreens, allergy	2	ICT
	Skin aging, New trends in anti-aging cosmetic ingredients and treatments, antioxidants, UV filters, after sun products- skin organ culture models, cosmetics for the elderly. skin tolerance, principles of skin irritation, allergy and hypoallergenic products.	4	Lecture
UNIT 11I	**COSMETIC PRODUCTS FOR SKIN AND BODY**		
	Commercially available cosmetic products	2	ICT and material collection by students.
	Skin- base materials, Baby care products, Antiperspirants, Deodorants and perfumes. Cooling ingredients and their mechanism of action.	4	Lecture
UNIT 1V	**COSMETIC PRODUCTS FOR HAIR, NAILS, LIPS AND EYES**		
	Preparation of sampoo and conditioner.	2	ICT and demonstration.
	Hair Conditioners, Shampoos, Hair dyes and Hair gels, Nail cosmetics, Lips cosmetics and eye cosmetics.	4	Lecture
UNIT V	**COSMETOLOGY CAREERS, ETHICS AND REGULATIONS**		
	Training and licensing requirements	2	Collecting information through ICT.
	Cosmetology occupations: Hair Stylist, Theatrical and Performance Makeup Artist, Esthetician and Manicurist and Pedicurist. General concepts of Ethics in human testing, Safety, Trends in cosmetic regulations in the U.S.A. and European Union.	4	Lecture

Course Outcomes (Cos)	Mean scores of Cos										R e s u l t : T h e S
	PO 1	PO 2	PO 3	PO 4	PO 5	PS O1	PS O2	PS O3	PS O4	PS O5	
CO1	5	4	4	4	3	3	4	4	3	4	3.8
CO2	5	3	4	4	3	3	4	4	3	4	3.7
CO3	5	3	4	4	3	3	4	4	4	4	3.8
CO4	5	3	4	4	3	3	4	4	3	4	3.7
CO5	5	3	4	4	3	3	4	4	4	4	3.8

Result: The Score for this Course is 3.76 (High Relationship)

Course Designer : Dr. J. ARUL MOLI

Dr. D. RENUGA

Programme : M.Sc Chemistry **CORE 14**
Semester : IV **Hours : 5 P/W, 75 Hrs/S**
Sub. Code : DD1 **Credits : 4**

TITLE OF THE PAPER: ORGANIC CHEMISTRY IV

Pedagogy	Hours	Lecture	Peer Teaching/Seminar/roleplay/ Discussion/Turorial/Problem solving session/Quiz/Lab session/Videos/ Demonstration Class/Library session	ICT
	5	3	1	1

PREAMBLE:

The objective of the course is make the student have a good and deep knowledge about Photochemistry, Pericyclic reactions, Steroids and Harmones, Carbohydrates and Flavonoids, Terpenoids and Alkaloids.

COURSE OUTCOME **At the end of Semester IV, the students will be able to have a**	**Unit**	**Hrs P/S**
Unit 1 CO1: to apply Photo chemistry to new systems	1	15
Unit 2 CO2: gain in depth knowledge in Pericyclic reactions	2	15
Unit 3 CO3: able to plan the new synthesis of Steroids and Hormones	3	15
Unit 4 CO4: Chemistry of Carbohydrates and Flavanoids	4	15
Unit 5 CO5: Chemistry of Terpenoids and Alkaloids	5	15

ORGANIC CHEMISTRY – IV

UNIT – I

PHOTOCHEMISTRY

Photochemical Energy – Electronic Excitation – Excited States, Modes of Dissipation of Energy – Energy transfer – Jablonski Diagram– Quantum Efficiency – Photochemistry of Carbonyl compounds (Photo reduction – Norrish type I & II reaction – Reactions of cyclic ketones – The Paterno – Buchi reactions – photochemistry of α, β -unsaturated. Compounds – photochemistry of Olefins – (Cis–Trans Isomerization) – Photorearrangement of cyclohexadienones.

UNIT – II

PERICYCLIC REACTIONS: Conservation of Molecular orbital Symmetry – Symmetry properties of Molecular orbitals (1,3- butadiene, hexatriene), Electrocyclic reactions- Correlation diagram and FMO method (cyclobutene - butadiene, cyclohexadiene - hexatriene system) – Cyclo addition reactions – Correlation diagram and FMO method (2S + 2S, 4S+ 2S system) - Sigmatropic Rearrangement – Suprafacial and antra facial process- analysis of

sigmatropic rearrangement - Cope and Claisen rearrangement – Applications of PMO method to Pericyclic reactions (Electrocyclic reactions,Cyclo addition and Sigmatropic reactions) .

UNIT III

STEROIDS AND HORMONES

Stereochemistry of Steroids - Structural elucidation of cholesterol – structural and syntheses of ergo calciferol, Lanosterol (Elucidation not necessary)

Hormones : Synthesis of Androsterone, Testosterone, Oestrone, and Progesterone.

UNIT – IV

CARBOHYDRATES AND FLAVANOIDS

Disaccharides: Determination of the size of the ring in sugars – structural elucidation of Sucrose and Maltose – inversion of Sucrose – General studies of Lactose and Cellobiose.

Polysaccharides: General methods of elucidating the structure of Polysaccharides – Brief study of Cellulose & Starch.

General methods for the elucidation of structure of flavones – General study of Isoflavones and Anthocyanin – Synthesis of Quercetin.

UNIT – V

TERPENOIDS AND ALKALOIDS Isoprene rule – Isolation – classification of terpenoids with examples – General methods of Structural determination of terpenoids – Structure and Synthesis of Zingiberine – Santonin, Abietic acid, Camphor – Biosynthesis of Terpenoids.

Alkaloids Occurrence – Isolation – Classification – General methods of structural elucidation of Alkaloids – structure and synthesis of Cinchonine – Reserpine – Cocaine – Quinene

References

1 C.H. Depuy and D.L. Chapman, Molecular Reactions and Photochemistry, Prentice Hall, 1975

2 T.L. Gilchrist and R.C. Storr, Organic Reactions and Orbital Symmetry, 2nd Edn., Cambridge, 1972.

3 S.M. Muherjee and S.P. Singh, Pericyclic Reactions, Macmillan, 1976.

4 E.L. Eliel, Stereochemistry of Carbon Compounds, McGraw Hill, 1962.

5 V.M. Potapov, Stereochemistry, MIR Publishers, Moscow 1979.

6 D. Nasipuri, Stereochemistry of Organic compounds, 2nd Edn, New Age International, New Delhi, 1972.

7 E.L. Eliel, N.C. Allinger, S.J. Angyal and G.A. Morrision, Conformational Analysis, Interscience, New York, 1965.

8 O.P. Agarwal, Organic Chemistry Natural products Vol. I & II, Himalaya Publishing House.

9 S.M. Muherjee and S.P. Singh, Reaction Mechanism in Organic Chemistry, Mc Milan India Ltd., 1975.

10 R.T. Morrison and B. N. Boyd, "Organic Chemistry", 6th Edn., Prentice Hall of India, New Delhi, 1975.

11 I.L. Finar, Organic Chemistry, Vol. I and II, 5th edition ELBS. 1975.
12 R.B. Woodward and R. Hoffmann, The conversion of Orbital Symmetry, Verlog cheminGmbh and Academic Press 1971.
13 R. Chatwal, Organic Chemistry of Natural Products Vol I & II, Himalaya Publishing House.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1 : PHOTOCHEMISTRY			
	Photo chemical energy, continuous electronic excitation, modes of dissipation of energy	2	ICT
	photochemistry of carbonyl compounds and olefins, Jablonski diagram	10	LECTURE
	Energy transfer, photo rearrangements	3	SEMINAR
UNIT II PERICYCLIC REACTIONS			
	Conservation of molecular orbital symmetry, symmetry properties of MO	2	ICT
	Electrocylic and cyclo addition reactions	10	LECTURE
	Applications of PMO method to pericyclic reactions	3	SEMINAR
UNIT III STEROIDS AND HARMONES			
	Stereo chemistry of steroid	2	ICT
	Structural elucidation of cholesterol and synthesis of steroids	6	LECTURE
Harmones	Synthesis of 1. Androsterone 2. Testosterone 3.Oestrane 4. Estradiol and 5. Progesterone	7	Lecture, ICT, Seminar, Discussion
UNIT IV : CARBOHYDRATES AND FLAVONOIDS			
Disaccharides	Determination of the size of the ring in sugar, Structural elucidation of Sucrose and Maltose, inversion of Sucrose, General studies of Lactose and Cellobiose	2 3 2	Lecture and Library Class Lecture and Discussion Lecture
Polysaccharides	General methods of elucidating the structure of Polysaccharides, Brief study of Cellulose & Starch	2 1	Lecture, video and assignment Lecture
Flavones, Isoflavones, Anthocyanin, Quercetin	General methods for the elucidation of structure of Flavones General study of Isoflavones and Anthocyanin Synthesis of Quercetin	2 2 1	ICT, Tutorial and Discussion Lecture and Assignment Seminar

UNIT V : TERPENOIDS AND ALKALOIDS			
Terpenoids	Isoprene rule, Isolation, classification of terpenoids with examples General methods of Structural determination of terpenes Structure and Synthesis of Zingiberine, Santonin, Abietic acid, Camphor, Biosynthesis of Terpenoids.	2 2 3 1	Lecture and Library Class Lecture and Discussion Lecture, ICT and Seminar Lecture and Assignment
Alkaloids	Occurrence, Isolation, classification, General methods of structural elucidation of alkaloids Structure and Synthesis of Cinchonine, Reserpine, Cocaine, Quinene	3 4	Lecture and Video Lecture, ICT and Seminar

Course Outcomes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	
CO1	4	3	4	4	4	4	4	3	4	3	3.7
CO2	4	4	3	4	4	4	4	3	4	4	3.8
CO3	4	3	4	4	4	4	4	4	3	4	3.8
CO4	4	3	5	4	4	4	4	3	3	4	3.8
CO5	4	3	4	4	4	4	4	3	3	4	3.7
Mean Overall Score											3.76

Result: The Score for this Course is 3.76 (High Relationship)

Course Designer: Dr. C. MEENAKSHI
Dr. R. MUTHUSELVI

Programme : M.Sc Chemistry **CORE 15**
Semester : IV **Hours : 5 P/W, 75 Hrs/S**
Sub. Code : DD2 **Credits : 5**

TITLE OF THE PAPER: SELECTED TOPICS IN CHEMISTRY

Pedagogy	Hours	Lecture	Peer Teaching/Seminar//Discussion//Problem solving session/Quiz/videos/Library session.	ICT
	5	3	1	1

PREAMBLE: The objective of the course is to make the student understand basics of complex ionic structures and their characterization using XRD, know various physicochemical techniques used in analysis, importance of catalyst and applications of newer materials.

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: identify the structure of complex ionic compounds, describe the type of defects in metals, summarize the principles and applications of XRD	1	15
UNIT 2 CO2: appreciate the importance of new materials like dielectrics, composites, aerospace, light emitting diodes and magnetic materials with interesting properties leading to newer applications	2	15
UNIT 3 CO3: recognize the basic concept of Voltametry, amperometry and Polarographic techniques in electroanalytical chemistry	3	15
UNIT 4 CO4: illustrate the fundamentals of spectrophotometry, turbidimetry and flourimetry and their instrumentation, explain the separation and quantification of ions using electrogravimetric method	4	15
UNIT 5 CO5: acquire knowledge of physical & chemical characterization of catalyst and appreciate the vibrant role of catalyst in chemical reactions	5	15

UNIT I
SOLID STATE CHEMISTRY AND X-RAY DIFFRACTION

Structure of complex ionic compounds, imperfection in crystals, conductivity in ionic solids, Perovskite and spinel structure, Kapustinski equation, application of lattice energy, covalent solids, intrinsic and photoexcited semiconductor, non-stoichiometric compounds.

Bragg equation - Experimental methods- Laue method –Oscillating Crystal method – The powder method – Applications of X-ray analysis in inorganic and organic chemistry.

UNIT II

MATERIAL TECHNOLOGY

Dielectric materials – Piezo electricity- effect of temperature- brief idea about optical property- Aerospace materials properties and applications (brief idea). Composite materials any one Preparation and uses –Chelates as light emitting diodes, polymer light emitting diodes, phosphorescent light emitting diodes, organic polymer solar cells (only preliminary idea)Magnetic properties of materials – classification paramagnetic, ferromagnetic,

antiferromagnetic - Magnetic susceptibility – determination of magnetic susceptibility by Guoy balance.

UNIT III

ELECTROANALYTICAL CHEMISTRY

Polarography – theory, instrumentation, DME, Diffusion, kinetic and catalytic currents, Current –Voltage curves for reversible and irreversible systems, qualitative and quantitative applications to inorganic systems.

Amperometric titrations – Theory, instrumentation, types of titration curves, Biamperometry, applications.

Cyclic voltametry – Theory, instrumentations, Applications to inorganic systems.

UNIT IV

ELCTROGRAVIMETRY, PHOTOCHEMISTRY AND ELECTROCHEMICAL STUDIES

Theory of electro-gravimetric analysis – Electrolytic separation and determination of copper and nickel.

Spectrophotometry – spectrophotometric titration, determination of Fe(III) with EDTA and determination of Fe(III) in the presence of aluminium.

Turbidimetry – Principle, instrumentation , determination of sulphates and phosphates.

Fluorimetry – Principle, instrumentation, determination of quinine in toxic water.

UNITV

CATALYSIS

Acid Base catalysis- Kinetics of Acid Base catalysis- Enzymes Catalysis – Michaelis Menton equation - Characteristics of enzyme catalysis – Factors affecting rates of enzyme reactions - influence of P^H – influence of temperature, effect of activator, effect of inhibitor.

Heterogenous Catalysis: Surface reactions – Langmuir- Hinselwood mechanism - Kinetics of surface reactions- Unimolecular surface reactions and bimolecular surface reactions- Auto catalysis and oscillatory reactions.

References

1. Antony R.West, Solid state chemistry and applications, Wiley Eastern Pub.
2. Subash, Satish, Solid State, Prakathi Prakasham.
3 D.K. Chakrabarty & B.Viswanathan , Heterogenous Catalysis, New Age 2008.
4. Puri, Sharma & Pathania, Principles of physical Chemistry, Vishal publishers , ed.,2008.
5. N.D. Hannay –Solid state chemistry- Printice hall.
6. J.C. Kuriacose, Catalysis, Mac Millan India Ltd.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT I: **SOLID STATE CHEMISTRY AND X-RAY DIFFRACTION**			
	Structure of complex ionic compounds, Perovskite and spinel structure	4	Lecture

	imperfection in crystals, non-stoichiometric compounds conductivity in ionic solids, covalent solids, intrinsic and photoexcited semiconductor	3	Lecture / library session
	Kapustinski equation, application of lattice energy	2	Discussion
	Bragg equation - Experimental methods, Laue method, Oscillating Crystal method	3	Seminar/peer teaching
	The powder method & Applications of X-ray analysis in inorganic and organic chemistry.	3	ICT
UNIT II: **MATERIAL TECHNOLOGY**			
	Dielectric materials – Piezo electricity- effect of temperature- brief idea about optical property.	4	Lecture
	Aerospace materials properties and applications, Composite materials- Preparation and uses.	3	Discussion/ peer teaching
	Chelates as light emitting diodes, polymer light emitting diodes, phosphorescent light emitting diodes, organic polymer solar cells.	5	Seminar/ Quiz
	Magnetic properties of materials – classification paramagnetic, ferromagnetic, antiferromagnetic - Magnetic susceptibility – determination of magnetic susceptibility by Guoy balance.	3	ICT
UNIT III: **ELECTROANALYTICAL CHEMISTRY**			
	Polarography – theory, instrumentation, DME, Diffusion, kinetic and catalytic currents,	4	Lecture
	Current –Voltage curves for reversible and irreversible systems.	3	Lecture
	Polarography – qualitative and quantitative applications to inorganic systems	2	Discussion
	Amperometric titrations – Theory, instrumentation, types of titration curves,	3	Seminar/Peer teaching
	Theory, instrumentation and application of Biamperometry, Cyclic voltametry – Theory, instrumentations and Applications to inorganic systems.	3	ICT
UNIT IV : **ELECTROGRAVIMETRY, PHOTOCHEMISTRY AND ELECTROCHEMICAL STUDIES**			
	Theory of electro-gravimetric analysis – Electrolytic separation and determination of copper and nickel.	4	Lecture
	Principle and instrumentation of Spectrophotometry	3	Lecture

	spectrophotometric titration, determination of Fe(III) with EDTA and determination of Fe(III) in the presence of aluminium.	3	Seminar/Peer teaching
	Turbidimetry – Principle, instrumentation , determination of sulphates and phosphates.	2	Discussion
	Fluorimetry – Principle, instrumentation, determination of quinine in toxic water	3	ICT
UNIT V: **CATALYSIS**			
	Acid Base catalysis- Kinetics of Acid Base catalysis	3	Lecture
	Enzymes Catalysis – Michaelis Menton equation - Characteristics of enzyme catalysis – Factors affecting rates of enzyme reactions - influence of P^H – influence of temperature, effect of activator, effect of inhibitor.	4	Lecture
	Heterogenous Catalysis: Surface reactions –	2	Discussion
	Langmuir- Hinselwood mechanism - Kinetics of surface reactions	3	ICT
	Unimolecular surface reactions and bimolecular surface reactions- Auto catalysis and oscillatory reactions.	3	Seminar/Peer teaching

Course Outcomes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO 1	PO 2	PO3	PO4	PO 5	PSO1	PSO 2	PSO3	PSO4	PSO 5	
CO1	5	4	4	4	4	4	3	4	4	4	4.0
CO2	4	4	4	4	4	4	4	3	4	4	3.9
CO3	5	4	4	4	4	4	3	4	4	4	4.0
CO4	4	5	4	4	4	4	3	3	4	4	3.9
CO5	5	4	4	4	4	4	4	3	3	4	3.9
Mean Overall Score											3.94

Result: The Score for this Course is 3.94 (High Relationship)

Course Designer: Dr. D. RENUGA,
Dr. T. UMAMATHI,
Dr. K. ANURADHA

Programme : M.Sc Chemistry **ELECTIVE 4**
Semester : IV **Hours : 5 P/W, 75 Hrs/S**
Sub. Code : EDD1 **Credits : 5**

TITLE OF THE PAPER: GREEN CHEMISTRY

Pedagogy	Hours	Lecture	Peer Teaching/Seminar//Discussion//Problem solving session/Quiz/videos/Library session.	ICT
	5	3	1	1

PREAMBLE: The objective of the course is to make the student understand the concepts of green chemistry .

COURSE OUTCOME: At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: gain knowledge about the principles of green chemistry and about the green solvents	1	5
UNIT 2 CO2: discuss the organic reactions in solid-state	2	5
UNIT 3 CO3: demonstrate alternative energy sources for the organic synthesis	3	5
UNIT 4 CO4: choose appropriate reagents and catalysts for organic synthesis	4	5
UNIT 5 CO5: realize the significance of green synthesis	5	5

UNIT – I

Introduction – principles of green chemistry – explanation of 12 principles of green chemistry

Organic synthesis in water – Advantages – Pericyclic reactions (Diels – Alder reaction, Hetero Diels – Alder reaction) – Claisen rearrangement – wittig horner reaction – Michael reaction – aldol condensation – knoevenagel reaction – pinacol coupling – benzoin condensation – claisen Schmidt condensation – benzoin condensation – oxidation (epoxidation, dihyroxylation, aldehydes, ketones) – reduction (C –C double bond, C-C triple bond, carbonyl compounds) Electrochemical synthesis (adiponitril, sebacic acid)

Organic synthesis using ionic liquids – Introduction – properties of ionic liquids – types of ionic liquids – preparation of ionic liquids – Baylis Hillman reaction in ionic liquids - Horner Wadsworth – Emmons Reaction in ionic liquids – Biotransformation in ionic liquids (Synthesis of epoixed, Geranyl acetate, trans esterification of glucose and L –ascorbic acid)

UNIT – II Organic synthesis in solid state

Solid state reaction at room temperature: Aldol condensation, Grignard reaction, Reformatsky reaction - Synthesis of Quinoxalin derivatives, β - keto sulphones from ketones, α –tosyloxy β - keto sulphones

Solid state reaction using solid support : Protection and de protection (formation of acetals and dioxolanes, N- alkylation reactions) – Oxidation (alcohols, sulphides, aromatisation) – Reduction (carbonyl compounds, crossed cannizaro reactions) – rearrangement (pinacol - pinacolone, Beckmann, Benzil – benzillic acid rearrangement) – Condensation reactions (Knoevenagal condensation,Wittig olefination reactions) - Synthesis of hetrocycles (Aziridines, Benzimidazoles, pyrozoles, pyrroles, Azoles, Quinolines, β – lactams, Flavones)

UNIT – III USE OF ALTERNATE ENERGY SOURCES

A. **Microwave assisted organic synthesis** – Introduction

Microwave assisted reactions in water: Hofmann elimination – hydrolysis of benzamides, N – Phenyl benzamides, methyl benzoate – oxidation of toluene – coupling of amines – N – heterocyclisation

Microwave assisted reactions in organic solvents: Fries rearrangement – Diels Alder reaction – Claisen rearrangement – Baylis Hillman reaction – Synthesis of β lactams – catalytic hydrogenation – ferrierrearrangement–pericyclic reactions – preparation of ferrocenyloxime – carbohydrates – radical reactions

B. **Ultra sound assisted organic synthesis**– Introduction – Instrumentation – physical aspects – types of sonochemical reactions – homogeneous sonochemical reactions (curtius rearrangement, organo metallic reactions. Annulation, Grignard reactions, addition reactions) heterogeneous liquid liquid reactions (soaponification, substitution, addition) - heterogeneous solid liquid reactions (oxidation, reduction)

UNIT – IV ORGANIC SYNTHESIS USING GREEN REAGENTS AND GREEN CATALYST

Green reagents : Singlet oxygen – ozone – hydrogen peroxide –dioxiranes – polymer supported reagents (PNBS, polymeric wittig reagent, EEDQ)

Green catalyst:

Phase transfer catalyst: Introduction – mechanism – types of Phase transfer catalyst – advantages of Phase transfer catalyst – Applications (Benzoin condensation, Darzen's reaction, Michael reaction,Williamson ether synthesis – the wittig reaction, Wittig Horner reaction, sulphurylides, oxidation ($KMnO_4$, hypochlorite, potassium ferricyanite)- reduction)

Crown ethers: Introduction – nomenclature – special features – synthetic application (Esterification, saponification, oxidation, substitution, elimination, displacement, superoxide anion, photocyanation, heterocyclisation, cation deactivation)

Biocatalyst: Introduction - advantage – classes of enzymes – specificity of enzymes – Biochemical or microbial oxidation (carbohydrates, steroids) – biochemical reduction – enzymes catalyzed hydrolytic processes – Application of enzymes

UNIT – V GREEN SYNTHESIS

Green synthesis of Adipic acid, adiponitrile, Ibuprofen, Methyl metacrylate, sebatic acid, poly aspartate, 2 – aroylbenzofurans, cyclohexane oxime, Lauryl lactum, 6APA, 11 α – hydroxyl progesterone, 3- phenyl catechol, prednisolone

References :

1. V.K.Ahluwalia, Green chemistry .
2. V.K.Ahluwalia, Green chemistry environmentally benign reactions.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1:			
	Pericyclic reactions, Free radical brominations,	2	ICT
	Principles of green chemistry Organic synthesis in water and in super critical carbon di oxide	10	LECTURE
	Organic synthesis using ionic liquids	3	SEMINAR
UNIT 11			
	Solid state reactions at room temperature	2	ICT
	Organic reactions using solid support	10	LECTURE
	Miscellaneous reactions	3	SEMINAR
UNIT III			
	Micro-wave assisted organic synthesis	2	ICT
	Ultra sound assisted organic synthesis	10	LECTURE
	Photo induced organic synthesis	3	SEMINAR
UNIT IV			
	Crown ethers and PTC	2	ICT
	Green reagents	10	LECTURE
	Biocatalysts	3	SEMINAR

UNIT V			
	Green synthesis of Ibu profen	2	ICT
	Green synthesis	10	LECTURE
	Lauryl lactum, 6-APA, Prednisolone	3	SEMINAR

Course Outcomes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO 1	PO 2	PO3	PO4	PO 5	PSO1	PSO 2	PSO3	PSO4	PSO 5	
CO1	4	4	3	4	4	3	4	4	4	4	3.8
CO2	4	3	4	4	4	4	3	4	3	4	3.7
CO3	3	4	4	4	4	3	4	4	4	4	3.8
CO4	4	3	4	3	4	4	4	4	3	4	3.7
CO5	4	4	4	3	4	3	4	4	3	4	3.7
Mean Overall Score											3.74

Result: The Score for this Course is 3.74 (High Relationship)

Course Designer: Dr. C. MEENAKSHI
Dr. A. MARY REMONA

Programme : M.Sc Chemistry **ELECTIVE 4**
Semester : IV **Hours : 5 P/W, 75 Hrs/S**
Sub. Code : EDD2 **Credits : 5**

TITLE OF THE PAPER: MEDICINAL AND PHARMACEUTICAL CHEMISTRY

Pedagogy	Hours	Lecture	Peer Teaching/Seminar//Discussion//Problem solving session/Quiz/videos/Library session.	ICT
	5	3	1	1

PREAMBLE: The objective of the course is to make the student understand fundamentals of medicinal and pharmaceutical chemistry

COURSE OUTCOME: At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: Gain knowledge about the fundamentals of medicinal chemistry, pharmacokinetics, concepts of prodrug and soft drug and drug design. To understand the development of QSAR.	1	5
UNIT 2 CO2: To describe the structural features and SAR of penicillin G, cephalosphorin, streptomycin, terramycin, erythromycin and chloramphenicol.	2	5
UNIT 3 CO3: To classify chemotherapeutic agents and design the synthesis of antinoplastic agents and antitubercular drugs.	3	5
UNIT 4 CO4: To employ the synthesis and therapeutic action and SAR of antipertensive drugs.	4	5
UNIT 5 CO5: Analysis of pharmaceutically important compounds using UV-vis, NMR, mass spectroscopy, TLC, HPLC and GC techniques.	5	5

UNIT I
FUNDAMENTALS OF MEDICINAL CHEMISTRY

Introduction to the history of medicinal chemistry – Pharmacokinetics: Introduction to drug absorption, distribution, drug metabolism and elimination. Concept of prodrug and soft drug. Drug Design – Lead compounds, structure – activity relationship (SAR) and the development of Quantitative Structure Activity Relationship (QSAR).

UNIT II
ANTIBIOTICS AND ANTIBACTERIALS

Structural features and SAR of the following antibiotics – penicillin G, cephalosphorin and their semisynthetic analogs (β–lactam), streptomycin (amino glycoside), terramycin (tetracycline), erythromycin (macrolide) and chloramphenicol.

UNIT III
CHEMOTHERAPEUTIC AGENTS

Antineoplasticagents: Classification, synthesis, assay, e.g., cyclophosphamide, ifosfamide, clorambucil, busulfan, decarbazine, methotrexate, azathioprine, 6-mercaptopurine, 5-fluorouracil and cisplatin.
Antitubercular drugs: Classification, synthesis, assay, e.g., chloroquine, primaquine, amadodiaquine, mefloquine and progunail pyrimethamine.

UNIT IV

SYNTHESIS AND THERAPEUTIC ACTION AND SAR OF ANTIHYPERTENSIVE DRUGS

Nifedipine, Captopril, hydralazine, sodium nitroprusside, clonidine, methyldopa and guanothidine.

UNIT V
PHARMACEUTICAL ANALYSIS
Principles, instrumentation and applications to the following: Absorption spectroscopy (UV, visible & IR). Principles and applications of NMR, Mass spectroscopy, Chromatographic methods – TLC, HPLC and GC.

References

1. Introduction to Medicinal Chemistry, A Gringuage, Wiley-VCH.
2. Wilson and Gisvold's Text Book of Organic Medicinal and Pharmaceutical Chemistry, Ed Robert F. Dorge.
3. An Introduction to Drug Design, S.S. Pandey and J.R. Dimmock, New Age International.
4. Burger's Medicinal Chemistry and Drug Discovery, Sixth Edition, Ed.M.E.vWolff, John Wiley.
5. The Organic Chemistry of Drug Design and Drug Action, R.B. Silverman, Academic Press.
6. Finar, I. L. & Finar, A. L. Organic Chemistry Vol. 2, Addison-Wesley (1998)
7. Finar, I. L. Organic Chemistry Vol. 1, Longman (1998)
8. Gringauz, A. Introduction to Medicinal Chemistry: How Drugs Act and Why? John Wiley & Sons (1997).
9. Patrick, G. L. Introduction to Medicinal Chemistry Oxford University Press (2001).
10. Medicinal Chemistry, Sriram.D
11. Medicinal Chemistry, Kar. Ashuthosh

12. Introductory Medicinal Chemistry, J.B.Taylor and P.D.Kennewell, Ellisworth pub. 1985.
13. Medicinal Chemistry, Laxmi.C
14. Pharmaceutical Chemistry, B.Jeyasree Gosh
15. Text book of Pharmaceutical Organic Chemistry, Mohammed Ali.
16. Synthetic Drug, Gurdeep Chatwal.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1:			
	Pharmacokinetics: Introduction to drug absorption, distribution, drug metabolism and elimination.	2	ICT
	Introduction to the history of medicinal chemistry. Concept of prodrug and soft drug. Drug Design of Lead compounds, structure – activity relationship (SAR)	10	LECTURE
	Development of Quantitative Structure Activity Relationship (QSAR).	3	SEMINAR
UNIT 11			
	Structural features and SAR of penicillin G	2	ICT
	Structural features and SAR of cephalosphorin and their semisynthetic analogs (β – lactam), terramycin (tetracycline) and chloramphenicol.	10	LECTURE
	Structural features and SAR of streptomycin (amino glycoside) and erythromycin (macrolide).	3	SEMINAR
UNIT III			
	Synthesis and applications of chloroquine and cisplatin.	2	ICT
	Synthesis of antineoplasticagents assay, e.g., cyclophosphamide, ifosfamide, clorambucil, busulfan, decarbazine, methotrexate, azathioprine, 6-	10	LECTURE

	mercaptopurine, 5-fluorouracil and antitubercular drugs viz.primaquine, amadodiaquine, mefloquine and progunail pyrimethamine.		
	Classification of antineoplasticagents and antitubercular drugs	3	SEMINAR
UNIT IV			
	Synthesis and therapeutic action of sodium nitro prusside.	2	ICT
	Synthesis and therapeutic action of Nifedipine, Captopril, hydralazine, clonidine, and guanothidine	10	LECTURE
	Synthesis and therapeutic action of methyldopa	3	SEMINAR
UNIT V			
	Instrumentation of TLC, HPLC and GC	2	ICT
	Instrumentation and applications to the following: Absorption spectroscopy (UV, visible & IR). Principles and applications of NMR, Mass spectroscopy,	10	LECTURE
	Principles and applications of TLC, HPLC and GC.	3	SEMINAR

Course Outcomes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO 1	PO 2	PO3	PO4	PO 5	PSO1	PSO 2	PSO3	PSO4	PSO 5	
CO1	4	4	3	4	4	3	4	4	4	4	3.8
CO2	4	3	4	4	4	4	3	4	3	4	3.7
CO3	3	4	4	4	4	3	4	4	4	4	3.8
CO4	4	3	4	3	4	4	4	4	3	4	3.7
CO5	4	4	4	3	4	3	4	4	3	4	3.7
Mean Overall Score											3.74

Result: The Score for this Course is 3.74 (High relationship)

Course Designer: Mrs. D. RENUGA

Programme : M.Sc Chemistry **CORE 12**
Semester : III & IV **Hours : 4 P/W, 60 Hrs/S**
Sub. Code : DL3 **Credits : 4**

TITLE OF THE PAPER : PHYSICAL CHEMISTRY PRACTICAL

Pedagogy	Hours	Lab session//Demonstration class/Viva voce
	4	4

PREAMBLE: The objective of the course is to make the student to do the physical chemistry experiments independently – Electrical and Non-Electrical experiments.

COURSE OUTCOME: At the end of the Semester, the Students will be able to	Unit	Hrs
UNIT 1 CO1: do the non-electrical experiments skillfully.	1	60
UNIT II CO2: do the electrical experiments confidently.	2	60

CHEMICAL KINETICS

1. Determination of the rate constant of the reaction of acid catalysed iodination of acetone and determination of the order of the reaction with respect to acetone and iodine.
2. Study of kinetics of reaction between persulphate and potassium iodide.

PHASE RULE

3. Construction of phase diagram for a simple binary system forming simple eutectic mixture and to find the unknown composition of a given mixture.

DISTRIBUTION LAW

4. Determination of molecular weight and degree of association of benzoic acid in benzene by partition method.

THERMOCHEMISTRY

5. Determination of Heat of solution of KNO_3 by solubility method.

ADSORPTION ISOTHERM

6. Determination of adsorption of acetic acid from aqueous solution by charcoal and verify the validity of Freundlich adsorption isotherm.

CONDUCTIVITY MEASUREMENTS

7.a. Determination of cell constant
7. b. Determination of molar conductance of strong electrolyte at different concentrations and testing the validity of Onsagar′s theory as limiting law at high dilution.

8. Determination of molar conductance of a weak acid at different concentrations. Verification of Ostwald´s dilution law and determination of dissociation constant of weak acid.
9. Conductometric titrations of mixture of HCl and Acetic acid against sodium hydroxide.
10. Precipitation titrations: (mixtures of halides against silver nitrate (or) $BaCl_2$ Vs $(NH_4)_2SO_4$
11. To determine the solubility product K_{sp} of a sparingly soluble salt PbI_2 using conductometry method.

POTENTIOMETRIC TITRATIONS

12. Potentiometric acid base titrations : Determination of pH of a given solution using quinhydrone., Titration of strong acid Vs Strong base, Titration of weak acid Vs strongbase
13. Potentiometric redox titrations : Determination of strength of given ferrous sulphate using standard ferrous ammonium sulphate and link potassium dichromate.

14. Determination of the strength and the dissociation constant of a weak acid.

pH METRY

15. Determination of the strength of the unknown solution of HCl by titrating it with sodium carbonate using pH meter.

References

1. V.Venkatesan, R. Veerasamy and A.R. Kulandaivelu, Basic Principles of Practical Chemistry, S.Chand and Sons, 2004.
2. Physical Chemistry Laboratory manual compiled by .B.Viswanathan, V.R.Vijayaraghavan, T. Sundaravelu, Kamala Govindarajan, S.Vivekanandan and V.Kannappan, Centre of Science Education School of Chemistry, University of Madras.
3. Practical Chemistry by O.P. Pandey, D.N. Bajpal and S. Giri, Reprint 2005.
4. J.B. Yadav; "Advanced Practical Physical Chemistry" 6th Edn., Goel Pub. Meerut, 1986.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1 :NON-ELECTRICAL EXPERIMENTS			
	Chemical kinetics, Phase rule, Distribution law, Thermochemistry and adsorption isotherm	50	Lab Session
	Chemical kinetics, Phase rule, Distribution law, Thermochemistry and adsorption isotherm	5	Demonstration
	Chemical kinetics, Phase rule, Distribution law, Thermochemistry and adsorption isotherm	5	Viva
UNIT I 1 : ELECTRICAL EXPERIMENTS			
	Conductivity Experiments, Potentiometric titrations & pH Metry	50	Lab Session

	Conductivity Experiments, Potentiometric titrations & P^H Metry	5	Demonstration
	Conductivity Experiments, Potentiometric titrations & P^H Metry	5	Viva

Course Outcomes (Cos)	Programme Specific Outcomes (PSOs)										Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	4	5	4	4	4	5	5	4	4	4	4.3
CO2	5	4	4	4	5	4	5	4	4	4	4.3
Mean Score											4.3

Result: The Score for this Course is 4.3 (Very High Relationship)

Course Designer: Dr. J. ARUL MOLI
Mrs. P. ROOPAKALYANI

Programme : M.Sc Chemistry **CORE 13**
Semester : III & IV **Hours : 4 P/W, 60 Hrs/S**
Sub. Code : DL4 **Credits : 4**

TITLE OF THE PAPER : INORGANIC & ORGANIC QUANTITATIVE ANALYSIS PRACTICAL

Pedagogy	Hours	Lab session//Demonstration class/Viva voce
	4	4

PREAMBLE: The objective of the course is to make the student to do the estimation independently.

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs
UNIT 1 CO1: do the volumetric and gravimetric estimation skillfully.	1	40
UNIT II CO2: do the complexometric titrations confidently.	2	20
UNIT III CO3 do the organic estimation skillfully.	3	40
UNIT III CO3 do the colorimetric estimation skillfully.	3	20

I VOLUMETRIC AND GRAVIMETRIC ESTIMATION

1. Estimation of Copper & Nickel
2. Estimation of Iron & Nickel or Estimation of Copper & Zinc

II COMPLEXOMETRIC TITRATION

1. Estimation of Zinc / Magnesium.
2. Estimation of hardness of water.

III ORGANIC ESTIMATION

1. Estimation of Ethylmethylketone
2. Estimation of Glucose
3. Saponification of an oil
4. Estimation of Glycine

IV. COLORIMETRY

1. Estimation of Iron/Copper/Nickel.
2. Determination of unknown concentration of $KMnO_4/K_2Cr_2O_7$.

References

1. G.Svehla, Vogel′s Quantitative Inorganic Analysis, 7th Ed. Pearson Education, 2003

2. B.B. Dey and M.V. Sitaraman, Laboratory manual of organic chemistry –.
3. Gnanapragasam and Ramamurthy, Organic Chemistry Lab ManuaL, Viswanathan Publishers Pvt Ltd, 2006.
4. V.Venkatesan, R. Veerasamy, A.R.Kulandaivelu, Basic Principles of Practical Chemistry, S.Chand and Sons, 2004.
5. Practical Chemistry by O.P.Pandey, D.N.Bajpal and S.Giri, Reprint 2005.
6. Sundaram, P.Krishnan and P.S.Ragavan, Practical Chemistry, Viswanathan Printers and Publishers.,1993.
7. Subash-Satish, Advanced Inorganic Analysis.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT I : VOLUMETRIC AND GRAVIMETRIC ESTIMATION			
	Estimation of Copper & Nickel, Estimation of Iron & Nickel or Estimation of Copper & Zinc	30	Lab Session
		5	Demonstration
		5	Viva
UNIT II : COMPLEXOMETRIC TITRATION			
	Estimation of Zinc / Magnesium, Estimation of hardness of water.	12	Lab Session
		4	Demonstration
		4	Viva
UNIT III ORGANIC ESTIMATION			
	Estimation of Ethylmethylketone, Estimation of Glucose, Saponification of an oil, Estimation of Glycine.	30	Lab Session
		5	Demonstration
		5	Viva
UNIT III COLORIMETRY			
	Estimation of Iron/Copper/Nickel, Determination of unknown concentration of $KMnO_4/K_2Cr_2O_7$.	12	Lab Session
		4	Demonstration
		4	Viva

Course Outcomes (Cos)	Programme Specific Outcomes (PSOs)										Mean scores of Cos
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	4	5	4	4	4	5	5	4	4	4	4.3
CO2	5	4	4	4	5	4	5	4	4	4	4.3
										Mean Score	4.3

Result: The Score for this Course is 4.3 (Very High Relationship)

Course Designer: Dr. K. VIGNESWARI
Dr. N. MANONMANI

Programme : M.Sc Chemistry | **CORE 16**
Semester : IV | **Hours : 7 P/W, 105 Hrs/S**
Sub. Code : DPW | **Credits : 5**

INDIVIDUAL PROJECT

To plan and design, retrieve relevant literature, organize and conduct, process the data, record the observations and interpret. The work shall be conducted in the department under the guidance of the project supervisor or in other institutions or with interdisciplinary collaboration from external departments or institutions.