



PSGR KRISHNAMMAL COLLEGE FOR WOMEN
College of Excellence
(An Autonomous Institution, Affiliated to Bharathiar University)
(Reaccredited with 'A' Grade by NAAC, An ISO 9001:2008 Certified Institution)
Peelamedu, Coimbatore-641004



DEPARTMENT OF CHEMISTRY

**CHOICE BASED CREDIT SYSTEM &
OUTCOME BASED EDUCATION SYLLABUS**

MASTER OF CHEMISTRY

2016 - 2018



PSGR KRISHNAMMAL COLLEGE FOR WOMEN
College of Excellence
(An Autonomous Institution, Affiliated to Bharathiar University)
(Reaccredited with 'A' Grade by NAAC, An ISO 9001:2008 Certified Institution)
Peelamedu, Coimbatore-641004



PROGRAMME OUTCOMES

After completion of the programme, the students will have

PO1 :ability to function as responsible individuals with ethical values, accountable to the community

PO2 :detailed knowledge of the major areas of chemistry including a wide range of factual information and experimentally observed phenomena.

PO3 :ability to apply chemical concepts in new situations i.e., ability to predict physical and chemical properties by comparison with analogues.

PO4 : professional Skill to handle standard equipments and to analyze the data.

PO5 :ability to solve unseen chemical problems both qualitative and quantitative by interpretation and manipulation of experimental data.

PO6 :ability to present chemical research results to a technically literate audience by means of an oral presentation, scientific poster or a written report.

PO7 : ability to assimilate in the course of different modules throughout the various years of study and to apply this when required.

PROGRAMME SPECIFIC OUTCOME

The students at the time of graduation will

PSO1 : possess skills in spectral, analytical, qualitative and quantitative techniques which will be useful in industry

PSO2 :be able to design a synthetic route for new compounds and transform innovative ideas into reality

PSO3 : possess skill in problem solving, critical thinking and analytical reasoning as applied to scientific problems.



PSGR KRISHNAMMAL COLLEGE FOR WOMEN
College of Excellence
 (An Autonomous Institution, Affiliated to Bharathiar University)
 (Reaccredited with 'A' Grade by NAAC, An ISO 9001:2008 Certified Institution)
 Peelamedu, Coimbatore-641004



DEPARTMENT OF CHEMISTRY
2016-2018

Sem	Subject Code	Title of the paper	Instruction hours/ week	Total Hours		Duration of Examination	Max. Marks			Credits
				Contact Hours	Tutorial Hours		CA	ESE	Total	
I	MCE1601	Paper – I Organic Chemistry – I (Organic Reaction Mechanism & Stereochemistry)	5	71	4	3	40	60	100	5
	MCE1602	Paper – II Physical Chemistry – I (Classical & Statistical Thermodynamics)	5	71	4	3	40	60	100	5
	MCE1603	Paper – III Analytical Techniques in Chemistry	5	71	4	3	40	60	100	5
	MCE16P1	Practical – I Organic Chemistry Practical - I	5	75	-	-	-	-	-	-

	MCE16P2	Practical – II Inorganic Chemistry Practical – I	5	75	-	-	-	-	-	-
	MCE16P3	Practical – III Physical Chemistry Practical – I	5	75	-	-	-	-	-	-
II	MCE1604	Paper IV Organic Chemistry-II (Reagents, Rearrangements, Pericyclic Reactions & Photochemistry)	5	71	4	3	40	60	100	5
	MCE1605	Paper V Physical Chemistry-II (Group Theory & Quantum Chemistry)	5	71	4	3	40	60	100	5
	MCE1606	Paper VI-Spectroscopy	4	56	4	3	40	60	100	5
	MCE16P1	Practical I Organic Chemistry Practical – I	4	60	-	6	40	60	100	4
	MCE16P2	Practical II Inorganic Chemistry Practical – I	4	60	-	6	40	60	100	4
	MCE16P3	Practical III Physical Chemistry Practical – I	4	60	-	6	60	90	150	5
	MCP14A1	IDC-Clinical microbiology & Biochemistry	4	60	-	3	-	10 0	100	4
III	MCE1607	Paper – VII Organic Chemistry – III (Chemistry of Natural Products)	5	71	4	3	40	60	100	5

	MCE1608	Paper – VIII Elective – I (Coordination & Organometallic Chemistry) (or)	4	56	4	3	40	60	100	4
	MCE1609	Paper – VIII Elective – II Medicinal Chemistry	4	56	4	3	40	60	100	4
	MCE1610	Paper -IX- Physical Chemistry III (Reaction Kinetics & Electrochemistry	4	56	4	3	40	60	100	4
	MCE16P4	Practical-IV-Organic Chemistry Practical – II	4	60	-	6	40	60	100	4
	MCE16P5	Practical-V-Inorganic Chemistry Practical – II	4	60	-	6	40	60	100	4
	MCE16P6	Practical-VI Physical Chemistry Practical – II	5	75	-	6	60	90	150	5
	MCE14S1	Research Methodology	2	30	-	3	-	-	100	2
	MNM15C S	Cyber Security	2	26	4	2	-	-	-	Grade
	MCE16C E	Comprehensive Examination	-	-	-	1	-	-	-	Grade
IV	MCE1611	Paper – X Elective III - Chemistry & Technology of Polymers (Or)	4	56	4	3	40	60	100	4
	MCE1612	Paper – X Elective IV – Applied Chemistry	4	56	4	3	40	60	100	4

	MCE1613	Paper- XI Green Chemistry	3	41	4	3	40	60	100	3
	MCE1614	paper - XII Nano Chemistry and Bioinorganic Chemistry	3	41	4	3	40	60	100	3
	MCE1315 (Optional) MCE1316	ALC – Environmental Chemistry (Or) ALC- Industrial Chemistry	Self stud y	-	-	3	25	75	100	5
	MCE16P ROJ	Project & Viva-voce (Jan - March)		3 Mont hs	-		20	80	100	5
		Grand Total							220 0+ 100	90+ 5

QUESTION PAPER PATTERN

Continuous Internal Assessment: 50 Marks

BLOOM'S CATEGORY	SECTION	MARKS	TOTAL
K ₁	A – 5 X 2 Marks	10	50
K ₁ , K ₂	B – 4 X 5 Marks	20	
K ₃ , K ₄	C - 2/3 X 10 Marks	20	

End Semester Examination – 100 Marks (I & II Semester)

BLOOM'S CATEGORY	SECTION	WORD LIMIT	MARKS	TOTAL
K ₁ , K ₂	A-15 X 2 Marks (No choice)	One or two sentences	30	100
K ₄ , K ₃	B - 6/7 X 6 Marks	250	36	
K ₄ , K ₅	C - 3/5 X 8 Marks	400	24	
K ₅ , K ₆	D - 1 X 10 Marks (No choice)	600	10	

End Semester Examination – 100 Marks (III & IV Semester)

BLOOM'S CATEGORY	SECTION	WORD LIMIT	MARKS	TOTAL
K ₁ , K ₂	A-10 X 3 Marks (No choice)	One or two sentences	30	100
K ₄ , K ₃	B - 6/7 X 6 Marks	250	36	
K ₄ , K ₅	C - 3/5 X 8 Marks	400	24	
K ₅ , K ₆	D - 1 X 10 Marks (No choice)	600	10	

INTER-DISCIPLINARY COURSE (IDC) – 100 Marks

Bloom's Category	Section	Marks	Total
Understand(K ₂)	A – 5X5 marks (Either or)	25	100
Apply / Analyse Evaluate (K ₃ , K ₄ , K ₅)	B – 5 X15marks (Either or)	75	

ADVANCED LEARNERS COURSE (ALC)

Continuous Internal Assessment: 25 Marks

BLOOM'S CATEGORY	SECTION	MARKS	TOTAL
K3, K4	A – 4 / 6 X 4 Marks	16	25
K4, K5	B – 1 / 2 X 9 Marks	9	

End Semester Examination: 75 Marks

BLOOM'S CATEGORY	SECTION	MARKS	TOTAL
K3, K4	A-5/8 X 5=25 Marks	25	75
K4, K5	B – 5/8 X 10 =50 Marks	50	

CYBER SECURITY

Continuous Internal Assessment: 40 Marks

SECTION	MARKS	TOTAL
A – 5 / 8 X 2 Marks	10	40
B – 6 / 8 X 5 Marks	30	

PROJECT

Each faculty will be allotted 2/3 students. A specific problem will be assigned to the students or they will be asked to choose a problem/area of interest. The topic/area of work will be finalized at the end of III semester, allowing scope for the students to gather relevant literature during the vacation. The research work can be carried out in the college or at any other organization approved by the guide and the HOD. Viva Voce/presentation will be conducted by a panel comprising of HOD, internal / external examiners. A power point presentation by the student before the audience will be evaluated on the basis of student's response to the questions.

Internal Assessment: 20 Marks

Review	Mode of Evaluation	Marks	Total
I	Selection of the field of study, Topic & Literature collection	5	20
II	Research Design and Data Collection	10	
III	Analysis & Conclusion, Preparation of rough draft	5	

External Assessment: 80 Marks

Mode of Evaluation	Marks	Total
Project Report		
Relevance of the topic to academic / society	10	60
Objectives	10	
Experimental Design	20	
Expression of Results and Discussion	20	
Viva Voce		
Presentation	10	20
Discussion	10	

WEIGHTAGE ASSIGNED TO VARIOUS COMPONENTS OF
CONTINUOUS INTERNAL ASSESSMENT

Theory

	CIA I	CIA II	Model Exam	Assignment/ Class Notes	Seminar	Quiz	Class Participation	Library Usage	Attendance	Max. Marks
Core / Allied	5	5	6	4	5	4	5	3	3	40
ALC		10	15	-	-	-	-	-	-	25
Information Security	40	40		10		10				100

Practical

Model Exam	Lab Performance	Regularity in Record Submission	Attendance	Maximum Marks
12	20	5	3	40

RUBRICS
Assignment/ Seminar

Maximum - 20 Marks (converted to 4 marks)

Criteria	4 Marks	3 Marks	2 Marks	1 Mark
Focus Purpose	Clear	Shows awareness	Shows little awareness	No awareness
Main idea	Clearly presents a main idea.	Main idea supported throughout	Vague sense	No main idea
Organisation: Overall	Well planned	Good overall organization	There is a sense of organization	No sense of organization
Content	Exceptionally well presented	Well presented	Content is sound	Not good
Style: Details and Examples	Large amounts of specific examples and detailed description	Some use of examples and detailed descriptions	Little use of specific examples and details	No use of examples

CLASS PARTICIPATION

Maximum - 20 Marks (converted to 5 marks)

Criteria	5 Marks	4 Marks	3 Marks	2 Marks	1 Mark	Points scored
Level of Engagement in Class	Student proactively contributes to class by offering ideas and asks questions more than once per class.	Student proactively contributes to class by offering ideas and asks questions once per class	Student contributes to class and asks questions occasionally	Student rarely contributes to class by offering ideas and asking no questions	Student never contributes to class by offering ideas	
Listening Skills	Student listens when others talk, both in groups and in class. Student incorporates or builds off of the ideas of others.	Student listens when others talk, both in groups and in class.	Student listens when others talk in groups and in class occasionally	Student does not listen when others talk, both in groups and in class.	Student does not listen when others talk, both in groups and in class. Student often interrupts when others speak.	
Behavior	Student almost never displays	Student rarely displays	Student occasionally displays	Student often displays	Student almost always	

	disruptive behavior during class	disruptive behavior during class	disruptive behavior during class	disruptive behavior during class	displays disruptive behavior during class	
Preparation	Student is almost always prepared for class with required class materials	Student is usually prepared for class with required class materials	Student is occasionally prepared for class with required class materials	Student is rarely prepared for class with required class materials	Student is almost never prepared for class.	
					Total	

MAPPING OF POs WITH Cos

COURSE	PROGRAMME OUTCOMES						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
COURSE - MCE1601							
CO1	H	H	H	H	M	H	H
CO2	H	H	H	H	H	H	H
CO3	H	H	H	H	H	H	H
CO4	H	H	H	H	H	H	H
COURSE - MCE1602							
CO1	H	H	H	M	H	H	H
CO2	H	H	H	M	H	H	H
CO3	H	H	H	M	H	H	H
CO4	H	H	M	M	M	H	H
CO5	H	H	H	M	H	H	H
COURSE - MCE1603							
CO1	H	H	H	H	H	H	H
CO2	H	H	H	H	M	H	H
CO3	H	H	H	H	H	H	H
CO4	H	H	H	H	H	H	H
CO5	H	H	H	H	H	H	H
COURSE - MCE1604							
CO1	H	H	H	M	H	H	H
CO2	H	H	H	M	H	H	H
CO3	H	H	H	M	H	H	H
CO4	H	H	H	M	H	H	H

CO5	H	H	H	M	H	H	H
COURSE - MCE1605							
CO1	H	H	H	M	M	M	M
CO2	H	H	H	M	M	M	M
CO3	H	H	H	M	H	M	M
CO4	H	H	H	M	M	M	H
CO5	H	H	H	M	H	M	H
CO6	H	H	M	M	H	L	H
COURSE - MCE1606							
CO1	H	H	H	H	H	M	H
CO2	H	H	H	M	H	M	H
CO3	H	H	H	M	M	M	H
CO4	H	H	M	M	H	M	H
CO5	H	H	M	M	H	M	H
COURSE - MCE16P1							
CO1	H	H	H	M	H	H	H
CO2	H	H	H	L	H	H	H
CO3	H	H	H	L	H	M	M
CO4	H	H	M	M	M	M	M
CO5	H	H	H	H	H	H	H
COURSE - MCE16P2							
CO1	H	H	H	M	H	H	H
CO2	H	H	H	M	H	H	H
CO3	H	H	H	M	H	H	H
CO4	H	H	H	M	H	H	M
CO5	H	H	H	H	H	H	H

COURSE - MCE16P3							
CO1	H	H	H	H	M	M	M
CO2	H	H	H	H	H	H	H
CO3	H	H	H	M	M	M	M
CO4	H	H	H	M	H	H	H
COURSE - MCP14A1							
CO1	H	M	H	M	H	H	M
CO2	H	H	H	H	L	L	M
CO3	H	H	M	H	M	M	M
CO4	H	M	M	M	H	H	M
CO5	H	M	M	H	H	H	H
COURSE - MCE1607							
CO1	H	H	H	L	H	H	H
CO2	H	H	H	M	H	H	H
CO3	H	H	H	M	H	H	H
CO4	H	H	H	L	M	M	H
CO5	H	H	H	M	M	H	H
COURSE - MCE1608							
CO1	H	H	H	M	M	H	H
CO2	H	H	H	M	H	H	H
CO3	H	H	H	M	H	H	H
CO4	H	H	H	H	H	H	H
CO5	H	H	H	H	M	H	H
COURSE - MCE1609							
CO1	H	H	H	M	H	H	H
CO2	H	H	H	L	M	H	H

CO3	H	H	H	L	H	H	H
CO4	H	H	H	M	M	H	H
CO5	H	H	H	M	H	H	H
COURSE - MCE1610							
CO1	H	H	H	M	M	H	H
CO2	H	H	H	H	H	H	H
CO3	H	H	H	M	H	H	H
CO4	H	H	H	H	H	H	H
CO5	H	H	H	M	H	H	H
COURSE - MCE16P4							
CO1	H	H	H	H	H	H	H
CO2	H	H	H	H	H	H	H
CO3	H	H	H	H	H	H	H
COURSE - MCE16P5							
CO1	H	H	H	H	H	H	H
CO2	H	H	H	M	H	H	H
CO3	H	H	H	M	H	H	H
COURSE - MCE16P6							
CO1	H	H	H	H	H	H	H
CO2	H	H	H	H	H	H	H
CO3	H	H	H	H	H	H	H
COURSE - MCE1611							
CO1	H	H	H	M	H	H	H
CO2	H	H	H	M	H	H	H
CO3	H	H	H	M	H	H	H
CO4	H	H	H	M	H	H	H

CO5	H	H	H	M	H	H	H
COURSE - MCE1612							
CO1	H	H	H	M	M	H	H
CO2	H	H	H	M	M	H	H
CO3	H	H	H	L	M	M	H
CO4	H	H	H	M	M	H	H
CO5	H	H	H	M	M	H	H
COURSE - MCE1613							
CO1	H	H	H	M	H	H	H
CO2	H	H	H	H	H	H	H
CO3	H	H	H	M	H	H	H
COURSE - MCE1614							
CO1	H	H	H	M	M	H	H
CO2	H	H	H	M	H	H	H
CO3	H	H	H	M	M	H	H
COURSE - MCE1315							
CO1	H	H	H	M	M	H	H
CO2	H	H	H	M	M	H	H
CO3	H	H	H	M	M	H	H
CO4	H	H	H	M	M	H	H
COURSE - MCE1316							
CO1	H	H	H	M	M	H	H
CO2	H	H	H	M	M	H	H
CO3	H	H	H	M	M	H	H

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE1601	PAPER I – ORGANIC CHEMISTRY – I (Organic Reaction Mechanism & Stereochemistry)	THEORY	71	4	-	5

Preamble

To enable the students to

- gain knowledge about the aromaticity and organic reaction mechanism
- understand the conformation & stereochemistry of organic compounds
- learn the mechanism of substitution & elimination reactions in aliphatic & aromatic compounds

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	classify organic compounds as aliphatic or aromatic compounds and to analyze the mechanistic pathway of organic reactions.	K ₂ , K ₄
CO2	apply concepts of isomerism to organic compounds	K ₃
CO3	classify organic reactions and to propose suitable mechanism.	K ₅
CO4	predict the product in organic reactions	K ₆

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	H	H	H	M	H	H
CO2	H	H	H	H	H	H	H
CO3	H	H	H	H	H	H	H
CO4	H	H	H	H	H	H	H

H-High; M-Medium; L-Low

PAPER I – ORGANIC CHEMISTRY – I [MCE1601]

(Organic Reaction Mechanism & Stereochemistry) (71 Hrs)

Unit I (14 Hrs)

Aromaticity

Criteria - Huckel's rule – Aromatic character in benzene, four, five, seven, eight membered rings- Aromaticity of benzenoids & heterocyclic compounds. Non benzenoid aromatics- azulene, ferrocene, tropolone, sydnones & annulenes (synthesis not required) - Non aromatic & anti-aromatic systems. Nomenclature of bicyclic & tricyclic systems.

Study of Organic Reaction Mechanism

Non kinetic methods-Product analysis, intermediate criteria (isolation, trapping & detection)-Isotopic labeling & cross over experiments - Stereochemical evidence. Kinetic methods-Mechanistic implications of rate law-Isotope effects. Kinetic & Thermodynamic control of reactions-Hammonds postulates, linear free energy relationship-Hammett & Taft equations.

Unit II (14 Hrs)

Stereochemistry

Optical Isomerism - Concept of chirality- Stereochemistry of sulphur & nitrogen compounds - Concept of prochirality - Enantiotopic & diastereotopic ligands & faces- Stereospecific & stereoselective reactions. R, S - nomenclature of compounds having one & more than one chiral centres- Axis chirality- (Optical isomerism of biphenyls, allenes & spirans)- Planar chirality (Optical isomerism of ansa compounds & cyclophanes)- Helicity (Optical isomerism of over- crowded molecules)

Geometrical Isomerism

E-Z Notation- Determination of configuration of geometrical isomers, Stereoisomerism of cyclic compounds (upto six membered rings), Aldoximes & ketoximes.

Conformational Analysis

Configuration & conformation- Conformation of acyclic compounds, cyclohexane, decalins, perhydrophenanthrene & carbohydrates. Effect of conformation on reactivity.

Unit III

(14 Hrs)

Aliphatic Nucleophilic Substitution

The S_N1 , S_N2 SN^i mechanisms. The neighbouring group mechanism, neighbouring group participation by π & σ bonds, anchimeric assistance. Nucleophilic substitution at an allylic, aliphatic, trigonal & vinylic carbon. Reactivity- effects of substrate structure, attacking nucleophile, leaving group & reaction medium. Phase transfer catalysis, ambident nucleophiles & ambident substrates.

Aromatic Nucleophilic Substitution

The S_NAr , S_N1 , Benzyne & SR_N1 Mechanisms. Reactivity – Effect of substrate structure, leaving group & attacking nucleophile.

Unit IV

(14 Hrs)

Aliphatic Electrophilic Substitution

Bimolecular mechanisms – S_E2 (front), S_E2 (back) & SE^i . Unimolecular mechanism- S_E1 mechanism, electrophilic substitution accompanied by double bond shifts. Effect of substrate, leaving group & solvent polarity on the reactivity, Friedel- Craft's acylation at olefinic carbon, Stork Enamine reaction & decarboxylation of aliphatic acids.

Aromatic Electrophilic Substitution

Mechanism, orientation & reactivity, the ortho/para ratio, Friedel- Crafts alkylation, Scholl reaction (arylation). Formylation: Gattermann reaction, Gattermann-Koch reaction, Reimer- Tiemann reaction, Kolbe-Schmidt reaction, Houben- Hoesch reaction, Vilsmeier-Haack reaction, Hofmann-Martius & Jacobsen reactions.

UNIT V

(15 Hrs)

Elimination Reactions

E1, E2 & E1cB mechanisms, orientation of double bond- structural & stereochemical factors governing eliminations - Hofmann & Saytzeff rules, Bredt's rule - Effect of changes in the substrate, base, leaving group & medium on E1, E2 & E1cB reactions- Elimination vs substitution- Pyrolytic elimination- Chugaev reaction, Hofmann degradation, Cope elimination.

Text Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	Jerry March	Advanced Organic Chemistry	Wiley Publications	reprint 2010, 4 th Edition.
2	I.L. Finar	Organic Chemistry Vol I	Pearson Education	reprint 2007, 6 th Edition
3	I.L. Finar	Organic Chemistry Vol II	Pearson Education	reprint 2009, 5 th Edition
4	Jagdamba Singh & Yadav	Advanced Organic Chemistry	Pragati Prakasham	2010, 6 th Edition

Reference Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	R.K. Bansal	Organic Reaction Mechanism	Tata McGraw Hill Publications	reprint 2006, 3 rd Edition
2	F.A.Carey & Sundberg	Advanced Organic Chemistry	A Plenum / Rosetta Edition	1990, 3 rd Edition, 2009(Reprint)
3	D. Nasipuri	Stereochemistry of Organic Compounds	Wiley Eastern Ltd	1991, 2 nd Edition

Pedagogy:

Lecture by chalk & talk, power point presentation, e-content, Simulation, numerical exercises, group discussion, assignment, quiz, seminar.

Course Designers:

1. Dr.G.Selvi
2. Mrs.N.Shyamaladevi

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE1602	PAPER-II-PHYSICAL CHEMISTRY PAPER – I (Classical & Statistical Thermodynamics)	THEORY	71	4	-	5

Preamble

To make the students to

- acquire knowledge about fugacity, activity and chemical potential.
- understand the need for third law of thermodynamics and probability concept
- gain knowledge about the different distribution laws (classical and statistical) and their applications

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	interpret the physical significance of chemical potential.	K ₂
CO2	apply and analyse probability to molecular energy levels.	K ₃ , K ₄
CO3	calculate the molecular velocities based on Maxwell Boltzmann distribution law.	K ₄
CO4	evaluate thermodynamic properties from partition partition functions	K ₆
CO5	apply statistical thermodynamics to the properties of identical indistinguishable particles like electrons	K ₃

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	H	H	M	H	H	H
CO2	H	H	H	M	H	H	H
CO3	H	H	H	M	H	H	H
CO4	H	H	M	M	M	H	H
CO5	H	H	H	M	H	H	H

H-High; M-Medium; L-Low

PHYSICAL CHEMISTRY PAPER – I [MCE1602]

(Classical & Statistical Thermodynamics)

(71 Hrs)

Unit I

(14 Hrs)

Classical Thermodynamics

Concept of Chemical potential – Fugacity- Definition- Determination of fugacity of gases by graphical method, from equation of state, approximation method & generalized method- variation of fugacity with temperature. fugacity & the standard state for non ideal gases- Fugacity coefficient, fugacity of mixture of non- ideal gases. Activity & activity coefficient. Standard states – Activity of solutions. Determination of activity of solute & solvent.

Unit II

(14 Hrs)

Third Law of Thermodynamics

Nernst heat theorem, third law of thermodynamics - Need for third law, different forms of stating third law, negative absolute temperature, thermodynamic quantities at absolute zero, probability & third law, statistical meaning of third law & apparent exceptions.

Probability & Ensembles

Theorems of Permutations, Combinations & Probability. Thermodynamic probability to molecular systems- States of maximum thermodynamic probability of systems involving energy levels. Distinguishable & indistinguishable particles. Microstates & macrostates. Ensembles – Definition- Microcanonical, canonical & grand canonical ensembles.

Unit III

(14 Hrs)

Maxwell Boltzmann Statistics

Stirling's approximation formula, Maxwell Boltzmann distribution law – Assumptions, derivation for the system having non- degenerate & degenerate energy levels. Experimental verification of Maxwell's distribution of molecular velocities by Stern method. Limitations of Maxwell Boltzmann distribution law.

2D Velocity Distribution Law

Maxwell's Distribution law of molecular velocities, evaluation of alpha & beta in Boltzmann statistics. Evaluation of average velocity, root mean square velocity & most probable velocity from distribution law of molecular velocities and energies of an ideal gas.

Unit IV**(14 Hrs)****Equipartition of Principle of Energy**

Calculation of heat capacities of ideal gases- Limitations.

Partition Functions

Definition- Explanation- Molecular partition function- Molar partition function- Relationship between partition function & thermodynamic properties E, H, S, A, G, C_V & C_P . Translational partition functions- Sackur- Tetrode equation. Rotational partition functions – Ortho/para hydrogen- Vibrational partition functions- Electronic partition functions. Evaluation of thermodynamic properties for mono & diatomic ideal gas molecules from translational, rotational and vibrational partition functions.

Unit V**(15 Hrs)****Quantum Statistics**

Bose Einstein distribution law- Derivation – Entropy of bosons. Derivation of Planck's black body radiation law. Bose Einstein condensation. Helium at low temperature. Fermi – Dirac distribution law- Derivation, Entropy of fermions. Applications - Electron gas, fermi energy of free electrons at absolute zero. Heat capacity of free electrons in metals. Einstein theory & Debye theory of heat capacity of solids.

Text Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	Samuel Glasstone	Thermodynamics for Chemists	East West Press	Reprint 2002
2	M.C. Gupta	Statistical Thermodynamics	Wiley Eastern Publications	1990, 1 st Edition

Reference Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	P.W. Atkins	Physical Chemistry	Oxford	1978, 1 st Edition

			University	(Reprint 2005)
2	Gurdeep Raj	Advanced Physical Chemistry	GOEL Publishing House	2002, 27 th Edition
3	Peter Atkins & Julio de Paula	Elements of Physical Chemistry	Oxford University	2 nd Print 2010, 5 th Edition
4	F.W. Sears and G.L. Salinger	Thermodynamics, Kinetic & Statistical thermodynamics	Narosa Publishing House	Reprint 2013
5	Frederick.T. Wall	Chemical Thermodynamics	W.H. Freeman & Company	1974, 3 rd Edition

Pedagogy:

Lecture by chalk & talk, power point presentation, e-content, Simulation, numerical exercises, group discussion, assignment, quiz, seminar.

Course Designers:

1. Dr.K.Parameswari
2. Dr. D.Nalini
3. Dr. G.Selvi

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE1603	PAPER III- ANALYTICAL TECHNIQUES IN CHEMISTRY	THEORY	71	4	-	5

Preamble

To enable the students to

- understand and analyze various types of chromatographic techniques.
- relate the different thermal and electro analytical techniques.
- recognize the principles of XRD and interpret XRD data.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	classify chromatography into HPLC, GC-MS, SFC and locate their applications.	K ₂
CO2	employ the theory of turbidimetry, Nephelometry to determine the concentration of solutions.	K ₃
CO3	apply the concepts of ORD & CD to predict the confirmation and conformations of simple cyclic ketones	K ₂ , K ₃
CO4	classify thermo and electro analytical techniques and to assess the thermal stability and concentration of solutions	K ₄ , K ₆
CO5	Apply XRD crystal structure determination	K ₃

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	H	H	H	H	H	H
CO2	H	H	H	H	M	H	H
CO3	H	H	H	H	H	H	H
CO4	H	H	H	H	H	H	H
CO5	H	H	H	H	H	H	H

H - High; M-Medium; L-Low

PAPER III – ANALYTICAL TECHNIQUES IN CHEMISTRY [MCE1603] (71 Hrs)

Unit I (14 Hrs)

Chromatography

High Pressure Liquid Chromatography (HPLC): Introduction, Characteristic features of HPLC, Principle, column processes and band broadening, instrumentation, Applications of HPLC.

Gas Chromatography (GC): Introduction, Principle, Theory, instrumentation, Evaluation of gas chromatogram, identification of chromatogram, plate theory for gas chromatography, Applications.

Gas Chromatography Mass Spectrometry (GC-MS) - Ion monitoring by GC MS system.

Super Critical Fluid Chromatography (SFC): Characteristics of super critical fluids, Instrumentation for SFC, Components for SFC, Comparison of SFC with HPLC & GLC, Applications of SFC

Unit II (14 Hrs)

Analytical Techniques

ORD & CD – Principle, instrumentation - Visual polarimetry (for ORD) types of ORD curves, axial haloketone rule & octant rule – Applications to determine the configuration & conformation of simple monocyclic & bicyclic ketones. Nephelometry & turbidimetry – Tyndall effect – Instrumentation & applications.

Unit III (14 Hrs)

Thermoanalytical Methods

Principle - Thermogravimetric analysis & differential thermal analysis- discussion of various components with block diagram- TG/DTA thermogram of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, $\text{MgC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ & $\text{Ca}(\text{OOCCH}_3)_2 \cdot \text{H}_2\text{O}$ – DTA/TGA curves of SrCO_3 in air & $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ in air & CO_2 . Factors affecting TGA & DTA curves. UPS & ESCA - Basic principles, sources, instrumentation, applications. Discussion of PES spectra of simple molecules nitrogen, oxygen & sulphur.

Unit IV**(14 Hrs)****X-ray Diffraction**

Fundamentals of XRD- Powder and rotating crystal methods. Determination of lattice types, analysis of X-ray data for cubic system- NaCl, KCl crystals. Fourier synthesis, Neutron diffraction and structure determination. Types of solids – close packing of atoms and ions- bcc, fcc, hcp- voids-radius ratio and crystal geometry influence on structures – CsCl, Wurtzite, Zinc blende, rutile, fluorite, antiferite – diamond and graphite.

Unit V**(15 Hrs)****Electro Analytical Techniques**

Coulometry: Introduction, Types of Coulometric methods, Types of Coulometers – O₂-H₂, Ag and I₂ coulometer, Coulometric titrations- Internal and external generation of titrants, application of coulometric titrations.

Polarography: Introduction, apparatus, working, polarographic measurements, Interpretation of polarographic waves, equation for polarographic wave, half wave potential, types of currents, DME advantages, Application of Polarography

Cyclic Voltammetry: Principle, Normal pulse voltammetry (NPV), Differential pulse voltammetry (DPV), Square wave voltammetry (SWV) Preconcentration and stripping technique, Anodic stripping voltammetry, cathodic Voltammetry, adsorptive stripping voltammetry.

Text Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	B. K Sharma	Instrumental Methods of Chemical Analysis	Goel Publications	1996, 15 th Edition
2	H. H Willard, L. L Merritt. & J. A Dean, F.A. Settle	Instrumental Methods of Analysis	CBS Publishers & Distributors	1986, 7 th Edition

3	Dr. H. Kaur	Instrumental Methods of Chemical Analysis	Pragati Prakashan	2008, 4 th Edition
4	Mahinder Singh	Analytical Chemistry- Instrumental Techniques	Dominant Publishers & Distributors NewDelhi	2003, 1 st Edition
5	E.L Eliel	Stereochemistry of Carbon Compounds	Tata Mc Graw Hill	2004, 30 th Edition

Reference Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	S. M. Khopkar	Basic Concepts of Analytical Chemistry	Wiley Eastern Ltd	1884, First Edition
2	D. A. Skoog, F.J.Holler & D. M West	Analytical Chemistry- An Introduction	Saunders College Publications	1994, 8 th Edition
3	M.S.Yadav	Instrumental Methods of Chemical Analysis	Campus Book	2006, 1 st Edition

Pedagogy:

Lecture by chalk & talk, power point presentation, e-content, Simulation, numerical exercises, group discussion, assignment, quiz, seminar.

Course Designers:

1. Dr. S.Chitra
2. Dr. N.Muthulakshmi Andal
3. Dr. N.Arunadevi

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE1604	PAPER IV - ORGANIC CHEMISTRY II (Rearrangements, Pericyclic Reactions, Retro Synthesis & Photochemistry)	THEORY	71	4	-	5

Preamble

To enable the students to

- gain knowledge on the chemistry of carbonyl compounds.
- learn the mechanism of molecular rearrangements.
- learn the stereo specificity of reactions by PMO, FMO & correlation diagram method.
- study the various oxidation – reduction reagents & Retro Synthesis.
- understand the principles of photochemistry and photochemical reactions of ketones.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	apply the reactions of carbonyl compounds to organic synthesis.	K ₃
CO2	design and analyze synthetic strategy for organic compounds and sketch the rearrangements.	K ₅ , K ₄
CO3	construct correlation diagrams for pericyclic reaction and to predict the stereochemistry.	K ₅
CO4	categorize reactions based on the oxidising and reducing agents.	K ₄
CO5	appreciate the role of photochemistry and the significant applications of photochemistry in research.	K ₆

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	H	H	M	H	H	H
CO2	H	H	H	M	H	H	H
CO3	H	H	H	M	H	H	H
CO4	H	H	H	M	H	H	H
CO5	H	H	H	M	H	H	H

H - High; M-Medium; L-Low

PAPER – IV -ORGANIC CHEMISTRY –II [MCE1604]

(Rearrangements, Pericyclic Reactions, Retro Synthesis & Photochemistry) (71 Hrs)

Unit I (14 Hrs)

Chemistry of carbonyl compounds

Synthesis of Aldehydes & Ketones. Typical additions to carbonyl compounds – Addition of water, alcohol, thiol, bisulphite, HCN & amino compounds. Mannich reaction, Meerwein Ponndorf-Verley Reduction, Grignard, Claisen & Dieckmann, Stobbe, Knoevenagel, Darzen, Wittig, Thorpe, Benzoin & Darzen's Glycidic Ester Condensation, Michael Addition.

Unit II (14 Hrs)

Molecular Rearrangements

Intramolecular 1, 2 –shifts, Wagner Meerwein & related rearrangements, Migration to carbonyl carbon –Neber & Baeyer Villiger Rearrangement. Rearrangement to electron deficient nitrogen & oxygen – Dienone – Phenol, Favorskii, Fries, Wolff, Benzidine, Steven's, Demzanov, Sommelet-Hauser, Chapman & Wallach Rearrangements.

Unit III (14 Hrs)

Pericyclic Reactions

Orbital Symmetry, Frontier Orbitals of ethylene, 1, 3-butadiene, 1, 3, 5- hexatriene. Classification of pericyclic reactions. Electrocyclic reactions – $4n$ & $4n+2$ systems, Woodward – Hoffmann rules, Correlation Diagram, FMO & PMO approach [1, 3-dienes & 1, 3, 5-trienes]

Cycloadditions

Antarafacial & Suprafacial additions, $4n$ & $4n+2$ systems, 1, 3- dipolar addition, Diel's Alder Reaction.

Sigmatropic Rearrangements

Suprafacial & antarafacial shifts of hydrogen, Cope, Claisen & di- π methane rearrangement.

Unit IV (14 Hrs)

Retro Synthesis

Definitions of some terms used in Retro Synthesis- Guidelines for choosing disconnections- Guidelines - 1 to 3. One Group C-X disconnections- carbonyl derivatives,

alcohols & olefins. Chemoselectivity- Introduction - Guidelines-1 to 7. Reversal of polarity(Umpolung) – Definition- Umpolung reagents (Epoxides, α – halo ketones, nitro compounds).

Protecting Groups

Introduction, protection of alcohols- principle – protecting group for alcohols- acetals/ketals, ethers, protection of carbonyl groups- principle – protecting group for carbonyl compounds- acyclic acetals & ketals, protection of carboxylic acid groups- principle – protecting group for carboxylic acid – methylester, protection of amino groups- principle – protecting group for amino group- formamide.

Unit V

(15 Hrs)

Organic Photochemistry

Introductory theory of light absorption, photophysical processes- Jablonski Diagram, IC, ISC, fluorescence, phosphorescence. Photochemical reactions of Ketones –Norrish type I & II, Paterno Buchi Reaction, Photoreduction of Ketones. Photochemical reactions of alkenes – Cis-trans isomerism, Photochemistry of α , β -unsaturated Ketones, Photodimerisation, Photosensitisation, Photooxidation.

Oxidation & Reduction

Metal hydride reduction – Reactions involving replacement of oxygen by hydrogen, reactions in which an oxygen is removed from the substrate, Reductive coupling. Oxidation-Aromatisation of six membered rings, oxidation of alcohols to aldehydes & ketones, Oxidative cleavage of glycols, Ozonolysis, Sommelet reaction. Reactions involving both oxidation & reduction – Cannizaro, Tishchenko & Willgerodt reactions.

Text Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	V.K.Ahluwalia	Organic Reaction Mechanism	Narosa Publishing House	2010, 3 rd Edition
2	Jagadamba Singh & L.D.S. Yadav	Advanced Organic Chemistry	Pragati Prakasam	2007, 6 th Edition

3	Jerry March	Advanced Organic Chemistry – Reactions, Mechanism & Structure	John Wiley Publications Ltd.	2008, 4 th Edition.
4	A.Peter Sykes	A Guide Book to Mechanism in Organic Chemistry	Longman Publications	2009, 6 th Edition.
5	Charles H Depuy, Orville L. Chapman	Molecular reactions and photochemistry	Printice Hall	1972, illustrated

Reference Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	T.L. Gilchrist & R.C. Storr	Organic Reactions & Orbital Symmetry	Cambridge University Press	1975, 1 st Edition.
2	Goutam Brahmachari	Organic Name Reactions	Narosa Publishing House	reprint 2009
3	Solomons & Fryhles	Organic Chemistry	John Wiley & Sons	2010, 8 th Edition
4	Stuart Warren	Organic Synthesis- The Disconnection Approach	John Wiley & Sons	2004, 1 st Edition
5	R.O.C.Norman and J.M.Coxon	Principles of Organic Synthesis	CRC Press	Second reprint 2012, 3 rd Edition

Pedagogy

Lecture by chalk & talk, power point presentation, e-content, Simulation, numerical exercises, group discussion, assignment, quiz, seminar.

Course Designers:

1. Dr. S. Chitra
2. Mrs. P. Kanchana
3. Mrs. K. Kalaiselvi

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE1605	PAPER V-PHYSICAL CHEMISTRY II (Group Theory and Quantum Chemistry)	THEORY	71	4	-	5

Preamble

To enable the students to

- study the atomic structure and quantum mechanics with the help of group theory
- acquire knowledge about multiplication table for point groups
- learn the application of group theory to vibrational spectroscopy
- understand the significance of operators and their use in quantum mechanics
- know about the wave nature of particles, derivation of Schrodinger wave equations and their applications.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	classify molecules into point groups	K ₂
CO2	construct the character table for point groups	K ₅
CO3	predict the IR and Raman active vibration modes for molecules based on group theory	K ₆
CO4	relate uncertainty and correspondence principles for the derived wave functions from Schrodinger wave equations	K ₃
CO5	distinguish radial/probability functions and curves and judge the shapes of s and p orbitals using quantum mechanical approach	K ₄ ,K ₆
CO6	generalise the HMO treatment of simple and conjugated π electron systems	K ₅

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	H	H	M	M	M	M
CO2	H	H	H	M	M	M	M
CO3	H	H	H	M	H	M	M
CO4	H	H	H	M	M	M	H
CO5	H	H	H	M	H	M	H
CO6	H	H	M	M	H	L	H

H - High; M-Medium; L-Low

PAPER V- PHYSICAL CHEMISTRY II [MCE1605]

(Group Theory & Quantum Chemistry)

(71 Hrs)

Unit I

(14 Hrs)

Symmetry Elements & Symmetry Operations

Definition of identical & equivalent elements – Configurations – Symmetry operations & symmetry elements – Rotation – Axis of symmetry – Reflections – Symmetry planes – Inversion, centre – improper rotations – Rotation- Reflection axis – Effect of performing successive operations (Commutative & non-Commutative)- Inverse operations. Groups & their basic properties - Definition of a group – Basic properties of a group – Definition of Abelian group – Isomorphic group – Similarity transformation & classes – Group multiplication tables- Symmetry classification of molecules into point groups (Schoenflies symbol only)- Difference between point group & space group – Various symmetry operations of tetrahedral point groups.

Matrices

Definition of matrix, square , diagonal , null , unit, row , column , symmetric , skew symmetric & conjugate matrices – Matrix multiplication (Commutative & non-Commutative) determination of inverse of a matrix, block multiplication of matrices – Addition & subtraction of matrices – Matrix notations for symmetry operations of C_{2v} & C_{3v} point groups (use of vectors)- construction of character tables for C_{2v} & C_{3v} point groups.

Unit II

(14 Hrs)

Reducible & Irreducible representations

Definition of reducible & irreducible representations – Irreducible representation as orthogonal vectors – Direct product rule – The Great Orthogonality Theorem & its consequences (statement only, proof not needed)- Determination of the characters for irreducible representation of C_{2v} & C_{3v} point groups – using the Orthogonality Theorem – Calculation of binary coordinates in the character tables for C_{2v} & C_{3v} point groups – Calculation of character values of reducible representations per unshifted atom for each type of symmetry operation – Determination of total Cartesian Representation – Determination of Direct sum from total Cartesian Representation.

Group theory & Vibrational spectroscopy – Vibrational modes as basis for group representation – Symmetry selection rules for IR & Raman spectra (Mutual Exclusion Principle – Classification of vibrational modes).

Unit III

(14 Hrs)

Introduction to Quantum Mechanics

Failure of classical mechanics & need for quantum mechanics. Functions – Types & theorems - Algebra of operators: commutator, linear & non-linear operators. Eigen functions & Eigen values. Postulates of quantum mechanics correspondence between physical quantities in classical mechanics & operators in quantum mechanics, linear & angular momentum operators, Hamiltonian operator & Hermitian operator. de Broglie's Wavelength, Heisenberg's uncertainty principle Schrodinger Wave Equations – (Time dependent & time independent)- Requirements of the acceptable wave function. Particle in a one-dimensional box, quantisation of energy, Normalization of wave function, Orthogonality of the particle in a one dimensional box.

Unit IV

(14 Hrs)

Quantum Mechanics I

Particle in a 3 dimensional box, separation of variables, degeneracy with respect to particle in a cubical box. Solving of Schrodinger Equation for the one dimensional harmonic oscillator model of a diatomic molecule, solving of Schrodinger Equation for a Rigid Rotor Model of a diatomic molecule, Schrodinger Equation for the H- atom (H – like species) , separation of variables (solving of radial equation is not needed but nature of the solution to be given). Radial wave function, Radial distribution curves, Probability wave function, Probability distribution curves, Shapes of s & p orbitals only.

Unit V

(15 Hrs)

Quantum Mechanics II

Electron spin- the He atom & the Pauli principle, symmetric, & antisymmetric nature of the wave functions. Slater determinants – Approximate wave function of many electron atoms. Need for approximation methods. The perturbation theory (1st order only). Application of the perturbation method to Helium atom. Variation principle – Application of variation method to helium atom. Born-Oppenheimer Approximation – Treatment of the H²⁺ ground state by LCAO-MO method. HMO treatment of simple & conjugated π electrons systems- Ethylene, allyl, butadiene & benzene systems.

Text Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	A.K Chandra	Introduction to Quantum Chemistry	Tata Mc Graw Hill Publications	1974, 4 th Edition
2	R.K. Prasad	Quantum Chemistry	New Age International Publishers	1996, 4 th Edition
3	F.A. Cotton	Chemical Applications of Group Theory	Wiley Publications Ltd	2009, 3 rd Edition
4	S. Swarnalatha, T. Saroja, R.M. Ezhilarasi	A Simple Approach to Group Theory in Chemistry	Universities Press	Reprint 2009

Reference Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	K.V.Raman	Group Theory & its Applications to Chemistry	Tata McGraw-Hill Publications	reprint 1994
2	Donald. A. Mc. Quarrie	Quantum Chemistry	Viva Books Publications	reprint 2011
3	Ira. N. Levine	Quantum Chemistry	Pearson Publications	2007, 6 th Edition

Pedagogy

Lecture by chalk & talk, power point presentation, e-content, Simulation, numerical exercises, group discussion, assignment, quiz, seminar.

Course Designers:

1. Dr.N.Muthulakshmi Andal
2. Mrs.V.Hemapriya

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE1606	PAPER- VI – SPECTROSCOPY	THEORY	56	4	-	5

Preamble

To enable the students to

- understand the principles and instrumentation of various spectroscopic techniques
- study the effects of solvents and molecular parameters on UV and IR absorptions
- learn the applications of NMR and ESR spectra
- determine the structure of unknown compounds by spectral analysis

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	apply and evaluate the UV/Vis spectroscopy as a qualitative and quantitative method	K ₃ , K ₆
CO2	predict the vibrations of molecules and to judge whether they are infra-red active	K ₄ , K ₆
CO3	develop skills in sample preparation for and acquisition of IR spectra, UV-visible spectra, and NMR spectra	K ₅
CO4	assess the charge to mass ratio for the sample under test and to propose the fragmentation pattern	K ₅ , K ₆
CO5	relate the g factor, nuclear spin, and hyperfine coupling constant with structure of the complexes	K ₃

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	H	H	H	H	M	H
CO2	H	H	H	M	H	M	H
CO3	H	H	H	M	M	M	H
CO4	H	H	M	M	H	M	H
CO5	H	H	M	M	H	M	H

H - High; M-Medium; L-Low

Unit I

(11 Hrs)

UV & Visible Spectroscopy

Electronic excitation - Origin of different bands - Intensity of bands - Selection rules - Laws of photometry- Correlation of electronic absorption with molecular structure -Simple chromophoric groups - Solvent effect-solvent perturbation effect – Woodward Fieser rules - Application of electronic spectroscopy to conjugated dienes, polyenes, α,β - unsaturated carbonyl compounds, benzenoid systems.

Unit II

(11Hrs)

Infrared Spectroscopy

Principle, the modes of stretching & bending vibrations- Bond properties & absorption trends- Instrumentation of infrared spectroscopy – Description of double beam IR spectrophotometer – IR spectra of polyatomic molecules – Factors affecting the vibrational frequencies – Applications of IR spectroscopy – Intra & intermolecular hydrogen bonding – Finger Print region – Far IR region - Metal- ligand stretching vibrations.

Unit III

(11 Hrs)

Proton NMR Spectroscopy

Nuclear Spin States- Nuclear magnetic moments-Absorption of energy- ^1H chemical shift – Factors affecting chemical shifts – Spin – spin splitting- (n+1rule) –Coupling constant - Deuterium exchange - First order & non first order spectra- A review. Chemical shift & magnetic equivalence, Shift reagents, NMR instrumentation –Applications of NMR to compounds such as ethanol, acetaldehyde, 1,1,2-trichloroethane, cinnamic acid, ethyl acetate, furfuraldehyde and α -chloro propionic acid.

Unit IV

(11 Hrs)

Carbon – ^{13}C NMR Spectroscopy

The ^{13}C nucleus – Chemical shifts – Spin – spin splitting – Double resonance techniques - Homonuclear & heteronuclear decoupling - Broad band decoupling – Off resonance decoupling – Nuclear Overhauser Effect (NOE) -basic idea only, ^{13}C relaxation mechanisms.

ESR Spectroscopy

Theory – Derivative curves – The ‘g’ shift - Hyperfine splitting – Zero field splitting & Kramer’s degeneracy – Factors affecting the magnitude of the g values - Identification of free radicals- EPR spectra of inorganic compounds.

Unit V

(12 Hrs)

Mass Spectrometry

Introduction – Principle – Ion production (EI, CI, FD & FAB), Instrumentation, Presentation of spectral data – Molecular ions – Meta stable ions – Molecular ion peak. Nitrogen rule – Isotopic abundance analysis. Fragmentation Process – Symbolism (scission only) – Even & odd electron ions - Scission with Rearrangement. Retro Diels Alder Rearrangement - Mc Lafferty Rearrangement – Double bond &/ or ring equivalents implied from a formula. Fragmentation associated with functional groups – alkanes, alcohols, aldehydes, ketones, carboxylic acids, esters, amides, amines and ethers.

Text Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	Jag Mohan	Organic Spectroscopy	Narosa Publishing House	2009, 2 nd Edition.
2	William Kemp	Organic Spectroscopy	ELBS Publications	1991, 3 rd Edition.
3	Y. R Sharma	Elementary Organic Spectroscopy	S. Chand Publications	2013, 5 th Edition
4	R.S. Drago	Physical Methods in Inorganic Chemistry	East West Pvt. Ltd.	1992, 2 st Edition.

Reference Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	D. L. Pavia, G.M. Lampman, G.S.Kriz & James R.Vyvyan	Spectroscopy	Brooks/Cole Publications	2015, 5 th Edition.
2	R.M. Silverstein, F.X. Webster	Spectrometric Identification of Organic Compounds	John Wiley Publications	2014, 8 ^h Edition
4	P.S.Kalsi	Spectroscopy	New Age International (P) Ltd.	reprint 2009

Pedagogy:

Lecture by chalk & talk, power point presentation, e-content, Simulation, numerical exercises, group discussion, assignment, quiz, seminar.

Course Designers:

1. Dr .K. Parameswari
2. Ms.E.Kayalvizhy
3. Mrs.G.Sathya Priyadarshini

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE16P1	PRACTICAL I - ORGANIC CHEMISTRY PRACTICAL – I	PRACTICAL	-	-	135	4

Preamble

To enable the students to

- separate two component organic mixture.
- identify the separated components by qualitative tests.
- determine the boiling point / melting point of components.
- prepare organic compounds.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	separate organic mixtures by solvent extraction	K ₄
CO2	analyze organic compounds	K ₄
CO3	synthesize suitable derivatives of organic compounds	K ₅ , K ₆
CO4	develop skills in the synthesis of organic compounds	K ₅
CO5	determine boiling point /melting point	K ₆

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	H	H	M	H	H	H
CO2	H	H	H	L	H	H	H
CO3	H	H	H	L	H	M	M
CO4	H	H	M	M	M	M	M
CO5	H	H	H	H	H	H	H

H - High; M-Medium; L-Low

PRACTICAL I - ORGANIC CHEMISTRY PRACTICAL – I MCE16P1 (135 Hrs)

1. Qualitative Analysis

Analysis of two component mixtures – Separation, identification of components and determination of melting point/ boiling point of the components.

2. One stage preparations and purification by recrystallization technique

- (i) m-dinitrobenzene from Nitrobenzene
- (ii) Resacetophenone from Resorcinol
- (iii) Tribromoaniline from Aniline
- (iv) Diazoaminobenzene from Aniline
- (v) Anthranilic acid from Pthalimide
- (vi) Salicylic acid from methylsalicylate
- (vii) Benzoic acid from benzaldehyde
- (viii) Methyl orange from sulphanilic acid

3. Characterization of any two of the above compounds by IR spectra

Note: A minimum of six organic mixtures & six preparations should be done by each student.

Text Books:

LAB MANUAL - Prepared by Faculty, Department of Chemistry, PSGR Krishnammal College for Women

Reference Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	Arthur I. Vogel	Elementary Practical Organic Chemistry (part 2) Qualitative Organic Analysis	Pearson Education	2011, 2 nd Edition.
2	F.G. Mann & B.C. Saunders	Practical Organic Chemistry	Pearson Education	2009, 4 th Edition

Pedagogy:

Demonstration and hands on practicals

Course Designers:

1. Dr.S.Chitra
2. Mrs.E.Kayalvizhy
3. Mrs.G.Sathyapriyadharshini

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE16P2	PRACTICAL II – INORGANIC CHEMISTRY PRACTICAL-I	PRACTICAL	-	-	135	4

Preamble

To enable the students to

- separate the common and rare cations in a mixture
- characterize two common and two less familiar cations
- estimate quantitatively calcium, magnesium, nickel and zinc by complexometry
- prepare inorganic complexes

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	separate common and rare cations .	K ₃
CO2	analyse and report cations in a mixture.	K ₄
CO3	estimate the metal ions in complexes.	K ₅
CO4	develop skill of designing and performing the synthesis of inorganic complexes.	K ₅ , K ₆
CO5	operate sophisticated instruments like spectronic 20D+ and UV Visible spectrophotometer.	K ₃ , K ₆

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	H	H	M	H	H	H
CO2	H	H	H	M	H	H	H
CO3	H	H	H	M	H	H	H
CO4	H	H	H	M	H	H	M
CO5	H	H	H	S	H	H	H

H - High; M-Medium; L-Low

PRACTICAL II - INORGANIC CHEMISTRY PRACTICAL –I [MCE16P2] (135 Hrs)

1. Qualitative Analysis:

Qualitative Analysis employing semi micro methods & spot tests of mixtures of common cations & ions of the following less familiar elements.

Molybdenum , Thallium, Tungsten, Selenium, Tellurium, Cerium, Thorium, Titanium, Zirconium, Vanadium, Beryllium, Uranium & Lithium.

2. Titrimetry

Complexometric titrations using EDTA - Estimations of Calcium, Magnesium, Nickel & Zinc.

3. Preparation of Inorganic Complexes:

- i. Potassium tri(oxalato)aluminate(III)
- ii. Nickel ammonium sulphate
- iii. Tris(thiourea)copper (I)chloride
- iv. Potassium tris(oxalato)ferrate(III)
- v. Hexammine cobalt(III)chloride
- vi. Ammonium hexachloro stannate(IV)
- vii. Tetrammine copper(II)sulphate

4. Characterization of any two of the above complexes by IR spectra

5. Colorimetric estimations of Cu^{2+} & Ni^{2+} using Spectronic 20D+.

6. Finding λ_{max} of Ni^{2+} & Fe^{2+} complexes using UV-Visible Spectrophotometer.

Text Books:

LAB MANUAL - Prepared by Faculty, Department of Chemistry, PSGR Krishnammal College for Women

Reference Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	Arthur I.Vogel	Macro & Semimicro Qualitative Inorganic Analysis	Orient Longmans Ltd	1967, 1 st Edition
2	G.Palmer	Experimental Inorganic Chemistry	Cambridge University Press	1962, 3 rd Edition.

Pedagogy:

Demonstration and hands on practicals

Course Designers:

1. Mrs. P. Kanchana
2. Mrs.V. Hemapriya

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE16P3	PRACTICAL III - PHYSICAL CHEMISTRY PRACTICAL - I	PRACTICAL	-	-	135	5

Preamble

To make the students to

- understand the principle and to carry out the potentiometric titrations.
- determine the pH and pK_a values of buffers and acids
- determine the molecular weight of solutes.
- construct the Phase diagram of two components systems.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	set up a pH electrode to prepare for a potentiometric titration	K ₆
CO2	examine the strength of the solutions and K _a values by potentiometry	K ₄
CO3	calculate the molecular weight of chemical compounds from K _f values by Rast micro method	K ₄
CO4	construct and analyze Phase diagrams	K ₅ , K ₆

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	H	H	H	M	M	M
CO2	H	H	H	H	H	H	H
CO3	H	H	H	M	M	M	M
CO4	H	H	H	M	H	H	H

H - High; M-Medium; L-Low

PRACTICAL III - PHYSICAL CHEMISTRY PRACTICAL – I [MCE16P3] (135Hrs)

1. Molecular weight determination by Rast Micro Method
2. Phase study: Simple Eutectic System & Compound Formation
3. Phase Study: System with Compound Formation
4. Determination of Transition Temperature of Salt Hydrate
5. Viscosity: Variation of viscosity of liquids with temperature
6. Refractive Index: Determination of Refractive Index (unknown composition of a mixture of liquids)
7. Electromotive Force:
 - (i) Determination of Standard Potentials (Cu, Zn, Ag)
 - (ii) Evaluation of Thermodynamic Quantities from EMF Data (Daniel Cell)
 - (iii) Determination of pH & pKa values using Hydrogen & Quinhydrone electrodes
8. Potentiometric Titrations:
 - i. Titration of HCl Vs NaOH
 - ii. Titration of mixture of acids against a strong base
 - iii. Titration of CH₃COOH Vs NaOH
 - iv. Redox titrations:
 - (a) Titration of Ferrous ammonium sulphate against Potassium dichromate
 - (b) Titration of Potassium iodide against Potassium permanganate
 - v. Determination of solubility product of a sparingly soluble salt (Concentration Cell & Chemical Cell)
 - vii. Precipitation titrations:
 - (a) Estimation of KI by titration with AgNO₃ using KCl as standard
 - (b) Titration of mixture of halides against AgNO₃ solution
 - viii. Heat of solution by solubility method

Text Books:

LAB MANUAL-Prepared by Faculty, Department of Chemistry, PSGR Krishnammal College for Women.

Reference Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	B.P. Levitt	Findlay's Practical Physical Chemistry	Longman Publications	1973, 9 th Edition
2	G.Palmer	Experimental Physical Chemistry	Cambridge University Press	1964, 1 st Edition
3	B. Viswanathan & P.S. Raghavan	Practical Physical Chemistry	Viva Books	2009, 3 rd Edition

Pedagogy:

Demonstration and hands on practicals

Course Designers:

1. Dr.S.Chitra
2. Mrs.E.Kayalvizhi
3. Mrs.G.Sathyapriyadharshini

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCP14A1	IDC –CLINICAL MICROBIOLOGY & BIOCHEMISTRY	THEORY	60	-	-	4

Preamble

- To enable the students to understand the principles of clinical chemistry
- To gain the importance of hypertension and hypotension
- To enable the students to understand the principles and the concepts underlying clinical laboratory tests in clinical chemistry
- To differentiate the blotting technique and vaccination types
- To acquire knowledge on basic mechanisms involved in the causation and treatment of common disease and their influence on clinical presentation and therapy

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	differentiate the clinical specimens	K ₃
CO2	classify the composition of blood, Perform analysis of chemical analytes in blood and other body fluids	K ₂ , K ₃
CO3	calculate the test results and convert them to form meaningful in patient assessment	K ₃
CO4	Compare and contrast the different types of blotting techniques and vaccination.	K ₆
CO5	correlate laboratory results with infectious diseases processes	K ₄

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	M	H	M	H	H	M
CO2	H	H	H	H	L	L	M
CO3	H	H	M	H	M	M	M
CO4	H	M	M	M	H	H	M
CO5	H	M	M	H	H	H	H

H - High; M-Medium; L-Low

INTER DISCIPLINARY COURSE (For M. Sc., Chemistry/ Botany Students)

CLINICAL MICROBIOLOGY & BIOCHEMISTRY [MCP14A1] (60 Hrs)

Unit I (12 Hrs)

Clinical microbiology

Clinical specimens –Collection- needle aspiration, Incubation, Catheter; handling, transport. Isolation of microbes from specimens-selective media, differential media, enrichment media, characteristic media. Identification of microbes (virus, bacteria, fungi and parasites) through morphological and biochemical characteristics.

Unit II (12 Hrs)

Principles of clinical biochemical analysis: Basis of analysis of body fluids for diagnostic prognostic and monitoring purposes. Blood Analysis: Composition of blood, blood grouping & matching, physiological function of Plasma protein, role of blood as oxygen carrier, blood pressure - Hypertension & hypotension, coagulation of blood, Anaemia – causes & control .Urea determination- the urease method, estimation of bile pigment in serum, estimation of total protein in serum, estimation of total proteins and albumin based on biuret method and BCG method.

Unit III (12Hrs)

Clinical Chemistry

Determination of Glucose in Serum by Folin & Wu's method, Determination of Serum Cholesterol - Sackett's method for total cholesterol. Diagnostic test for Sugar in Urine. Test for salt in Serum, Test for Chlorides. Detection of Cholesterol in Urine, Detection of Diabetes . Typical reference ranges for biochemical analyst Viz, sodium, potassium, urea, creatinum, AST, ALT, AP and cholesterol and their significance. Biological role of sodium, potassium, calcium, iodine, copper and zinc.

Unit IV (12Hrs)

Electrophoresis, Blotting and Vaccination

Principles, Techniques: southern, western and northern blotting. Vaccines and immunizations: Active immunization, passive immunization, Type of vaccines-whole organism vaccines, purified macromolecules as vaccines, Recombinant –vector vaccines, DNA vaccines.

Unit V**(12 Hrs)****Common Diseases & their treatments****Insect borne diseases:** Malaria, Filariasis & Plague.**Air Borne diseases:** Diphtheria, Whooping cough, Influenza, Measles mumps, Tuberculosis**Water borne diseases:** Cholera, Typhoid, & Dysentery. Common disease of the digestive system- jaundice, respiratory system- asthma, nervous system- epilepsy. Some other common diseases-piles, leprosy. First aid for accidents. Common poisons & their antidotes - acid poisoning, alkali poisoning, Poisoning by disinfectants hallucinogens.**Toxic effects of metals:** Toxicity of Iron , Copper , Arsenic , Mercury, Lead, Cadmium, Aluminium & Radionuclide & Wilson's disease.**Text Books:**

S.No	Author	Title	Publishers	Year of publication
1	Asim. K. Das	Bioinorganic chemistry 1 st edn.	Books & Allied Pvt Ltd.	2007
2	Jayashree Ghosh	Textbook of Pharmaceutical Chemistry 3 rd edn	S. Chand & Co	2003
3	Jayashree Ghosh	Fundamental concepts of Applied Chemistry 1 st edn	S. Chand & Co	2006
4	Rana, S.V.S	Bio Techniques. Theory and Practice.	Rastogi Publications, Meerut.	2005
5	Ambika Shanmugam	Fundamentals of Biochemistry for Medical Students	Nagaraj and Company Private Limited	2005
6	Mallikarjuna Rao, N	Medical Biochemistry 6 th edn.	New Age International (P) Limited, Publishers	2006

Reference Books:

S.No	Author	Title	Publishers	Year of publication
1	Lensing M.Prescott, John P, Harley, Donald A Klein.	Microbiology,6 th Edition,	Tata mc Graw Hill, New Delhi	2005
2	Keith Wilson, John Walker.	Principles and Techniques of Biochemistry and Molecular Biology, 6 th Edn.	Cambridge University Press	2008
3	By Douglas B. Lowrie, Robert G. Whalen	DNA vaccines- methods and protocols	Humana press, Totowa, New Jersey	2000

Pedagogy

Lecture by chalk & talk, power point presentation, e-content, simulation, numerical exercises, group discussion, assignment, quiz, seminar.

Course Designers:

1. Mrs.N.ShyamalaDevi, Dr.N.Aruna Devi
2. Dr. K. Gajalakshmi, Dr.K .S. Tamilselvi

Semester: III

Title : Cyber Security

Subject Code: MNM15CS

Objective

This course presents the principles of Cyber Security and its attack. It covers all aspects of cyberspace, botnet, cyber crime and its case studies.

Unit I

Cyberspace: Introduction- Web Threats for Organizations - Security and Privacy Implications from Cloud Computing - Social Media Marketing - Social Computing and the Associated Challenges for Organizations - Protecting People's Privacy in the Organization- Organizational Guidelines for Internet Usage- Safe Computing Guidelines and Computer Usage Policy.

Unit II

Security Threats: Malicious Software, Types of Attacks, Threats to E-commerce, e-cash, Credit/Debit Cards.

Unit III

Cyber Security: Introduction - An Essential Component of Cyber security - Forensics Best Practices for Organizations - Media and Asset Protection - Importance of Endpoint Security in Organizations.

Unit IV

Cyber Attacks: Introduction - How Criminals Plan the Attacks - Social Engineering - Cyberstalking -Cybercafe and Cybercrimes - Botnets: The Fuel for Cybercrime - Attack Vector - Cloud Computing

Unit V

Case Study on Cyber Crime & Security: Introduction on Cyber Crime - Trends in Mobility - Credit Card Frauds in Mobile and Wireless Computing Era. Illustrations, Examples and Mini-Cases - Introduction - Real-Life Examples - Mini-Cases Illustrations of Financial Frauds in

Cyber Domain - Digital Signature-Related Crime Scenarios - Digital Forensics Case Illustrations
- Online Scams.

Text Books:

S.No	Author	Title of the Book	Publisher	Year of publication
1	Faculty of Computer Science – PG	Essentials of Cyber Security	KalaiKathir Achachagam	2016

Reference Books:

S.No	Author	Title of the Book	Publisher	Year of publication
1	Nina Godbole and Sunit Belpure	Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives	Publication Wiley	2011
2	William Stallings	Network Security Essentials – Applications and Standards	Pearson Education	2011

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE1607	PAPER-VII ORGANIC CHEMISTRY-III (CHEMISTRY OF NATURAL PRODUCTS)	THEORY	71	4	-	5

Preamble

To enable the students to

- learn about isolation, separation & identification of terpenoids, alkaloids & steroids
- gain knowledge about the structural elucidation of terpenoids, steroids, alkaloids, flavones & anthocyanins.
- acquire knowledge about the structural elucidation of nucleic acids and their biological functions.
- understand the synthetic utility of DDQ, DCC, NBS, H₂O₂ and OSO₄.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	classify and identify the functional groups present in terpenoids, alkaloids, steroids, flavones and anthocyanins	K1, K ₂
CO2	Illustrate the structure of terpenoids, alkaloids, steroids, flavones and anthocyanins	K3
CO3	Sketch and analyse the synthesis of terpenoids, alkaloids, steroids, flavones and anthocyanins	K3, K ₄
CO4	Integrate the chemistry of nucleic acid and their biological functions	K5
CO5	Predict the use of DDQ, DCC, NBS, OsO ₄ and H ₂ O ₂	K6

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	H	H	L	H	H	H
CO2	H	H	H	M	H	H	H
CO3	H	H	H	M	H	H	H
CO4	H	H	H	L	M	M	H
CO5	H	H	H	M	M	H	H

H - High; M-Medium; L-Low

Paper-VII Organic Chemistry-III [MCE1607]

(Chemistry of Natural Products)

(71 Hrs)

Unit I

(14 Hrs)

Terpenes

Isolation & classification of terpenes. Structural elucidation & synthesis of Zingiberine, Eudesmol, Abietic acid, Caryophyllene, Cadenine, Camphor & Santonin.

Unit II

(14Hrs)

Steroids

Introduction-structural elucidation & synthesis of cholesterol, ergosterol, vitamin D, Male sex hormones- androsterone & testosterone, Female sex hormones- Oestrone, equilenin, Progesterone.

Unit III

(14 Hrs)

Alkaloids

Introduction-structural elucidation & synthesis of Reticuline, Morphine, Reserpine, Quinine, Atropine, yohimbine & glaucine.

Unit IV

(14Hrs)

Nucleic Acids

Structure of RNA & DNA, Structure of nucleosides - bases present - point of linkage of base & sugar - structure of nucleotides - pairing of bases-biological functions of RNA & DNA-genetic continuity- role of RNA in protein synthesis.

Reagents in Organic Synthesis

DDQ, DCC, OsO₄, H₂O₂ and NBS

Unit V

(15 Hrs)

Flavones & Anthocyanins

Structure, synthesis & reactions of Flavones, Isoflavones & Flavanols- Apigenin, Diadzein, Quercetin. Structure and synthesis of Anthocyanins. Cyanin chloride - Pelargonin chloride- Delphinin chloride, Peonin chloride- Colour of Anthocyanins.

Text Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	O.P. Agarwal	Organic Chemistry Natural Products, Vol.I	Goel Publishers	2008, 38 th Edition
2	O.P. Agarwal	Organic Chemistry Natural Products, Vol.II	Goel Publishers	2009, 36 th Edition
3	O.P. Agarwal	Organic Chemistry- Reactions & Reagents Vol-II	Goel Publishers	2009, 45 th Edition

Reference Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	V.K. Ahluwalia	Chemistry of Natural Products	Ane Books Pvt. Ltd	2006, 1 st Edition
2	P.S. Kalsi	Chemistry of Natural Products	Kalyani Publishers	1983, 1 st Edition
3	I.L. Finar	Organic Chemistry Vol.I	Pearson Education	Reprint, 2007, 6 th Edition
4	I.L. Finar	Organic Chemistry Vol.II	Pearson Education	Reprint, 2011
5	N.R.Krishnaswamy	Chemistry of Natural Products	University Press	2000

Pedagogy:

Lecture by chalk & talk, power point presentation, e-content, numerical exercises, group discussion, assignment, quiz, seminar.

Course Designers:

1. Dr. S. Chitra
2. Mrs. V. Hemapriya

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE1608	PAPER-VIII ELECTIVE I - COORDINATION & ORGANOMETALLIC CHEMISTRY	THEORY	56	4	-	4

Preamble

To enable the students to

- understand the theories of bonding in complexes & spectral applications
- gain knowledge in term symbols and electronic spectra of complexes
- acquire knowledge regarding organometallic complexes and their applications as catalysts for chemical reactions.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	explain the bonding characteristics in coordination compounds in terms of Crystal Field Theory and Molecular Orbital Theory	K2
CO2	predict the spectra of complexes using TS and Orgel diagrams	K6
CO3	formulate mechanisms for reactions of transition metal complexes	K5
CO4	reproduce the preparation, properties and uses of metal carbonyls	K1
CO5	apply coordination complexes as catalyst for reactions	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	H	H	M	M	H	H
CO2	H	H	H	M	H	H	H
CO3	H	H	H	M	H	H	H
CO4	H	H	H	H	H	H	H
CO5	H	H	H	H	M	H	H

H - High; M-Medium; L-Low

Paper – VIII Elective: I Co-ordination and Organometallic Chemistry [MCE1608]

(56 Hrs)

Unit I (11Hrs)

Coordination Chemistry

Nomenclature of coordination compounds – isomerism, structural & stereoisomerism – octahedral & square planar complexes. Bonding in complexes-Valence bond theory, Crystal field theory- Crystal field effects in tetrahedral, octahedral & square-planar symmetries. CFSE-Weak & strong field effects-Spectrochemical Series. Magnetic Properties. Applications of CFSE. Molecular Orbital Theory- Based on group theoretical approach, M.O diagrams of octahedral complexes with & without pi-bonding. - Experimental evidence for pi-bonding.

Unit II (11 Hrs)

Electronic spectra of complexes

Characteristics of d-d transitions-selection rules. Energy level diagrams –Orgel diagrams. Sugano –Tanabe diagrams (only for d^2, d^3 & d^6 ions), Jahn-Teller tetrahedral distortions. Spin-orbit coupling. Nephelauxetic effect. Charge transfer spectra. Mossbauer spectroscopy- Principle- Applications of Mossbauer spectroscopy in the characterization of Fe & Sn complexes

Unit III (11 Hrs)

Reactions of complexes

Inert and labile complexes- Substitution reactions in square planar and octahedral complexes, S_N^1 CB mechanism. Trans effect- mechanism and applications. Theories of trans effect. Oxidation –reduction reactions – through atom/group transfer-through electron transfer. Mechanism of electron transfer reactions in solution phase – outer sphere mechanism and inner sphere mechanism.

Unit IV (11 Hrs)

Organometallic Chemistry

Basics of Organometallic Chemistry –Hapticity- Classification of ligands and its limitations- 18 e^- rule, Metal carbonyls- Preparation, Structure, bonding and reactions. Metal Nitrosyls – Preparation and Bonding, Dinitrogen complexes- Metal alkenes – Zeise salt – bonding, Cyclopentadienyl complexes (Ferrocene) – Preparation and properties. Concept of

Isolobality and Isolobal analogues- ML_5 , ML_4 , ML_3 Fragments- Examples- $Mn(CO)_5$, $Fe(CO)_4$, $Co(CO)_3$.

Unit V

(12Hrs)

Catalysis by Organometallic compounds

Organometallic reactions - Coordinative unsaturation, oxidative addition reaction, Reductive elimination, Insertion reaction, Hydrogenation of alkenes (Wilkinson catalysis), Hydroformylation (Oxo process), Oxidation of Olefins (Wackers process), Carbonylation of Methanol (Monsanto Process), Polymerization of Olefins (Zeigler –Natta catalysts) Metal clusters– Introduction to metal carbonyl cluster - Wade’s rule. WGS (Water Gas Shift) – Synthesis. Cyclo-oligomerisation of acetylene (Repps and Wilki’s Catalyst).

Text Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	James. E. Huheey, Ellen. A. Keiter, R. Keiter, O.K. Medhi	Inorganic Chemistry- Principles of Structure & Reactivity	Pearson education	2011, 9 th Edition.
2	R.C Mehrotra & A. Singh	Organometallic Chemistry- A Unified Approach	New Age Publishers	2005, 2 nd Edition.
3	Puri, Sharma & Kalia	Principles of Inorganic Chemistry	Milestone Publishers and Distributors	2012-13, 31 st Edition
4	Wahid.U.Malik, G.D.Tuli & R.D.Madan	Selected Topics in Inorganic Chemistry	S.Chand & Co	2010, 30 th Edition.

Reference Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	F.A. Cotton & G. Wilkinson	Basic Inorganic Chemistry	Wiley Interscience Publishers	2014, 3 rd Edition.
2	J.D.Lee	Concise Inorganic Chemistry	Chapman and Hall	2013, 4 th Edition

Pedagogy

Lecture by chalk & talk, power point presentation, e-content, numerical exercises, group discussion, assignment, quiz, seminar.

Course Designers:

1. Dr. K. Kalaiselvi
2. Dr. P. Amutha

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE1609	PAPER – VIII ELECTIVE II – MEDICINAL CHEMISTRY (OPTIONAL)	THEORY	56	4	-	4

Preamble

To enable the students to

- learn about the drug metabolism & their activity
- understand about Cancer chemotherapy and Cardiovascular Drugs
- gain knowledge about different treatment for local anti-infective drugs

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	explain the procedures followed in drug design and development of QSAR	K1,K3
CO2	interpret Pharmacokinetic parameters and appraise the significance of drug metabolism in medicinal chemistry	K2,K5
CO3	classify and integrate the synthesis of antineoplastic drugs to cancer chemotherapy	K2, K5
CO4	predict the mechanism of action of Cardiovascular Drugs	K6
CO5	evaluate the general mode of action and synthesis of Local Anti-infective Drugs	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	H	H	M	H	H	H
CO2	H	H	H	L	M	H	H
CO3	H	H	H	L	H	H	H
CO4	H	H	H	M	M	H	H
CO5	H	H	H	M	H	H	H

H - High; M-Medium; L-Low

PAPER – VIII ELECTIVE II – MEDICINAL CHEMISTRY (OPTIONAL)

Unit I (11 Hrs)

Introduction to drugs

Sources of drugs, absorption of drugs, Routes of administration of drugs, biotransformation of drugs. Mechanism of action of drugs. Factors prolonging action of drugs, Excretion. Toxicity of drugs. Development of new drugs, procedures followed in drug design, concepts of lead compound & lead modification, concepts of prodrugs & soft drugs, structure activity relationship(SAR), factors affecting bioactivity, resonance, inductive effects, isosterism, bio isosterism, spatial considerations. Theories of drug activity : occupancy theory, rate theory, induced fit theory. Quantitative structure activity relationship. History & development of QSAR. Concepts of drug receptors. Elementary treatment of drug receptor interactions.

Unit II (11 Hrs)

Pharmacokinetics

Introduction to drug absorption, disposition, elimination using pharmacokinetics, important pharmacokinetic parameters in defining drug disposition & in therapeutics. Mention of uses of pharmacokinetics in drug development process.

Pharmacodynamics

Introduction, elementary treatment of enzyme stimulation, enzyme inhibition, sulphonamides, membrane active drugs, drug metabolism, xenobiotics, biotransformation, significance of drug metabolism in medicinal chemistry.

Unit III (11 Hrs)

Antineoplastic Agents

Introduction, classification, cancer chemotherapy, special problems, role of alkylating agents & anti metabolites in treatment of cancer. Mention of carcinolytic antibiotics & mitotic inhibitors. Synthesis of mechlorethamine, cyclophosphamide, melphalan, uracil, mustards & 6-mercaptopurine. Recent development in cancer chemotherapy. Hormone & Natural products.

Unit IV (11Hrs)

Cardiovascular Drugs

Introduction - classification of cardiac glycosides, antiarrhythmic drugs, therapeutic uses. Antihypertensive agents, Vasopressor Drugs – Mechanism of Action. Synthesis of verapamil, methldopa.

Unit V

(12 Hrs)

Local Antiinfective Drugs

Introduction & general mode of action. Synthesis of sulphonamides, furazolidone, nalidixic acid, ciprofloxacin, norfloxacin, dapsone, amino salicylic acid, isoniazide, ethionamide, ethambutal, fluconazole, econazole, griseofulvin, chloroquin & primaquin.

Text Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	Ashutosh Kar	Medicinal Chemistry	New Age international	2005, 3 rd Edition
2	R.S Satoskar & S.D.Bharkar	Pharmacology & Pharmatherapeutics Vol 1 & 2	Popular Prakashan	1989, 11 th Edition.

Reference Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	G. Padrick	Medicinal Chemistry	Viva Books Pvt. Ltd	2002, 2 nd Edition
2	Sriram & Yogeeswari	Medicinal Chemistry	Pearson Education	2010, 2 nd Edition.

Pedagogy:

Lecture by chalk & talk, power point presentation, e-content, numerical exercises, group discussion, assignment, quiz, seminar.

Course Designers:

1. Dr.S.Chitra
2. Dr.D.Nalini

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE1610	PAPER–IX PHYSICAL CHEMISTRY– III (Reaction Kinetics & Electrochemistry)	THEORY	56	4	-	4

Preamble

To enable the students to

- acquire knowledge about theories of electrolytes, electrode and chemical kinetics & its applications
- learn the concepts of catalysis, adsorption & its mechanisms
- impart knowledge about corrosion, batteries and its commercial applications and control

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	apply the theories of electrolytes and compare the structures of electrical double layers	K3, K4
CO2	examine and predict the kinetics of electrode reaction	K4, K6
CO3	calculate the rate of reactions	K4
CO4	apply the theories of adsorption & catalysis and predict the mechanism of surface phenomena	K3, K6
CO5	discuss the types of batteries, fuel cells, importance of corrosion and its mechanism	K2

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	H	H	M	M	H	S
CO2	H	H	H	H	H	H	S
CO3	H	H	H	M	H	H	S
CO4	H	H	H	H	H	H	H
CO5	H	H	H	M	H	H	H

H - High; M-Medium; L-Low

Paper –IX Physical Chemistry – III [MCE1610]

(Reaction Kinetics & Electrochemistry)

(56 Hrs)

Unit I

(11Hrs)

Theories of Electrolytes

Arrhenius theory (Basic idea) – Limitations - Debye-Huckel-Onsager equation – Calculation of A & B, physical significance of k, Tests of Debye-Huckel. Wein effect, Debye-Falkenhagen effect.

Electrode electrolytic interface

Electrical double layer, electrocapillary phenomena- Lippman equation, Measurements of double layer capacitances, theoretical models of double layers- Helmholtz model, Guoy Chapmann model- potential of zero charge, Stern model- outer & inner Helmholtz planes

Unit II

(11Hrs)

Electrode Kinetics

Kinetics of electron transfer, the transfer coefficients, Butler Volmer equation, Tafel equation, charges transfer resistance, Multistep process.

Irreversibility in electrochemical reactions

Overtoltage – Hydrogen overtoltage, oxygen overtoltage, measurement of overtoltage, factors affecting overtoltage, importance of overtoltage.

Unit III

(11Hrs)

Chemical Kinetics

The ARRT – Thermodynamic treatment of ARRT- Significance of reaction coordinate- Application of ARRT- Unimolecular & bimolecular processes- Potential energy surface- Kinetic isotopic effects- Principles of microscopic reversibility- Steady State Approximation- Third order & termolecular reactions. Primary salt effect.

Reactions in solutions

Factors affecting reaction rates in solution – The influence of solvent, ionic strength, dielectric constant & pressure on reactions in solutions.

Unit IV**(11 Hrs)****Catalysis**

Acid – base catalysis – specific & general (Bronsted Catalysis law), Enzyme catalysis – Michaelis-Menton equation, effect of pH & temperature on an enzyme catalysed reaction (Single substrate only)

Adsorption

Differences between physisorption & chemisorptions - Theories of adsorption – Freundlich, Langmuir, BET & Gibb's, Langmuir – Hinshelwood.

Unit V**(12Hrs)****Batteries**

Types, characteristics. Primary batteries – Dry cells, metal-air batteries, Ag₂O-Zn batteries. Secondary batteries – Pb-acid battery.

Fuel cells

Classification, H₂ – O₂ fuel cell, Hydrocarbon – Oxygen fuel cell, Phosphoric acid fuel cells.

Corrosion

Types & importance of corrosion. Electrochemical principles of corrosion - Polarisation of the electrodes – Concentration polarization, Activation polarization.

Text Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	S. Glasstone	Introduction to Electrochemistry	EastWest Press Private Ltd	2011, 10 th Printing.
2	K.J. Laidler	Chemical Kinetics	Pearson Education Pvt. Ltd	2007, 3 rd Edition.
3	B.R. Puri, L.R. Sharma, M.S. Pathania	Principles of Physical Chemistry	Vishal Publications	2011, 45 th Edition

Reference Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	A. Frost & R.G.Pearson	Kinetics & Mechanism	Wiley Eastern Pvt Ltd	1970, 2 nd Edition
2	Gurdeep Raj	Advanced Physical Chemistry	GOEL Publishing House	2002, 27 th Edition
3	John.O.M. Bockris & A.K.N. Reddy	Modern Electrochemistry (Vol I & II)	Plenum Publishing Corporation	2006, 2 nd Edition
4	Raj Narayanan	An Introduction to Metallic Corrosion & its Prevention	Oxford & IBH Publishing Co., Pvt Ltd	1988, 1 st Edition.
5	Jain P C and Monika Jain	Engineering Chemistry	Dhanpat Rai	2006

Pedagogy:

Lecture by chalk and talk, power point presentation, e-content, Numerical exercise, group discussion, assignment, quiz, peer learning, seminar

Course Designers:

1. Dr. D. Nalini
2. Mrs. E. Kayalvizhy

RESEARCH METHODOLOGY [MCE14S1]

Special Course

Credit - 2

(30 Hrs)

Objectives:

- To acquire knowledge about sampling & errors
- To inculcate basic ideas regarding research, thesis/report writing
- To gain knowledge about use of MS office in research
- To understand the principle, types & instrumentation of AAS

UNIT I

(6 Hrs)

Errors involved in Chemical Analysis

Classification of errors. Determination of accuracy of results -significant figures - *mean standard deviation*. Gaussian distribution - deviation from the Gaussian law of error distribution.

UNIT II

(6 Hrs)

IUPAC rules for Nomenclature

Introduction to chemical abstracts – Subject index, substance index, author index, formula index & other indices. Use of these indices with examples –Use of computer browsing for literature search & downloading – *Basics of internet services* – Different sources of abstracts, articles & papers for browsing & downloading.

Unit III

(6 Hrs)

Principles of Research

Title & abstract, writing the thesis. Types of report. Laboratory observation, records. Document preparation using computers - *Use of Microsoft word & Microsoft excel*, word perfect & other packages for document preparation & formatting.

Unit IV

(6 Hrs)

Sampling

Introduction to sampling-Definitions, theory of sampling-techniques of sampling – Statistical criteria of good sampling & required size-*Stratified sampling Vs random sampling.*

Unit V

(6 Hrs)

Atomic Absorption Spectroscopy

Types of Atomic Absorption Spectra-Emission methods-Absorption methods-fluorescence methods-Atomizers for Atomic spectra-Flame atomizers-flames of flame spectra, electro thermal atomizers –*Application of atomic absorption spectroscopy *

***Self-study portions**

Text Books :

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	S.M. Khopkar	Basic Concepts of Analytical Chemistry	Wiley Eastern Ltd	1985, 1 st Edition
2	D.A. Skoog, D.M. West & F. James Holler	Analytical Chemistry – An Introduction	Saunders College Publishing	1994, 6 th Edition
3	Hans F. Ebel, Claus bliefert	The Art of Scientific writing	Wiley Publishing	2005, 2 nd Edition

Reference Books :

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	C.R. Kothari	Research Methodology- Methods & Techniques	New Age International Publishers	reprint 2011, 2 nd Edition
2	D.A. Skoog & F.J. Holler	Principles of Instrumental Analysis	Harcourt College Publishers	2001, 5 th Edition
3	Y.K. Singh, R. Nath	Research Methodology	APH Publishing Corporation	2005, 1 st Edition

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE16P4	PRACTICAL IV – ORGANIC CHEMISTRY PRACTICAL II	PRACTICAL	-	-	60	4

Preamble

To enable the students to

- estimate quantitatively the amount of phenol, aniline, glucose present in the given solutions & unsaturation of oils
- analyze the R_M value of butter, saponification / Iodine values of oils
- extract the active constituents of milk and tea
- prepare organic compounds by a two stage process

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	experiment and estimate quantitatively the amount of phenol, aniline and glucose in the given solution	K2 , K3
CO2	examine the degree of unsaturation in butter and oils	K3
CO3	prepare organic compounds and determine their m.pt.s.	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	H	H	H	H	H	H
CO2	H	H	H	H	H	H	H
CO3	H	H	H	H	H	H	H

H - High; M-Medium; L-Low

PRACTICAL IV – ORGANIC CHEMISTRY PRACTICAL II [MCE16P4] (60 Hrs)

1. Estimations:

Estimation of phenol, aniline, methyl ketone, glucose & unsaturation.

2. Analysis of oils :

Reichert-Meissel value, Iodine value, Saponification value & Acetyl value.

3. Extraction & estimation of active constituents:

- i. Lactose from milk.
- ii. Caffeine from tea
- iii. Citric acid or ascorbic acid from a tablet or from a natural source.

4. Two stage preparations:

- i. p-nitro acetanilide
- ii. 1,3,5-tribromo benzene
- iii. p-bromo acetanilide
- iv. Eosin
- v. p-bromo aniline
- vi. m-nitro benzoic acid from methyl benzoate.

5. Interpretation of FT-IR of the following functional groups – C=O, -CH=N-, -OH, Phenolic -OH, -NH₂ & -NH group

Text Books:

LAB MANUAL - Prepared by Faculty, Department of Chemistry, PSGR Krishnammal College for Women.

Reference Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	F.G. Mann & B.C. Saunders	Practical Organic Chemistry	Pearson Education	2009, 4 th Edition
2	Mendhan Jetal	Text Book of Quantitative Chemical Analysis	Pearson	2009, 6 th Impression

Pedagogy:

Demonstration and hands on practicals

Course Designers:

1. Dr. N.Muthulakshmi Andal
2. Mrs. N.Shyamala Devi

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE16P5	PRACTICAL V - INORGANIC CHEMISTRY PRACTICAL – II	PRACTICAL	-	-	60	4

Preamble

To enable the students to

- Analyze quantitatively the metal ions such as Cu, Ni, Fe, Zn, Ca and Ba in a mixture
- Estimate ferrous ion, oxalic acid and nitrite by cerimetry
- Separate the components in ink and flowers by chromatography.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	separate and estimate the metal ions in a mixture	K2, K4
CO2	estimate the inorganic components by cerimetric method	K2
CO3	separate the components in natural and commercial products	K4

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	H	H	H	H	H	H
CO2	H	H	H	M	H	H	H
CO3	H	H	H	M	H	H	H

H - High; M-Medium; L-Low

PRACTICAL V - INORGANIC CHEMISTRY PRACTICAL – II [MCE16P5] (60 Hrs)

Cerimetry

1. Estimation of ferrous iron in ferrous ammonium sulphate.
2. Estimation of oxalic acid.
3. Estimation of Nitrite.

Estimation of metal ions in a mixture

1. Estimation of copper & nickel in a mixture
2. Estimation of Iron & Nickel in a mixture
3. Estimation of Copper & Zinc in a mixture
4. Estimation of Calcium & Barium in a mixture.
5. Estimation of Copper & Iron in a mixture.

Chromatography: Paper & Thin layer: Separation of Components in ink & flowers.

Text Books:

LAB MANUAL - Prepared by Faculty, Department of Chemistry, PSGR Krishnammal College for Women.

Reference Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	J.Mendham, R.C.Denney, J.D.Barnes, M.Thomas, B.Sivasankar	Vogel's Text Book of Chemical Analysis	Pearson Publications	1996, 6 th Edition
2	A.I Vogel	A Text Book of Quantitative Inorganic Analysis	The ELBS and Longmans, Green & Co.Ltd	5 th Edition 1997

Pedagogy:

Demonstration and hands on practicals

Course Designers:

1. Mrs. E. Kayalvizhy
2. Mrs. V. Hemapriya

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE16P6	PRACTICAL VI – PHYSICAL CHEMISTRY PRACTICAL – II	PRACTICAL	-	-	75	5

Preamble

To make the students to

- understand the principle of conductivity experiments and carry out conductometric titrations.
- determine the rate constant for acid and base hydrolysis of esters and primary salt effect.
- learn the kinetics of adsorption of oxalic acid on charcoal.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	experiment and estimate the strength of the solutions by conductivity method.	K2, K3
CO2	experiment and calculate the rate constant for ester hydrolysis	K3, K4
CO3	apply Freundlich isotherm to adsorption of oxalic acid on charcoal	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	H	H	H	H	H	H
CO2	H	H	H	H	H	H	H
CO3	H	H	H	H	H	H	H

H - High; M-Medium; L-Low

PRACTICAL VI – PHYSICAL CHEMISTRY PRACTICAL – II (MCE16P6) (75 Hrs)

Conductivity Experiments:

- 1 Determination of equivalent conductance of a strong electrolyte & the verification of DHO equation.
- 2 Verification of Ostwald's Dilution Law & Kohlrausch's Law for weak electrolytes.
- 3 Determination of pK_a of a weak acid.
- 4 Determination of solubility of a sparingly soluble salt.
- 5 Acid-base titration (weak acid vs strong base, Mixture of acids vs strong base)
- 6 Precipitation titrations (mixture of halides vs $AgNO_3$)

Kinetics:

- 1 Acid hydrolysis of an ester at room temperature
- 2 Saponification of ester at room temperature
- 3 Evaluation of Arrhenius parameters E & A (any two temperatures only)
- 4 $S_2O_8^{2-}$ Study on Primary salt effect & determination of concentration of KNO_3

Adsorption: Adsorption of oxalic acid on charcoal

Text Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	B. Viswanathan & P.S. Raghavan	Practical Physical Chemistry	Viva Books	2009, 3 rd Edition.

Pedagogy:

Demonstration and hands on practicals

Course Designers:

1. Dr.S.Chitra
2. Dr. N. Aruna Devi
3. Dr. K. Kalaiselvi

Cyber Security [MNM15CS]

(26 Hrs)

Objective

This course presents the principles of Cyber Security and its attack. It covers all aspects of cyberspace, botnet, cyber crime and its case studies.

Unit I (5 Hrs) Cyberspace:

Introduction- Web Threats for Organizations - Security and Privacy Implications from Cloud Computing - Social Media Marketing - Social Computing and the Associated Challenges for Organizations - Protecting People's Privacy in the Organization- Organizational Guidelines for Internet Usage- Safe Computing Guidelines and Computer Usage Policy.

Unit II (5 Hrs)

Security Threats:

Malicious Software, Types of Attacks, Threats to E-commerce, e-cash, Credit/Debit Cards.

Unit III (5 Hrs)

Cyber Security: Introduction - An Essential Component of Cyber security - Forensics Best Practices for Organizations - Media and Asset Protection - Importance of Endpoint Security in Organizations

Unit IV (5 Hrs)

Cyber Attacks: Introduction - How Criminals Plan the Attacks - Social Engineering - Cyberstalking -Cybercafe and Cybercrimes - Botnets: The Fuel for Cybercrime - Attack Vector - Cloud Computing

Unit V (6 Hrs)

Case Study on Cyber Crime & Security: Introduction on Cyber Crime - Trends in Mobility - Credit Card Frauds in Mobile and Wireless Computing Era. Illustrations, Examples and Mini-Cases - Introduction - Real-Life Examples - Mini-Cases Illustrations of Financial Frauds in Cyber Domain - Digital Signature-Related Crime Scenarios - Digital Forensics Case Illustrations - Online Scams.

Text Book

S.No	Author	Title of the Book	Publisher	Year of Publication
1	Faculty of Computer Science – PG	Essentials of Cyber Security	Kalaikathir Achachagam	2016

Reference Book

S.No	Author	Title of the Book	Publisher	Year of Publication
1	Nina Godbole and Sunit Belpure	Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives	Publication Wiley	2011
2	William Stallings	Network Security Essentials – Applications and Standards	Pearson Education	2011

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE1611	PAPER – X ELECTIVE –III CHEMISTRY & TECHNOLOGY OF POLYMERS	THEORY	56	4	-	4

Preamble

To enable the students to

- understand the kinetics of polymerization.
- learn about co-polymerization and ring opening polymerization.
- gain knowledge about Z-N Polymerization.
- learn the technology & applications of polymers.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	analyze the kinetics of polymerization reaction	K4
CO2	discuss the importance of ring opening polymerization and co-polymerization	K2
CO3	apply Z-N catalyst for the synthesis of stereo specific polymers	K3
CO4	appraise the different methods of fibre technology	K4
CO5	predict the role of elastomers and specialty polymers for various applications	K6

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	H	H	M	H	H	H
CO2	H	H	H	M	H	H	H
CO3	H	H	H	M	H	H	H
CO4	H	H	H	M	H	H	H
CO5	H	H	H	M	H	H	H

H - High; M-Medium; L-Low

Paper –X Elective –III Chemistry & Technology of Polymers [MCE1611]

(56 Hrs)

Unit I (11 Hrs)

Step & Chain Growth Polymerization: Polymers – Introduction, Classification of polymers – Polymerization reactions – Chain polymerization & Step Polymerization – Types, Mechanism & Kinetics. Molecular weight control in linear polymerization, Flory's MWD, Interfacial polymerization. Radical chain polymerization - General Mechanism, Kinetics & Sequence of events – Initiation by Thermolysis, Photolysis & Redox method. Initiator efficiency, Chain transfer reaction.

Unit – II (11 Hrs)

Copolymerization & Ring Opening Polymerization: Copolymers - Types, Importance of Copolymerization, Copolymer equation – Derivation – Significance & Experimental determination of Monomer reactivity ratios. Ideal, Alternating & Block copolymerization Behavior. Q-e scheme. Rate of Copolymerization- Derivation based on chemical controlled termination & Diffusion controlled termination. General characteristics ring opening polymerization-Kinetics and mechanism of cyclic ethers.

Unit III (11 Hrs)

Ziegler – Natta Polymerization: Definition of Z-N catalysts – Modification of Z-N catalysts by Third components – Mechanism of Z-N polymerization of α –Olefins – Monometallic & Bimetallic. Kinetics of Z-N polymerization – Rate curves, polymerization product – Adsorption kinetics. Stereochemical structures of PP, PB & PIP.

Unit IV (11Hrs)

Fibre Technology: Criteria for fibre formation – properties of textile fibres- Denier, Crimp, Moisture regain, Moisture absorption – Tenacity, aesthetic properties. Spinning – melt, wet, & dry. Fibre after treatments - Scouring, Sizing, Lubrication, Finishing. Manufacture of Nylon, Polyester, Viscose rayon & Polyacrylonitrile fibre.

Unit V**(12 Hrs)**

Elastomers: Molecular requirements, Vulcanization- Sulphur & Non sulphur, Mechanism & Reinforcement- Synthetic rubbers – Composition, Properties & Uses: SBR, Nitrile, Butyl rubber, Neoprene, Thiokol, Composition, Properties & uses.

Specialty polymers: Polyelectrolytes, Conducting polymers – Biomedical polymers – as implant materials, carriers of bioactive substances & polymeric drugs.

Text Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1.	F. W. Billmeyer	Text Book of Polymer Science	John Wiley	2002, 3 rd Edition
2.	P. J Flory	Principles of Polymer Chemistry	Asian Books,	2006, 1 st Edition
3.	George Odian	Principles of Polymerization	Wiley	Reprint 2007, 4 th Edition

Reference Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1.	V.K. Ahluwalia	Polymer Sciences	Anes Student Edition	2008 1 st Edition
2.	George. T. Austin	Shreves Chemical Process Industries	McGraw Hill International	1988 5 th Edition
3.	V.A. Shenai	Technology of Textile Processing Vol. I Textile Fibres	Viva Books Sevak Publishing	1984 2 nd Edition

Pedagogy:

Lecture by chalk and talk, power point presentation, e-content, group discussion, assignment, quiz, peer learning, seminar

Course Designers:

1. Dr.K.Kalaiselvi
2. Mrs.Sowmya Ramkumar

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE1612	PAPER – X ELECTIVE - IV- APPLIED CHEMISTRY (OPTIONAL)	THEORY	56	4	-	4

Preamble

To enable the students to

- understand the principle and chemistry of milk and leather processing
- acquire knowledge about ceramic products and lubrication
- learn about lubricants, explosives and rocket fuels.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	list the properties of milk & predict the quality of milk and milk products based on their physical properties	K1, K6
CO2	explain the different steps in leather processing and analyze the effluent problem in tanneries	K2 & K4
CO3	appraise the chemistry involved in manufacturing ceramic products	K4
CO4	relate the properties of lubricants and rocket fuels to their applications	K6

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	H	H	M	M	H	H
CO2	H	H	H	M	M	H	H
CO3	H	H	H	L	M	M	H
CO4	H	H	H	M	M	H	H
CO5	H	H	H	M	M	H	H

H - High; M-Medium; L-Low

Paper – X Elective - IV- APPLIED CHEMISTRY (Optional) [MCE1612] (56 Hrs)

UNIT I (11Hrs)

Dairy chemistry

Composition of Milk; Flavour and aroma of Milk; Physical properties of Milk; Effect of heat on Milk; Pasteurization; Homogenization; Milk products; Cream; Butter; Ice Cream; Milk Powder.

UNIT II (11Hrs)

Leather Chemistry

Introduction, Structure of hides and skin, Leather Processing – Process before tannage- flaying and curing (drying, salt curing and brine curing and pickling), Soaking, Liming, Fleshing, Unhairing, Deliming and Bating.

Tanning Process – Vegetable tanning, Synthetic tanning, Chrome tanning and Aldehyde tanning.

Tannery effluents and byproduct problems – primary treatment and secondary treatment .

UNIT III (11Hrs)

Ceramic Industries

Basic raw materials- Chemical conversions including basic ceramic chemistry, Whitewares, Structural clay products, Refractories – specialized ceramic products, vitreous enamel, kilns.

UNIT IV (11 Hrs)

Lubricants

Introduction, functions, requirements, mechanism of lubrication, classification of lubricants, properties of lubricating oil – viscosity, viscosity index, oiliness, flash and fire points, cloud and pour points, carbon residue, aniline point, volatility, corrosion stability and decomposition stability.

UNIT V (12 Hrs)

Explosives and rocket fuels

Introduction, characteristics, classification – primary, high and low, requirements of explosives, rocket propellants, characteristics, classification – solid and liquid propellants with examples.

Text Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1.	Durga Nath Dhar	Applied Chemistry – II	Vayu Education of India	2009 1 st Edition
2.	R.Gopalan, Chitra Ramachandran,	Applied Chemistry for Engineers	Vikas Publishing House	2001 1 st Edition
3.	Jayashree Ghosh	Fundamental Concepts of Applied Chemistry	S. Chand &Co	2006 1 st Edition

Reference Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1.	George T.Austin	Shreve's Chemical Process Industries	McGraw – Hill Book Co	1984 5 th Edition.
2.	M..Karunanithi, T.Ramachandran, H.Venkataraman, N. Ayyaswamy	Applied Chemistry	Anuradha Agencies	Reprint 2006

Pedagogy:

Lecture by chalk & talk, power point presentation, e-content, Simulation, numerical exercises, group discussion, assignment, quiz, seminar.

Course Designers:

1. Mrs.E.Kayalvizhy
2. Mrs.P.Kanchana

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE1613	PAPER – XI GREEN CHEMISTRY	THEORY	41	4	-	3

Preamble

To enable the students to

- understand the basic principles and importance of green chemistry for industrial applications.
- gain knowledge about catalysts and catalytic reactions, various reagents and their current applications in industry.
- acquire knowledge about the Microwave and Ultra sound assisted synthesis.
- understand the concept of phase-transfer catalysis.
- gain knowledge about crown ethers and their applications.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	define green chemistry and explain basic principles	K1 ,K2
CO2	discuss and appraise green reagents, microwave and ultrasound assisted synthesis	K2, K6
CO3	analyse the synthetic applications and advantages of ionic liquids, phase transfer catalysis and crown ethers	K4

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	H	H	M	H	H	H
CO2	H	H	H	H	H	H	H
CO3	H	H	H	M	H	H	H

H - High; M-Medium; L-Low

Unit I**(8 Hrs)****Green Chemistry**

Definition- Need for green chemistry- Basic principles - Planning a green synthesis in the laboratory- Atom efficiency process & atom economy- Rearrangement, addition, substitution, elimination. Synthesis involving basic principles of green chemistry – synthesis of styrene, adipic acid- green chemistry in day-today life – Dry cleaning of clothes, versatile bleaching agents.

Unit II**(8 Hrs)****Green reagents**

Dimethyl carbamate, polymer supported reagents, green catalysts-acidic ,basic, oxidation and polymer supported catalysts.

Microwave Induced Green Synthesis

Introduction- Microwave assisted reactions in water – Hoffmann elimination, hydrolysis, oxidation, inorganic solvents- Esterification, chalcone synthesis, Diel's Alder reaction, decarboxylation and Fries rearrangement.

Unit III**(8 Hrs)****Ultrasound Assisted Green Synthesis**

Introduction- esterification, saponification, oxidation, reduction, hydroboration, coupling reaction, Diels Alder reaction, Cannizaro reaction, Strecker synthesis, Reformatsky reactions..

Ionic liquids

Introduction, Applications in organic synthesis-Diels Alder reaction, Advantages & disadvantages of ionic liquids.

Unit IV**(8 Hrs)****Phase transfer catalysts**

Introduction, definition, mechanism of phase transfer catalysed reaction, types and advantages of phase transfer catalysts, types of phase transfer catalysed reactions, Preparation of phase transfer catalysts, applications of phase transfer catalysis in organic synthesis- alcohols from alkyl halides and addition to olefins.

Unit V**(9Hrs)****Crown ethers**

Introduction, nomenclature, special features, nature of donor site, general synthesis of crown ethers -synthesis of [12] crown- 4, [18] crown -6 and cryptates. Synthetic applications – esterification, saponification and KMnO_4 oxidation.

Text Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1.	V.K.Ahluwalia	Environmentally Benign Reaction	Ane Books Pvt Ltd	2009, 1 st Edition- Reprint
2.	Ahluwalia, M.Kidwai	New trends in Green Chemistry	Anamaya Publishers	2007, , First reprint of second edition
3.	V.K.Ahluwalia, Renu Aggarwal	Organic synthesis- Special techniques	Narosa Publishing House	Copyright 2001

Reference Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1.	Rashmi Sanghi, M.M.Srivastava	Green Chemistry Environment Friendly Alternatives	Narosa Publishing House	2009, Fourth reprint.

Pedagogy:

Lecture by chalk & talk, power point presentation, e-content, Simulation, numerical exercises, group discussion, assignment, quiz, seminar.

Course Designers:

1. Dr. K. Kalaiselvi
2. Dr. A. Kiruthika

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE1614	PAPER – XII- NANO CHEMISTRY AND BIOINORGANIC CHEMISTRY	THEORY	41	4	-	3

Preamble

To enable the students to

- gain knowledge about Nano chemistry.
- know about the various methods of synthesis, properties and applications of nanomaterials.
- understand the mechanism of oxygen transport by haemoglobin and myoglobin.
- learn about the biological functions of co-ordination complexes and their applications in various fields.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	discuss the synthesis of Nanomaterials.	K2
CO2	analyse the properties of nanoparticles and illustrate their applications	K3, K4
CO3	recognize and appraise the role of inorganic compounds in biological systems.	K2, K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	H	H	M	M	H	H
CO2	H	H	H	M	H	H	H
CO3	H	H	H	M	M	H	H

H - High; M-Medium; L-Low

Paper – XII- NANO CHEMISTRY AND BIOINORGANIC CHEMISTRY [MCE1614]

(41 Hrs)

Unit I

(8 Hrs)

Nanochemistry I

Introduction, Definition, Nature & Nanomaterials. Synthesis of metal nanoparticles – Physical methods (Laser Ablation, Physical Vapour Deposition, Sputtering & Solvated Metal Atom Dispersion) Chemical Methods – Thermolysis, Sonochemical Approach, Reduction of metal ions .Phase Transfer processes in nanomaterial Synthesis, synthesis of nanoparticles by biological agents. Synthesis of semiconductors nanomaterials – Precipitation method, thermal decomposition of complex precursors.

Unit II

(8 Hrs)

Nanochemistry II

Synthesis of ceramic nanomaterials – Physical methods (Gas condensation method, Laser method), chemical method (Sol-Gel Synthesis). Characterization of Nanomaterials (SEM, Scanning Tunneling Microscopy & atomic force microscopy), TEM. Stability of nanoparticles in solution.

Properties of Nanomaterials – Size effect, optical, electrical & magnetic properties, Brief account of application of nanomaterials

Unit III

(8 Hrs)

Nanochemistry III

Fullerenes -Introduction and properties, Carbon Nanotube- types, properties, defects, synthesis and applications-structural materials, electromagnetic field, chemical field, electrical circuits and current applications.

Unit IV

(8 Hrs)

Inorganic chemistry of biological systems 1

Metalloporphyrines and Respiration – cytochromes, dioxygen binding, transport and utilization. The binding of dioxygen to myoglobin, physiology of myoglobin and haemoglobin, structure and function of haemoglobin, ferredoxins and rubredoxins, blue copper proteins-

Electron transport blue proteins with a single type 1 copper centre, Blue oxidase proteins with type 1, 2 and 3 copper proteins

Unit V

(9 Hrs)

Inorganic chemistry of biological systems 2

Photosynthesis- chlorophyll and the photosynthetic reaction centre, Nitrogen fixation – *In-Vitro*, *Invivo*, Na⁺/K⁺ pump enzymes – structure and function of carboxy peptidase A, carbonic anhydrase, vitamin B12 – structure and functions , applications of coordination complexes in medicine, agriculture, horticulture and industry.

Text Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1.	James.E.Huheey, Keiter	Inorganic chemistry- Principle of structure and reactivity	Pearson	2006, 4 th Edition
2.	Mark Ratner, Daniel Ratner	Nanotechnology	Pearson education	2008, 1 st Edition
3.	S .Shanmugam	Nanotechnology	MJPPublishers	2010, 1 st Edition
4.	B. Viswanathan	Nanomaterials	Narosa publishing House	Reprint 2010

Reference Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1.	AsimK.Das	Bioinorganic chemistry	Books and Allied Pvt Ltd	2007, 1 st Edition.
2.	Richard Booker	Nanotechnology	Earl Boyren , John Wiley.	2005, 1 st Edition

Pedagogy:

Lecture by chalk & talk, power point presentation, e-content, Simulation, numerical exercises, group discussion, assignment, quiz, seminar.

Course Designers:

1. Dr. D. Nalini
- 2 Mrs. G. SathyaPriyadarshini

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE1315	ALC-OPTIONAL - ENVIRONMENTAL CHEMISTRY	THEORY		Self- Study		5

Preamble

To enable the students to

- understand the environmental concepts & ecological perspectives.
- gain vivid knowledge about air & water pollution.
- gain knowledge about environmental management & environmental legislations in India

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	sketch the kinds of ecology and illustrate the factors affecting environment	K3
CO2	categorize air and water pollutants and examine the suitable control measures	K4
CO3	propose suitable treatment method for water treatment	K5
CO4	integrate environmental assessment, management, audit and risk management	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	H	H	M	M	H	H
CO2	H	H	H	M	M	H	H
CO3	H	H	H	M	M	H	H
CO4	H	H	H	M	M	H	H

H - High; M-Medium; L-Low

ALC-OPTIONAL - ENVIRONMENTAL CHEMISTRY [MCE1315] (Self study)

Unit I

Environment

Components of Environment, factors affecting, types, concepts. Segments of environment- Atmosphere, hydrosphere, lithosphere & biosphere.

Ecology

Definitions, kinds of ecology, environment & ecofactors- Abiotic & biotic factors.

Unit II

Air Pollution

Introduction, major sources of air pollution, classification of air pollutants- NO_x , SO_x , CO_x , hydrocarbons, and particulates- Effect & control of air pollutants. Greenhouse gases effect- Major sources, impact, consequences, control & remedial measures.

Unit III

Water Pollution

Definitions- Types of water pollution- Ground water, surface water, lake water, river water & sea water. Sources of water pollution – Sewage & domestic wastes, industrial effluents, agricultural discharges, fertilizers, detergents, toxic metals, radioactive materials – harmful effects. Classification of water pollutants – Inorganic pollutants & toxic metals, organic pollutants, detergents.

Unit IV

Water Treatment

Softening of water, demineralization of water – Water quality parameters- Physio-Chemical measurements – Suspended solids, dissolved solids, pH values, acidity, alkalinity, DO, BOD, COD, chlorides, fluorides & nitrates. Major industrial effluents- Pulp, paper & board, textile, tannery, electroplating, distillery – Effects & treatment.

Unit V

Environmental Management

Environmental impact assessment (EIA) – Types, benefits, characteristics. Environmental management system (EMS) – Basic considerations, elements. Environmental audit (EA) –

Objectives, audit process. Environmental risk assessment (ERA) – Precautionary principle, polluter pays principle & beneficiary pays principle. Environmental legislations in india – The Water (prevention & control of pollution) cess Act 1977. The Air (Prevention & Control of Pollution) Act 1981, Forest (Conservation) Act 1980, The environment (Protection) Act 1986.

Text Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1.	N.Manivasakam	Industrial Effluents	Sakthi Publications, Coimbatore	Reprint1997
2.	B.K.Sharma & H.Kaur	Environmental Chemistry	Goel Publishing House	1995, 2 nd Edition
3.	N.Vasudevan	Essentials of Environmental Sciences	Narosa Publishing House Pvt. Ltd	Reprint 2009

Reference Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1.	A.K.De	Environmental Chemistry	New Age International Pvt Ltd	2003, 5 th Edition.
2.	James E.Girard	Principles of Environmental Chemistry	Sanat Printers	2011, 2 nd Edition
3	B.K.Sharma	Industrial Chemistry	Goel Publishing House	2008, 14 th Edition.

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE1316	ALC - (OPTIONAL) - INDUSTRIAL CHEMISTRY	Theory		Self-Study		5

Preamble

To enable the students to

- gain knowledge in the manufacture of Sugar, Glass and Cement
- understand the properties of Glass, Cement and Rubber
- know the applications of Paints, Varnishes , Glass, Cement and Rubber

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	illustrate the manufacture of sugar, paint, varnishes, glass, cement and rubber	K3
CO2	analyse the properties of sugar, paint, varnishes, glass, cement and rubber	K4
CO3	assemble the applications of sugar, paint, varnishes, glass, cement and rubber and develop newer dimensions for industries	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	H	H	M	M	H	H
CO2	H	H	H	M	M	H	H
CO3	H	H	H	M	M	H	H

H - High; M-Medium; L-Low

ALC (OPTIONAL) INDUSTRIAL CHEMISTRY [MCE1316] (Self study)

Unit I

Sugar

Introduction - Manufacture of Cane Sugar - Extraction of juice - Purification of Juice - Defection, Sulphitation and carbonation - Concentration or evaporation. Crystallization- Separation of crystals, drying, refining- Recovery of sugar from molasses, bagasse- Manufacture of sucrose from beet root.

Unit II

Paints

Classification of paints- Constituents of paints – Setting of the paint – Requirements of a good paint – Methods of applying paints.

Varnishes

Introduction – Raw materials – Manufacture of varnishes.

Unit III

Glass

Introduction – Physical properties of glass - Chemical properties of glass – Characteristics of glass - Raw Materials - Chemical reactions – Methods of manufacture – Formation of the batch material, melting, shaping, annealing and finishing.

Unit IV

Cement

Introduction – Raw materials – Manufacture – Wet process, Dry process – Reactions in kiln – Setting of cement – Properties of cement- uses. Plaster of Paris–Gypsum – Lime.

Unit V

Rubber

Introduction – Importance of rubber – Types of rubber - Coagulation of rubber – Refining of crude rubber – Drawbacks of raw rubber – Rubber fabrication – Vulcanization – Techniques, properties. Properties of rubber

Text Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1.	B.K.Sharma	Industrial Chemistry	Goel Publishing House	2008, 14 th Edition

Reference Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1.	P.C.Jain & Monika Jain	Engineering Chemistry	Dhanpat Rai Publishing Co., (P) Ltd	2003, 14 th Edition
2.	C Parameswara Moorthy & C.V.Agarwal, Andhra Naidu,	Text Book of Engineering Chemistry	BS Publications	2006, 1 st Edition

Duration: 3 Months**CIA: 20 Marks****ESE: 80 Marks****Total: 100 Marks****Objective**

To make the students understand the importance of experimental analysis, scientific approach in solving problems related to the environment and society and to education and train the students to write scientific papers.

Individual Project and Viva Voce

Each staff will be allotted 2/3 students. A specific problem will be assigned to the students or they will be asked to choose a problem/area of interest. The topic/area of work will be finalized at the end of III semester, allowing scope for the students to gather relevant literature during the vacation. The research work can be carried at the college or any other organization approved by the staff coordinator and the HOD. Viva Voce/presentation will be conducted by a panel of internal; examiners including the HOD and the staff coordinator guiding the project. A power point / OHP presentation by the group before the audience will be evaluated on the basis of students response to questions.

Area of work

Synthetic organic chemistry, Coordination chemistry, Corrosion studies, Environmental chemistry.

Methodology

Each project should contain the following details:

Brief introduction on the topic

Review of literature

Materials and Methods

Experimental Results and Discussion –evidences in the form figures, tables and photographs can be enclosed

Summary

Bibliography

Evaluation:

Internal Evaluation of the project work will be carried out in stages as described below:

I Review – Selection of the field of study, Topic & literature collection	- 5 marks
II Review – Research design and Data Collection	- 10 marks
III Review – Analysis & Conclusion, Preparation of rough draft	- 5 marks
Total	- 20 marks

End Semester Examination

Total – 80 marks

Evaluation of the

Project : Relevance of the topic to the academic / society	- 10 Marks
Objectives	- 10 Marks
Experimental design	- 20Marks
Expression of results and discussion	- 20 Marks
Total	- 60 Marks

Viva Voce:

Presentation	- 10 Marks
Discussion	- 10 Marks
Total	- 20 Mark

Total - 100 Marks (Internal Evaluation – 20 marks , ESE – 80 marks)