



PSGR
Krishnammal College for Women



DEPARTMENT OF CHEMISTRY

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

BACHELOR OF CHEMISTRY

2021 - 2024



PROGRAMME LEARNING OUTCOMES (PLO's)

After completion of the programme, the student will be able to

- PLO1** : accept the common responsibility to preserve the environment and to contribute to the development
- PLO2** : acquire in depth knowledge on core concepts of theoretical and practical Chemistry to the subject areas namely organic, inorganic, physical, analytical and Computational Chemistry
- PLO3** : attain communication skill- written, verbal, logical and digital
- PLO4** : explore the relative choice of Generic Electives (GE), Skill Enhancement Courses (SEC) and Ability Enhancement Courses (AEC)
- PLO5** : enhance the ability to execute Laboratory procedures of organic, inorganic and physical systems and setting standard procedures
- PLO6** : apply the understandings and the knowledge gained, to solve the quantitative and qualitative problems and to emerge as potential entrepreneur.

PROGRAMME SPECIFIC OUTCOME (PSO's)

The students at the time of graduation will

- PSO1** : possess skills in safe handling of chemicals taking into account their Physical and chemical properties.
- PSO2** : be able to apply the theoretical concepts of instrument that are commonly used in most chemistry fields as well as interpret and use data generated in instrumental chemical analyses.
- PSO3** : be capable to employ critical thinking and scientific inquiry in the performance, design, interpretation and documentation of laboratory experiments, at a level suitable to succeed at an entry-level position in chemical industry or a chemistry graduate program.



DEPARTMENT OF CHEMISTRY

2021-2022 BATCH

SEM	Part	Subject Code	Title of the Paper	Instruction hours/week	Contact hours	Tutorial	Duration of Examination	Examination Marks			Credits
								CA	ESE	TOTAL	
I	I	TAM2101/ HIN2101/ FRE2101	Language T/H/F Paper I	6	86	4	3	50	50	100	3
	II	ENG2101/	English Paper-I	6	86	4	3	50	50	100	3
	IIIA	CE21C01	General Chemistry Paper - I	6	86	4	3	50	50	100	5
	IIIA	CE21CP1	Chemistry Practical - I	3	45	-	-	-	-	-	-
	IIIA	PS21A01/ TH21A01	IDC Allied Physics Paper - I	4	56	4	3	30	45	75	4
			IDC Allied Mathematical Statistics I with R	7	101	4	3	50	50	100	5
	IIIA	PS21AP1	Allied Physics Practical	3	45	-	-	-	-	-	-
IV	NME19B1/ NME19A1/ NME12WS/ NME12AS/ NME12GS/ NME21ES	Basic Tamil / Advanced Tamil / Women Studies/ Ambedhkar Studies/ Gandhian Studies/NEN- Introduction to Entrepreneurship	2/2/ 2	28/26/ 26	2/4/4	-/2/-	50/ 50/ 100	50/ 50/-	100/ 100/ 100	2	
II	I	TAM2102/ HIN2102/ FRE2102	Language T/H/F Paper - II	6	86	4	3	50	50	100	3
	II	ENG2102	English Paper-II	6	86	4	3	50	50	100	3

	III A	CE21C02	General Chemistry Paper - II	5	71	4	3	50	50	100	5
	III A	CE21CP1	Chemistry Practical I	3	45	-	3	50	50	100	4
	III A	PS21A02/ TH21A02	IDC Allied Physics Paper - II	5	71	4	3	30	45	75	4
			IDC Allied Mathematical Statistics II with R	8	116	4	3	50	50	100	5
	III A	PS21AP1	Allied Physics Practical	3	45	-	3	25	25	50	2
	IV		Open Course - Self Study Online Courses	-	-	-	-	-	-	-	-
	IV	NME19B2/ NME19*A2	Basic Tamil/Advanced Tamil**	-	-	-	-	-	-	-	-
	V		Effective English Communication	2	26	4	2	50	50	100	2
	IIIB	NM12GAW	Foundation Course –1 (General Awareness)	Self study (Onlin							Grade
III	I	TAM2103/ HIN2103/ FRE2103	Language T/H/F Paper III	6	86	4	3	50	50	100	3
	II	ENG2103/ ENG21F3	English Paper-III	5	71	4	3	50	50	100	3
	III A	CE21C03	General Chemistry paper -III	4	56	4	3	50	50	100	4
	III A	CE21CP2	Chemistry Practical - II	3	45	-	-	-	-	-	-
	III A	TH21A09/ PL21A01/ AS21A01	Allied Mathematics for Sciences I	7	101	4	3	50	50	100	5
			[OR] Allied Botany Paper I/Allied Zoology paper I	4	56	4	3	30	45	75	4
	III A	PL21AP1/ AS17AP1	Allied Practical – Botany/Zoology	3	45	-	-	-	-	-	-
	III	CE21SB01	Skill based subject-Computational Chemistry-I /	3	41	4	2	25	75	100	3
	III B	NM21EVS	Foundation Course-II (Environmental Studies) *	Self study	-	-	-	100	-	100	grade
III B	HR	Foundation Course-III (Universal Human Values and	2	26	4	-	-	100		2	
VI	JOB1334	Job Oriented Course	After 12.30 PM		GRADE **						
IV	I	TAM2104/ HIN2104/ FRE2104	Language T/H/F Paper – IV	6	86	4	3	50	50	100	3

II	ENG2104	English Paper IV	5	71	4	3	50	50	100	3	
III	CE21C04	General Chemistry Paper – IV	4	56	4	3	50	50	100	4	
III	CE21CP2	Chemistry Practical II	3	45	-	3	50	50	100	5	
III	TH21A10/ PL21A02/	Allied Mathematics for Sciences II/ Allied Botany paper II/	7	101	4	3	50	50	100	5	
III	PL21AP1/ AS21AP1	Allied Practical – Botany/Zoology	3	45	-	3	50	50	100	2	
III	CE20SB02/ CE20SBCE	Skill based subject-Computational Chemistry-II / Coursera course (Environmental Chemistry and	3	43	2	2	25	75	100	3	
IV	NM21DTG	Design Thinking	2	26	4	-	-	100		2	
V		Extension Activities NSS/NCC/YRC/Sports & Games/Ecowatch/YiNet/Rotract/E D Cell	-	-	-	-	-	100		1	
III A	CE21C05	Paper – V Inorganic Chemistry	58	2	3	50	50	100	4	58	
III A	CE21C06	Paper - VI Organic Chemistry	58	2	3	50	50	100	4	58	
III A	CE21C07	Paper VII Physical Chemistry	58	2	3	50	50	100	4	58	
III A	CE21E01	AOS - I Polymer Chemistry	58	2	3	50	50	100	5	58	
III A	CE21E02	AOS-II Optional Analytical Chemistry	58	2	3	50	50	100	5	58	
V	III A	CE21SBCE	Coursera-(Environmental Chemistry and Chemical Biology)	45	-	-	-	-	100	3	45
III A	CE21AC1	ALC I – Optional Agro Industrial Chemistry	-	-	3	25	75	100*	5*	-	
III A	CE21AC2	ALC II-Optional Pharmaceutical Chemistry	-	-	3	25	75	100	5*	-	
III A	CE21CP3	Chemistry Practical -III	75	-	-	-	-	-	-	75	
III A	CE21PROJ	Project & Viva Voce	-	-	-	50	50	100	5	-	
VI	NM21CS1	Cyber Security 1	28	2	-	100	-	100	Grad e	28	

	III A		Comprehensive Examination	-	-	1	-	-	-	Grade	-
			Community Services 30 hours						(Completed or not)		
	VI	INST1	Field work/ Institutional Training	-	2 weeks		100		100	2	-
VI	III	CE21C08	Paper – VIII Organic Chemistry	6	88	2	3	50	50	100	5
	III	CE21C09	Paper–IX Physical Chemistry	5	73	2	3	50	50	100	5
	III	CE21C10	Paper – X Physical Methods and Chemical Structure	6	88	2	3	50	50	100	5
	III	CE21E03	AOS - III Dye Chemistry	5	73	2	3	50	50	100	4
	III	CE21E04	AOS - IV Optional Novel Inorganic Solids and Nanomaterials	5	73	2	3	50	50	100	4
	III	CE21SBP	Skill Based Subject-Computational Chemistry Practical	3	43	2	3	100	-	100	3
	III	CE21AC3	ALC III – Optional Food Chemistry and Technology	Self Stud	-	-	3	25	75	100*	5*
	III	CE21AC4	ALC IV- Optional Leather Chemistry	Self Stud	-	-	3	25	75	100*	5*
	III	CE21CP3	Chemistry Practical- III	5	150	-	6	50	50	100	5

SEMESTER- I

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE21C01	GENERAL CHEMISTRY PAPER - I	THEORY	86	4	-	5

Preamble

To enable the students to

- understand quantum mechanics as a mathematical model to produce wave functions and energies
- learn about the fundamental ideas, physical significance and theories of bonding in molecules
- gain knowledge about the polar effects and their importance in affecting the properties of compounds
- recognize the concept of aromaticity and properties of aromatic compounds
- understand the principles of thermodynamics and thermo chemistry

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	apply the principles of quantum mechanics to understand atomic structure	K ₃
CO2	discuss the types of bonding and their theories	K ₂
CO3	apply polar effects to explain the properties of organic compounds	K ₃
CO4	Appraise Huckel's rule and explain the mechanism of electrophilic aromatic substitution reactions of benzene	K ₂ , K ₄
CO5	state and apply laws of thermodynamics and perform calculations for physical processes involved	K ₁ , K ₃

Mapping with Programme Outcomes

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

H-High; M-Medium; L-Low

GENERAL CHEMISTRY PAPER – I (CE21C01) (86 Hrs)

Unit I

(17 hrs)

Atomic Structure

Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Quantum numbers - Electronic configuration of elements, effective nuclear charge. Wave mechanical concepts of Rutherford's Nuclear model of the atom and its limitations. Bohr's theory and its limitations, dual behaviour of matter and radiation, de Broglie's relation, Heisenberg Uncertainty principle. Hydrogen atom spectra. Atomic orbitals. Schrodinger wave equation, Significance of ψ and ψ^2 (no derivation required), shapes of s,p,d orbitals.

Periodic Properties

Atomic and ionic radii, ionization energy, electron affinity and electronegativity – definition, factors determining ionization energy and electro negativity, and their applications.

Unit II

(17 hrs)

Chemical Bonding & Molecular Structure

Introduction to different types of Bonding- **Covalent bonding** - Valence bond theory and its limitations, Hybridisation - Types of overlap of atomic orbitals. Valence shell electron pair repulsion theory (VSEPR) to BF_3 , NH_3 , H_2O , ClF_3 , SF_4 , PF_5 , SF_6 .

Concept of resonance and resonating structures for CO_3 and CO .

MO theory- Introduction, bonding and magnetic properties (for simple homo nuclear and hetero nuclear diatomic molecules)

Ionic bonding- Factors influencing the formation of ionic bonding. Ionic crystals NaCl , CsCl . Lattice energy of ionic crystals, statement of Born-Landé equation for calculation of ionization energy, Born-Haber cycle and its application, polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character.

Hydrogen bonding-Types with examples. Vanderwaal's forces and London forces.

Co-ordinate covalent bond-with examples, Comparison between ionic, covalent and coordinate bonding.

Unit III

(17 hrs)

Thermodynamics-I

Definitions of terms involved, extensive and intensive properties, path functions vs state functions, exact and inexact differentials. First law of thermodynamics, adiabatic and isothermal processes, reversible and irreversible processes - Work done, Joule-Thomson effect, Joule-Thomson Coefficient –Problems.

Thermo chemistry

Heat of neutralization, heat of solution, heat of combustion. Bomb calorimeter, determination of heat of combustion, heat of dilution. Integral and differentials. Hess's law - calculation of bond energy, bond length, dissociation energy, Kirchoff's equation- applications.

Unit IV

(17 hrs)

Fundamental aspects of Organic reaction mechanisms

Nucleophiles and electrophiles, Reactive Intermediates: Carbocations, Carbanions and free radicals-Formation, structure and stability. Inductive Effect, Electromeric Effect, Resonance and Hyper conjugation, (Baker - Nathan effect), Steric effect-examples and effect on reactivity. Comparison of acid strength-halogen substituted acids. Basic strength of RNH_2 , R_2NH , R_3N and aniline and stability of alkenes based on hyper conjugation.

Cycloalkanes-Nomenclature, methods of preparation, chemical reactions, Baeyer's strain theory and its limitations.

Unit V

(18 hrs)

Aromaticity

Structure of benzene, Dewar structure, isomer number, resonance structure of benzene. Kekule structure, resonance energy and stability of benzene, reactions of benzene, orbital picture of benzene, aromatic character- Huckel's rule, Non-benzenoid aromatic compounds.

Aromatic electrophilic substitution- mechanism of nitration, sulphonation, halogenation, Friedel craft's alkylation, acylation and diazonium coupling

Industry 4.0

Introduction to Industry 4.0- Need – Reasons for Adopting Industry 4.0 - Definition – Goals Technologies of Industry 4.0- Developing Molecular Structure - ChemSketch, Chem Draw. Applications of Artificial Intelligence in chemistry for predicting the properties of molecular structure- MOPAC and Avogadro.

Text Books

S. No	Author	Title of the Book	Publishers	Year of Publication
1	ArunBahl B. S. Bahl	Advanced Organic Chemistry	S. Chand Sons Company Pvt Ltd	2016
2	Jagdamba Singh	Undergraduate Organic Chemistry Vol I	PragathiPrakahasan	2010
2	P. L. Soni	Text Book of Inorganic Chemistry	Sultan Chand and Sons	2013
4	B. R. Puri, L. R. Sharma, M. S. Patania	Principles of Physical Chemistry	Vishal Publishing & Co	2017

Reference Books

S. No	Author	Title of the Book	Publishers	Year of Publication
1	B. R. Puri, L. R. Sharma, K. K. Kalia	Principles of Inorganic Chemistry	Milestone Publishers and Distributors	2011
2	R. T. Morrison and R. N. Boyd	Organic Chemistry	Pearson India Education Services	2010
3	R. D. Madan	Modern Inorganic Chemistry	S. Chand Sons Company Pvt Ltd	2014

Pedagogy:

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

Course Designers

1. Dr. N. Shyamala Devi
2. Dr. S. Jone Kirubavathy

Question Paper Pattern End Semester Examination

BLOOM'S CATEGORY	SECTION	WORD LIMIT	MARKS	TOTAL
K ₁ , K ₂	A-11/13 X 2 MARKS	ONE OR TWO SENTENCES	22	100
K ₁ , K ₂	B -5/7 X 6 MARKS	300	30	
K ₃ , K ₄	C - 4/6 X 12MARKS	600-800	48	

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE21A01	IDC - CHEMISTRY FOR BIOLOGISTS – I (offered to B.Sc Botany & Zoology)	THEORY	56	4	-	4

Preamble

To enable the students to

- gain knowledge about the nature of bonding and hybridization
- learn the importance of aromaticity and isomerism.
- understand the preparation of standard solutions and chromatographic techniques.
- acquire knowledge on the significance of aminoacids and proteins.
- familiarize the applications of solar energy and water treatment techniques.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	recognize the importance of ionic, covalent, hydrogen bonding and relate it to shapes/hybridization of discuss the shapes and hybridization of compounds	K1
CO2	differentiate aromatic and non-aromatic compounds and appraise isomerism in organic compounds	K2, K3
CO3	demonstrate the preparation of standard solutions and apply chromatographic techniques	K3
CO4	analyse the chemistry of amino acids and proteins	K4
CO5	appraise the importance of solar energy and water treatment techniques	K4

Mapping with programme Outcomes

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

H- High; M-Medium; L-Low

IDC – CHEMISTRY FOR BIOLOGISTS - I (CE21A01)

(offered to B.Sc Botany & Zoology))

(56 hrs)

UNIT I

(11 hrs)

Bonding

Types of bonding - Covalent bond - nature, structure and hybridization of CH₄, C₂H₄, C₂H₂ and C₆H₆ molecule. Nature of ionic bond, structure of NaCl and CsCl. Hydrogen bonding - inter and intra molecular, nature and its effect on structure and its consequences. Shapes and hybridization of BeCl₂, H₂O, NH₃ and PCl₅ based on VSEPR theory.

UNIT II

(11 hrs)

Organic reactions and Stereoisomerism

Types of organic reagents - electrophiles, nucleophiles and free radicals. Aromaticity - Huckel's rule, mechanism of nitration, sulphonation, halogenation, Friedel craft's alkylation and acylation of benzene.

Stereoisomerism - geometrical isomerism (cis - trans isomerism only), optical isomerism (lactic acid and tartaric acid). Conformation - a simple treatment of ethane, n-butane and cyclohexanes.

UNIT III

(11 hrs)

Analytical Chemistry

Role and importance of analytical chemistry - principle of volumetric analysis - calibration of glasswares, standardization - experimental requirements - concentration units (normality and molarity) – Types and preparation of standard solutions. Types of titrations - indicators for acid-base titrations.

Chromatography – principle and classification - paper, column, thin layer, electrophoresis and ion-exchange chromatography and its applications.

UNIT IV

(11 hrs)

Amino acids and Proteins

Amino acids - classification, preparation of amino acids - Gabriel phthalimide synthesis, Erlen Meyer azlactone synthesis. Properties of amino acids and action of heat on α , β , γ amino acids - dipeptide synthesis. Protein - classification according to composition and function, primary and secondary structure, properties and colour reactions of proteins.

UNIT V**(12 hrs)****Solar energy and Water treatment**

Solar energy - renewable energy and non - renewable energy sources - solar energy - solar cells, solar heating, solar collector (flat plate collector only), applications.

Water treatment - hardness of water - temporary and permanent hardness, disadvantages of hard water. Softening methods - reverse osmosis, zeolite and demineralization process. Purification of water for domestic purpose - disinfection by chlorine, ozone and UV light.

Text Books:

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1.	R. Gopalan. P.S. Subramanian and K. Rengarajan	Elements of Analytical Chemistry	Sultan Chand & Sons, Educational Publishers, New Delhi	Reprint 2013
2.	Dr. V. Veeraiyan	Textbook of Allied Chemistry	High mount Publishing house, triplicane, Chennai.	Reprint 2005
3.	ArunBahl B. S. Bahl	Advanced Organic Chemistry	S. Chand Sons Company Pvt Ltd,	Reprint 2012
4.	P.C Jain & Monika Jain	Engineering chemistry	DhanpatRai Publishing Co Pvt Ltd.	Reprint 2015

Pedagogy:

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

Course Designers

1. Dr. R. Revathi
2. Dr. N. Anusuya

**Question Paper Pattern
End Semester Examination**

BLOOM'S CATEGORY	SECTION	WORD LIMIT	MARKS	TOTAL
K ₁ , K ₂	A-11/13 X 2 MARKS	ONE OR TWO SENTENCES	22	100
K ₁ , K ₂	B -5/7 X 6 MARKS	300	30	
K ₃ , K ₄	C - 4/6 X 12MARKS	600-800	48	

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE21A03	IDC – ALLIED CHEMISTRY PAPER –I (offered to B.Sc Physics)	THEORY	56	4	-	4

Preamble

To enable the students to

- understand the concepts of organic chemistry
- gain knowledge about the theories of chemical bonding.
- understand the different terms in phase rule and its applications
- learn the concepts of chemical kinetics, photo chemistry, solid state chemistry.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	classify organic reactions and predict the geometry of organic molecules based on hybridization	K ₂
CO2	define and recognize the types of chemical bonding with its effect on structure and property	K ₃ , K ₄
CO3	state and apply the laws of thermodynamics to analyze the feasibility of reactions	K ₂ , K ₄
CO4	explain the basic concepts of chemical kinetics & photo chemistry	K ₂
CO5	discuss the phase diagram of simple eutectic system and recognize the typical crystal lattices	K ₄

Mapping with Programme Outcomes

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

H- High; M-Medium; L-Low

IDC – Allied Chemistry Paper –I (CE21A03)

(offered to B.Sc Physics)

(56 Hrs)

UNIT I

(11 Hrs)

Basics of Organic Chemistry

Types of reagents - electrophiles, nucleophiles and free radicals, Classification of reactions - addition, substitution, elimination, condensation, polymerisation and rearrangements, Polar effects- inductive effect, resonance and hyper-conjugation. Steric effect.

Hybridization and geometry of organic molecules - CH_4 , C_2H_4 , C_2H_2 , C_6H_6 molecules, structure of graphite and diamond.

UNIT II

(11Hrs)

Chemical Bonding

Types of bonding - Covalent bond - nature, structure and hybridization of CH_4 , C_2H_4 , C_2H_2 and C_6H_6 molecule. Ionic bond - Nature of ionic bond, structure of NaCl and CsCl .

Hydrogen bonding - inter and intra molecular, nature and its effect on structure and its consequences. Shapes and hybridization of BeCl_2 , H_2O , NH_3 and PCl_5 based on VSEPR theory.

Metallic bonding-semiconductors - intrinsic, extrinsic n-type and p-type semiconductors.

UNIT III

(11 hrs)

Energetics

Definition of certain terms - system, surrounding, reversible and irreversible process, First law of thermodynamics, limitations – Second Law of thermodynamics-different statements - Carnot cycle - efficiency - Carnot theorem - thermodynamic scale of temperature – Joule-Thomson effect- enthalpy - bond energy -entropy and free energy- definitions.

UNIT IV

(11 Hrs)

Chemical Kinetics & Photochemistry

Chemical kinetics- order and molecularity, rate expression for I, II and III order (derivation not required), methods of determining order of a reaction.

Concept of energy of activation, effect of temperature on reaction rate and Arrhenius equation.

Catalysis - homogeneous and heterogeneous catalysis, theories of catalytic activity, catalysts used in industrial processes.

Photochemistry- comparison between thermal and photochemical reactions, Beer-Lambert's law, Grotthus-Drapper's law, Einstein's law, quantum yield, phosphorescence, fluorescence, chemiluminescence and photosensitization - definitions with examples.

UNIT V

(12 Hrs)

Solutions and Solid State

Solution- types and examples of solutions - liquid in liquid, Raoult's laws, deviation from ideal behavior, vapour- pressure curve for a totally miscible binary liquid systems obeying Raoult's law, partially miscible liquid system (phenol-water system)

Solid state- typical crystal lattices - unit cell, elements of symmetry, Bragg's equation, Weiss Indices, Miller indices, simple body centered and face centered lattices.

Text Books

S.No	Authors	Title of the Book	Publishers	Year of Publication
1.	Dr. Veeraiyan V	Text book of Allied Chemistry	Highmount Publishing House, Chennai-14	Reprint 2006
2.	B.R.Puri, L.R.Sharma, L.S.Pathania	Principles of Physical chemistry	Vishal Publishing Co, Jalandhar, New Delhi	Reprint 2019

Pedagogy:

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

Course Designers:

Dr.Sowmya Ramkumar

Dr.S.Charulatha

Question Paper Pattern

End Semester Examination

BLOOM'S CATEGORY	SECTION	WORD LIMIT	MARKS	TOTAL
K ₁ , K ₂	A-11/13 X 2 MARKS	ONE OR TWO SENTENCES	22	100
K ₁ , K ₂	B -5/7 X 6 MARKS	300	30	
K ₃ , K ₄	C - 4/6 X 12MARKS	600-800	48	

SEMESTER -II

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE21C02	GENERAL CHEMISTRY PAPER - II	THEORY	86	4	-	5

Preamble:

To enable the students to

- escalate the variations in atomic and physical properties of the s & p-block elements
- recognize the relationships between constitutional (structural) isomers, conformational isomers, and geometric isomers
- understand the terminology, factors, similarities and differences of nucleophilic substitution reactions and elimination reactions
- gain knowledge on the types and properties of colloids and liquid crystals
- learn the concepts of 2nd law of thermodynamics

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	recall and appreciate the electronic configurations and general trends of s & p-block elements	K ₂ , K ₃
CO2	Analyze the stereoisomerism in organic compounds-optical/geometrical/conformational isomerism	K ₄
CO3	Illustrate nucleophilic substitution reactions in alkyl/aryl halides	K ₃
CO4	examine the properties of suspension, colloids, liquid crystals, and appraise the application of colloids	K ₁ , K ₄
CO5	assess, develop and apply the continuity equation for open and closed systems using second law of thermodynamics	K ₄

Mapping with Programme Outcomes

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

H-High; M-Medium; L-Low

GENERAL CHEMISTRY PAPER – II (CE21C02)

(71 Hrs)

Unit I

(14hrs)

s-Block elements : General characteristics, physical and chemical properties and uses , Compounds of s-block elements- oxides, hydroxides, peroxides, super oxides- preparation and properties-oxo salts-carbonates-bicarbonates-nitrates-halides and poly halides.Diagonal relationships, salient feature of hydrides, solvation and complexation tendencies.

p-Block elements – Comparative study (including diagonal relationship) of group 13 to 17 elements, compounds like hydrides, oxides, carbides and halides group 13 to 16. Hydrides of boron – diborane and its structure.Basic properties of halogens, interhalogens and poly halides.

Concepts of virtual lab: flame test for s and p Block elements

Unit –II

(15hrs)

Stereochemistry of organic compounds

Concepts of isomerism, types of isomerism.**Optical isomerism** – elements of symmetry, chirality, stereo genic centre, optical activity, enantiomers and their properties, chiral and achiral molecules with two stereo genic centres, diastereomers and meso compounds, threo and erythrodiastereomers, resolution of enantiomers, inversion, retention and racemization.

Configuration- Relative and absolute configuration, D &L system, Sequence rules and R S system of nomenclature.

Geometric isomerism – determination of configuration of geometric isomers. E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds.

Conformational isomerism – conformational analysis of ethane and n-butane: conformations of alkyl substituted cyclohexane. Newman projection and Sawhorse formulae, Fischer and flying wedge formulae. Difference between configuration and conformation.

Unit–III

(14 Hrs)

Alkyl and Aryl Halides

Alkyl Halides: Types of Nucleophilic Substitution- SN^1 , SN^2 and SN^i mechanism.

Preparation: from alkenes and alcohols. Reactions:hydrolysis, nitrite & nitro formation, nitrile &isonitrile formation. Williamson's ether synthesis.

Aryl Halides – Preparation, properties and structure of chlorobenzene. Benzyne Mechanism, Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides.

UNIT IV

(14 hrs)

Colloidal State

Definition of colloids, Classification of Colloids, Solids in Liquids (SOLS): Properties-kinetic, optical and electrical; stability of colloids, protective action, Hardy-Schulze law, gold number. Liquids in Liquids (emulsions): types of emulsions, preparation, emulsifier Liquids in Solids (Gels): Classification, preparation and properties, inhibition, general applications of colloids Liquid Crystals: difference between liquid crystal, solid and liquid. Classification, structure of nematic and Cholestric phases. Thermography and seven segment cell.

UNIT V

(14hrs)

Thermodynamics –II

Second law of thermodynamics – Need for second law, Carnot cycle, different statements, entropy-definition, physical significance, entropy of an ideal gas, entropy changes in isothermal transformation, entropy changes in reversible and irreversible processes. Trouton's rule. Entropy as a function of T and V, entropy as a function of T and P. Entropy of mixing of ideal gas. General conditions of equilibrium and spontaneity- Conditions of equilibrium and spontaneity under constraints, definition of A and G, physical significance of A and G. Maxwells relations. Temperature and pressure dependence of G, Gibbs – Helmholtz equation.

Text Books

S. No	Author	Title of the Book	Publishers	Year of Publication
1	ArunBahl B. S. Bahl	A Text Book of Organic Chemistry	S. Chand Sons Company Pvt Ltd	2016
2	Jagdamba Singh, L. D. S. Yadhav	Advanced Organic Chemistry	PragathiPrakahasan	2013
3	P. L. Soni	Text Book of inorganic Chemistry	Sultan Chand and Sons	2013
4	B. R. Puri, L. R. Sharma, M. S. Patania	Principles of Physical Chemistry	Vishal Publishing & Co	2017

Reference Books

S. No	Author	Title of the Book	Publishers	Year of Publication
1	ArunBahl B. S. Bahl	Advanced Organic Chemistry	S. Chand Sons Company Pvt Ltd,	2009
2	R. T. Morrison and R. N. Boyd	Organic Chemistry	Pearson India Education Services	2010
3	K. S. Tewari, N. K. Vishnoi	A Textbook of Organic Chemistry	Vikas Publishing House	2017
4	P. S. Kalsi	Stereochemistry	New Age International	2000
5	B. R. Puri, L. R. Sharma, K. K. Kalia	Principles of Inorganic Chemistry	Milestone Publishers and Distributors	2011
6	R. D. Madan	Modern Inorganic Chemistry	S. Chand Sons Company Pvt Ltd	2014

Pedagogy:

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

Course Designers

1. Dr. N. Shyamaladevi
2. Dr. S. Jone Kirubavathy

Question Paper Pattern

End Semester Examination

BLOOM'S CATEGORY	SECTION	WORD LIMIT	MARKS	TOTAL
K ₁ , K ₂	A-11/13 X 2 MARKS	ONE OR TWO SENTENCES	22	100
K ₁ , K ₂	B -5/7 X 6 MARKS	300	30	
K ₃ , K ₄	C - 4/6 X 12MARKS	600-800	48	

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE21A02	IDC – CHEMISTRY FOR BIOLOGISTS - II (offered to B.Sc Botany & Zoology)	THEORY	71	4	-	5

Preamble

To enable the students to

- learn the nomenclature, applications of coordination compounds and their significance in bioinorganic chemistry
- analyze the chemistry behind fuels, fertilizers and polymers.
- gain knowledge about the functions of various drugs and important terms in the chemistry of dyes.
- understand the basic concepts of chemical kinetics and catalysis.
- familiarize the importance of pH and Buffer

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	name the coordination compounds and appraise its applications	K1, K4
CO2	examine the applications of fuels, fertilizers and polymers	K3
CO3	analyse the chemical compounds used in drugs and dyes.	K4
CO4	explain the basic concepts of chemical kinetics and analyse the industrial applications of catalysis.	K1, K4
CO5	recognize the importance of pH and buffers in living systems	K2

Mapping with Programme Outcomes

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

H- High; M-Medium; L-Low

IDC – CHEMISTRY FOR BIOLOGISTS -II (CE21A02)

(offered to B.Sc Botany & Zoology)

(71 hrs)

Unit I

(15 hrs)

Coordination and Bioinorganic Chemistry

Nomenclature - mononuclear complexes. Theories - Werner, Sedgwick - EAN rule, Pauling's theory - postulates and examples. Applications of coordination compounds - in qualitative and quantitative analysis. Chelation and its industrial importance with reference to EDTA in analytical chemistry. Structural features and biological functions of Chlorophyll, Haemoglobin, Rubredoxin and Ferredoxin.

Unit II

(14 hrs)

Industrial Chemistry

Fuel gases - Natural gas, water gas, semi water gas, carbureted water gas, producer gas and oil gas (manufacturing details not needed) composition and uses only.

Fertilizers- Primary and secondary nutrients, need and requirements of fertilizers - preparation, properties and uses of urea, super phosphate of lime, ammonium sulphate, triple super phosphate and potassium nitrate. Pesticides - classification with examples.

Polymers – Classification - preparation and uses of PVC, Teflon & Polyethylene. Inorganic polymers - synthesis, properties and uses of silicones.

Unit III

(14 hrs)

Synthetic drugs and Synthetic dyes

Synthetic drugs -Introduction, classification - based on chemical structure and therapeutic action and requirements of a drug. Sulpha drugs and mode of action. Hypnotics, sedatives, anticonvulsants, antidepressants, antipyretics, anaesthetics, antihistamines, anticoagulant, analgesics, diuretics, antimalarial, antifungal, antibacterial, antitubercular and antileprosy - definition, examples and side effects.

Synthetic dyes - Introduction, chromophore, auxochrome, chromogen, bathochromic, hypsochromic, hyperchromic and hypochromic shifts. Azo dyes, vat dyes, mordant dyes. Food colours - general treatment.

Unit IV

(14 hrs)

Chemical Kinetics and Catalysis

Chemical Kinetics - Definition - order and molecularity - rate of reaction – expression for first, second and third order reactions. Effect of temperature on reaction rate – Arrhenius equation – concept of activation energy - Collision theory (elementary treatment only) - failures of Collision theory.

Catalysis - types, mechanism of catalytic action - homogeneous, heterogeneous and enzyme catalysis, industrial applications of enzymes.

Unit V**(14 hrs)****Importance of pH and Buffer**

pH, pH scale, buffer solutions - types - buffer mixture of weak acid and its salt - buffer mixture of weak base and its salt. Importance of pH and buffer in the living system.

Hydrolysis of salts – types (strong acid vs strong base, weak acid vs strong base, strong acid vs weak base, weak acid vs weak base) - hydrolysis constant (K_h) - relation between K_h , K_a and K_w - degree of hydrolysis and determination - indirect method, electrical conductance method (Bredig's method), freezing point depression and from distribution law.

Text Books:

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1.	B.S.Bahl, ArunBahl and G.D.Tuli	Essentials of Physical Chemistry	S Chand & Company Ltd, New Delhi.	Reprint 2010
2.	B.K.Sharma	Industrial Chemistry	GOEL Publishing House	Reprint 2016
3.	Dr. V.Veeraiyan	Text book of Allied Chemistry	2 nd Edn, High mount Publishing house, triplicane, Chennai.	Reprint 2005

Pedagogy:

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

Course Designers

1. Dr. R. Revathi
2. Dr. N. Anusuya

Question Paper Pattern
End Semester Examination

BLOOM'S CATEGORY	SECTION	WORD LIMIT	MARKS	TOTAL
K_1, K_2	A-11/13 X 2 MARKS	ONE OR TWO SENTENCES	22	100
K_1, K_2	B -5/7 X 6 MARKS	300	30	
K_3, K_4	C - 4/6 X 12MARKS	600-800	48	

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDI T
CE21A04	IDC – ALLIED CHEMISTRY PAPER –II (offered for B.Sc Physics)	THEORY	71	4	-	4

Preamble

To enable the students to

- understand the concepts of aromaticity, isomerisms and nuclear chemistry
- gain knowledge about the basics of surface chemistry
- know the basics of fuels, polymers and water treatment methods
- understand the concepts of electrochemistry

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	relate the properties of aromatic compounds and organic reactions	K ₄
CO2	recognize the basic concepts of nuclear chemistry	K ₂
CO3	categorize the solution based on its pH	K ₄
CO4	identify the chemistry of fuels, polymers and plastics	K ₁
CO5	define various terms in electrochemistry and to solve problems related to conductance	K ₁ , K ₃

Mapping with Programme Outcomes

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

H- High; M-Medium; L-Low

IDC – Allied Chemistry Paper –II (CE21A04)

(offered for B.Sc Physics)

(71Hrs)

UNIT I

(14 Hrs)

Nuclear Chemistry

Fundamental particles of nucleus, isobars, isotones and isomers- definition and examples. differences between chemical reactions and nuclear reaction, fusion and fission, mass defect, derivation of $1\text{amu} = 931\text{ MeV}$ - nuclear binding energy and calculation - packing fraction, n/p ratio, magic numbers-radioactive series- $4n+1$, $4n+2$, $4n+3$, group displacement law- modes of radioactive decay- half-life period- applications of radio isotopes- carbon dating and rock dating.

UNIT II

(14Hrs)

Organic Chemistry

Aromatic compounds:aromaticity, Huckel's rule, aromatic electrophilic substitution,mechanism of nitration, sulphonation, halogenation, Friedel-Craft's alkylation and acylation.

Isomerisms: optical isomerism - elements of symmetry, polarized light and optical activity, isomerism of lactic acid and tartaric acid, racemisation and resolution. Geometrical isomerism- cis-trans isomerism.keto-enol tautomerism. Conformational analysis of ethane, n-butane and cyclohexane.

UNIT III

(14Hrs)

Electrochemistry

Electronic and electrolytic conductors, Arrhenius theory of electrolytic dissociation. Conductance - specific & equivalent conductance and their determination, variation of conductance with dilution, Ostwald's dilution law. Kohlrausch's law. Application of conductance measurements - determination of degree of dissociation of weak electrolytes, conductometric titrations.

Faraday's law of electrolysis, Galvanic cells:EMF and its origin, standard electrode potentials, reference electrodes (NHE and Calomel), electrochemical series and its applications, formation of standard cells, cell reaction and calculation of EMFs.

UNIT IV

(14Hrs)

Solution- mole concept, mole fraction, molality, molarity, normality.Primary and secondary standards- preparation of standard solutions, principle of volumetric analysis (with simple problems), acid-base and redox titration.

Ionic product of water-pH, pKa, pKb - definition, determination of pH by indicator method.

Buffer solutions- types, buffer action, pH of buffer solutions, importance of pH and buffers in living systems.

Surface chemistry- Emulsions, Gels- preparation, properties and applications,

Chromatography – basic principles of column, paper and thin layer chromatography.

UNIT V

(15Hrs)

Industrial Chemistry

Fuels- classification-gaseous fuels like water gas, producer gas, liquefied petroleum gas, gobar gas, compressed natural gas

Polymers- classifications, preparation and applications of PVC, Teflon, Polyethylene&bakelite, synthesis, properties and uses of silicones.

Hardness of water- temporary and permanent hardness, disadvantages of hard water - softening of hard water - Zeolite process, demineralization process and reverse osmosis - purification of water for domestic use: use of chlorine, ozone and UV light.

Text Books

S.No	Authors	Title of the Book	Publishers	Year of Publication
1.	H.J.Arniker	Essentials of Nuclear Chemistry	New Age International Pvt., Ltd.,	Reprint 2016
2.	Dr. Veeraiyan V	Text book of Allied Chemistry	Highmount Publishing House, Chennai-14	Reprint 2006
3.	B.R.Puri, L.R.Sharma, L.S.Pathania	Principles of Physical chemistry	Vishal Publishing Co, Jalandhar, New Delhi	Reprint 2019

Pedagogy

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

Course Designers

Dr.Sowmya Ramkumar

Dr.S.Charulatha

Question Paper Pattern
End Semester Examination

BLOOM'S CATEGORY	SECTION	WORD LIMIT	MARKS	TOTAL
K ₁ , K ₂	A-11/13 X 2 MARKS	ONE OR TWO SENTENCES	22	100
K ₁ , K ₂	B -5/7 X 6 MARKS	300	30	
K ₃ , K ₄	C - 4/6 X 12MARKS	600-800	48	

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE21CP1	CHEMISTRY PRACTICAL - I	THEORY	86	4	-	5

Preamble

To enable the students to

- learn the theoretical basis of qualitative inorganic analysis containing simple and interfering radicals and analyze a mixture containing two anions, one of which is interfering and two cations.
- Learn the quantitative estimations and calculation of pH

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	identify, separate the cations into groups and report the acid and basic radicals	K ₁ , K ₂
CO2	estimate the percentage amount of chlorine, carbonates, Mg, Na in bleaching powder, hard water, detergent	K ₄
CO3	estimate the percentage amount of chlorine, carbonates, Mg, Na in bleaching powder, hard water, detergent	K ₄

Mapping with Programme Outcomes

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

H-High; M-Medium; L-Low

Chemistry Practical – I (CE21CP1)**(90 Hrs)****Credits: 4**

1. Analysis of mixture containing two anions one of which is interfering in nature and two cations:

The following cations and anions may be given

Anions : Cl^- , CO_3^{2-} , Br^- , NO_3^- , SO_4^{2-} , F^- , BO_3^{2-} , $\text{C}_2\text{O}_4^{2-}$, CrO_3^{2-} , PO_4^{3-}

Cations : Pb^{2+} , Cu^{2+} , Zn^{2+} , Mn^{2+} , Co^{2+} , Ni^{2+} , Ca^{2+} , Ba^{2+} , NH_4^+ , Mg^{2+} , Cd^{2+} , Sr^{2+}

GROUP EXPERIMENTS:

2. (i) Estimation of available chlorine in bleaching powder
(ii) Estimation of hardness of water
3. pH Measurements
 - (i) Measurement of pH of different solutions like aerated drinks, fruit juices, shampoos and soaps using pH meter (Note: Use dilute solutions of soaps and shampoos)
 - (ii) Preparation of buffer solutions
 - a. Sodium acetate-acetic acid
 - b. Ammonium chloride-Ammonium hydroxide

Text Book

Lab Manual - Prepared by Faculty, Department of Chemistry, PSGRKCW

Reference book:

S.No	Authors	Title of the Book	Publishers	Year of Publication
1	V. V. Ramanujam	Inorganic semi micro qualitative analysis,	The National Publishing Co.	Revised 3 rd Edn., 1974
2	Jain P. C and Jain M	Engineering Chemistry	DhanpatRai and Sons	16 th edition, 2013
3	Vogel A. I	Text Book of Practical Organic Chemistry	Prentice Hall	2011, 5 th edition
4	Khosla B D, Garg V C, Gulati A	Senior Practical Physical Chemistry	R Chand & Co	2011

Pedagogy:

Demonstration and individual hands on practical's

Course Designers

1. Dr. N. Shyamaladevi
2. Dr. S. Jone Kirubavathy

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE21AP1	IDC –CHEMISTRY PRACTICAL FOR BIOLOGISTS (offered to B.Sc Botany & Zoology)	PRACTICAL	-	-	90	2

Preamble

To enable the students to

- estimate the given substance volumetrically.
- analyse and identify the organic compounds qualitatively

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	define the various terms in volumetric analysis	K ₁
CO2	perform the volumetric analysis and estimate the quantity present.	K ₂ , K ₃
CO3	identify and analyse organic compounds	K ₃

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

IDC –CHEMISTRY PRACTICAL FOR BIOLOGISTS (CE21AP1)

(offered to B.Sc Botany & Zoology)

(90hrs)

1. Volumetric Analysis

- i. Estimation of sodium hydroxide using standard sodium carbonate.
- ii. Estimation of Carbonate, bicarbonate mixture using sodium hydroxide
- iii. Estimation of hydrochloric acid using standard oxalic acid.
- iv. Estimation of oxalic acid using standard sulphuric acid.
- v. Estimation of ferrous sulphate using standard Mohr's salt solution.
- vi. Estimation of potassium permanganate using standard oxalic acid.
- vii. Estimation of hardness of water (Temporary and permanent).

2. Organic Compound Analysis

Systematic analysis of organic compounds containing one functional group and characterization by confirmatory tests and preparing suitable derivative - Phenols, Acids (mono and di), Aromatic primary amine, Amides (mono and diamide) and Glucose.

Text Book:

Lab Manual- Prepared by Faculty, Department of Chemistry, PSGRKCW

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	N.S.Gnanapragasam, G.Ramamurthy	Organic Chemistry Lab Manual	S.Viswanathan Printers & Publishers Pvt Ltd	3 rd Edn.,2011
2	A.I. Vogel	A text book of quantitative inorganic analysis	Longman publishers	12 th Edn., 2011

Pedagogy

Demonstration and individual hands on Practicals.

Course Designers:

Dr.R.Revathi

Dr.N.Anusuya

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE21AP2	IDC – ALLIED CHEMISTRY PRACTICAL (offered for B.Sc Physics)	PRACTICAL	-	-	90	2

Preamble

To enable the students to

- estimate the given substance volumetrically
- understand the principle and carry out potentiometric / conductometric titrations

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	define the various terms in volumetric analysis	K ₁
CO2	perform the volumetric analysis and estimate the quantity present.	K ₂ , K ₃
CO3	Calculate the hardness of water samples	K ₄
CO4	recall the various terms in conductometric and potentiometric experiments	K ₁

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

IDC – ALLIED CHEMISTRY PRACTICAL (CE21AP2)(90hrs)

(Offered for B.Sc Physics) (90hrs)

1. Volumetric Analysis

- I. Estimation of sodium hydroxide using standard sodium carbonate.
- II. Estimation of carbonate, bicarbonate mixture using sodium hydroxide
- III. Estimation of hydrochloric acid using standard oxalic acid.
- IV. Estimation of oxalic acid using standard sulphuric acid.
- V. Estimation of ferrous sulphate using standard Mohr's salt solution.
- VI. Estimation of potassium permanganate using standard oxalic acid.
- VII. Estimation of hardness of water (temporary and permanent).

2. Conductivity Experiments

1. Determination of cell constant
2. Determination of dissociation constant of a weak acid.
3. Conductometric titration: Acid – base

3. Potentiometric Titration

1. Acid - base
2. Redox titration

Text Book : Lab Manual- prepared by faculty, Department of Chemistry, PSGR Krishnammal College for Women, Coimbatore

Reference Books

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	V.Venkateswaran, R. Veeraswamy & A.R. Kulandaivelu	Basic Principles of Practical Chemistry	S.Chand & Co.	2012 Reprint 2 nd Edn.
2	B. Vishwanathan, P.S. Raghavan	Practical Physical Chemistry	Viva Books	2014 Reprint

Pedagogy

Demonstration and individual hands on Practicals

Course Designers

Dr.Sowmya Ramkumar

Dr.S.Charulatha

SEMESTER III

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE21C03	GENERAL CHEMISTRY PAPER - III	Theory	56	4	-	4

Preamble

To enable the students to

- gain knowledge about the characteristics and metallurgy of d-block elements.
- understand the chemistry of interhalogen compounds.
- learn the concepts of acids and bases.
- familiarize the organic reactions of aldehydes, ketones, Carboxylic acids and esters.
- acquire insight into phase rule and its applications.

Course Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	describe the methods of extraction and refining techniques of metals from their ores, examine the concepts of acids and bases, recognize the different naming reaction, examine the purification techniques	K1
CLO2	compare the properties of d-block elements, discuss the concepts of acids and bases, predict the mechanism of oxidation and condensation reactions, identify the ideal & non-ideal solutions	K2
CLO3	illustrate the chemistry of interhalogen compounds, interpret the electronegativity, hardness and softness, relate the properties of dicarboxylic acid, sketch the phase diagram for one component and two component system	K3
CLO4	analyze the metallurgy of d block elements, examine the synthesis of aldehydes and ketones, categorize the general methods of preparation of hydroxy acids, distinguish one and two component systems based on phase rule	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	H	H	H	H	H	M
CLO2	H	H	H	H	H	M
CLO3	H	H	H	H	H	H
CLO4	H	H	H	H	H	H

H - High; M-Medium; L-Low

GENERAL CHEMISTRY PAPER – III (CE21C03)

(56Hrs)

Unit – I

(11Hrs)

d-block elements

Introduction, position, general characteristics-metallic character, atomic volume and densities, melting point and boiling point, atomic radii, ionic radii, ionization potential, standard reduction potential, magnetic property, catalytic property and formation of alloys. Horizontal comparison of Fe, Co, Ni and Zn, Cd and Hg groups.

Metallurgy, properties and uses of Ti, V, Mo and W.

Inter halogen compounds

ICl, ClF₃, BrF₅, IF₇ - Preparation, properties, structure and uses.

Unit –II

(11Hrs)

Acids and Bases

Definitions, different approaches - Arrhenius concept, Bronsted-Lowry concept, solvent system definition, Lewis definition. Relative strength of acids and bases. Acidity and basicity of solvolytic reaction. HSAB - Principle. Application & limitations of HSAB concept. Symbiosis, theoretical basis of hardness and softness. **Electronegativity, hardness and softness. π -bonding contributions.**

Nonaqueous Solvents

Classification-protic and aprotic solvents, liquid ammonia (acid-base, precipitation, complex formation, ammonolysis and solvolysis reactions) and liquid sulphur dioxide (acid-base, solvolytic, metathetical, complex formation and amphoteric reactions).

Unit – III

(11Hrs)

Carbonyl Compounds

Nomenclature, classification and reactivity, general methods of preparation of aldehydes and ketones. Mechanism of nucleophilic additions to carbonyl group - addition of HCN, alcohols, thiols, sodium bisulfite, Grignard reagents. Oxidation reactions - Tollens' reagent, KMnO₄, hypochlorite, SeO₂ and per acids. Reduction reactions - H₂/Ni, H₂-Pd-C, NaBH₄, LiAlH₄, MPV, Clemmensen and Wolff-Kishner reductions. Condensation reactions with ammonia and its derivatives- **Aldol, Perkin, Knoevenagel, Reformatsky and Cannizzaro reactions.**

Unit –IV**(11 Hrs)***Carboxylic acids and their functional derivatives*

Nomenclature and classification of aliphatic and aromatic carboxylic acids. Preparation, properties and uses of Dicarboxylic acids (Oxalic, Malonic, Glutaric, Adipic acid) and Unsaturated acids (Acrylic acid and Crotonic acid).

Hydroxy acids - Preparation, properties and uses of Tartaric acid and Citric acid.

Esters - Nomenclature, Isomerism, General methods of preparation - Esterification, alcoholysis of acid chlorides and acid anhydrides, silver salt method, Tischenko reaction. Properties and uses. **Active methylene compounds - acetoacetic ester, and malonic ester- preparation, properties and uses.**

Unit –V (12 Hrs)*Solutions of Non electrolytes*

Ideal and non-ideal solutions - Raoult's law, vapour pressure of non-ideal solutions, fractional distillation of binary liquid solutions, distillation of immiscible liquids, Nernst distribution law and its applications. Azeotropic distillation, solubility of partially miscible liquids - Phenol - water system, **Nicotine-water system and Triethylamine- water system.**

Phase Equilibria

Concepts of phase, component and degrees of freedom. Gibbs' phase rule – derivation. One component system - Water and sulphur. Two component system - Simple eutectic: Lead-silver system, **Formation of compound with congruent melting point- Mg-Zn system, incongruent melting point - Ferric chloride – water system.**

Text Books:

S. No.	Authors	Title of the Book	Publishers	Year of Publication
1	B.S. Bahl & Arun Bahl	Organic Chemistry	S.Chand & Co, 15th Edn	2009
2	R. D Madan	Modern Inorganic Chemistry	S. Chand & Co, 3rd Edn	2011
3	B.R. Puri, L.R. Sharma, M.S.	Principles of Physical Chemistry	Vishal Publications, 45th Edn	2011

	Pathania			
--	----------	--	--	--

Reference Books:

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	B.S. Bahl & Arun Bahl	Essentials of Physical Chemistry	S.Chand & Co, 22nd Edn	2014
2	R.T. Morrison & R.W. Boyd	Organic Chemistry	Pearson Prentice Hall, 17th Edn	2011
3	A. Petersykes	A Guide book to Mechanism in Organic Chemistry	Pearson Education Ltd, 6th Edn	2009

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

Course Designers:

1. Dr.N.Arunadevi
2. Dr. G. Subashini

Question Paper Pattern

EndSemesterExamination: 100Marks

BLOOM'S CATEGORY	SECTION	WORD LIMIT	MARKS	TOTAL
K1, K2	A - 5 x 2 Marks (No Choice)	One or Two Sentences	10	100
K1, K2	B - 5 x 6 Marks (Either/or)	300	30	
K3, K4	C - 5x 12Marks (Either/or)	600-800	60	

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE21CP2	CHEMISTRY PRACTICAL – II	PRACTICAL	-	-	90	5

Preamble

Enable the students to

- identify functional groups in organic compounds
- develop skill in quantitative analysis of solutions volumetrically
- analyze colorants and adulterants in foods and milk/milk products

Course Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	analyze organic compounds systematically and prepare suitable derivatives	K4
CLO2	calculate the strength of unknown solutions by titrimetric methods	K4
CLO3	interpret the various colorants and adulterants in foods and beverages	K3

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	H	H	H	H	H	M
CLO2	H	H	M	H	H	H
CLO3	H	H	H	H	M	H

H - High; M-Medium; L-Low

Systematic Analysis - Organic Compounds

Preliminary tests, detection of elements, nature of the functional group, confirmatory tests and preparation of derivatives – acids, phenols, aldehydes, ketones, amines, amides, carbohydrates, esters and nitro compounds.

Volumetric Analysis

Acidimetry and Alkalimetry

1. Estimation of sulphuric acid using standard oxalic acid.
2. Estimation of sodium hydroxide using standard sodium carbonate.

Permanganimetry

1. Estimation of oxalic acid using standard Mohr's salt solution.
2. Estimation of Mohr's salt solution using standard oxalic acid.

Dichrometry

1. Estimation of Fe^{2+} ions using internal indicator.
2. Estimation of Fe^{3+} ions using internal indicator after reduction.

Complexometric titrations

1. Estimation of zinc using EDTA
2. Estimation of magnesium using EDTA

Iodometry

1. Estimation of Potassium dichromate.

Qualitative Analysis of Natural Food Colours (Group Experiments)

Caramel, Cochineal, Turmeric, Annatto, Chlorophyll and Betanin

Detection of Adulteration in milk and milk products (Group Experiments)

Urea, Glucose, Starch, Cellulose, Carbonates & Caustic Soda, Detergent, Salt, Hydrogen Peroxide.

Text Book:

Hand Book for Organic Practical's, prepared by Faculty, Department of Chemistry, PSGR Krishnammal College for Women

Reference Books:

S.No.	Authors	Title	Publishers	Year of Publication
1.	Brian S Furniss, Antony J Hannaford, Peter.W.G.Smith, Austin R. Tatchell	Vogel's Textbook of Practical Organic Chemistry	Longman Scientific & Technical	1989 5 th Edn.
2.	G H Jeffery, J Bassett, J Mendham, R C Denney	Vogel's Textbook of Quantitative Chemical Analysis	Bath Press, Great Britan	1989 5 th Edn.
3.	Ministry of Health and Family Welfare Board	Manuals of Methods of Analysis of Foods	Food Safety and Standards - Authority of India, Ministry of Health and Family Welfare, Government of India, New Delhi	2015

Pedagogy: Demonstration and individual hands on practical

Course Designers

1. Dr. N. Arunadevi
2. Dr. G. Subashini

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE21SB01	Skill Based Subject Computational Chemistry I	THEORY	41	4	-	3

Preamble

Enable the students to

- understand the basic concepts in computational chemistry & bioinformatics
- appraise the applications of open source tools in chemistry to stimulate molecular structures
- recognize the biological database
- relate the score matrix in sequence alignment

Course Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	recall the fundamentals of computers and computational chemistry tools	K1
CLO2	identify the biological databases for various application, the DNA sequencing methods, develop chemical structure representations using open source tools	K2
CLO3	sketch GUI display of chemical structure, perform text and structure based searches, determine the relative score made by matching two characters in a sequence alignment	K3
CLO4	analyse chemical structure representations using open source tools, recognise the challenges and opportunities in bioinformatics	K4

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	H	H	H	H	M	H
CLO2	H	H	H	H	M	H
CLO3	H	H	H	H	M	H
CLO4	H	H	H	M	M	H

H - High; M-Medium; L-Low

Semester III Skill Based Subject
Computational Chemistry I (CE21SB01)

Credits:2 **(41Hrs)**

Unit I **(8 Hrs)**

Fundamentals of Computers in Chemistry

Introduction to computers- Data and information, Computer system organisation, representation of numbers. Computer software's in chemistry- Introduction, Chemical Inventory System (CIS), Material Safety Data Sheet (MSDS), Electronic handbooks, Database.

Unit II **(8 Hrs)**

Introduction to Cheminformatics

Introduction- History & evolution, uses & prospects. Computer representation of chemical structure-graph, theoretical representation of chemical structures, connection tables and linear notations. Structure & substructure searching.

Unit III **(9 Hrs)**

Cheminformatics tools

Chemical structure representation (SMILES and SMARTS); Chemical databases: CSD, ACD, WDI, Chembank, PUBCHEM, Chemical structure file formats- SDF, Mol, XYZ, PDB; Structure visualization. Open source tools – Chem office, Chem draw, chem doodle, Chemistry 4D, Computational chemistry software sites.

Unit IV **(8 Hrs)**

Bioinformatics I

Introduction to Bioinformatics: - History, Scope, importance, challenges and opportunities. Classification of biological databases; sequence database – nucleic acids database (NCBI, DDBJ & EMBL), protein database (PDB, SwissProt), literature database (Pubmed); file formats - GenBank, SwissProt, PDB. Application of bioinformatics in various fields.

Unit V **(8 Hrs)**

Bioinformatics II

Sequencing Analysis: DNA sequencing - Maxam and Gilbert method, Sanger's method. Protein sequencing.

Scoring Matrices: Similarity searches - PAM and BIOSUM matrix, Dayhoff mutation matrix, construction of PAM and BLOSUM matrix.

Textbooks

S.No	Authors	Title of the Book	Publishers	Year of Publication
1	Ramesh Kumari	Computers & their Applications to Chemistry	Narosa Publishing House Pvt Ltd	2007, 2 nd Edn
2	KishorArora	Computers Applications in Chemistry	Anmol Publication PvtLtd	2004, 1 st Edn
3	Dan E Krane& Michael L Raymer	Fundamental concepts of Bioinformatics	Pearson Education	2003, 1 st Edn

Reference books

S.No	Authors	Title of the Book	Publishers	Year of Publication
1	RajarshaGuha& Andreas Bender	Computational Approaches in Cheminformatics & Bioinformatics	Wiley India Pvt Ltd	2012 1 st edition
2	SundarRajan S	Introduction to Bioinformatics	Himalaya Publishing House	2002, 1 st Edn

Pedagogy

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

Course Designers

1. Dr. G. SathyaPriyadarshini
2. Dr SowmyaRamkumar

SEMESTER IV

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE21C04	GENERAL CHEMISTRY PAPER - IV	Theory	56	4	-	4

Preamble

To enable the students to

- acquire knowledge about the chemistry of lanthanides and actinides.
- learn the concepts and theories of coordination chemistry.
- familiarize the preparation and properties of nitrogen containing compounds
- understand the basic concepts and theories of chemical kinetics.

Course Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	describe the significance of lanthanides and actinides, coordination compounds, nitro compounds, food science and chemical kinetics	K1
CLO2	illustrate the extraction of lanthanides and actinides, theories of coordination compounds, preparation of nitro compounds, types of food additives and basics of chemical kinetics	K2
CLO3	Interpret the properties of lanthanides and actinides, coordination compounds, nitro compounds, food adulteration and determination of rate of a reaction	K3
CLO4	Compare and contrast lanthanides & actinides, high spin –low spin complexes, mono, di & trinitro compounds, food additives, theories of kinetics	K4

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	H	H	H	H	H	M
CLO2	H	H	H	H	H	M
CLO3	H	H	M	H	H	H
CLO4	H	H	H	M	H	H
CLO5	H	H	H	H	H	M

H - High; M-Medium; L-Low

Unit - I

(11 Hrs)

Lanthanides and Actinides

Lanthanides: Lanthanide series, abundance and natural isotopes, lanthanide contraction, similarity in properties, occurrence, oxidation states, chemical properties of Ln(III) cations, magnetic properties. Colour and electronic spectra of lanthanide compounds, Lanthanide

contraction. Extraction of lanthanides from Monazite, separation of individual lanthanides by Ion exchange method. Lanthanum - occurrence, metallurgy, physical and chemical properties.

Actinides: Actinide series, abundance and natural isotopes, occurrence, oxidation states, preparation & properties of actinides and actinide contraction. Uranium - occurrence, metallurgy, physical and chemical properties.

Comparison of lanthanides and actinides. Updation of periodic table from Web.

Unit - II

(12 Hrs)

Coordination Chemistry

Introduction - Types of ligands; coordination sphere; coordination number; nomenclature of mononuclear and di nuclear complexes; chelate effect. **Isomerism: linkage, ionization, hydrate, coordination, coordination position isomerism, geometrical and optical isomerism.**

Theories - Sidgwick theory - EAN and stability, Valence bond theory - hybridization, geometry, magnetism, drawbacks of VBT. Crystal field theory - crystal field effects, assumptions of crystal field theory, crystal field splitting in octahedral and tetrahedral geometries - high - spin and low - spin complexes, **factors affecting CFSE.**

Unit – III

(11 Hrs)

Nitrocompounds, Amines and Diazonium Salts

Nitrocompounds: Aliphatic and aromatic nitro compounds - general methods of preparation, properties and uses.

Amines

Primary, secondary and tertiary amines preparation and reactions. Separation of aliphatic amines - Hofmann and Hinsberg methods. Comparison of their basicity. Aromatic amines- Commercial preparation of aniline, reactions - Ring substitution, diazotization, coupling reactions of aromatic amines.

Diazonium salts: Preparation from aromatic amines.

Reactions: conversion to benzene, phenol, dyes.

Unit - IV

(11 hrs)

Chemical Kinetics-I

Empirical laws and experimental aspects - order and molecularity of reactions. Setting up and

solving simple differential equations for zero, first, second & third order reactions. Derivation for

half-life periods of first, second, third and zero order. **Determination of order of reactions.**

Arrhenius equation & concept of energy of activation. Collision theory & derivation of rate constant for bimolecular reactions-theory of absolute reaction rates- derivation for the rate constant in terms of partition functions.

UNIT V

(11Hrs)

Introduction to Food Science

Functions of food - energy yielding, body building, protection and regulation, maintenance of health. Food groups, food guide pyramid, food in relation to health.

Food Additives

Definition, need for additives, classification - preservatives, antioxidants, sequestrants, surface acting agents, bleaching and maturing agents, starch modifiers, flavoring agents and flavour enhancers, non-nutritive dietary sweeteners, nutrient supplements, food colours, stabilizers and thickeners, functions and uses of food additives.

Food Adulteration and Testing

Introduction, legal aspects and prevention, common food adulterants, analysis of various food adulterants in oils, ghee, coffee powder, chili powder, turmeric powder and meat. Harmful effects of the adulterants. Food additives- sweeteners, preservatives, flavors, colorants, pesticide contaminants and toxicants.

Text Books

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	B.S. Bahl&ArunBahl	Organic Chemistry	S.Chand& Co, 15 th Edn	2009
2	R. D Madan	Modern Inorganic Chemistry	S. Chand & Co, 3 rd Edn	2011
3	B.R. Puri, L.R. Sharma, M.S. Pathania,	Principles of Physical Chemistry	Vishal Publications, 45 th Edn	2011
4	B. Srilakshmi	Food Science	New Age International Pvt Ltd, 3rd edition	2003
5	Vijaya Khader	Text Book on Food Storage and Preservation	Kalyani Publishers 1 st Edn	1999

Reference Books

S. No.	Authors	Title of the Book	Publishers	Year of Publication
1	Morrison, Boyd Bhattacharjee	Organic Chemistry	Pearson education	7 th edition 2011
2	Gardon M Barrow	Physical Chemistry	Tata Mcgraw Hill	5 th Edition 2010
3	Puri, Sharma, Kalia	Principles of Inorganic Chemistry	Vishal Publishing Co	33 rd Edition 2016

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

assignment, quiz, peer learning, student seminar, problem solving exercise

Portion marked in Bold – Blended Learning

Course Designers:

1. Dr. N. Arunadevi
2. Dr. G. Subashini

Blended Learning

UNIT-I

Unit No	Topic	Contents
I	Comparison of lanthanides and actinides,	You Tube Video https://www.youtube.com/watch?v=AE7aKG-tWqM https://www.youtube.com/watch?v=m45zQIEQJws
	Updation of periodic table from Web.	Google https://letstalkscience.ca/educational-resources/stem-in-context/newest-elements-on-periodic-table
II	Isomerism: linkage, ionization, hydrate, coordination, coordination position isomerism, geometrical and optical isomerism.	https://www.youtube.com/watch?v=n-lAbWjiNKA https://www.youtube.com/watch?v=FLVG08FjcoI https://www.youtube.com/watch?v=PO9NYeb0Tdc
	Factors affecting CFSE.	https://www.youtube.com/watch?v=qSvsEMxjPAY https://www.youtube.com/watch?v=5AG35BALLBI
III	Diazonium salts: Preparation from aromatic amines, reactions - conversion to benzene and phenol.	https://www.youtube.com/watch?v=8hJySbRvOHs https://www.youtube.com/watch?v=jcMbEujYMmU
IV	Determination of order of reactions.	https://www.youtube.com/watch?v=4wOb58n5eJA https://www.youtube.com/watch?v=hovN5YQEzbQ https://www.youtube.com/watch?v=N2bLOeYkubg
V	Food Adulteration and Testing Introduction, legal aspects and prevention, common food adulterants, analysis of various food adulterants in oils, ghee, coffee powder, chili powder, turmeric powder and meat.	https://www.youtube.com/watch?v=ue9cE7YdjNU https://slideplayer.com/slide/6081032/ https://www.youtube.com/watch?v=mSi-0P7gUlw

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE21SB02	Skill Based Subject Computational Chemistry II	THEORY	43	2	-	2

Preamble

Enable the students to

- understand the use of informatics in drug design and development
- recognise the mechanism of drug designing
- understand the concept of molecular modelling, mechanics and interactions

Course Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	understand the phases of drug design, features of molecular mechanics, energy concept, drug likeness and toxicity property of drugs.	K1
CLO2	recognize the mode of chemical interaction, new drug targets, coordinates system and potential energy surface, protein-ligand docking and hard/soft drugs	K2
CLO3	Identification of target and lead molecule, calculate the force field, molecular descriptors, drug likeness score	K3
CLO4	interpret the bonding and non-bonding interaction, “drug likeness” in chemical structure, analyze the properties of the chemical structure for drug activity	K4

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	H	H	H	H	M	H
CLO2	H	H	H	M	M	H
CLO3	H	H	H	M	M	H
CLO4	H	H	H	M	M	H

H - High; M-Medium; L-Low

Semester IV
Skill Based Subject
Computational Chemistry II (CE21SB02)

Credits: 2 **(43 Hrs)**

Unit I **(8 Hrs)**

Introduction to Molecular Modeling: Molecular Modeling and Pharmacoinformatics in Drug Design, Phases of Drug Discovery, Target identification and validation, lead identification and optimization, finding of new drug targets.

Unit II **(9 Hrs)**

Concepts in Molecular Modeling: Coordinate System; potential energy surfaces; molecular graphics; Quantum mechanics; **Molecular Mechanics:** Features of molecular mechanics, force fields.

Unit III **(9 Hrs)**

Molecular Interaction Parameters

Bond structure and bending angles – electrostatic, van der Waals and non_bonded interactions, hydrogen bonding, Inter and intramolecular interactions: Weak interactions in drug molecules; hydrogen bonding in molecular mechanics; Energy concept and its importance in drug action.

Unit IV **(9 Hrs)**

Virtual Screening: Introduction, “Drug likeness” and compound filters, Structure based virtual screening – protein-ligand docking, scoring function for protein-ligand docking

Unit V **(8Hrs)**

Properties of drugs: Concept of hard and soft drugs; Chemistry of ADME and toxicity properties of drugs. Lipinski rule, agonist and antagonist.

Textbooks

S.No	Authors	Title of the Book	Publishers	Year of Publication
1.	Dan E Krane & Michael L Raymer	Fundamental concepts of Bioinformatics	Pearson Education	2003, 1 st Edn
2	Rajarsha Guha & Andreas Bender	Computational Approaches in Cheminformatics & Bioinformatics	Wiley India Pvt Ltd	2012 1 st edition

Reference books

S.No	Authors	Title of the Book	Publishers	Year of Publication
1	Sundar Rajan S	Introduction to Bioinformatics	Himalaya Publishing House	2002, 1 st Edn

Pedagogy

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

Course Designers

1. Dr. G. Sathya Priyadarshini
2. Dr Sowmya Ramkumar

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE21SBP1	Skill Based Subject Practical - Computational Chemistry Practical	PRACTICAL	-	-	45	2

Preamble

Enable the students to

- understand the essential features and tools of cheminformatics
- design chemical structures using chemical software

Course Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	recognize the tools used in cheminformatics software	K1
CLO2	represent the SMILE string for the chemical structure and vice versa	K2
CLO3	sketch out the code for chemical structures	K3
CLO4	interpret the minimum energy configuration and the hypothetical properties of chemical structures	K4

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	H	H	H	H	M	H
CLO2	H	H	H	H	M	H
CLO3	H	H	H	M	M	H

H - High; M-Medium; L-Low

Semester V
Skill Based Subject Practical
Computational Chemistry Practical I (CE21SBP1)

Credits: 2

(45 Hrs)

1. Graphical User Interface Display - Draw chemical structures using open source tools: Chem Sketch, Chem Draw, G Chempaint
2. Interconversion of name / SMILES code to structure and vice-versa using Chemdraw.
3. Optimization of chemical structures for minimum energy configuration.
4. Analysis of molecular properties of chemical structures – molecular formula, molecular weight, composition, molar volume, density and specific refractivity using Chem sketch.
5. Output in different file formats – SDF file, mol File, XYZ coordinates, PDB
6. Finding the Pharmacophore properties using Rule of Thumb
7. Studies on active site structural features using Autodock.

Textbook

S.No	Authors	Title of the Book	Publishers	Year of Publication
1.	Muthukumarasamy Karthikeya and RenuVyas	Practical Cheminformatics	Springer	2014

Pedagogy

Demonstration, Hands on training

Course Designers

1. Dr. G. Sathya Priyadarshini
2. Dr. Sowmya Ramkumar

COURSE NUMBER- NM21DTG	COURSE NAME – DESIGN THINKING	Category	L	T	P	Credit
		Theory	26	2	-	2

Preamble:

1. To expose the students to the concept of design thinking as a tool for innovation
2. To facilitate them to analyze the design process in decision making
3. To impart the design thinking skills

Course Outcome

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

CLO Number	CLO Statement	Knowledge Level
CLO 1	Understand the concepts of Design thinking and its application in varied business settings	K1
CLO 2	Describe the principles, basis of design thinking and its stages	K2
CLO 3	Apply design thinking process in problem solving	K3
CLO 4	Analyze the best practices of design thinking and impart them in business and individual day to day operations.	K4

Mapping with Programme Outcomes

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
CLO 1	S	M	M	S	S
CLO 2	M	S	S	M	M
CLO 3	S	S	S	M	S
CLO 4	S	S	S	S	S

S-Strong; M-Medium; L-Low

NM21DTG - DESIGN THINKING

UNIT – 1

(5 Hours)

Design Thinking Overview: ***Introduction to Design Thinking*** and Design Research Strategies -***Design Thinking Skills***

UNIT – II

(5 Hours)

Design Thinking Mindset - ***Principles of Design Thinking - Basis for design thinking*** -

Design Thinking Hats - Design thinking team

UNIT – III

(5 Hours)

Empathize - definition - Listen & Empathize with the Customers and / or Users - Tools and Techniques

UNIT – IV

(5 Hours)

Define - Definition - Defining the Problem - Tools and Techniques - Journey mapping and

Ideate - definition - Ideation techniques

UNIT – V

(6 Hours)

Prototype - Definition - Prototype Alternate Solutions - ***Test the Solutions*** - Visualization

- Story Telling - Cautions and Pitfalls - Best Practices

(*Seminar - Internal evaluation only)

Text Books:

Sl. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Christian Mueller-Roterberg	Handbook of Design Thinking Tips & Tools for how to design thinking	Amazon Kindle Version	2018
2	Gavin Ambrose Paul Harris	Design Thinking	AVA Publishing Switzerland	2010

Reference Books:

Sl. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Maurício Vianna Ysmar Vianna Isabel K. Adler Brenda Lucena Beatriz Russo	Design Thinking - Business Innovation	MJV Press	2011
2	Moritz Gekeler	A practical guide to design thinking	Friedrich- Ebert- Stiftung	2019
3	J. Berengueres	The Brown Book of Design Thinking	UAE University College, Al Ain	2014

**Design Thinking – Finishing School Assessment pattern
CA – 100 marks**

CIA I (Unit I & II) Duration 1 hr

Section A	(3/5) x 5 marks	15 marks
Section B	(1/2) x 10 marks	10 marks
	Total	25 Marks

CIA II (UNIT III, IV & V) Duration 1 hr

Section A	(3/5) x 5 marks	15 marks
Section B	(1/2) x 10 marks	10 marks
	Total	25 Marks

***Project – 50 marks**

Stage	Marks
Stage 1 – Empathize	10
Stage 2 – Define	10
Stage 3 – Ideate	10
Stage 4 – Prototype	10
Stage 5 - Test	10
Total	50 marks

*Group project – Maximum 6 students per team, concept note of the project has to be approved by the HoD before the start of the project

INTERNAL COMPONENT MARKS

CA I	25
CA II	25
Project	50
TOTAL	100

SEMESTER V

COURSE NUMBER	COURSENAME	CATEGORY	L	T	P	CREDIT
CE21C05	PAPER V - INORGANIC CHEMISTRY	THEORY	58	2	-	4

Preamble

To enable the students to

- familiarize with metals, alloys and types of conductors
- acquire knowledge about isotopes and nuclear reactions
- learn the chemistry of metallic carbonyls and silicon compounds
- gain vivid insight into Bioinorganic Chemistry/Nanotechnology

Course Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	recall the basic concepts of metals and alloys; nuclear forces; binding energy; metal ions in biology; preparation and types of metallic carbonyls/silicon compounds and nanomaterials	K1
CLO2	examine band and MO theories; nuclear models; modes of radioactive decay; characteristics of metalloproteins and enzymes; properties of metallic carbonyls and silicon compounds; techniques of synthesizing nanoparticles	K2
CLO3	interpret the conducting properties of metals; radioactive series; synthesis of radioisotopes; role of metal ions in biological systems and applications of isotopes, metallic carbonyls and nanomaterials	K3
CLO4	categorize and analyze the types of alloys; Atomic Power Projects; features of biological pigments; structures and uses of silicates; characterization techniques of nanoparticles	K4

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	M	H	H	M	M	M
CLO2	H	H	H	M	M	M
CLO3	H	H	H	M	M	H
CLO4	H	H	H	M	M	M

H - High; M-Medium; L-Low

Paper – V Inorganic Chemistry [CE21C05] (58 Hrs)

UNIT I (11Hrs)
Metals and Alloys

Structure of Metals - Electrical, Optical & Mechanical properties of metals. Valence Bond Theory, MO theory. Conductors, Insulators and Semiconductors - Intrinsic and Extrinsic semiconductors, High Temperature Superconductors.

Types of Alloys - Substitutional, Interstitial and Intermetallic solid solutions, Classification of Alloys. Hume – Rothery ratio rules - Characteristics of Alloys

UNIT II (11Hrs)
Radioactive Isotopes

Introduction- Nuclear stability-Mass defect- Binding energy- n/p ratio, Nuclear reactions.Nuclear models- Liquid Drop/ Shell models - Magic numbers. Modes of Radioactive Decay- Half-life period

Isotopes - Nature, symbolic representation, structure, isolation of isotopes - Various methods. Uses of isotopes in various fields.

Artificial Radioactivity

Artificial transmutation.Synthesis of Radioisotopes. Radioactive series - $4n+1$, $4n+2$, $4n+3$. Nuclear reactors - Working Principle and Instrumentation.Atomic Power Projects in India. Safety measures, disposal of Reactor wastes. Detection and Measurement of Radioactivity- Geiger-MullerCounter.

UNIT III (12 Hrs)
Bioinorganic Chemistry

Metal ions in biology and their vital role in the active site, Structure and functions of metalloproteins and enzymes.

Structure & characteristic features of Hemoglobin, myoglobin Chlorophyll.

Elements of Life: Essential major, trace &ultra trace elements. Basic chemical reactions in the biological systems and the role of metal ions specially Na^+ , K^+ , Mg^{2+} , Ca^{2+} ,

$\text{Cu}^{2+/+}$ and Zn^{2+} transport across biological membranes - Na^+ & K^+ ion pump, ionophores

UNIT IV

(12Hrs)

Metallic Carbonyls and Compounds of Silicon

Metallic Carbonyls: Types, Preparation, properties, EAN Rule; Carbonyls of Chromium, Manganese, Iron, Nickel and Cobalt – Preparation, properties and uses.

Silicon Compounds: Silicic acids, sodium silicates, silicon tetrachloride, hydrofluorosilicic acids – Preparation, properties and uses. Silicates – Classification and Structure

UNIT V

(12 Hrs)

Nanotechnology

Introduction, properties of nanomaterials with examples. Techniques to synthesize nanoparticles- Physical methods-Physical vapour deposition (evaporation and sputtering) – Laservapourization, chemical/reduction methods. Characterization of nanoparticles – SEM & TEM (Elementary ideas only). Applications in chemistry & biology.

Text Books:

S. No	Authors	Title	Publishers	Year of Publication
1	H.J. Arniker	Essentials of Nuclear Chemistry	New Age International Pvt. Ltd. Publishers	2011 4 th Edn
2	B. Viswanathan	Nanomaterials	Narosa Publishing House	2014 Reprint
3	Wahid U. Malik, G.D. Tuli, R.D. Madan	Selected Topics in Inorganic Chemistry	S. Chand & Co. Ltd	2010 30 th Edn
4	Asim K. Das	Bioinorganic Chemistry	Books and Allied (Pvt) Ltd	2013 Reprint
5	R.D. Madan	Modern Inorganic Chemistry	S. Chand & Co.,	III Revised Edition 2011

Reference Books:

S.No.	Authors	Title	Publishers	Year of Publication
1	James.E.Huheey, Ellen.A.Keiter, Richard L Keiter, OkhilK.Medhi	Inorganic Chemistry - Principle Structure and Reactivity	Pearson Publishers	2011 9 th Edn.
2	Richard Booker, Earl Boysen	Nanotechnology	John Wiley	2005 1 st Edn.
3	Mark Ratner, Daniel Ratner	Nanotechnology: A Gentle Introduction to the NextBig Idea	Pearson Education	2008 1 st Edn.
4	F.Albert Cotton, Geoffrey Wilkinson, Paul. L. Gaus	Basic Inorganic Chemistry	John Wiley & Sons Pvt. Ltd.	1995 III Edition

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

Course Designers:

1. Dr. P.Kanchana
2. Dr. N. MuthulakshmiAndal

Question PaperPattern
End Semester Examination: 100 Marks

SECTION	WORD LIMIT	MARKS	TOTAL
A - 5 x 2 Marks (No Choice)	One or Two Sentences	10	100
B -5 x 6 Marks (Internal Choice at same CLO Level)	300	30	
C – 5x 12Marks (Internal Choice at same CLO Level)	600-800	60	

COURSE NUMBER	COURSENAME	CATEGORY	L	T	P	CREDIT
CE21C06	PAPER –VI ORGANIC CHEMISTRY	THEORY	58	2	-	4

Preamble

To enable the students to

- learn the chemistry of Carbohydrates, terpenoids and alkaloids
- acquire knowledge about synthesis and applications of polynuclear hydrocarbons and heterocyclic compounds
- familiarize about reterosynthesis and green chemistry

Course Outcomes

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

CLO Number	CO Statement	Knowledge Level
CLO1	recall the natural products and their synthesis	K1
CLO2	classify and distinguish the natural products and their various synthetic methods	K2
CLO3	illustrate and elucidate the functions , structures of natural products and to employ suitable synthetic routes	K3
CLO4	analyze the structure, synthesis and feasible approaches towards organic compounds	K4

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	H	H	H	M	H
CLO2	H	H	H	H	H
CLO3	H	H	H	H	H
CLO4	H	H	H	M	H

H - High; M-Medium; L-Low

Paper VI- Organic Chemistry (CE21C06)

(58Hrs)

UNIT I

(11Hrs)

Carbohydrates

Classification and nomenclature, preparation and properties of monosaccharides (Glucose and Fructose), interconversion of Glucose and Fructose, chain lengthening & chain shortening of aldoses, configuration of monosaccharides. Open chain structure & cyclic structure of D (+) Glucose. Introduction to disaccharides, properties, structure of Sucrose.

UNIT II

(11Hrs)

Terpenoids

Classification, nomenclature, occurrence and general methods of structure determination, isoprene rule, structural elucidation and synthesis - Geranial, α -Terpineol, α -Pinene, Menthol and Dipentene.

UNIT III

(12 Hrs)

Alkaloids

Definition, nomenclature and physiological action, occurrence, isolation, general methods of structure elucidation, degradation, classification based on nitrogen heterocyclic ring, structural elucidation and synthesis of Coniine, Nicotine, Piperine and Papaverine.

UNIT IV

(12 Hrs)

Fused polynuclear aromatic hydrocarbons and Heterocyclic Compounds

Preparation, properties and uses of Naphthalene, Anthracene and Phenanthrene, Benzanthracene and Pycene.

Preparation, properties and uses of Furan, Pyrrole, Thiophene and Pyridine – Methods of synthesis & chemical reaction with particular emphasis to mechanism of electrophilic substitution. Nucleophilic substitution in pyridine. Comparison of basicity of pyrrole & pyridine. Quinoline, Isoquinoline and Indole – with special reference to Skraup synthesis, Bischler-Napieralski synthesis and Fischer indole synthesis, chemical properties.

UNIT V**(12Hrs)****Retrosynthesis**

Terminology-Disconnection, Synthon, Synthetic Equivalent(SE), Functional Group Interconversion (FGI), retro synthetic analysis-Linear, convergent and combinatorial synthesis, Target molecule (TM). Guide lines for choosing disconnections-guideline (1, 2, 3). Retrosynthesis of the following molecules: 4-methyl acetophenone, benzocaine, chlorobenzide, hex-3-ene-1-ol.

Green Chemistry

Microwave induced organic synthesis: Introduction, Advantages, Limitations & Applications- Esterification, Deacetylation.

Sonochemistry: Introduction, Synthetic Applications – Esterification, Saponification, Hydrolysis, Substitution.

Text Books:

S.No.	Authors	Title	Publishers	Year of Publication
1	B.S. Bahl & Arun Bahl	Advanced Organic Chemistry	S.Chand & Co	2014, 15 th Edn Revised
2	I.L. Finar	Organic Chemistry Vol I	Pearson India	2012 6 th Edn
3	Jagdamba Singh & L.D.S. Yadav	Organic Synthesis	Pragati Prakashan	2016, Reprint 11 th Edn
4	V.K. Ahluwalia, Renu Aggarwal	Organic Synthesis- Special Techniques	Narosa Publishing House	2012, Reprint 2 nd Edn

Reference Books

S.No.	Authors	Title	Publishers	Year of Publication
1	I.L. Finar	Organic Chemistry Vol II	Pearson Education	2011, 5 th Edn
2	R.T. Morrison & R.W. Boyd	Organic Chemistry	Pearson Prentice Hall	2011, 17 th Edn
3	N. Tewari	Advanced Organic Chemistry	Books and Allied (Pvt) Ltd	2016, Reprint

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

Course Designers:

1. Dr. E.Kayalvizhy
2. Dr. G.Selvi

Question Paper Pattern
End Semester Examination: 100 Marks

SECTION	WORD LIMIT	MARKS	TOTAL
A - 5 x 2 Marks (No Choice)	One or Two Sentences	10	100
B -5 x 6 Marks (Internal Choice at same CLO Level)	300	30	
C – 5x 12Marks (Internal Choice at same CLO Level)	600-800	60	

COURSE NUMBER	COURSENAME	Category	L	T	P	Credit
		Theory	58	2	-	4

Preamble

Enable the students to

- understand the theories of chemical kinetics
- acquire insight into photochemical laws and reactions
- learn the types of adsorption isotherms / theories of catalysis
- gain knowledge about the various symmetry elements
- understand the principles of quantum chemistry

Course Outcomes

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

CLO Number	CO Statement	Knowledge Level
CLO1	Relate and illustrate the concepts of kinetics ,various laws of photo/surface chemistry and recognize the principles of group theory and quantum chemistry	K1
CLO2	Relate and compare the theories of kinetics , photochemical and photo physical processes, isotherms and molecular-crystallographic symmetry	K2
CLO3	Utilize the kinetics of complex, fast , photochemical reactions and apply adsorption isotherms, symmetry behaviors of various molecules	K3
CLO4	Analyze and examine the theories of kinetics, photo physical processes ,catalysis , One and Three Dimensional boxes	K4

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	H	H	H	H	H
CLO2	H	H	H	H	H
CLO3	H	H	H	H	H
CLO4	M	H	H	H	H

H- High; M-Medium; L-Low

PAPER – VII -PHYSICAL CHEMISTRY (CE21C07)

(58 Hrs)

Unit - I

Chemical Kinetics-II

(11Hrs)

Theories of unimolecular reactions – Lindemann's theory, Hinshelwood Theory.

Kinetics of complex reactions – opposing or reversible, consecutive & chain reactions.

Kinetics of reactions in solution-diffusion controlled reactions. Influence of ionic strength and Solvent on reaction rates in solutions.

Kinetics of fast reactions – stopped flow, flash photolysis and pulse radiolysis techniques.

Unit - II

Photochemistry

(12 Hrs)

Absorption of light and photochemical processes. Differences between thermal and photochemical reactions – Lambert Beer's law. Grothaus-Draper law – Stark-Einstein law. The hydrogen-bromine reaction, The hydrogen-chlorine reaction, comparison between the above two photochemical and thermal reactions, decomposition of acetaldehyde. Photophysical processes – Jablonski diagram - Fluorescence, Phosphorescence, photosensitization and chemiluminescence. (Elementary treatment only).

Unit - III

Surface Chemistry

(12 Hrs)

Adsorption vs absorption – Different types - Differences between physisorption and chemisorption - Adsorption isotherms and isobars. The Freundlich and Langmuir adsorption isotherms only.

Catalysis – Types. Theories – intermediate adsorption theory, modern adsorption theory. Industrial applications.

Unit - IV

Group Theory

(11 Hrs)

Symmetry elements-symmetry operations-point groups of simple molecules (Water, Ammonia, Benzene) - Identification & determination. Comparison of molecular & crystallographic symmetry. Group multiplication table-Matrix representation of symmetry operations.

Unit-V

(12Hrs)

Quantum Chemistry

Principles of quantum chemistry - Postulates of quantum mechanics (only statements). Concepts of operators, Eigen functions, Eigen values, Schrodinger equation. Particle in one dimensional box – derivation for energy. . Applications to particle in a box model –

Quantization effects – Electronic spectra - particle in a three-dimensional box -separation of variables – degeneracy.

Text Books

S.No.	Authors	Title	Publishers	Year of Publication
1.	B.R. Puri, L.R. Sharma, M.S. Pathania	Principles of Physical Chemistry	Vishal Publications	2016, 47 th Edn
2.	P.L.Soni, O.P.Dharmarha &U.N.Dash	Text Book of Physical Chemistry	Sultan Chand & Co.	2016, Revised
3.	S. Swarnalakshmi, T. Saroja, R. M. Ezhilarasi	A Simple Approach to Group Theory in Chemistry	University Press Publishers	2008, 1 st Edn.
4.	A.K Chandra Quantum Chemistry Tata McGraw	A.K Chandra Quantum Chemistry Tata McGraw	A.K Chandra Quantum Chemistry Tata McGraw	2017, 4 th Edn
5.	P.W. Atkins, J. D. Paula	Physical Chemistry	Oxford University Press	2017, 11 th Edn

Reference Books

S.No.	Authors	Title	Publishers	Year of Publication
1.	ArunBahl, B. S.Bahl, G. D. Tuli	Essentials of Physical Chemistry	S. Chand & Co.	2014 5 th Edn.
2.	Gurdeep Raj	Advanced Physical Chemistry	ParkatiPrakasa m Publishers	2019 22 nd Edn.
3.	K.J. Laidler	Chemical Kinetics	Pearson Education Pvt. Ltd	2014 3 rd Edn.
4.	K. V. Raman	Group Theory and its Applications to Chemistry	Tata McGraw- Hill Publishing Co.	2004 Reprint 3 rd Edn.
5.	R.K. Prasad Quantum Chemistry New Age	R.K. Prasad Quantum Chemistry New Age	R.K. Prasad Quantum Chemistry New Age	2020 4 th revised Edn.

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

Course Designers:

1. Dr. N.Shyamaladevi

2. Dr. C.Nithya

Question Paper Pattern
End Semester Examination: 100 Marks

SECTION	WORD LIMIT	MARKS	TOTAL
A - 5 x 2 Marks (No Choice)	One or Two Sentences	10	100
B -5 x 6 Marks (Internal Choice at same CLO Level)	300	30	
C – 5x 12Marks (Internal Choice at same CLO Level)	600-800	60	

COURSE NUMBER	COURSENAME	CATEGORY	L	T	P	CREDIT
CE21E01	AOS - I POLYMER CHEMISTRY	THEORY	58	2	-	5

Preamble

To enable the students to

- learn the basic concepts and classification of polymers
- impart knowledge about polymerization techniques/mechanism
- understand the stereochemistry and molecular weight determination methods of polymers
- familiarize the different polymer processing techniques

Course Outcomes

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

CLO Number	CO Statement	Knowledge Level
CLO1	recall the basic concepts and know the importance of stereochemistry, polymer additives, and specialty polymers	K1
CLO2	understand the classification and properties of polymers, polymer modification and recycling processes	K2
CLO3	identify the stereochemistry, mechanism and manufacturing methods of polymers along with its modification	K3
CLO4	analyze stereochemical aspects, characterisation methods and polymer processing techniques of polymers	K4

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	H	H	M	H	H
CLO2	H	H	M	H	H
CLO3	H	H	M	H	H
CLO4	H	H	M	H	H

H - High; M-Medium; L-Low

AOS-I POLYMER CHEMISTRY [CE21E01]

(58 Hrs)

UNIT-I

(12 Hrs)

Polymers

Introduction and Properties, Basic concepts - monomers, polymers, polymerization, degree of polymerization, classification of polymers. Characteristics of step and chain growth polymerizations.

Mechanisms of Polymerization

Free radical, anionic and cationic -mechanisms of addition polymerization. Copolymerization, derivation of copolymer equation -Conditions of formation of block, alternate & random copolymers. Methods of formation of block &graft copolymers.

UNITII

(11 Hrs)

Polymer Stereochemistry

Stereospecific polymers -Factors influencing stereo regulations, tacticity of polymers - Tactic forms of polymers of mono substituted & 1,2- disubstituted ethylenes, Zeigler-Natta catalysts. Monometallic and bimetallic mechanisms of Zeigler - Natta polymerization (only mechanism), crystalline and amorphous states, methods of determination of degree of crystallinity, glass transition temperature - Factors influencing T_g - Determination and importance of T_g .

UNIT-III

(12 Hrs)

Chemical Modification of Polymers

Chemical Modification of Polymers – aminolysis, hydrolysis, vulcanization, cyclisation, hydrogenation, epoxidation, sulphonation, grafting and crosslinking of polystyrene.

Polymer Technology

Polymer processing techniques, calendaring, film casting, extrusion, compression moulding, injection moulding, blow moulding and foaming.

Polymer Additives

Introduction to plastic additives – fillers, plasticizers, UV stabilizers & absorbers, antioxidants, flame retardants, colourants, shaping and finishing, curing agents and photostabilizers

UNIT-IV**(12 Hrs)****Polymer Characterization**

Molecular Weights-definition - Determination of molecular weights by End Group Assay, Ebullioscopy, Cryoscopy, Osmotic Pressure, Vapour Pressure, gel permeation chromatography. Thermal analysis (TGA, DTA, DSC of polymers), Light Scattering-Refractive Index increment, Ultracentrifuge and Viscosity methods.

UNIT-V**(11 Hrs)****Manufacture of Polymers**

Manufacture of typical polymers - Polyethylene, PVC, Polystyrene, Nylon, Polyester, Phenolic resins, Teflon.

Specialty Polymers

Conducting polymers - Introduction, conduction mechanism, application. Applications of Polymer colloids, microgels, biomedical polymers. Recycling of polymers - Steps involved in recycling - Advantages and disadvantages.

Text Books:

S.No	Authors	Title	Publishers	Year of Publication
1	Fred. W. Billmeyer	Text book of Polymer Science	Wiley Eastern Ltd	2009, Reprint 3 rd Edn
2	V.R. Gowariker, N.V. Viswanathan, Jayadev Sreedhar	Polymer Science	New Age International Ltd	2015, 2 nd Edn

Reference Books:

S.No	Authors	Title	Publishers	Year of Publication
1	Bahadur & N.V. Sastry	Principles of Polymer Science	Narosa Publishers	2007 5 th Edn
2	M.P. Stevens	Polymer Chemistry- An Introduction	Oxford Publications	2009 3 rd Edn
3	J.R. Fred	Polymer Science & Technology	Prentice Hall of India	2014 3 rd Edn

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

Course Designers:

1. Dr. S. JoneKirubavathy
2. Dr. P.Amutha

Question Paper Pattern
End Semester Examination: 100 Marks

SECTION	WORD LIMIT	MARKS	TOTAL
A - 5 x 2 Marks (No Choice)	One or Two Sentences	10	100
B -5 x 6 Marks (Internal Choice at same CLO Level)	300	30	
C – 5x 12Marks (Internal Choice at same CLO Level)	600-800	60	

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE21E02	AOS-II (OPTIONAL) – ANALYTICAL CHEMISTRY	THEORY	58	2	-	5

Preamble

To enable the students to

- gain knowledge about the basic principles of gravimetric, volumetric and thermal analysis
- analyse the industrial applications of atomic absorption spectroscopy
- acquire knowledge about electroanalytical techniques

Course Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	explain the theories of gravimetric and volumetric analyses	K1
CLO2	compare the principles of thermal methods of analyses and illustrate their applications	K2
CLO3	outline the principles and applications of flame photometry and polarimeter	K3
CLO4	elaborate the theories and industrial importance of atomic absorption spectroscopy, principles, applications and working of polarography, nephelometry and turbidimetry	K4

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	H	H	H	H	H	H
CLO2	H	H	H	H	M	H
CLO3	H	H	H	H	M	H
CLO4	H	H	H	H	M	H
CLO5	H	H	H	H	M	H

H - High; M-Medium; L-Low

AOS-II (OPTIONAL) - ANALYTICAL CHEMISTRY (CE21E02)

(58 Hrs)

UNIT I

(11Hrs)

Gravimetric and Volumetric Methods of Analysis

Theories of precipitation, purification of precipitates. Volumetric analysis – Preparation of solutions, theories of indicators, principles of acid-base, redox, complexometric & precipitation titrations.

UNIT II

(12Hrs)

Thermal Methods of Analysis

Introduction - TGA - Types, principle & method, instrumentation, factors affecting TGA, applications. Differential Thermogravimetric analysis (DT) - Principle and working, instrumentation, factors affecting DTA, applications – calcium oxalate monohydrate, calcium acetate monohydrate & copper sulphate pentahydrate. Thermometric titrations – Apparatus & applications

UNIT III

(12 Hrs)

Polarimetry & flame photometry

Polarization of light - Specific rotation, measurement of rotatory power, polarimeter, applications of polarimetry.

Flame photometry - Principle, flame temperature, metallic spectra in flames, instrumentation and applications.

UNIT IV

(11Hrs)

Atomic Absorption Spectroscopy

Principle, preparation of samples, measurement of atomic absorption, methods of calibration, instrumentation, sources, devices for the formation of an atomic vapour. Optical system-detectors and indicators in AAS-Read out devices. Types of Burners. Analytical applications-Biochemical analysis-pollution analysis. Interferences-cation & anion interferences.

UNIT V

(12Hrs)

Electroanalytical Methods

Polarography - Principles, dropping mercury electrode, advantages and disadvantages, instrumentation. Applications – qualitative & quantitative analysis.

Nephelometry & Turbidimetry - Introduction, working principles, instrumentation, factors affecting measurement & applications

Fluorimetry - Principle and applications

Text Books:

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1.	R. Gopalan, P. S Subramaniam & P. S Rangarajan	Elements of Analytical Chemistry	S. Chand & Co.	2013 Reprint 3 rd Edn
2.	B. K Sharma	Instrumental Methods of Analysis	Goel Publishing House	2011 27 th Edn
3.	H. Kaur	Instrumental Methods of Chemical Analysis	PragatiPrakashan	2012

Reference Books:

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1.	S. M. Khopkar	Fundamentals of Analytical Chemistry	New Age International (Pvt) Ltd.	2008 3 rd Edn.
2.	Mahindersingh	A Text Book of Analytical Chemistry – Instrumental Techniques	Dominant Publishers & Distributors (Pvt) Ltd.	2005

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

Course Designers:

1. Dr. S. Jone Kirubavathy

Question Paper Pattern
End Semester Examination: 100 Marks

SECTION	WORD LIMIT	MARKS	TOTAL
A - 5 x 2 Marks (No Choice)	One or Two Sentences	10	100
B - 5 x 6 Marks (Internal Choice at same CLO Level)	300	30	
C – 5x 12Marks (Internal Choice at same CLO Level)	600-800	60	

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE21SB02	Skill Based Subject Computational Chemistry II	THEORY	41	4	-	3

Preamble

Enable the students to

- understand the use of informatics in drug design and development
- recognize the mechanism of drug designing
- understand the concept of molecular modeling, mechanics and interactions

Course Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	understand the phases of drug design, features of molecular mechanics, energy concept, drug likeness and toxicity property of drugs.	K1
CLO2	recognize the mode of chemical interaction, new drug targets, coordinates system and potential energy surface, protein-ligand docking and hard/soft drugs	K2
CLO3	Identification of target and lead molecule, calculate the force field, molecular descriptors, drug likeness score	K3
CLO4	interpret the bonding and non-bonding interaction, “drug likeness” in chemical structure, analyze the properties of the chemical structure for drug activity	K4

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	H	H	H	H	M	H
CLO2	H	H	H	M	M	H
CLO3	H	H	H	M	M	H
CLO4	H	H	H	M	M	H

H - High; M-Medium; L-Low

Skill Based Subject
Computational Chemistry II (CE21SB02)

Credits: 3

(41 Hrs)

Unit I

(8 Hrs)

Introduction to Molecular Modeling: Molecular Modeling and pharmacoinformatics in Drug Design, Phases of Drug Discovery, Target identification and validation, lead identification and optimization, finding of new drug targets

Unit II

(8 Hrs)

Concepts in Molecular Modeling: Coordinate System; potential energy surfaces; molecular graphics; Quantum mechanics; Molecular Mechanics: Features of molecular mechanics, force fields;

Unit III

(8 Hrs)

Molecular Interaction Parameters: Bond structure and bending angles – electrostatic, van der Waals and non_bonded interactions, hydrogen bonding, Inter and intramolecular interactions: Weak interactions in drug molecules; hydrogen bonding in molecular mechanics; Energy concept and its importance in drug action.

Unit IV

(8 Hrs)

Virtual Screening: Introduction, “Drug likeness” and compound filters, Structure based virtual screening – protein-ligand docking, scoring function for protein-ligand docking

Unit V

(9 Hrs)

Properties of drugs: Concept of hard and soft drugs; Chemistry of ADME and toxicity properties of drugs. Lipinski rule, agonist and antagonist.

Textbooks

S.No	Authors	Title of the Book	Publishers	Year of Publication
1.	Dan E Krane & Michael L Raymer	Fundamental concepts of Bioinformatics	Pearson Education	2003, 1 st Edn
2	Rajarsha Guha & Andreas Bender	Computational Approaches in Cheminformatics & Bioinformatics	Wiley India Pvt Ltd	2012 1 st edition

Reference books

S.No	Authors	Title of the Book	Publishers	Year of Publication
1	Sundar Rajan S	Introduction to Bioinformatics	Himalaya Publishing House	2002, 1 st Edn

Pedagogy

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

Course Designers

3. Dr. G. Sathya Priyadarshini
4. Dr Sowmya Ramkumar

EVALUATION PATTERN

TEST I (THEORY/PRACTICAL) : 50 Marks

TEST II(THEORY/PRACTICAL): 50 Marks

TOTAL: 100 Marks

COURSE NUMBER	COURSENAME	CATEGORY	L	T	P	CREDIT
CE21AC1	ALC– I (OPTIONAL)- AGROINDUSTRIAL CHEMISTRY	THEORY	-		Self-study	5

Preamble

To enable the students to

- become familiar with water analysis and treatment
- acquire knowledge about the extraction of perfumes
- recognize the roles of fertilizers and pesticides
- understand the chemistry of sugar, oil, fats and waxes

Course Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	describe the importance of water treatment, manufacture of perfumes, fertilizers, sugars, oils, fats & waxes	K1
CLO2	outline the quality parameters (water) and manufacturing techniques, perfumes, fertilizers, sugars, oils, fats & waxes	K2
CLO3	Illustrate the commercially important properties of water, perfumes, fertilizers, sugars, oils, fats & waxes	K3
CLO4	analyze the chemistry of water, perfumes, fertilizers, sugars, oils, fats & waxes	K4

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	H	H	M	H	H
CLO2	H	H	M	H	H
CLO3	H	H	M	H	H
CLO4	H	H	M	H	H

- H - High; M-Medium;L-Low

ALC –I AGROINDUSTRIAL CHEMISTRY [CE21AC1]

UNIT I

Water Treatment & Analysis

Sources of water supply for agriculture. Hard & soft water. Water softening methods: lime soda process, phosphate conditioning, permutit and ion-exchange processes. Water analysis; determinations of hardness, acidity, alkalinity, pH value, amount of free carbon dioxide, fluoride content, chloride content & their estimations. Biological Oxygen Demand (BOD), chemical oxygen demand (COD), chlorine demand and their determinations. Impact of heavy metals (Pb, Cd & Hg) Treatment of industrial effluents (primary and secondary processes).

UNIT II

Synthetic Perfumes Introduction, ingredients of perfumes – vehicle, fixatives, odoriferous substance (definition, examples only). Manufacture of perfume – flowchart. Extraction with volatile solvent, prickling. Important essential oils (examples only).

Natural Perfumes - Production of natural perfumes, flower perfumes, fruit flavours.

UNIT III

Fertilizers

Effect of N, P, K, secondary nutrients & micro nutrients on plant growth / development. Importance of nitrogenous fertilizers. Nitrogen cycle and fixation of atmospheric nitrogen. Principle and manufacture of ammonium nitrate, ammonium sulphate, urea and nitrolim. Phosphate fertilizers. Preparation and uses of mono / diammonium phosphates, super phosphates, and triple super phosphates. Potassium fertilizers-potassium nitrate, potassium chloride, potassium sulphate. Mixed fertilizers. Methods of compost in green manuring, concentrated organic manures and their chemical composition. Oil cakes, horn and hoof meal.

Pesticides

Classification – Insecticides, fungicides & herbicides. General methods of preparation, application & toxicity. Insect attractants & repellants - Fluorine compounds, boron compounds, arsenic compounds, organomercuric compounds, DDT, BHC, Pyridine compounds.

UNIT IV

Chemistry of Sugar and Fermentation

Details of manufacture of sucrose from cane sugar-extraction of juice, purification, concentration, crystallization, separation & refining of crystals, recovery of sucrose from molasses. Manufacture of sucrose from beetroot. Estimation of sucrose & inversion of sugar by Polarimetry. Manufacture of alcohol from molasses & starch by fermentation process.

UNIT V

Oils, Fats and Waxes

Classification of oils, fats & waxes. Distinction between oils, fats & waxes. Essential oils - Isolation and its uses. Hydrogenation of oils - Principle & manufacture. Definition & determination of saponification value, acid value, iodine value, RM value and Hehner value & their significance. Elaiden test for oils. Some common waxes like spermaceti, bees wax, bayberry wax & their uses. Soap & its manufacture: toilet & transparent soaps. Cleansing action of soaps & detergents

Text Books:

S.No.	Authors	Title	Publishers	Year of Publication
1	B.K.Sharma	Industrial Chemistry	Goel Publishing House	2014 3 rd Edn.
2	M.C. Arora & M. Singh	Industrial Chemistry	Anmol Publications	2004 Reprint

Reference Book:

S.No.	Authors	Title	Publishers	Year of Publication
1	S.S.Dara	Textbook of Engineering Chemistry	S.Chand & Co.	2014 3 rd edition
2	P. C. Jain & M.Jain	Engineering Chemistry	Dhanpat Raj Publishing Company Pvt Ltd	2009 18 th Edn
3	B. Srilakshmi	Food Science	New Age International (Pvt) Ltd.	2015 6 th edition

Course Designer:

1. Dr. N. Anusuya

Question Paper Pattern

End Semester Examination:75 Marks

SECTION	MARKS	TOTAL
A-5/8X5=25Marks	25	75
B- 5/8X10=50 Marks	50	

COURSE NUMBER	COURSENAME	CATEGORY	L	T	P	CREDIT
CE21AC2	ALC-II (OPTIONAL) PHARMACEUTICAL CHEMISTRY	THEORY			Self-study	5

Preamble

Enable the students to

- Understand the basic concepts of chemistry and routes of drug administration
- Acquire knowledge about medicinally important compounds and cardiovascular drugs
- Know the role of synthetic drugs and organic pharmaceutical aids

Course Outcomes

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

CLO Number	CO Statement	Knowledge Level
CLO1	Identify the chemistry of drug molecules	K1
CLO2	classify illustrate the routes of drug administration	K2
CLO3	Illustrate the different types of synthetic drugs	K3
CLO4	Analyse the medical importance of compounds & explain the importance of organic compounds in pharmaceuticals	K4

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	H	H	H	M	M	M
CLO2	H	H	H	M	M	M
CLO3	H	H	H	M	M	M
CLO4	H	H	H	M	M	M
CLO5	H	H	H	M	M	M

H-High; M-Medium; L-Low

ALC-II(OPTIONAL) - PHARMACEUTICAL CHEMISTRY[CE21AC2] (Self study)

UNIT I

Basic Concepts of Drugs

Definition- drug, pharmacology, pharmacognosy, pharmacy, therapeutics, toxicology, chemotherapy, pharmacopeia (BP, IP, USP), national formulary, pharmacophore, bacteria, virus, vaccines, toxoids, primary immunization, additive effect, synergism, antagonism, placebo, LD₅₀, ED₅₀ and therapeutic index. Sources, routes, biotransformation, prolongation & excretion of drugs, drug toxicity.

UNIT II

Synthetic Drugs-I

Analgesics - Definition -Different types of pain (superficial, deep non visceral, visceral, referred & psychogenetic),classification-Morphine & its derivatives. Synthetic assay & uses of Pethidine and Methadone

Antipyretic Analgesics - Salicylic acid derivatives - Paracetamol, phenacetin - Propanoic acid derivative - Ibuprofen.

Antibiotics - Definition, microbial synthesis structure, assay & uses of Chloramphenicol & Penicillin. Structure & uses of Streptomycin and Tetracyclines.

Sulphonamides - Definition, mechanism of action, classification, SAR, synthesis & uses of Sulphacetamide, Sulphathiazole, Phthalylsulphathiazole - Sulphadiazine and Sulpha pyridine - assay.

UNIT III

Synthetic Drugs – II

Antiseptics and Disinfectants - Definition and disinfection – phenol coefficient – examples – phenolic compounds, dyes, cationic surfactants & chloro compounds. Tranquilizers-definition & examples. Psychedelic drugs- LSD and marijuana.

Anaesthetics - Definition – classification - volatile anaesthetics (nitrous oxide, ethers, halo hydrocarbons, chloroform, haloethane)- Ferguson principle-intravenous anaesthetics-

structure of thiopental sodium – local anaesthetic cocaine - source & structure-preparation & uses of procaine orthocaine and benzocaine.

Cancer and Antineoplastic Drugs - Antimetabolite, natural substances, hormones, alkylating agents, inorganic complexes & other compounds - Definition of hypoglycemic drugs - types & cause for diabetic—examples (Sulphonylureas and biguanides).

UNIT IV

Medicinally Important Compounds

Al, P, As, Hg & Fe. Uses of $MgSO_4 \cdot 7H_2O$, milk of magnesia, magnesium trisilicate, aluminium hydroxide gel, dihydroxyaluminiumaminoacetate, aluminium acetate and aluminium mono stearate - paroxon -phosphorine, cyclophosphamide – tricyclophos - preparation & uses of thio tepa-sodium and copper cacodylates-preparation and uses of aromatic areseicals (carbosone, tryparsamide, acetarsonide, neoarsphenamine, oxophenarisine) $HgCl_2$ / HgI_2 & $Hg(CN)_2$ as disinfectants –importance of organic mercury compounds, structure & uses of thiomersal, netro mersalmer bromine & mersalylacids, ferrous gluconate, $FeSO_4$, scale preparation (ferric ammonium acetate) ferrous fumarate, ferrous succinate & ferrous chlorinate.

UNIT V

Organic Pharmaceutical Aids

Definition, agents for kidney function (aminohippuric acid) –liver function (sulphobrothalein sodium, rose Bengal), Corneal ulcer detection (Fluorescein sodium), Blood volume determinations (Evans blue) pituitary function (metyrapone), Ointment bases, preservatives – antioxidants - sequestrants, colouring, sweetening, flavouring, emulsifying and stabilizing agents.

AIDS

Causes of HIV, Propagation, Prevention & Treatment.

Cardiovascular Drugs

Blood-composition - grouping-Rh factor-buffers in blood-Functions of plasma proteins-clotting mechanism-blood pressure. Definition & names of following drugs - Coagulants and anticoagulants- Cardiotonic drugs, Antiarrhythmic drugs, Antihypertensive drugs, Antianginal agents, Vasodilators, Lipids lowering agents, Sclerosingagents.

TextBooks:

S.No.	Authors	Title	Publishers	YearofPublication
1	R.S Satoskar & S.D.Bhandarkar	Pharmacology and Pharmatherapeutics, Vol 1 &2	Popular Prakashan	2009 21 th Edn.
2	Ashutosh Kar	Medicinal Chemistry	NewAge International	2005 3 rd Edn.

ReferenceBooks:

S.No	Authors	Title	Publishers	Year of Publication
1	G.Patrick	Medicinal Chemistry	Viva Books(Pvt) Ltd.	2002, 1 st Edn.
2	D. Sriram, P.Yogeeswari	Medicinal Chemistry	Pearson Education	2010, 2 nd Edn
3	JayashreeGhosh	A Text Book of Pharmaceutical Chemistry	S. Chand & Co.	2012Revised

Course Designers: Dr.G.Subashini

End SemesterExamination:75 Marks

Question paper Pattern

SECTION	MARKS	TOTAL
A-5/8X5=25Marks	25	75
B- 5/8X10=50 Marks	50	

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE21CP3	CHEMISTRY PRACTICAL – III	Theory	-	-	150	5

Preamble

Enable the students to

- construct the phase diagram of two components systems
- understand the principle and carry out conductometric titrations
- estimate the given substance employing volumetric / gravimetric methods
- determine the rate constant of first order reaction
- analyze the water quality parameters

Course Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understanding the principles of gravimetric, conductivity, eutectic, CST and water quality parameters analyze the amount by titrimetric and gravimetric methods	K2
CLO2	Calculate the amount of inorganic compounds quantitatively by gravimetric method	K3
CLO3	Analyze the water quality parameters using volumetric method and purity of the prepared organic compounds	K4
CLO4	Determine the rate constant, CST, dissociation constant and eutectic composition of given samples	K4

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	H	H	M	H	H
CLO2	H	H	M	H	H
CLO3	H	H	M	H	H
CLO4	H	H	M	H	H

H- High; M-Medium; L-Low

SEMESTER V & VI
Chemistry Practical – III (CE21CP3)

(150 Hrs)

Physical Chemistry Experiments

1. Rate constant of methyl acetate – Acid Hydrolysis
2. Critical solution temperature of phenol – water system.
3. Effect of impurity on the CST of phenol – water system.
4. Determination of concentration of the given NaCl/Succinic acid from the study of CST – phenol – water system.
5. Phase diagram – simple eutectic system.

Conductivity Experiments

4. Determination of cell constant
5. Determination of λ_{∞} of a strong electrolyte using Debye Huckel Onsager equation.
6. Determination of dissociation constant of a weak acid.
7. Conductometric titration-Acid – Base

Preparation of the following Compounds:

- (i) p-bromoacetanilide (bromination)
- (ii) Salicylic acid from methyl salicylate (Hydrolysis)

Gravimetric Determination of the following using sintered glass crucible

1. Estimation of Barium as Barium sulphate.
2. Estimation of Calcium as Calcium oxalate monohydrate
3. Estimation of Nickel as Nickel DMG

Water Quality Parameter Analysis

1. Alkalinity
2. Hardness
3. Chloride
4. Dissolved Oxygen
5. TDS, TSS, TS and pH of the given water samples

Text Book

LAB MANUAL - Prepared by Faculty, Department of Chemistry, PSGRKCW

Reference Books

S.No.	Authors	Title	Publishers	Year of Publication
1.	J.A Findlay & Kitchener	Practical Physical Chemistry	Longmann Publication	1973 9 th Edn.
2.	V.Venkateswaran, R. Veeraswamy & A.R. Kulandaivelu	Basic Principles of Practical Chemistry	S.Chand & Co.	2012 Reprint 2 nd Edn.
3.	B. Vishwanathan, P.S. Raghavan	Practical Physical Chemistry	Viva Books	2014 Reprint
4.	A.I Vogel	A Text Book of Quantitative Inorganic Analysis	ELBS & Longmann, Green & Co. Ltd.	2011 9 th Edn.

Pedagogy: Demonstration and individual Hands on Practicals

Course Designers:

1. Dr. C. Nithya
2. Dr. P. Amutha

Project with Viva Voce (CE21PROJ)**Hours: 75****Credit: 5****CIA: 50 Marks****ESE: 50 Marks****Total: 100 Marks****Objectives**

Make the students to

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

Group Project and Viva Voce

Each faculty will be allotted 5 students. A specific problem will be assigned to the students. The topic/area of work will be finalized at the end of IV semester, allowing scope for the students to gather relevant literature during the vacation. The research work will be carried out in the chemistry laboratory. Viva Voce/presentation will be conducted by a panel comprising of HOD, internal examiners. A power point presentation by the student group will be evaluated on the basis of students' response to the questions.

Area 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

The above contents should not exceed 50 pages

Evaluation : Total - 100 Marks (Internal – 50 marks, External – 50 marks)**Internal Total - 50 marks**

I Review – Selection of the field of study, Topic & Literature Collection	- 15 marks
II Review – Research Design and Data Collection	- 15 marks
III Review – Analysis & Conclusion, Preparation of rough draft	- 20 marks

External Total – 50 marks**Project Evaluation****30 marks****Viva Voce****20 marks**