PSGR KRISHNAMMAL COLLEGE FOR WOMEN

College of Excellence

(An Autonomous Institution, Affiliated to Bharathiar University)
(Reaccredited with 'A' Grade by NAAC, An ISO 9001:2015 Certified Institution)
Peelamedu, Coimbatore-641004

DEPARTMENT OF CHEMISTRY

CHOICE BASED CREDIT SYSTEM &

OUTCOME BASED EDUCATION SYLLABUS

MASTER OF CHEMISTRY

2018 - 2020

PROGRAMME OUTCOMES

After completion of the programme, the students will have the

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.

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DEPARTMENT OF CHEMISTRY

2018- 2020

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	MCE1701	Paper – I Inorganic Chemistry and solid state chemistry	4	56	4	3	40	60	100	4
	MCE1702	Paper – II Organic Chemistry – I (Organic Reaction Mechanism & Stereochemistry)	5	71	4	3	40	60	100	5
	MCE1703	Paper – III Physical Chemistry – I (Classical & Statistical Thermodynamics)	5	71	4	3	40	60	100	5
	MCE1704	Paper – IV Analytical Techniques in Chemistry	4	56	4	3	40	60	100	4
	MCE17P1	Practical – I Organic Chemistry Practical - I	4	60	-	-	-	-	-	-
	MCE17P2	Practical – II Inorganic Chemistry Practical – I	4	60	-	-	-	-	-	-
	MCE17P3	Practical – III Physical Chemistry Practical – I	4	60	-	-	-	-	-	-
II	MCE1705	Paper V Organic Chemistry-II (Reagents, Rearrangements, Pericyclic Reactions& Photochemistry)	5	71	4	3	40	60	100	5
	MCE1706	Paper VI Physical Chemistry-II (Group Theory &Quantum Chemistry)	5	71	4	3	40	60	100	5
	MCE1707	Paper VII-Spectroscopy	4	56	4	3	40	60	100	4
	MCE17P1	Practical I Organic Chemistry Practical – I	4	60	-	6	40	60	100	4
	MCE17P2	Practical II Inorganic Chemistry Practical – I	4	60	-	6	40	60	100	4
	MCE17P3	Practical III Physical Chemistry Practical – I	4	60	-	6	40	60	100	4
	MCP14A1	IDC-Clinical microbiology &Biochemistry	4	60	-	3	-	100	100	4

III	MCE1708	Paper – VIII Organic Chemistry – III (Chemistry of Natural Products)	5	71	4	3	40	60	100	5
	MCE1709 (or) MCE1710	Paper – IX Elective – I (Coordination & Organometallic Chemistry) Paper – IX Elective – II Medicinal Chemistry	4 4	56 56	4 4	3 3	40 40	60 60	100 100	4 4
	MCE1711	Paper -X- 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	40	60	100	4
	MCE17S1	Research Methodology	2	30	-	3	-	-	100	2
	MNM15CS	Cyber Security	2	26	4	2	-	-	100	Grade
	MCE17CE	Comprehensive Examination	-	-	-	1	-	-	-	Grade
IV	MCE1712 MCE1713	Paper – XI Elective III - Chemistry & Technology of Polymers (Or) Paper – XI Elective IV – Applied Chemistry	4 4	56 56	4 4	3 3	40 40	60 60	100 100	4 4
	MCE1714	Paper- XII Green Chemistry	3	41	4	3	40	60	100	3
	MCE1715	paper - XIII Nano Chemistry and Bioinorganic Chemistry	3	41	4	3	40	60	100	3
	MCE1716 (Optional) MCE1717	ALC – Chemoinformatics (Or) ALC- Industrial Chemistry	Self-study	-	-	3	25	75	100	5
	MCE17PROJ	Project & Viva-voce (Jan - March)		3 Months	-		20	80	100	5
		Grand Total							**2200 + 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

BLOOM'S CATEGORY	SECTION	WORD LIMIT	MARKS	TOTAL
K1, K2	A-10 X 3 Marks (No choice)	One or two sentences	30	100
K4, K3	B - 6/7 X 6 Marks	250	36	
K4, K5	C - 3/5 X 8 Marks	400	24	
K5, K6	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 / Analyze / 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	

SPECIAL COURSE – RESEARCH METHODOLOGY– 100 Marks

Section	Marks	Total
A – 5X5 marks (Either or)	25	100
B – 5 X15marks (Either or)	75	

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	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 disruptive behavior during class	Student rarely displays disruptive behavior during class	Student occasionally displays disruptive behavior during class	Student often displays disruptive behavior during class	Student almost always 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 - MCE1701							
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	H	H	H
CO5	H	H	H	H	H	H	H
COURSE - MCE1702							
CO1	H	H	H	M	M	H	H
CO2	H	H	H	M	L	H	H
CO3	H	H	H	M	L	H	H
CO4	H	H	H	M	L	H	H
CO5	H	H	H	M	M	H	H
COURSE - MCE1703							
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 - MCE 1704							
CO1	H	H	H	H	H	H	H
CO2	H	H	H	M	H	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 - MCE1705							
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 - MCE1706							

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
COURSE - MCE1707							
CO1	H	H	H	H	H	H	H
CO2	H	H	H	M	H	H	H
CO3	H	H	H	M	H	H	H
CO4	H	H	M	M	H	H	H
CO5	H	H	M	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 - MCE17P1							
CO1	H	H	H	H	H	H	H
CO2	H	H	H	L	H	H	H
CO3	H	H	H	L	H	H	H
CO4	H	H	H	H	H	H	H
CO5	H	H	H	H	H	H	H
COURSE - MCE17P2							
CO1	H	H	H	H	H	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
CO5	H	H	H	H	H	H	H
COURSE - MCE17P3							
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
CO5	H	H	H	H	M	M	M
COURSE -MCE1708							
CO1	H	M	H	L	M	H	H
CO2	H	H	H	M	H	H	H
CO3	H	H	H	M	H	H	H
CO4	H	H	H	L	M	H	H
CO5	H	H	H	L	H	H	H
COURSE - MCE1709							
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	M	H	H	H
CO5	H	H	H	M	H	H	H
COURSE - MCE1710							
CO1	H	H	M	L	M	M	H
CO2	H	H	M	L	M	M	H
CO3	H	H	M	L	M	M	H
CO4	H	H	M	L	M	M	H
CO5	H	H	M	L	M	M	H
COURSE - MCE1711							
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	M	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 - MCE1712							
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
CO5	H	H	H	M	M	H	H
COURSE - MCE1713							
CO1	H	H	H	M	M	H	H
CO2	H	H	H	M	M	M	H
CO3	H	H	H	L	M	M	H
CO4	H	H	H	M	M	M	H
COURSE - MCE1714							
CO1	H	H	H	M	H	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	H	H	H	H
COURSE - MCE1715							
CO1	H	H	H	M	M	H	H
CO2	H	H	H	M	H	H	H
CO3	H	H	H	M	M	H	H
CO4	H	H	H	H	M	H	H
CO5	H	H	H	H	M	H	H
COURSE - MCE1716							
CO1	H	H	H	H	M	H	H
CO2	H	H	H	H	M	H	H
CO3	H	H	H	H	M	H	H

CO4	H	H	H	H	M	H	H
CO5	H	H	H	H	M	H	H
COURSE - MCE1717							
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
CO5	H	H	H	M	M	H	H

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE1701	INORGANIC CHEMISTRY PAPER – I (Inorganic Chemistry and Solid State Chemistry)	THEORY	56	4	-	4

Preamble

To make the students to

- gain knowledge about structure and bonding in inorganic chains and rings.
- understand the concepts of isopoly, heteropoly acids , anions and inorganic polymers.
- learn about inorganic crystals and structural determination methods.

Course Outcomes

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

CO Number	CO Statement	Knowldge Level
CO1	Identify and extend the applications of inorganic compounds as rings and clusters	K_2, K_3
CO2	Appraise the importance of inorganic polyacids	K_5
CO3	Extend and assess the applications of inorganic compounds as polymeric structures	K_2, K_5
CO4	Distinguish the types of solids and their defects	K_4
CO5	Determine and compile the structures of inorganic crystals	K_5, K_6

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	H	H	H
CO5	H	H	H	H	H	H	H

H - High; M-Medium; L-Low

INORGANIC CHEMISTRY PAPER – IMCE1701

(Inorganic chemistry and solid state chemistry)**(56 Hrs)**

Unit – I **(12 Hrs)**

Chains and Rings

Chain – Catenation. Heterocatenation - Silicate minerals, orthosilicates, pyrosilicates, zeolites-intercalation compounds-preparation and properties.

Rings – Borazines, phosphozenes – Preparation, properties and structure.

Unit – II **(11 Hrs)**

Isopoly and Heteropoly Acids and Anions

Introduction, polymerization of CrO_4^{2-} anion, polymerization of molybdates, tungstates, vanadates, niobates and tantalates. Isopoly anions and isopoly acids of Mo^{6+} and W^{6+}, isopoly vanadates, isopoly niobates and isopoly tantalates. Heteropoly anions and heteropoly acids – different types, important reactions of iso and heteropoly anions.

Unit – III **(11 Hrs)**

Inorganic Polymers

Introduction, general properties, glass transition temperature, classification. Nitrides of sulphur - S_4N_4, $S_4N_3^+$, $(SN)_x$ – One dimensional conductors-preparation and structure. Silicon based polymers – Preparation, properties and types of silicones.

Unit – IV **(11 Hrs)**

Solid State Chemistry – I

Structure – Types and classification of solids, distinction between crystalline and amorphous solids. Unit cell, Bravais lattice, classification of crystals based on bond type and packing in crystals. Imperfections in crystals – Types of defects, stoichiometric defects – Schottky and Frenkel. Non-stoichiometric defects – Metal excess and metal deficient, consequences of metal deficiency defects.

Unit – V **(11 Hrs)**

Solid State Chemistry – II

Inorganic crystals – Coordination number, radius ratio rule and shapes of ionic crystals. Structures of ionic crystals – AX type: CsCl, ZnS (Zinc blende, Wurtzite), AX_2 type: CaF_2,

TiO_2, CdI_2. Experimental methods of crystal structure determination: X - ray diffraction, electron diffraction and neutron diffraction. Comparative study of the three diffraction methods.

Text Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	SatyaPrakash, G.D. Tuli, S.K. Basu, R.D. Madan	Advanced Inorganic Chemistry – Vol. I	S.Chand & Co. Ltd.	Reprint 2012
2	Gurdeep Raj	Advanced Inorganic Chemistry – Volume I	Krishna Prakasam Media (P) Ltd.	1999, 25th Edition
3	B.R. Puri, L.R. Sharma, K.C. Khalia	Principles of Inorganic Chemistry	Milestone Publisher	Copyright 2007-2008
4	James E. Huheey, Ellen A. Keiter	Inorganic Chemistry	Pearson	Copyright 2006, 4th Edition

Reference Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	F. Albert Cotton and Geoffrey Wilkinson	Advanced Inorganic Chemistry	Wiley Interscience	1999, 6th Edition
2	Anthony R. West	Solid State Chemistry and its Application	Wiley India	2011 Reprint
3	J.D. Lee	Concise Inorganic Chemistry	Wiley India	2010 Reprint

Pedagogy:

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

Course Designers:

Dr. P. Kanchana

Dr. S. Jone Kirubavathy

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE1702	PAPER II – 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	analyze and predict the aromaticity of compounds	K4, K2
CO2	develop skills for identifying the kinetics of reactions	K5
CO3	predict and apply the mechanism for synthesizing organic compounds	K2, K3
CO4	analyze various elimination reactions and compare with substitution reactions	K4
CO5	employ the concepts of stereo isomerism to organic compounds	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	L	H	H
CO3	H	H	H	M	L	H	H
CO4	H	H	H	M	L	H	H
CO5	H	H	H	M	M	H	H

H - High; M-Medium; L-Low

PAPER-II- ORGANIC CHEMISTRY – I MCE1702

(Organic Reaction Mechanism and 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 and heterocyclic compounds. Non benzenoid aromatics- azulene, ferrocene, tropolone, sydnones and annulenes (synthesis not required) - Non aromatic and anti-aromatic systems.

Reaction Mechanism

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

Unit II (14 Hrs)

Aliphatic Nucleophilic Substitution

The S_N1, S_N2 $S_N$imechanisms. The neighbouring group mechanism, neighbouring group participation by π and σ bonds, anchimeric assistance.

Nucleophilic substitution at an allylic, aliphatic, trigonal and vinylic carbon. Reactivity effects of substrate structure, attacking nucleophile, leaving group and reaction medium, phase transfer catalysis, ambident nucleophiles and ambident substrates. Swain-Scott, Grunwald- Winstein relationship.

Aromatic Nucleophilic Substitution

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

O and S – nucleophiles, Bucherer and Rosenmund reactions, Von Richter rearrangement.

Unit III (15 Hrs)

Aliphatic Electrophilic Substitution

Bimolecular mechanisms – S_E2 (front), S_E2 (back) and S_Ei. Unimolecular mechanism- S_E1 mechanism, substitution by double bond shifts, other mechanisms – addition-elimination and cyclic mechanism.

Hydrogen electrophiles: hydro-dehydrogenation, keto-enol tautomerism.

Halogen electrophiles: Halogenation of aldehydes, ketones and carboxylic acids. Nitrogen electrophiles: aliphatic diazonium coupling. Sulphur electrophiles: sulphonation Carbon electrophiles: acylation, alkylation, Stork-enamine reaction.

Aromatic Electrophilic Substitution

Mechanism, orientation and reactivity, the ortho/para ratio. Reactions involving nitrogen electrophiles: nitration, nitrosation and diazonium coupling, ipso substitution. Sulphur electrophiles: Sulphonation, Jacobsen rearrangement. Carbon electrophiles: Alkylation, acylation, arylation reactions - Scholl reaction, Gattermann reaction, Gattermann-Koch reaction, Reimer- Tiemann reaction, Kolbe-Schmidt reaction, Houben- Hoesch reaction, Vilsmeier-Haack reaction, Hoffmann-Martius reactions.

Unit IV **(14 Hrs)**

Elimination Reactions

E1, E2 and E1cB mechanism, orientation of double bond- structural and stereochemical factors governing eliminations - Hoffmann and Saytzeff rules, Bredt's rule - Effect of changes in the substrate, base, leaving group and medium in E1, E2 and E1CB reactions- Elimination vs substitution- Pyrolytic elimination- Chugaev reaction- Hoffmann degradation- Cope elimination.

Unit V **(14 Hrs)**

Stereochemistry

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

Geometrical Isomerism

E-Z Notation- Determination of configuration of geometrical isomerism- Stereoisomerism of cyclic compounds (upto six membered ring) - Aldoximes and ketoximes.

Conformational Analysis

Configuration and conformation- Conformation of acyclic compounds- cyclohexane, decalins, perhydrophenanthrenes and carbohydrates. Effect of conformation on reactivity, Curtin Hammett Principle.

Text Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	I.L. Finar	Organic Chemistry Vol I	Pearson Education	reprint 2009,6th Edition
2	I.L. Finar	Organic Chemistry Vol II	Pearson Education	reprint 2011,5th Edition
3	Jagdamba Singh and Yadav	Advanced Organic Chemistry	Pragati Prakasham	2010, 6th Edition
4	Jerry March	Advanced Organic Chemistry	Wiley Publications	reprint 2010,4th Edition.
5	Stanely H. Pine	Organic Chemistry	Tata MC Graw Hill	2007, 5th Edition
6	Jie Jack Li	Name Reactions	Springer	2004, 2nd 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, 3rd Edition
2	F. A.Carey and Sundberg	Advanced Organic Chemistry-Part A	Springer	2010
3	F. A.Carey and Sundberg	Advanced Organic Chemistry-Part B	Springer	2007
4	D .Nasipuri	Stereochemistry of Organic Compounds	New Age Publishers	2008, 2nd Edition

Pedagogy:

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

Course Designers:

1. Dr. G. Selvi
2. Mrs.N.Shyamala Devi
3. Dr. K. Kalaiselvi
4. Dr. P. Amutha

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE1703	Paper-III-PHYSICAL CHEMISTRY PAPER – I (Classical & Statistical Thermodynamics)	THEORY	71	4	-	5

Preamble

To enable the students to

- understand and apply the concept of fugacity, activity and chemical potential.
- acquire knowledge on third law of thermodynamics and probability and ensembles.
- gain knowledge about the 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.	K2
CO2	apply and analyze probability to molecular energy levels.	K3 , K4
CO3	calculate the molecular velocities based on Maxwell Boltzmann distribution law.	K4
CO4	apply thermodynamic concepts to evaluate the relationship between thermodynamic properties.	K3, K6
CO5	evaluate statistical thermodynamics to the properties of identical indistinguishable particles like electrons	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	M	M	M	H	H
CO5	H	H	H	M	H	H	H

H - High; M-Medium; L-Low

PAPER III- PHYSICAL CHEMISTRY PAPER – I MCE1703

(Classical and 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 and generalized method- variation of fugacity with temperature. Fugacity and the standard state for non-ideal gases- Fugacity coefficient, fugacity of mixture of non- ideal gases.

Activity and activity coefficient. Standard states – activity of solutions. Determination of activity of solute and solvent by freezing point method.

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, thermodynamic quantities at absolute zero, probability and third law, statistical meaning of third law and apparent exceptions, negative absolute temperature.

Probability and Ensembles

Theorems of permutations, combinations and probability. Thermodynamic probability to molecular systems- States of maximum thermodynamic probability of systems involving energy levels.

Distinguishable and indistinguishable particles. Microstates and macrostates. Ensembles – definition- microcannonical, cannonical and grand cannonical ensembles.

Unit III **(14 Hrs)**

Maxwell Boltzmann Statistics

Stirling's approximation formula, Maxwell Boltzmann distribution law – assumptions, derivation for the system having non- degenerate and 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 and beta in Boltzmann statistics. Evaluation of average velocity, root mean square velocity and most probable velocity from distribution law of molecular velocities, 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 and thermodynamic properties E, H, S, A, G, C_V and 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 and diatomic ideal gas molecules from partition functions.

Unit V **(15 Hrs)**

Quantum Statistics

Bose Einstein distribution law- derivation – entropy of boson applications. 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. Heat capacity – Einstein theory and Debye theory, Debye T-cube law, comparison of Maxwell Boltzmann, Bose Einstein, Fermi - Dirac statistics

Text Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	Samuel Glassstone	Thermodynamics for Chemists	East West Press	Reprint 2002
2	M.C. Gupta	Statistical Thermodynamics	Wiley Eastern Publications	1990, 1st Edition
3	Ashley	Classical and Statistical Thermodynamics	Pearson Education	2012

Reference Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	P.W. Aktins	Physical Chemistry	Oxford University	1978, 1st Edition (Reprint 2005)
2	Gurdeep Raj	Advanced Physical Chemistry	GOEL Publishing House	2002, 27th Edition
3	Peter Atkins & Julio de Paula	Elements of Physical Chemistry	Oxford University	2nd Print 2014,5th 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, 3rd Edition.

Pedagogy:

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

Course Designers:

1. Dr. D.Nalini
2. Dr.N.Arunadevi
3. Dr. K. Kalaiselvi
4. Mrs. Sowmya Ramkumar

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE1704	PAPER IV– ANALYTICAL TECHNIQUES IN CHEMISTRY	THEORY	56	4	-	4

Preamble

To enable the students to

- understand and analyze various types of chromatographic techniques.
- acquire knowledge about the configuration and confirmation of organic molecules by ORD and CD
- gain knowledge about the different thermal and electro analytical techniques.
- understand the principle of atomic absorption and Emission spectroscopy

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Apply HPLC, GC and SFC chromatographic techniques to identy the components	K1, K3
CO2	Relate the concepts of ORD & CD to predict the configuration and conformations of simple cyclic ketones	K3, K6
CO3	Classify thermo analytical techniques and to assess the thermal stability of a chemical compound	K2, K4, K6
CO4	Infer the principle, instrumentation of coulometry, polarography and cyclic voltammetry	K4
CO5	Perceive the sources, properties, types of atomizers and their applications	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	M	H	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 IV– ANALYTICAL TECHNIQUES IN CHEMISTRY - MCE1704 (56 Hrs)

Unit I **(11 Hrs)**

Chromatography

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

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

Super Critical Fluid Chromatography (SFC) - Characteristics of super critical fluids, Comparison of SFC with HPLC & GLC, Applications of SFC

Unit II **(11 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.

Unit III **(11 Hrs)**

Thermoanalytical Methods

Principle - Thermogravimetric analysis & differential thermal analysis- discussion of various components with block diagram- TGA & DTA curves of $CuSO_4.5H_2O$, $MgC_2O_4.H_2O$ & $Ca(OOCCH_3)_2.H_2O$ – Simultaneous DTA-TGA curves of $SrCO_3$ in air & $CaC_2O_4.H_2O$ in air & CO_2. Factors affecting TGA & DTA curves. UPS & ESCA- Basic principles, sources, instrumentation, applications. DSC- Principle, Instrumentation and application.

Unit – IV **(12 Hrs)**

Electro Analytical Techniques

Coulometry: Introduction, Types of colometric methods, Types of coulometers – O_2-H_2, Ag & I_2 coulometer, coulometric titrations- Internal and external generation of titrants, applications.

Polarography: Introduction, apparatus, working, polarographic measurements, interpretation of polarographic waves, equation for polarographic wave, half wave potential, DME - Applications.

Cyclic Voltammetry: Principle, Normal Pulse Voltammetry (NPV), Differential Pulse Voltammetry (DPV)

Unit – V **(11 Hrs)**

Atomic Spectroscopy

Sources of atomic and emission absorption spectra. Atomic spectroscopy based on flame atomization – flame atomizers, properties of flames, quantitative analysis. Flame Atomic Absorption Spectroscopy – Introduction, sources, instrumentation. Flame emission spectroscopy – Introduction, instrumentation.

Text Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1.	E.L Eliel	Stereochemistry of Carbon Compounds	Tata Mc Graw Hill	2004, 30th Edition
2.	Dr. H. Kaur	Instrumental Methods of Chemical Analysis	Pragati Prakashan	2008, 4th Edition
3.	Mahinder Singh	Analytical Chemistry- Instrumental Techniques	Dominant Publishers & Distributors NewDelhi	2003, 1st Edition
4.	B. K Sharma	Instrumental Methods of Chemical Analysis	Goel Publications	1996, 15th Edition
5.	H. H Willard, L. L Merritt. and J. A Dean, F.A. Settle	Instrumental Methods of Analysis	CBS Publishers & Distributors	1986, 7th Edition

Reference Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1.	L.I.Antropov	Theoretical electrochemistry	MIR publishers, Moscow	1972, 1st Edition
2.	S. M. Khopkar	Basic Concepts of Analytical Chemistry	Wiley Eastern Ltd	1884, First Edition
3.	D. A Skoog, F.J.Holler and D. M West	Analytical Chemistry- An Introduction	Saunders College Publications	1994, 6th Edition
4.	M.S.Yadav	Instrumental Methods of Chemical Analysis	Campus Book	2006, 1St Edition

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

Course Designers:

1. Ms. E. Kayalvizhy
2. Mrs. G. Sathya Priyadarshini

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE1705	PAPER V -ORGANIC CHEMISTRY –II	THEORY	71	4	-	5

Preamble

To enable the students to

- understand the applications of reagents in organic synthesis
- gain knowledge about the mechanism of molecular rearrangements
- learn the stereochemistry of pericyclic reactions by correlation diagram, FMO and PMO methods
- understand the principles of photochemistry and Retro Synthesis and their applications

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	assess the use of organic reagents in synthesis of new compounds	K5
CO2	recognize and analyze the mechanisms of various molecular rearrangements	K2, K4
CO3	classify pericyclic reactions and interpret the product formation based on the stereochemical methods	K2, K5
CO4	apply retro synthesis to design synthetic routes for synthesis of organic compounds	K3
CO5	appreciate the role of photochemistry and the significant applications of photochemistry in research.	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 – V -ORGANIC CHEMISTRY –II (MCE1705)

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

Unit I (14 Hrs)

Reagents in Organic Synthesis

Use of the following reagents in organic synthesis and functional group transformations - complex metal hydrides, Gilman's reagent, lithium dimethyl cuprate (LDC), lithium diisopropyl amide (LDA), dicyclohexyl carbodimide (DCC), 1,3-dithiane, tri-n-butyl tin hydride,Osmium tetroxide, DDQ, SeO_2, phase transfer catalysts - Crown ethers, Wilkinson's catalyst, Baker's yeast.

Unit II (14 Hrs)

Molecular Rearrangements

Intramolecular 1, 2- shifts, Wagner Meerwein and related rearrangements, Migration to carbonyl carbon: Neber and Baeyer Villiger rearrangement. Rearrangement of electron deficient nitrogen and oxygen: Dienone – Phenol, Favorskii, Fries, Wolf, Benzidine, Steven's, Demzanov, Sommlet-Hauser, Chapmann and Wallach rearrangements.

Unit III (14 Hrs)

Pericyclic Reactions

Molecular orbital symmetry, Frontier orbitals of ethylene, 1, 3-butadiene, 1, 3, 5-hexatriene. Classification of pericyclic reactions. Electrocyclic reactions – 4n and 4n+2 systems, Woodward –Hoffmann rules, Correlation diagram, FMO and PMO approach [1, 3-dienes and 1, 3, 5-trienes]

Cycloadditions

Antarafacial and suprafacial additions, 4n and 4n+2 systems, 1, 3- dipolar addition, Diel's Alder reaction.

Sigmatropic Rearrangements

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

Unit IV (15 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 and 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 and ketals, protection of carboxylic acid groups- principle – protecting group for carboxylic acid – methyl ester, protection of amino groups- principle – protecting group for amino group- formamide.

Unit V **(14 Hrs)**

Organic Photochemistry

Introductory theory of light absorption, photophysical processes- Jablonski diagram, IC, ISC, fluorescence, phosphorescence. Photochemical reactions of Ketones –Norrish type I and II, Paterno Buchi reaction, Photoreduction of Ketones, Photochemistry of α, β-unsaturated ketones, Photochemical reactions of olefins – Cis-trans isomerism, Dimerization reactions, photochemistry of butadiene, Photochemistry of aromatic compounds and photooxidation.

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	2013, 4th Edition
2	Jagadamba Singh & L.D.S. Yadav	Advanced Organic Chemistry	Pragati Prakasam	2007, 6th Edition
3	Jerry March	Advanced Organic Chemistry -Reactions, Mechanism & Structure	John Wiley Publications Ltd	2008, 4th Edition.
4	S. M. Mukherji and S.P. Singh	Reaction mechanism in organic chemistry	The macmillan company of India Ltd	1984, 1st Edition.

Reference Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	Mary Fieser and Louis Fieser	Reagents in Organic Synthesis	Wiley Interscience	2011, Vol.26
2	J.N.Gurtu and R.Kapar	Organic Reactions and Reagents	S.Chand &Co Pvt., Ltd.,	1988 1st Edition
3	Solomons & Fryhles	Organic Chemistry	John Wiley & Sons	2010, 8th Edition
4	T.L. Gilchrist & R.C. Storr	Organic Reactions & Orbital Symmetry	Cambridge University Press	1975, 1st Edition.
5	Stuart Warren	Organic Synthesis- The Disconnection Approach	John Wiley & Sons	2004, 1st Edition
6	Charles H Depuy, Orville L. Chapman	Molecular reactions and photochemistry	Printice Hall	1976, 1st Edition.
7	Nicholas J. Turro	Modern Molecular photochemistry	The Benjamin/cummings publishing co., Inc	1978, 1st Edition.

Pedagogy:

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

Course Designers:

1. Dr. S. Chitra
2. Dr. K. Kalaiselvi

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE1706	**PAPER VI - PHYSICAL CHEMISTRYII** (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 in vibrational spectroscopy and determination of hybridization types in nonlinear molecules
- 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 Outcome

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

CO Number	CO Statement	Knowledge Level
CO1	classify molecules into point groups	K2
CO2	construct the character table for point groups	K5
CO3	predict the IR and Raman active vibration modes for molecules and type of hybridization in nonlinear molecules based on group theory	K6
CO4	relate uncertainty and correspondence principles for the derived wave functions from Schrodinger wave equations	K3
CO5	distinguish radial/probability functions and curves and judge the shapes of s and p orbitals using quantum mechanical approach	K4,K6
CO6	generalize the HMO treatment of simple and conjugated π electron systems	K5

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 VI- PHYSICAL CHEMISTRY II - MCE1706

(Group Theory &Quantum Chemistry)(71 Hrs)

Unit I **(14 Hrs)**

Symmetry Elements and Symmetry Operations

Definition of identical and equivalent elements – Configurations – Symmetry operations and symmetry elements – Rotation – Axis of symmetry – Reflections – Symmetry planes – Inversion, centre – improper rotations – Rotation- Reflection axis – Effect of performing successive operations (Commutative and non-commutative)- Inverse operations.

Groups and their basic properties

Definition of a group – Basic properties of a group – Definition of Abelian group – Isomorphic group – Similarity transformation and classes – Group multiplication tables- Symmetry classification of molecules into point groups (Schoenflies symbol only)- Difference between point group and space group – Various symmetry operations of tetrahedral point groups.

Matrices

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

Unit II **(14 Hrs)**

Reducible and Irreducible representations

Definition of reducible and irreducible representations – Irreducible representation as orthogonal vectors – Direct product rule – The Great Orthogonality Theorem and its consequences (statement only, proof not needed)- Determination of the characters for irreducible representation of C_{2v} and C_{3v} point groups – using the orthogonality theorem – Calculation of binary co-ordinates in the character tables for C_{2v} and 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. Type of hybridization of atomic orbitals in acetylene, CH_4 and $[PtCl_4]^{2-}$.

Group theory and Vibrational spectroscopy

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

Unit III **(14 Hrs)**

Birth and Postulates of Quantum Mechanics

Failure of classical mechanics- Black body radiation, photo electric effect and Compton effect. The need for quantum mechanics.

Functions - Real, complex, odd, even, orthogonal and normalized functions.

Operator - linear and non-linear, differential, Hermitian, Hamiltonian, momentum (linear and angular) commutator (Theorems) and non- commutators, Eigen functions and eigen values.

Postulates of quantum mechanics-Statements and Discussion

Schrodinger Wave Equations - (Time dependent and time independent); Requirements of the acceptable wave function.

Unit IV **(14 Hrs)**

Quantum Mechanical models/ Applications

Particle in 1D box-quantization of energy, normalization of wave function, orthogonality/ orthonormal set of particle.Particle in 3D box- separation of variables, degeneracy Harmonic Oscillator-wave equation and its solution for diatomic molecule. Anharomonicity. Rigid Rotor-wave equation and its solution for diatomic molecule.

Unit V **(15 Hrs)**

Application of Quantum Mechanics to Hydrogen and Poly electron atom

H- atom (H – like species) - wave equation, 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 and p orbitals only.

Approximation methods- Need for approximation. Perturbation and Variation methods (1^{st} order only) - Applications of the methods to Helium atom. Born-Oppenheimer Approximation method; Hartree- Fock self-consistent field method.

Hydrogen molecular ion- Treatment of the ground state by LCAO-MO method

Helium atom- Electron spin, Pauli Exclusion Principle, Slater determinants – Approximate wave function of many electron atoms.

Electronic structure of conjugated systems- Huckel method applied to ethylene, allyl systems, butadiene and benzene.

Text Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	A.K Chandra	Quantum Chemistry	Tata Mc Graw Hill Publications	2010
2	R.K. Prasad	Quantum Chemistry	New Age International Publishers	2001, 4th Edition
3	K.V.Raman	Group Theory and its Applications to Chemistry	Tata McGraw-Hill Publications	2002

Reference Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	F.A. Cotton	Chemical Applications of Group Theory	Wiley Publications Ltd	2013
2	Donald. A. Mc. Quarrie	Quantum Chemistry	Viva Books Publications	reprint 2011
3	Ira. N. Levine	Quantum Chemistry	Pearson Publications	2007, 6th Edition

Pedagogy:

Lecture by chalk and talk, power point presentation, e-content, 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
MCE1706	PAPER- VII – SPECTROSCOPY	THEORY	56	4	-	4

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 compounds from various spectral data

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	K3, K6
CO2	analyze the vibrations of molecules and identify the functional group present in it	K1, K4
CO3	predict the structure of compound using 1D and 2D NMR techniques	K6
CO4	assess the mass to charge ratio for the sample under test and to propose the fragmentation pattern	K5, K6
CO5	relate the g factor, nuclear spin, and hyperfine coupling constant with structure of the complexes	K2

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
CO4	H	H	M	M	H	H	H
CO5	H	H	M	M	H	H	H

H - High; M-Medium; L-Low

Paper- VII – SPECTROSCOPY (MCE1707) (56 Hrs)

Unit I **(11 Hrs)**

UV and Visible Spectroscopy

Electronic excitation, Origin of different bands - Intensity of bands - Selection rules, Laws of photometry, Instrumentaion, Correlation of electronic absorption with molecular structure, Simple chromophoric groups, Factors affecting transitions - Solvent effect, effect of steric hindrance, effect of conjugation. Woodward's rule for calculating absorption maximum in conjugated dienes, polyenes, α, β - unsaturated carbonyl compounds, benzenoid systems. Applications of UV spectroscopy.

Unit II **(11 Hrs)**

Infrared Spectroscopy

Principle, the modes of stretching and bending vibrations, bond properties and absorption trends, Instrumentation- Description of double beam IR spectrophotometer, IR spectra of polyatomic molecules, Factors affecting the vibrational frequencies, Applications of IR spectroscopy, Intra and intermolecular hydrogen bonding, Finger Print region, Far IR region, Metal- ligand stretching vibrations, Application of IR spectroscopy in differentiation of linkage isomers – cyano and isocyano, nitro and nitrito, thiocyanato and isothiocyanato complexes.

Unit III **(11 Hrs)**

Proton NMR Spectroscopy

Nuclear spin states, nuclear magnetic moments, absorption of energy, ^{1}H chemical shift, factors affecting chemical shifts, spin-spin splitting, (n+1rule),coupling constant - deuterium exchange , first order and non-first order spectra- a review. Chemical and magnetic equivalence, shift reagents, NMR instrumentation, applications of NMR spectroscopy. NMR spectrum of ethanol, acetaldehyde, 1,1,2-trichoroethane, cinnamic acid, ethyl acetate, furfuraldehyde and α-chloro propionic acid

Unit IV **(12 Hrs)**

Carbon -13 NMR Spectroscopy

^{13}C nucleus, chemical shifts, spin- spin splitting, double resonance techniques - homonuclear and heteronuclear decoupling, broad band decoupling, off resonance decoupling, ^{13}C relaxation mechanisms.

FT and 2D NMR Spectroscopy

Principle of FT-NMR, FID. Introduction of 2D techniques: COSY and Hetero – COSY.

ESR Spectroscopy

Theory , derivative curves, 'g' shift, hyperfine splitting , zero field splitting and Kramer's degeneracy , factors affecting the magnitude of the 'g' values , identification of free radicals, EPR spectra of inorganic compounds.

Unit V **(11 Hrs)**

Mass Spectrometry

Introduction, principle, ion production (EI, CI, FD and FAB), presentation of spectral data, molecular ions, meta stable ions , molecular ion peak. Nitrogen rule, isotopic abundance analysis. Fragmentation process, symbolism (scission only), even and odd electron ions, scission with rearrangement. Retro Diels Alder rearrangement, Mc Lafferty rearrangement, double bond and/ or ring equivalents implied from a formula. Fragmentation associated with functional groups – aliphatic compounds, aldehydes, ketones, carboxylic acids, esters, amides, alcohols, thiols, amines, ethers, sulphides and halides, aromatic compounds, elimination due to ortho groups.

Text Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	Jag Mohan	Organic Spectroscopy	Narosa Publishing House	2013
2	P.S.Kalsi	Spectroscopy of Organic Compounds	New Age International (P) Ltd	2014, 6th Edition
3	Y. R Sharma	Elementary Organic Spectroscopy	S. Chand Publications	2012, 4th Edition
4	William Kemp	Organic Spectroscopy	Palgrave Publications	2002
5	H. Kaur	Spectroscopy	Pragati Prakashan Publications	2015, 10th Edition.

Reference Books:

S.No	Name of the Authors	Title of the Book	Publishers	Year of Publication
1	R.S. Drago	Physical Methods in Inorganic Chemistry	East West Pvt. Ltd	1978, 1st Edition.
2	D. L. Pavia, G.M. Lampman, G.S.Kriz and James R.Vyvyan	Spectroscopy	Brooks/Cole Publications	2011, 5th Edition.

3	R.M. Silverstein, F.X. Webster	Spectrometric Identification of Organic Compounds	John Wiley Publications	2009, 6th Edition
4	M. S. Yadav	Molecular Spectroscopy	Arise Publishers & Distributors	2011, 1st Edition.

Pedagogy:

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

Course Designers:

1. Dr. D. Nalini
2. Dr. P. Amutha

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
- gain the importance of hypertension and hypotension
- understand the principles and the concepts underlying clinical laboratory tests in clinical chemistry
- differentiate the blotting technique and vaccination types
- 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)ClinicalMicrobiology

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

(12Hrs)Principles of Clinical Biochemical Analysis

Basis of analysis of body fluids for diagnosticprognostic 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, Filarisis & Plague.Air Borne diseases: Diphtheria, Whooping cough, Influenza, Measles mumps, Tuberculosis, Water borne diseases: Cholera, Typhoid, & Dysentry. 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 1st edn.	Books & Allied Pvt Ltd.	2007
2	Jayashree Ghosh	Textbook of Pharmaceutical Chemistry3rd edn	S. Chand & Co	2003
3	Jayashree Ghosh	Fundamental concepts of Applied Chemistry1st 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 6th 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,6th Edition,	Tata mc Graw Hill, New Delhi	2005
2	Keith Wilson, John Walker.	Principles and Techniques of Biochemistry and Molecular Biology, 6th 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 and talk, power point presentation, e-content, simulation, numerical exercises, group discussion, assignment, quiz, seminar.

Course Designers:

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

Course Number	Course Name	Category	L	T	P	Credit
MCE17P1	PRACTICAL I - ORGANIC CHEMISTRY PRACTICAL – I	PRACTICAL	-	-	120	4

Preamble

To enable the students to

- separate two components in an 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	K4
CO2	analyze organic compounds	K4
CO3	develop skills in the synthesis of organic compounds	K5
CO4	determine boiling point /melting point	K6

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

PRACTICAL I - ORGANIC CHEMISTRY PRACTICAL – I MCE17P1 (120 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) Methyl orange from sulphanilic acid

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

Note: A minimum of five organic mixtures should be done by each student.

Text Book: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, 2nd Edition.
2	F.G. Mann & B.C. Saunders	Practical Organic Chemistry	Pearson Education	2009, 4th Edition

Pedagogy: Demonstration and hands on practicals

Course Designers:

1. Dr.S.Chitra
2. Mrs.E.Kayalvizhy
3. Mrs.G.Sathya Priyadarshini

Course Number	Course Name	Category	L	T	P	Credit
MCE17P2	PRACTICAL II – INORGANIC CHEMISTRY PRACTICAL-I	PRACTICAL	-	-	120	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 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	K3
CO2	analyse and report cations in a mixture	K4
CO3	estimate the metal ions in complexes	K5
CO4	develop skills in the synthesis of inorganic complexes	K5, K6
CO5	Interpret IR spectra of metal complexes	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
CO4	H	H	H	H	H	H	H
CO5	H	H	H	H	H	H	H

H - High; M-Medium; L-Low

PRACTICAL II - INORGANIC CHEMISTRY PRACTICAL – I MCE17P2 (120 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 Magnesium, Nickel & Zinc.

3. Preparation of Inorganic Complexes

i. Tris(thiourea)copper (I)chloride
ii. Potassium tris(oxalato)ferrate(III)
iii. Hexammine cobalt(III)chloride
iv. Ammonium hexachlorostannate(IV)
v. Tetramminecopper(II)sulphate

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

Text Books:LAB MANUAL - Prepared by Faculty, Department of Chemistry, PSGRKrishnammal 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 Long man's Ltd	1968, 1st Edition
2	G.Palmer	Experimental Inorganic Chemistry	Cambridge University Press	1964, 3rd 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
MCE17P3	**PRACTICAL III - PHYSICAL CHEMISTRY PRACTICAL - I**	**PRACTICAL**	-	-	120	4

Preamble

To make the students to

- understand the principle and to carry out the potentiometric titrations.
- determine the pH and pKa 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 Ka 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 MCE17P3 (120Hrs)

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. 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
7. Potentiometric Titrations:
   i. Titration of HCl vs NaOH
   ii. Titration of mixture of acids against a strong base
   iii. Titration of CH_3COOH 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)
   vi. Precipitation titrations:
      (a) Estimation of KI by titration with $AgNO_3$ using KCl as standard

(b) Titration of mixture of halides against $AgNO_3$ solution

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, 9th Edition
2	G.Palmer	Experimental Physical Chemistry	Cambridge University Press	1964, 1st Edition
3	B. Viswanathan & P.S. Raghavan	Practical Physical Chemistry	Viva Books	2009,3rd Edition

Pedagogy: Demonstration and hands on practicals

Course Designers

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

Course Number	Course Name	Category	L	T	P	Credit
MCE1708	PAPER-VIII ORGANIC CHEMISTRY-III (Chemistry of Natural Products)	THEORY	71	4	-	5

Preamble

To enable the students to

- elucidate structures of terpenoids, alkaloids & steroids, flavones and anthocyanins
- acquire knowledge about the structures of nucleic acids and their biological functions
- understand the synthesis and reactivity of heterocyclic compounds.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	define and classify terpenes, alkaloids, steroids, flavones and anthocyanins	K1, K2
CO2	identify the functional groups and analyse the structures of terpenoids, alkaloids, steroids, flavones and anthocyanins	K3, K4
CO3	sketch out the synthesis of terpenoids, alkaloids, steroids, flavones and anthocyanins	K3
CO4	integrate the chemistry of nucleic acids and their biological functions	K_5
CO5	compare and discuss the reactivity of O, N and S heterocycles	K4, K6

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

Paper-VIII Organic Chemistry-III MCE1708

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

Structures of RNA & DNA, Structure of nuclecosides - 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.

Heterocyclic Compounds

Synthesis and reactivity of common heterocyclic compounds containing one or two heteroatoms - (O, N, S) Pyrazole group, Imidazole group, Oxazole group and Thiazole group.

Unit V **(15 Hrs)**

Flavones & Anthocynanins

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

Text Books:

S.No	Authors	Title	Publishers	Year of Publication
1.	O.P. Agarwal	Organic Chemistry Natural Products, Vol.I	Goel Publishers	2013, 42th Edn.
2.	O.P. Agarwal	Organic Chemistry Natural Products, Vol.II	Goel Publishers	2014, 41th Edn.
3.	I.L. Finar	Organic Chemistry Vol.II	Pearson Education	2011, 5th Edn

Reference Books:

S.No	Authors	Title	Publishers	Year of Publication
1.	V.K. Ahluwalia	Chemistry of Natural Products	Ane Books Pvt. Ltd	2006, 1st Edn.
2.	P.S. Kalsi	Chemistry of Natural Products	Kalyani Publishers	2001 Reprint, 1st Edn.
3.	I.L. Finar	Organic Chemistry Vol.I	Pearson Education	2007 Reprint, 6th Edn.
4.	K. Nakanishi	Natural Products Chemistry Vol. I & II	Academic Press, Inc	1975, 1st Edn.

Pedagogy: Lecture by chalk and talk, power point presentation, e-content, group discussion, assignment, quiz, seminar.

Course Designers:

1. Dr. S. Chitra
2. Dr. K. Kalaiselvi

Course Number	Course Name	Category	L	T	P	Credit
MCE1709	PAPER-IX Elective I - COORDINATION & ORGANOMETALLIC CHEMISTRY	THEORY	56	4	-	4

Preamble

To enable the students to

- understand the theories of bonding, reactions 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	examine the spectra of complexes using TS and Orgel diagrams	K4
CO3	formulate mechanisms for reactions of transition metal complexes	K5
CO4	appraise the preparation, properties and uses of metal carbonyls	K4
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	M	H	H	H
CO5	H	H	H	M	H	H	H

H - High; M-Medium; L-Low

Paper – IX Elective I -Coordination and Organometallic Chemistry [MCE1709] (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 - I row transition metal complexes : comparison of magnetic properties of Oh, Td & square planar Fe(II), CO(II), Ni(II) & Cu(II) complexes. 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 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, complementary/non-complementary reacitons. Trans effect-mechanism and applications. Theories of trans effect. Oxidation – reduction reactions – through atom/group transfer, electron transfer. Mechanism of electron transfer reactions in solution phase – outer sphere and inner sphere mechanism.

Unit IV (11 Hrs)

Organometallic Chemistry I

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)**

Organometallic Chemistry II

Organometallic reactions - Co-ordinative unsaturation, oxidative addition reaction, Reductive elimination & β – elimination. Insertion reaction, Hydrogenation of alkenes (Wilkinson catalyst), 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	Authors	Title	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, 9th Edn.
2.	R.C. Mehrotra & A. Singh	Organometallic Chemistry- A Unified Approach	New Age Publishers	2007, 2nd Edn.
3.	B.R.Puri, L.R.Sharma & K.C. Kalia	Principles of Inorganic Chemistry	Milestone Publishers and Distributors	2013, 31st Edn.
4.	Wahid.U.Malik, G.D.Tuli & R.D.Madan	Selected Topics in Inorganic Chemistry	S.Chand & Co.	2010, 30th Edn.

Reference Books:

S.No	Authors	Title	Publishers	Year of Publication
1.	F.A. Cotton & G. Wilkinson	Advanced Inorganic Chemistry	Wiley Interscience Publishers	2009, 6th Edn.
2.	J.D.Lee	Concise Inorganic Chemistry	Chapman and Hall	2009, Reprint, 5th Edn.

Pedagogy: Lecture by chalk and talk, power point presentation, e-content, group discussion, assignment, quiz, seminar.

Course Designers:

1. Dr. P. Kanchana
2. Dr. P. Amutha

Course Number	Course Name	Category	L	T	P	Credit
MCE1710	PAPER – IX 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 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
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	M	L	M	M	H
CO2	H	H	M	L	M	M	H
CO3	H	H	M	L	M	M	H
CO4	H	H	M	L	M	M	H
CO5	H	H	M	L	M	M	H

H - High; M-Medium; L-Low

PAPER – IX Elective II – Medicinal Chemistry (Optional) [MCE1710](56 Hrs)

Unit I **(11 Hrs)**

Introduction to Drugs

Sources, absorption, roots of administration of drugs, biotransformation, mechanism of action. Factors prolonging action, excretion & toxicity. 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, and spatial considerations. Theories of drug activity: Occupancy Theory, Rate Theory, induced fit theory. Quantitative Structure Activity Relationship(QSAR) - History & development. 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. 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. Carcinolytic antibiotics & mitotic inhibitors.Synthesis of mechlorethamine, cyclophosphamide, melphalan, uracil, mustards & 6-mercaptopurine. Recent developments 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, methyldopa.

Unit V **(12 Hrs)**

Local Anti-infective Drugs

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

Text Books:

S.No	Authors	Title	Publishers	Year of Publication
1.	Ashutosh Kar	Medicinal Chemistry	New Age International	2007, 4th Edn.
2.	R.S Satoskar & S.D.Bharkar	Pharmacology & Pharmatherapeutics Vol 1 & 2	Popular Prakashan	2015, 24th Edn.

Reference Books:

S.No	Authors	Title	Publishers	Year of Publication
1.	G. Patrick	An Introduction to Medicinal Chemistry	Oxford University Press	2009, 4th Edn.
2.	D. Sriram & P. Yogeeswari	Medicinal Chemistry	Pearson Education	2010, 2nd Edn

Pedagogy: Lecture by chalk and talk, power point presentation, e-content, group discussion, assignment, quiz, seminar.

Course Designers:
1. Dr. S. Chitra
2. Dr. K. Kalaiselvi

Course Number	Course Name	Category	L	T	P	Credit
MCE1711	PAPER – X PHYSICAL CHEMISTRY – III (Reaction Kinetics & Electrochemistry)	THEORY	56	4	-	4

Preamble

To enable the students to

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

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, K2
CO3	appraise the theories of chemical kinetics & calculate the rate of reactions	K3, K5
CO4	apply the theories of adsorption & catalysis and predict the mechanism of surface phenomena	K3, K2
CO5	discuss the types of batteries, fuel cells, theories of corrosion & its mechanism	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	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 Physical Chemistry – III

Reaction Kinetics & Electrochemistry [MCE1711] (56Hrs)

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- electrocapillary curves - Lippman equation, electro kinetic phenomena. Zeta potential and its applications. Measurements of double layer capacitances. Theoretical models of double layers- Helmholtz model, Gouy Chapmann model- potential of zero charge, Stern model- outer & inner Helmholtz planes

Unit II (11Hrs)

Electrode Kinetics

Kinetics ofelectron transfer, Butler Volmer equation, Tafel equation, transfer coefficients, charge transfer resistance, Multistep process. Application of Cyclic voltammetry to test reversibility of electron transfer.

Irreversibility in Electrochemical Reactions

Overvoltage – Hydrogen overvoltage, oxygen overvoltage, measurement of overvoltage, factors affecting and importances of overvoltage.

Unit III (11Hrs)

Chemical Kinetics

Theories of Reaction Rates

The ARRT – Thermodynamic treatment of ARRT- Significance of reaction coordinate- Application of ARRT- Unimolecular & bimolecular processes-Lindemann Christiansen hypothesis, RRKM theory, Potential energy surface- Kinetic isotopic effects- Principles of microscopic reversibility- Steady State Approximation- Third order & termolecular reactions. Primary and secondary salt effects.

Reactions in Solutions

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

Unit IV **(11 Hrs)**

Catalysis

Acid – base catalysis – specific & general (Bronsted Catalysis law), Enzyme catalysis – Michaelis-Menten 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, Ag_2O-Zn batteries. Secondary batteries – Pb-acid battery.

Fuel cells

Classification, $H_2 – O_2$ fuel cell, Hydrocarbon – Oxygen fuel cell, Phosphoric acid fuel cells.

Corrosion

Types & importance of corrosion. Passivation of metals – Pourbaix diagram – Evans diagram. Electrochemical principles of corrosion - Polarisation of the electrodes – Concentration polarization, Activation polarization. Methods to control corrosion.

Electrodeposition: Principle and applications.

Text Books:

S.No	Authors	Title	Publishers	Year of Publication
1.	S. Glasstone	Introduction to Electrochemistry	EastWest Press Pvt Ltd	2011, 10th Printing
2.	K.J. Laidler	Chemical Kinetics	Pearson Education Pvt Ltd	2007, 3rd Edn
3.	B.R. Puri, L.R. Sharma, M.S. Pathania	Principles of Physical Chemistry	Vishal Publications	2011, 5th Edn

Reference Books:

S.No	Authors	Title	Publishers	Year of Publication
1	A. Frost & R.G.Pearson	Kinetics & Mechanism	Wiley Eastern Pvt Ltd	1970, 2nd Edn
2	Gurdeep Raj	Advanced Physical Chemistry	GOEL Publishing House	2009, 35th Edn
3	John.O.M. Bockris & A.K.N. Reddy	Modern Electrochemistry (Vol I & II)	Plenum Publishing Corporation	2006, 2nd Edn
4	Raj Narayanan	An Introduction to Metallic Corrosion & its Prevention	Oxford & IBH Publishing Co., Pvt Ltd	1998 Reprint, 1st Edn
5	Jain P C and Monika Jain	Engineering Chemistry	Dhanpat Rai Publishing Co.,	2015, 16th Edn

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

Course Designers:

1. Dr. D. Nalini
2. Mrs. Sowmya Ramkumar

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 melting points	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

Reichart-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- carbonyl compounds, azomethine, alcohol, phenol & amine.

Text Book:

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

Reference Books:

S.No	Authors	Title	Publishers	Year of Publication
1.	F.G. Mann & B.C. Saunders	Practical Organic Chemistry	Pearson Education	2009 4^{th} Edn.
2.	G. H. Jeffery, J. Bassett, J. Mendham & R. C. Denney	Vogel's Text Book of Quantitative Chemical Analysis	Pearson Education	2009 6^{th} Edn.

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 Cerimetirc 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
2. Estimation of Iron & Nickel
3. Estimation of Copper & Zinc
4. Estimation of Calcium & Barium
5. Estimation of Copper & Iron

Chromatography

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

Text Book:

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

Reference Book:

S.No	Authors	Title	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	2000 6^{th} Edn
2	A.I Vogel	A Text Book of Quantitative Inorganic Analysis	ELBS & Longmann, Green & Co. Ltd.	2011 9^{th} Edn

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	4

Preamble

To enable 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 and primary salt effect.	K3,K4
CO3	apply Freundlich isotherm to study the nature of 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 – 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 & Determination of pK_a of a weak acid

3 Verification of Kohlrausch's Law for weak electrolytes.

4 Determination of solubility of a sparingly soluble salt.

5 Acid-base titration (strong acid vs strong base, weak acid vs strong base)

6 Precipitation titrations (mixture of halides only)

7 Determination of hydrolysis constant of aniline hydrochloride.

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- Study on Primary salt effect & determination of concentration of KNO_3

5 Bronsted Catalysis Law

Adsorption

Adsorption of oxalic acid on charcoal & determination of surface area (Freundlich isotherm only)

Text Book:

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

Reference Books:

S.No	Authors	Title	Publishers	Year of Publication
1.	A.J. Findlay & Kitchener	Practical Physical Chemistry	Longmann Publication	1973 9th Edn
2.	B. Viswanathan & P.S. Raghavan	Practical Physical Chemistry	Viva Books	2009 3rd Edition.

Pedagogy: Demonstration and hands on practicals

Course Designers:

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

RESEARCH METHODOLOGY [MCE17S1]

Special Course

Credit - 2 **(30 Hrs)**

Objectives:

- To acquire knowledge about sampling & errors
- To inculcate basic ideas regarding research, thesis writing
- To gain knowledge about the use of tools and software in research

UNIT I **(6 Hrs)**

Errors involved in Chemical Analysis

Classification, minimization of errors, determination of accuracy of results, reliability of results, rounding numbers -Significant figures - Mean standard deviation.

UNIT II **(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 III **(6 Hrs)**

Thesis Writing - I

Nature and purpose, the components of dissertation, overview, title and title page, abstract, preface and table of contents

Unit IV **(6 Hrs)**

Thesis Writing - II

Introduction, results, discussion, conclusion, experimental section, references and miscellaneous components. Preparation of dissertation

Unit V **(6 Hrs)**

Materials, Tools and Methods in Scientific Writing

Writing techniques – Introduction, word processing and page layout, hardware and operating systems, word processing and page layout software, writing and formatting with computer, becoming accustomed to your system

Text Books:

S.No	Authors	Title	Publishers	Year of Publication
1.	S.M. Khopkar	Basic Concepts of Analytical Chemistry	New Age International Publishers	2008 3rd Edn.
2.	D.A. Skoog, D.M. West & F. James Holler	Analytical Chemistry – An Introduction	Saunders College Publishing	2000 7th Edn.
3.	Hans F. Ebel, Claus Bliefert	The Art of Scientific Writing	Wiley Publishing	2005 2nd Edn.

Reference Books:

S.No	Authors	Title	Publishers	Year of Publication
1.	C.R. Kothari	Research Methodolgy-Methods & Techniques	New Age International Publishers	2011 Reprint 2nd Edn.
2.	D.A. Skoog & F.J. Holler	Principles of Instrumental Analysis	Harcourt Brace College Publishers	2007 6th Edn.
3.	Y.K. Singh, R. Nath	Research Methodology	APH Publishing Corporation	2005 1st Edn.

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

lntroduction 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	Publisher	Year of Publication
1	Faculty of Computer Science – PG	Essentials of Cyber Security	KalaiKathir Achachagam	2016

Reference Books:

S.No	Author	Title	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
MCE1712	PAPER – XI ELECTIVE –III CHEMISTRY & TECHNOLOGY OF POLYMERS	THEORY	56	4	-	4

Preamble

To enable the students to

- understand the kinetics of polymerization
- learn about co-polymerisation 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	reproduce the classification of polymers and analyze the kinetics of polymerization reaction	K1, 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	integrate the role of elastomers and speciality polymers for various applications	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
CO5	H	H	H	M	M	H	H

H - High; M-Medium; L-Low

Paper –XI Elective –III Chemistry & Technology of Polymers[MCE1712]

(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.

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 & Diffusion controlled termination.

Ring Opening Polymerization:General characteristics of 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.

Speciality Polymer

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

Text Books:

S.No	Authors	Title	Publishers	Year of Publication
1.	F. W. BillMeyer	Text Book of Polymer Science	John Wiley	2009 Reprint 3rd Edn.
2.	P. J Flory	Principles of Polymer Chemistry	Asian Books	2006 1stEdn.
3.	George Odian	Principles of Polymerization	John Wiley	2007 Reprint 4th Edn.

Reference Books:

S.No	Authors	Title	Publishers	Year of Publication
1.	V.K. Ahluwalia & Anuradha Mishra	Polymer Science : A Text Book	Ane Books	2008 1st Edn.
2.	George. T. Austin	Shreves Chemical Process Industries	McGraw Hill International	2012 Reprint 5th Edn.
3.	V.A. Shenai	Technology of Textile Processing Vol. I : Textile Fibres	Sevak Publishers	1991 3d Edn. Revised

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
MCE1713	PAPER – XI ELECTIVE - IV- APPLIED CHEMISTRY (optional)	THEORY	56	4	-	4

Preamble

To enable the students to

- understand the chemistry of dairy and leather processing
- acquire knowledge about ceramic products and lubricants
- learn about 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	K1, K2
CO2	explain the different steps in leather processing and analyze the effluent problems in tanneries	K2 & K4
CO3	appraise the chemistry involved in manufacturing ceramic products	K4
CO4	discuss the properties of lubricants and classification of explosives/ rocket fuels	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	M	H
CO3	H	H	H	L	M	M	H
CO4	H	H	H	M	M	M	H

H - High; M-Medium; L-Low

Paper – XI Elective - IV- APPLIED CHEMISTRY (Optional) [MCE1713] (56 Hrs)

UNIT I (11Hrs)

Dairy Chemistry

Composition of Milk, factors affecting the composition of milk, micrflora of raw milk, milk fat/ proteins/sugar flavour and aroma, physical properties, effect of heat, milk processing – clarification, pasteurization, homogenization. Milk products- Cream, Butter, Ice cream and milk powder. Adulteration of milk

UNIT II (11Hrs)

Leather Chemistry

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

Tanning Processes – Vegetable, Synthetic, Chrome and Aldehyde tanning. Tannery effluents and Byproducts – primary and secondary treatments.

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 and decomposition stabilities.

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	Authors	Title	Publishers	Year of Publication
1.	Durga Nath Dhar	Applied Chemistry –II	Vayu Education of India	2010 1st Edn
2.	B. Srilakshmi	Food Science	New Age International Publishers	2014 7th Edn
3.	Jayashree Ghosh	Fundamental Concepts of Applied Chemistry	S. Chand &Co	2006 1st Edn
4.	M. R. Adams & Maurice O. Moss	Food Microbiology	RSC Publishers	2007 3rd Edn

Reference books:

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

Pedagogy:

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

Course Designers:

1. Dr. S. Chitra
2. Dr. K. Kalaiselvi

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE1714	PAPER – XII GREEN CHEMISTRY	THEORY	41	4	-	3

Preamble

To enable the students to

- understand the basic principles and importance of green chemistry for industrial applications
- acquire knowledge about the microwave and ultra sound assisted synthesis
- understand the concept of phase-transfer catalysis
- gain knowledge about ionic liquids, 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
CO3	analyse the synthetic applications and advantages of ionic liquids	K4
CO4	appraise the advantages and the applications of phase transfer catalyst in organic synthesis	K5
CO5	propose Crown ethers for various reactions	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	H	H	H	H
CO3	H	H	H	M	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 –XII Green Chemistry [MCE1714] (41hrs)

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

Dimethylcarbamate, 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 Book:

S.No	Authors	Title	Publishers	Year of Publication
1.	V.K.Ahluwalia	Environmentally Benign Reaction	Ane Books Pvt Ltd	2012 2^{nd} Edn.
2.	V.K. Ahluwalia, M.Kidwai	New Trends in Green Chemistry	Anamaya Publishers	2012 Reprint
3.	V.K.Ahluwalia, Renu Aggarwal	Organic Synthesis - Special Techniques	Narosa Publishing House	2012 Reprint 2^{nd} Edn.

Reference Book:

S.No	Authors	Title	Publishers	Year of Publication
1	Rashmi Sanghi, M.M.Srivastava	Green Chemistry: Environment Friendly Alternatives	Narosa Publishing House	2012 Reprint 4^{th} Edn.

Pedagogy:

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

Course Designers:

1. Dr. G. Selvi
2. Mrs. G. Sathya Priyadarshini

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE1715	PAPER – XIII- 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	reproduce synthesis of nanomaterials by physical and chemical methods	K1
CO2	analyse the properties of nanoparticles and illustrate their applications	K3, K4
CO3	synthesize CNT and examine their properties in various fields.	K4
CO4	recognize the structure and functions of hemoglobin and non-iron sulphur proteins.	K2
CO5	appraise the role of inorganic compounds in biological systems	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
CO4	H	H	H	H	M	H	H
CO5	H	H	H	H	M	H	H

H - High; M-Medium; L-Low

Paper – XIII- Nanochemistry and Bioinorganic Chemistry [MCE1715]
(41 Hrs)

Unit I **(8 Hrs)**

Nanochemistry I

Introduction, definition & nature of 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, biosynthesis of nanoparticles. 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), 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 Nanotubes- 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 – I

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 protein.

Unit V **(9 Hrs)**

Inorganic Chemistry of Biological Systems – II

Photosynthesis- chlorophyll and the photosynthetic reaction centre, enzymes – structure and function of carboxy peptidase A, carbonic anhydrase, vitamin B_{12} – structure and functions, applications of coordination complexes in medicine, agriculture, horticulture and industry.

Text Books:

S.No	Authors	Title	Publishers	Year of Publication
1.	James.E.Huheey, Keiter	Inorganic Chemistry-Principles of Structure and Reactivity	Pearson Education	2009 5^{th} Edn
2.	Mark Ratner, Daniel Ratner	Nanotechnology	Pearson Education	2008 1^{st} Edn
3.	S .Shanmugam	Nanotechnology	MJP Publishers	2011 1^{st}Edn.
4.	B. Viswanathan	Nanomaterials	Narosa Publishing House	2014 Reprint

Reference Books:

S.No	Authors	Title	Publishers	Year of Publication
1.	CTI Reviews	Principles of Bioinorganic Chemistry	Cram101 Textbook Reviews	2016 1^{st} Edn
2.	Asim K.Das	Bioinorganic Chemistry	Books & Allied Ltd	2013 Reprint
3.	Richard Booker & Eary Boysen	Nanotechnology	John Wiley	2008 Reprint 1^{st} Edn

Pedagogy:

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

Course Designers:

1. Dr. N. Arunadevi
2. Mrs. G. Sathya Priyadarshini

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE1716	ALC - (OPTIONAL) - CHEMOINFORMATICS	THEORY	Self Study			5

Preamble

To enable the students to

- understand the principles of chemoinformatics and representation of molecules
- gain vivid knowledge about quantitative structure activity relationship
- know the applications of chemoinformatics.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	appraise the molecular structure database	K5
CO2	illustrate the representation of molecules	K3
CO3	summarize the methods of searching chemical structures	K6
CO4	interpret structure-spectra correlations and computer assisted structure elucidation	K5
CO5	design drug based on chemoinformatics	K6

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	M	H	H
CO3	H	H	H	H	M	H	H
CO4	H	H	H	H	M	H	H
CO5	H	H	H	H	M	H	H

H - High; M-Medium; L-Low

ALC-(OPTIONAL) – Chemoinformatics [MCE1716]

Self study

Unit I

Introduction to Chemoinformatics

Chemical drawing- three dimensional effect- optical activity- computer packages modelling, molecular structure database- file format- three dimensional display- proteins

Unit II

Representation of Molecules and Chemical Reactions

Nomenclature, different types of notations, SMILES coding, Matrix representations, Structure of Mol Files and Sd files, Libraries and tool kits, Different electronic effects, Reaction classification.

Unit III

Chemical Structures Search

Full structure search, substructure search, basic ideas, similarity search, three dimensional search methods, basics of computation of physical and chemical data and structure descriptors, data visualization.

Unit IV

Applications of Molecular Modeling

Prediction of Properties of Compounds, Linear Free Energy Relations, Quantitative Structure-Property Relations, Descriptor Analysis, Model Building, Modeling Toxicity, Structure-Spectra correlations, Prediction of NMR, IR and Mass spectra, Computer Assisted Structure elucidations, Computer Assisted Synthesis Design.

Unit V

Drug Design

Introduction, target identification and validation- lead finding and optimization- analysis of HTS data- virtual screening. Design of combinatorial libraries, Ligand-Based and structure based Drug design. Application of Chemoinformatics in Drug Design.

Text Books:

S.No	Authors	Title	Publishers	Year of Publication
1.	Andrew R. Leach & Valerie, J. Gillet	An Introduction to Chemoinformatics	Springer: The Netherlands	2009
2.	Gasteiger, J. &Engel, T.	Chemoinformatics: A Text-Book	Wiley-VCH	2006
3.	Alan Hinchliffe	Molecular Models for Beginners	John Wiley & Sons	2011

Reference Books:

S.No	Authors	Title	Publishers	Year of Publication
1	Jürgen Bajorath	Chemoinformatics: Concepts, Methods, and Tools for Drug Discovery	Humana Press	2004
2	Gupta. S. P.	QSAR & Molecular Modeling	Anamaya Publications	2011

Course Designers:

1. Mrs. S. Charulatha

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCE1717	ALC - (OPTIONAL) - INDUSTRIAL CHEMISTRY	THEORY	Self Study			5

Preamble

To enable the students to

- gain knowledge about the manufacture of sugar, glass, cement and varnishes
- understand the properties of glass, cement and rubber
- learn the chemistry of paints
- know the applications of 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, varnishes, glass and cement	K3
CO2	analyse the constituents and setting of paints	K4
CO3	examine the properties of sugar, paint, varnishes, glass, cement and rubber	K5
CO4	generalize the vulcanization techniques of rubber	K5
CO5	appraise the importance of Plaster of Paris and Gypsum	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
CO5	H	H	H	M	M	H	H

H - High; M-Medium; L-Low

ALC-(Optional)-Industrial Chemistry [MCE1717]

(Self-study)

Unit I

Sugar

Introduction, Manufacture of Cane Sugar - Extraction of juice, Purification of Juice, Defecation, Sulphitation, Carbonation, Concentration or Evaporation. Crystallization - Separation of crystals, drying, refining, recovery of sugar from Molasses, Bagasse. Manufacture of sucrose from beet root. Estimation of sugar, double sulphitation process, double carbonation.

Unit II

Paints

Classification, constituents, setting of paints, requirements of a good paint. Emulsion, Latex, Luminescent, Fire retardant and Heat resistant paints. Methods of applying paints. Special applications and failures of paint.

Varnishes - Introduction – Raw materials – Manufacture of varnishes.

Unit III

Glass

Introduction, Physical/Chemical properties, Characteristics of glass. Raw materials, methods of manufacture - formation of batch material, melting, shaping, annealing and finishing of glass.

Unit IV

Cement

Introduction, raw materials, manufacture – Wet process, Dry process, reactions in kiln, setting of cement, properties and uses of cement. Plaster of Paris, Gypsum, Lime.

Unit V

Rubber

Introduction, Importance, types and properties of rubber. Refining of crude rubber, drawbacks of raw rubber. Rubber fabrication, vulcanization techniques.

Text Books:

S.No	Authors	Title	Publishers	Year of Publication
1.	B.K.Sharma	Industrial Chemistry	Goel Publishing House	2008 14th Edn.

Reference Books:

S.No	Authors	Title	Publishers	Year of Publication
1.	P.C.Jain & Monika Jain	Engineering Chemistry	Dhanpat Rai Publishing Co., (Pvt) Ltd	2016 16th Edn.
2.	C. Parameswara Murthy, C.V.Agarwal, Andhra Naidu	Text Book of Engineering Chemistry	BS Publications	2006 1st Edn. Revised

Course Designers:

1. Dr. R. Revathi

Project with Viva Voce [MCE17PROJ] Credit: 5

Duration: 3 Months

CIA: 20 Marks ESE: 80 Marks Total: 100 Marks

Objectives

To make the students to

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

Individual Project and Viva Voce

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.

Suggested areas of work

Synthetic Organic Chemistry, Coordination Chemistry, Corrosion Studies, Environmental Chemistry, Polymer Chemistry, Phytochemistry, Nanochemistry, Physical Chemistry.

Methodology

Each project should contain the following details:

Brief introduction on the topic

Review of Literature

Materials and Methods

Results and Discussions – evidences in the form of figures, tables and photographs

Conclusion / Summary

Bibliography

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

Internal	**Total - 20 marks**
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

External	**Total – 80 marks**
Project	**Total – 60 marks**
Relevance of the topic to the academic / society	- 10 Marks
Objectives	- 10 Marks
Experimental design	- 20Marks
Expression of results and discussion	- 20 Marks
Viva Voce	**Total – 20 marks**
Presentation	- 10 Marks
Discussion	- 10 Marks