PSGR Krishnammal College for Women

DEPARTMENT OF CHEMISTRY

CHOICE BASED CREDIT SYSTEM &

OUTCOME BASED CURRICULAR FRAMEWORK

BACHELOR OF SCIENCE IN CHEMISTRY

2023-2026

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

PROGRAMME SPECIFIC OUTCOMES (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 : 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

PSGR Krishnammal College for Women

DEPARTMENT OF CHEMISTRY

CHOICE BASED CREDIT SYSTEM (CBCS) & LEARNING OUTCOME BASED CURRICULAR FRAMEWORK (LOCF)

SYLLABUS & SCHEME OF EXAMINATION

BACHELOR OF SCIENCE IN CHEMISTRY – 2023-2026 BATCH

SEM	Part	Course Code	Title of the Course		Instruction hours/week	Contact hours	Tutorial Hours	Duration of Examination	Examination Marks			Credits
									CA	ESE	TOTAL	
I	I	TAM2301/ HIN2301/ FRE2301	Language T/H/F Paper I	L	6	88	2	3	25	75	100	3
	II	ENG2301	English Paper-I	E	6	88	2	3	25	75	100	3
	IIIA	CE23C01	General Chemistry Paper -I	CC	6	88	2	3	25	75	100	5
	IIIA	CE23CP1	Chemistry Practical - I	CC	3	45	-	-	-	-	-	-
	IIIA	PS23A01/ TH23A01	Physics Paper - I Mathematical Statistics with R I	GE	4 7	58 103	2 2	3 3	20 25	55 75	75 100	4 5
	IIIA	PS23AP1	Physics Practical	GE	3	45	-	-	-	-	-	-
	IV	NME23B1/ NME23A1/ NME23WS/ NME23ES	Basic Tamil Paper -I / Advanced Tamil Paper-I / Women Studies*/ NEN-Introduction to Entrepreneurship*	AEC	2 2*	28 30*	2 -	- -	100 100	- -	100 100	2 2
II	I	TAM2302/ HIN2302/ FRE2302	Language T/H/F Paper - II	L	6	88	2	3	25	75	100	3
	II	ENG2302	English Paper-II	E	5	73	2	3	25	75	100	3
	IIIA	CE23C02	General Chemistry Paper - II	CC	6	88	2	3	25	75	100	5

	IIIA	CE23CP1	Chemistry Practical I	CC	3	45	-	3	25	75	100	4
	IIIA	PS23A02 TH23A02	Physics Paper - II Mathematical Statistics with R II	GE	5 8	73 118	2 2	3 3	20# 25	55# 75	75# 100	4 5
	IIIA	PS23AP1	Allied Physics Practical	GE	3	45	-	3	15*	35*	50*	2
	IV	NME23B2/ NME23A2	Basic Tamil Paper-II /Advanced Tamil**	AEC	-	-	-	-	100	-	100	-
	V	23PEPS1	Professional English (Science /Management/ Humanities/Commerce	AEC	-	25	5	-	100	-	100	2
	IIIB	NM21GAW	Foundation Course –1 (General Awareness) (Online)	AEC	SS	-	-	-	-	-	-	Gr.
III	I	TAM2303/ HIN2303/ FRE2303	Language III – Tamil Paper III/ Hindi Paper III/ French Paper III	L	6	88	2	3	25	75	100	3
	II	ENG2303	English Paper - III	E	5	73	2	3	25	75	100	3
	III	CE23C03	General Chemistry Paper III	CC	4	58	2	3	25	75	100	4
	III	CE23CP2	Chemistry Practical - II	CC	3	45	-	-	-	-	-	-
	III	TH23A09/ PL23A01/ AS23A01	Mathematics for Sciences I (or) Fundamentals of Botany - I / Invertebrata & Chordata	GE	7 4	103 58	2 2	3 3	25 20	75 55	100 75	5 4
	III	PL23AP1/ AS23AP1	Botany Practical / Zoology Practical	GE	3	45	-	-	-	-	-	-
III /IV	III	CS23SBGP/ CE23SCE1	GEN-AI / Environmental Chemistry and Chemical Biology	SEC	3	45	-	-	100	-	100	3
III	IV	NM23DTG	Design Thinking	AEC	2	30	-	-	100	-	100	2
	IV	NM22UHR	Universal Human values and Human Rights #	AECC	SS	-	-	-	100	-	100	Gr.
	IV	JOB1334	Job Oriented Course- Instrumental Methods of Chemical Analysis		After 12.30 pm 60 h	-	-	-	-	-	-	Gr.

IV	I	TAM2304/ HIN2304/ FRE2304	Tamil Paper IV / Hindi Paper IV / French Paper IV	L	6	88	2	3	25	75	100	3
	II	ENG2304	English Paper IV	E	5	73	2	3	25	75	100	3
	III	CE23C04	General Chemistry Paper – IV	CC	4	58	2	3	25	75	100	4
	III	CE23CP2	Chemistry Practical II	CC	3	45	-	3	25	75	100	5
	III	TH23A14/ PL23A02/ AS23A02	Mathematics for Sciences II/ Fundamentals of Botany II/ General Principles of Zoology	GE	7 5 5	103 73 73	2 2 2	3 3 3	25 20# 20#	75 55# 55#	100 75 75	5 4 4
	III	PL23AP1/ AS23AP1	Botany Practical/ Zoology Practical	GE	2 2	30 30	-	3 3	15* 15*	35* 35*	50 50	2
III /IV	III	CS23SBGP/ CE23SCE1	GEN-AI / Environmental Chemistry and Chemical Biology	SEC	3	45	-	-	100	-	100	3
IV	IV	NM23EI	Entrepreneurship and Innovation (Ignite X)	AECC	2	30	-	-	100	-	100	2
	IV	NM23EVS	Environmental Studies	AECC	SS	-	-	-	100	-	100	Gr.
	V	COCOACT	Co-Curricular Activity	GC	-	-	-	-	100	-	100	1
I-V	VI	COM15SER	Community Services 30 Hours	GC	-	-	-	-	-	-	-	-
I-V	VI	16BONL1 16BONL2	Online Course 1 Online Course 2	ACC	-	-	-	-	-	-	-	-

L - Language E - English
GE –Generic Elective
AEC – Ability Enhancement Courses
SEC - Skill Enhancement Courses
GC - General Courses

CC –Core Courses
ESE - End Semester Examination
AECC - Ability Enhancement Compulsory Courses
ACC - Additional Credit Courses
SS - Self Study

CA – Continuous Assessment

CA conducted for 25 and converted to 20, ESE conducted for 75 and converted to 55
* CA conducted for 25 and converted to 15, ESE conducted for 75 and converted to 35

PSGR
Krishnammal College for Women

BACHELOR OF SCIENCE IN CHEMISTRY
CHOICE BASED CREDIT SYSTEM (CBCS) &
LEARNING OUTCOMES-BASED CURRICULAM FRAMEWORK (LOCF)
SYLLABUS & SCHEME OF EXAMINATION
2023-2026 BATCH, SEMESTER V

Sem	Part	Course Code	Title of the Course	Course Type	Instruction hours/week	Contact hours	Tutorial Hours	Duration of Examination	Examination Marks			Credits
									CA	ESE	TOTAL	
V	III	CE23C05	Inorganic Chemistry	CC	4	58	2	3	25	75	100	4
	III	CE23C06	Organic Chemistry	CC	4	58	2	3	25	75	100	4
	III	CE23C07	Physical Chemistry	CC	4	58	2	3	25	75	100	4
	III	CE23E01/ CE23E02	Polymer Chemistry / Analytical Chemistry	DSE	4	58	2	3	25	75	100	4
	III	CE23SB01	Computational Chemistry	SEC	3	41	4	-	100	-	100	3
	III	CE21AC1/ CE21AC2	Agro Industrial Chemistry / Pharmaceutical Chemistry	ACC	SS	-	-	3	25	75	100	5#
	III	CE23CP3	Chemistry Practical -III	CC	5	75	-	-	-	-	-	-
	III	CE23PROJ	Project and Viva-voce	DSE	4	-	-	-	25	75	100	5
	IV	NM21CS1	Cyber Security I	AECC	2	30	-	-	100	-	100	Gr.
	IV	CE23INST	Field work/ Institutional Training	DSE	-	-	-	-	100	-	100	2
	VI	CE23COM	Comprehensive Examination	GC	-	-	-	-	100	-	100	Gr.
I-IV	VI	COM15SER	Community Services 30 Hours	GC	-	-	-	-	-	-	-	-
I-V	VI	16BONL1 16BONL2	Online Course Online Course	ACC	-	-	-	-	-	-	-	-

CC – Core Courses
CA – Continuous Assessment
AECC – Ability Enhancement Compulsory Courses
ESE–End Semester Examination
GC - General Courses
SEC – Skill Enhancement Courses
DSE – Discipline Specific Elective
ACC - Additional Credit Courses

[#] Credits applicable to candidates who take up Advanced Level Course examination

Examination System

Pattern:

Semester system will be followed. A semester consists of a minimum of 90 working days excluding the days of conduct of ESE. There will be Continuous Internal Assessment (CA) to evaluate the performance of students in each course and the End Semester Examination will be held at the end of every semester.

Weightage assigned to various components of Continuous Internal Assessment

Theory

CIA Test	: 5 marks **(conducted for 45 marks after 50 days)**
Model Exam	: 7 marks **(Conducted for 75 marks after 85 days)**
Seminar/Assignment/Quiz	: 5 marks
Class Participation	: 5 marks
Attendance	: 3 marks
Total	**: 25 Marks**

Practical

Lab Performance	: 7 marks
Regularity	: 5 marks
Model Exam	: 10 marks
Attendance	: 3 marks
Total	**: 25 marks**

Question Paper Pattern and distribution of marks

Language and English

Section A 5 x 1 (No choice)	: 5 Marks
Section B 4 x 5 (4 out of 6)	: 20 Marks (250 words)
Section C 2 x 10 (2 out of 3)	: 20 Marks (500 words)
Total	**: 45 Marks**

Core and Elective (first 3 units)

CA Question Paper Pattern: 3 x 15 = 45 Marks

CA Question from each unit comprising of

One question with a weightage of 2 Marks :2 x 3 = 6

One question with a weightage of 5 Marks (Internal Choice at the same CLO level):5 x 3 =15

One question with a weightage of 8 Marks (Internal Choice at the same CLO level):8 x 3 =24

Skill Based Subject Theory Courses

Test I	: 30 Marks (conducted for 50 Marks and converted to 30 Marks)
Test II	: 50 Marks

Assignment	: 10 Marks
Seminar	: 10 Marks
TOTAL	**: 100 Marks**

Students securing very low marks in internal assessment, only ESE marks will be considered as passing criteria from the third attempt and onwards

ALC

Section A (Paragraph answer) (4 out of 6) 4 x 4	: 16 Marks
Section B (Essay type) 1 out of 2	: 9 Marks
Total	**: 25 Marks**

Advanced Tamil / Basic Tamil

CIA Test	: 25 marks **(conducted for 50 marks after 50 days)**
Model Exam	: 50 marks **(Conducted for 75 marks after 85 days)**
Quiz	: 15 marks
Assignment	: 10 marks
Total	**: 100 Marks**

Introduction to Entrepreneurship

Quiz	: 50 marks
Assignment	: 25 marks
Project / Case Study	: 25 marks
Total	**: 100 Marks**

Professional English

Quiz (5 x 20 Marks)	: 100 Marks

General Awareness

GAW Test I (Quiz)	: 100 Marks
GAW Test II (Quiz)	: 100 Marks
GAW Test III (Quiz)	: 100 Marks

Average of all the three marks will be taken as the marks secured by the candidate for the subject. Passing minimum 40 %

Gen-AI

Quiz	: 50 Marks (5 quizzes with each 10 marks)
Case study	: 25 Marks
Online Exam	: 25 Marks (Departments to plan and conduct the exam)
Total	**: 100 Marks**

Design Thinking

Quiz	: 50 marks
Assignment	: 25 marks

Project / Case Study	: 25 marks
Total	**: 100 Marks**

Environmental studies

Assignment	: 25 marks
Project / Case study	: 25 marks
Quiz	: 50 marks
Total	**: 100 Marks**

Universal Human values and Human Rights

Quiz	: 50 marks
Assignment	: 25 marks
Project/ Case study	: 25 marks
Total	**: 100 marks**

Entrepreneurship and Innovation (Ignite X)

Quiz	: 50 marks
Assignment	: 30 marks
Project/ Case study	: 20 marks
Total	**: 100 marks**

Cyber Security I

Quiz	: 60 Marks
Case Study	: 20 Marks
Poster	: 20 Marks
TOTAL	**: 100 Marks**

Field Work / Institutional Training

Attendance	: 10 Marks
Work diary	: 15 Marks
Report	: 50 Marks
Viva Voce	: 25 Marks
Total	**: 100 Marks**

Project and Viva Voce

Internal	: 25 marks
Review I	: 5 marks
Review II	: 10 marks
Review II	: 10 marks
External	: 75 marks
TOTAL	**: 100 Marks**

End Semester Examination

Core and Elective

ESE Question Paper Pattern: 5 x 15 = 75 Marks

Question from each unit comprising of

One question with a weightage of 2 Marks : 2 x 5=10

One question with a weightage of 5 Marks (Internal Choice at the same CLO level): 5 x 5 =25

One question with a weightage of 8 Marks (Internal Choice at the same CLO level): 8 x 5 =40

ALC

Section A : 5 questions out of 8 - open choice 5x5 : 25 marks
Section B : 5 questions out of 8-open choice 5x10 : 50 marks
Total **: 75 marks**

Criteria for Attendance:

3 Marks
(Attendance 75% - 80% - 1 Mark, 81% - 90% - 2 Marks, 91% - 100% - 3 Marks)

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE23C01	GENERAL CHEMISTRY PAPER - I	THEORY	88	2	-	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
- understand the principles of thermodynamics and thermochemistry
- explore Industry 4.0through physical-to-digital-to-physical connection which potentially transform the chemical industry

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	understand the basics of quantum mechanics, bonding, reactive intermediates, thermodynamics and Industry 4.0	K1
CLO2	discuss the atomic structure, types of bonding, electronic effects on reactivity, stability of aromatic compounds and state / path function using thermodynamics	K2
CLO3	examine the periodic properties, strength of bonding, and apply the principles in identifying reaction mechanism. Apply laws of thermodynamics and learn the physical processes involved.Practice to understand the concepts of Industry 4.0	K3
CLO4	Analyze and perform calculations on periodic properties, Aromaticity, bonding theories, thermodynamic and thermochemistry principles.	K4

Mapping with Programme Learning Outcomes

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

S -Strong; M-Medium;

GENERAL CHEMISTRY PAPER – I (CE23C01) (88 Hrs)

Unit I **(18 hrs)**

Atomic Structure

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,dorbitals.Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Quantum numbers - Electronic configuration of elements, effective nuclear charge.

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 **(18 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, CIF_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-Lande 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 Loondon 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 **(17hrs)**

Fundamental aspects of Organic reaction mechanisms

Nucleophiles and electrophiles, Reactive Intermediates: Carbocations, Carbanionsandfree radicals-Formation, structure and stability. Inductive Effect, Electromeric Effect, Resonanceand 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 andaniline and stability of alkenes based on hyper conjugation.

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

Unit V **(18hrs)**

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- Applications of Artificial Intelligence in chemistry for predicting the properties of molecular structure – Chem sketch, Chem Draw, MOPAC, Avagadro.

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	Pragathi Prakahasan	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
5	P. Kaliraj, T. Devi,	Higher Education for Industry 4.0 and Transformation to Education 5.0		

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
4	Alasdair Gilchrist.	Industry 4.0: The Industrial Internet of Things, Apress Publications		

Related Online References:

1. Introduction to Industry 4.0 and Industrial Internet of Things by Prof. Sudip Mishra, IIT Kharagpur.
2. A Complete Guide to Industry 4.0-Udemy

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

SECTION	WORD LIMIT	MARKS	TOTAL
A - 5 x 2 Marks (No Choice)	One or Two Sentences	10	75
B -5 x 5 Marks (Internal Choice at same CLO Level)	300	25	
C – 5x 8 Marks (Internal Choice at same CLO Level)	600-800	40	

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE23A01	IDC - CHEMISTRY FOR BIOLOGISTS– I (Offered to B.Sc Botany/Zoology)	THEORY	58	2	-	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 amino acids and proteins
- familiarize the applications of solar energy and water treatment techniques

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	recallthe types of bonding , organic reagents, aminoacids and define the termsinvolved in analytical /environmental chemistry	K1
CLO2	Understand the concept of hybridization, classify aromatic/ non-aromatic compounds, aminoacids/proteins and demonstrate the preparation of standard solutions.	K2
CLO3	Interpret the structure & stereo isomerism of organic compounds and illustrate the importance of chromatographic techniques/renewable sources and water treatment technologies	K3
CLO4	Appraise the theories of bonding, conformational analysis and experiment the role of analytical techniques and softening processin various applications	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	S	S	S
CLO3	S	S	S	S	S
CLO4	S	S	S	S	S

S - Strong; M-Medium

IDC – CHEMISTRY FOR BIOLOGISTS - I (CE23A01) (58 hrs)
(Offered to B.Sc Botany / Zoology)

UNIT I (12 hrs)

Bonding

Types of bonding - Covalent bond - nature, structure and hybridization of CH_4, C_2H_4, $C_2H_2$and C_6H_6molecule.Ionic bond - Nature of ionic bond, structure of NaCl and CsCl.

Hydrogen bonding - inter and intra molecular, nature and its effect on its structure and its consequences.

Shapes and hybridization of $BeCl_2$, H_2O, NH_3 and PCl_5based on VSEPR theory.

UNIT II (12 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 and n-butane .

UNIT III (11 hrs)

Analytical Chemistry

Role and importance of analytical chemistry -principleof volumetric analysis - calibration of glasswares, standardization - experimental requirements -concentration units (normality and molarity) –types and preparation of standard solutions (primary and secondarystandards). 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 by 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 structures, 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.	Dr. V. Veeraiyan	Textbook of Allied Chemistry	High mount Publishing house, triplicane, Chennai.	Reprint 2006
2.	R. Gopalan. P.S. Subramanian and K. Rengarajan	Elements of Analytical Chemistry	Sultan Chand & Sons, Educational Publishers, New Delhi	Reprint 2013
3.	ArunBahl B. S. Bahl	Advanced Organic Chemistry	S. Chand Sons Company Pvt Ltd,	Reprint 2009
4.	P.C Jain & Monika Jain	Engineering chemistry	DhanpatRai Publishing Co Pvt Ltd.	Reprint 2003

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

SECTION	WORD LIMIT	MARKS	TOTAL
A - 5 x 2 Marks (No Choice)	One or Two Sentences	10	75
B -5 x 5 Marks (Internal Choice at same CLO Level)	300	25	
C – 5x 8 Marks (Internal Choice at same CLO Level)	600-800	40	

COURSE CODE	Course NAME	Category	L	T	P	Credit
CE23A03	IDC – ALLIED CHEMISTRY PAPER –I (offered to B.Sc Physics)	Theory	58	2	-	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

CLO Number	CLO Statement	Knowledge Level
CLO1	recollect the types of bonding, classify organic reactions, types and examples of solutions, the terminologies in thermodynamics, and the basics on the rate of a chemical reaction	K1
CLO2	relate the electronic factors that influence organic reactions, the types of chemical bonding with its effect on structure and property, law of thermodynamics on systems, theories of chemical kinetics & photo chemistry, elements of symmetry in crystal lattice	K2
CLO3	apply the concept of hybridization to organic molecules, theories of bonding in predicting the structure of a molecule, laws of thermodynamics to analyze the feasibility of reactions, concept of energy of activation on reaction rate, laws in explain the ideal behavior of solutions	K3
CLO4	analyze the nature of the organic molecule based on its hybridization, electronic effect, predict the conducting behavior of materials, calculate the enthalphy, bond energy, entropy of a system, construct the phase diagram of simple eutectic system and analyze the typical crystal lattices	K4

Mapping with Programme Learning Outcomes

CLOs	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	M	S	S	M	M	M
CLO2	M	S	S	M	M	M
CLO3	M	S	S	M	M	M
CLO4	M	S	S	M	M	M

S-Strong; M-Medium

IDC – Allied Chemistry Paper –I CE23A03 (58 Hrs)

(For B.Sc Physics)

UNIT I (12 Hrs)

Basics of Organic Chemistry

Classification of organic compound- types of reagents- electrophiles, nucleophiles and free radicals, Classification of reactions - addition, substitution, elimination, condensation, polymerisationandrearrangements, polar effects, inductive effect, resonance, 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 (12 Hrs)

Chemical Bonding

Ionic bond- nature of ionic bond, structure of NaCl, KCl and CsCl, factors influencing the formation of ionic bond. Covalent bond-nature of covalent bond, structure and shapes of $BeCl_2$, BF_3, CH_4, PCl_5, NH_3, H_2O, IF_7 based on VSEPR theory and hybridization. Hydrogen bonding - inter and intra molecular, nature and its effect on structure and properties. 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 of I law, need for II law - different statements of II law - carnot cycle - efficiency - carnot theorem - thermodynamic scale of temperature –Joule-Thomson effect- enthalphy - bond energy – definitions of entropy and free energy.

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 and Arrhenius equation, effect of temperature on reaction rate.

Catalysis- homogeneous and heterogeneous catalysis, theories of catalytic activity, catalyst 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 obeyingRaoult'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 2013
3.	SatyaPrakash, G.D. Tuli, S.K. Basu, R.D. Madan	Advanced Inorganic Chemistry – Vol. I	S.Chand& Co. Ltd.	Reprint 2012

Pedagogy

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

Course Designers:

1. Dr.Sowmya Ramkumar
2. Dr.S.Charulatha

Question Paper Pattern
End Semester Examination

SECTION	WORD LIMIT	MARKS	TOTAL
A - 5 x 2 Marks (No Choice)	One or Two Sentences	10	75
B -5 x 5 Marks (Internal Choice at same CLO Level)	300	25	
C – 5x 8 Marks (Internal Choice at same CLO Level)	600-800	40	

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE23CP1	CHEMISTRY PRACTICAL - I	THEORY	-	-	90	4

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

CLO Number	CLO Statement	Knowledge Level
CLO1	identify, separate the cations into groups and report the acid and basic radicals	K1, K2
CLO2	estimate the percentage amount of chlorine, carbonates, Mg, Na in bleaching powder, hard water, detergent	K4
CLO3	estimate the percentage amount of chlorine, carbonates, Mg, Na in bleaching powder, hard water, detergent	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	S	S	S
CLO3	S	S	S	S	S

S- Strong, M-Medium

Chemistry Practical – I (CE21CP1) (90 Hrs)

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-}, $C_2O_4^{2-}$, 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+}

2. GROUP EXPERIMENTS:

(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 3rdEdn., 1974
2	Jain P. C and Jain M	Engineering Chemistry	DhanpatRai and Sons	16th edition, 2013
3	Vogel A. I	Text Book of Practical Organic Chemistry	Prentice Hall	2011, 5th 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 CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE23AP1	**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 Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	define the various terms in volumetric analysis	K1
CLO2	perform the volumetric analysis and estimate the quantity present.	K2, K3
CLO3	identify and analyse organic compounds	K3

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	S	S	S
CLO3	S	S	S	S	S

S- Strong M-Medium

IDC –CHEMISTRY PRACTICAL FOR BIOLOGISTS (CE23AP1) (90hrs)
(offered to B.Sc Botany /Zoology)

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 Mohrs'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	3rd Edn.,2011
2	A.I. Vogel	A text book of quantitative inorganic analysis	Longman publishers	12thEdn., 2011

Pedagogy

Demonstration and individual hands on practical.

Course Designers:

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

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE23AP2	**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 Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	define the various terms in volumetric analysis	K1
CLO2	perform the volumetric analysis and estimate the quantity present.	K2, K3
CLO3	Calculate the hardness of water samples	K4
CLO4	recall the various terms in conductometric and potentiometric experiments	K1

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	S	S	S
CLO3	S	S	S	S	S
CLO4	S	S	S	S	S

S- Strong M-Medium

IDC – ALLIED CHEMISTRY PRACTICAL (CE23AP2) **(90hrs)**

(offered for B.Sc Physics)

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 Mohrs's salt solution.
vi. Estimation of potassium permanganate using standard oxalic acid.
vii. Estimation of hardness of water (temporary and permanent).

2. Conductivity Experiments

i. Determination of cell constant
ii. Determination of dissociation constant of a weak acid.
iii. Conductometric titration: Acid – base

3. Potentiometric Titration

i. Acid - base
ii. 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 2nd Edn.
2	B. Vishwanathan, P.S. Raghavan	Practical Physical Chemistry	Viva Books	2014 Reprint

Pedagogy

Demonstration and individual hands on Practicals

Course Designers

1. Dr.Sowmya Ramkumar
2. Dr.S.Charulatha

FOUNDATION COURSE (NME23ES)

INTRODUCTION TO ENTREPRENEURSHIP

CREDITS: 2

TOTAL HOURS: 30 **LECTURE HOURS: 30**

Unit 1:(5 hrs)

Nature of Entrepreneurship: **(3 hrs)**

Meaning –Need for Entrepreneurship –Qualities of Successful Entrepreneurs - Myths of Entrepreneurship

Activity: Assignment, Discussion **(2 hrs)**

Unit 2: (6 hrs)

Role of Entrepreneurs **(4 hrs)**

Significance of Entrepreneurship to the nation –Environmental Factors influencing Entrepreneurship – Entrepreneurial Process andFunctions- Challenges faced by Entrepreneurs

Activity: Quiz / Role Play **(2 hrs)**

Unit 3: (6 hrs)

Formulation of Business Idea: **(4 hrs)**

Business Idea Generation - Entrepreneurial Imagination and Creativity – Role of Innovation – Opportunity Evaluation

Activity: Business Idea Pitch **(2 hrs)**

Unit 4: (6 hrs)

Business Planning: **(4 hrs)**

Need for Market Study – Securing Finance from various Sources - Significance of Business plan – Components of Business plan

Activity: Schemes available for Entrepreneurs **(2 hrs)**

Unit 5: (7 hrs)

Project:

Interface with Successful Entrepreneurs – 4 hrs

Business Plan Presentation – 3 hrs

Reference Books

1. D.F. Kuratko and T.V. Rao, *Entrepreneurship - South Asian Perspective*, 2016, Cengage Learning India Pvt. Ltd. Delhi.
2. Arya Kumar, *Entrepreneurship: Creating and Leading an Entrepreneurial Organization*, 2012, Pearson Education India

Evaluation Pattern

INTERNAL COMPONENT

Quiz	50
Assignment	25
Project/Case Study	25
TOTAL	**100**

COURSE NUMBER	COURSE NAME	Category	L	T	P	Credit	Category
CE23C02	GENERAL CHEMISTRY PAPER - II	Theory	88	2	-	5	Theory

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 2^{nd} law of thermodynamics

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	understand the basics of s & p-block elements, isomerism of organic compounds, halides , colloids and thermodynamics	K1
CLO2	infer the general trends of s & p-block elements, stereochemistry of organic compounds, mechanism of organic reactions and explain the significance of colloids/thermodynamics	K2
CLO3	Examine the uses of s & p-block compounds, various types of stereoisomerism, reactivity of alkyl/aryl halides, types of colloids and conditions of equilibrium and spontaneity	K3
CLO4	Analyze the properties of s & p-block elements, the configuration and conformations of organic compounds, halides, colloids and thermodynamic functions	K4

Mapping with Programme Learning Outcomes

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

S-Strong; M-Medium;

GENERAL CHEMISTRY PAPER – II CE23C02 (88 Hrs)

Unit I **(18hrs)**

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 (Li with Mg & BE with Al), salient features 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 (salt-like carbides, covalent carbides & interstitial carbides) and halides group 13 to 16. Hydrides of boron – diboranes (preparation and properties) and its structure.Basic properties of halogens, interhalogens (Type XY, XY_3, XY_5 & XY_7) and poly halides.

Concepts of virtual lab: flame test for s,p elements

Unit –II **(18 hrs)**

Stereochemistry of organic compounds

Concepts of isomerism, types of isomerism. Optical isomerism – elements of symmetry, molecular chirality, enantiomers, stereogeniccentre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogeniccentres, properties of diastereomers, threo and erythrodiastereomers, meso compounds, resolution of enantiomers, inversion, retension and racemization. Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature.Geometric isomerism – determination of configuration of geometric isomers (dipole moment, boiling & melting points, formation of cyclic compounds). E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds.Conformational isomerism – conformational analysis of ethane and n-butane: conformations of cyclohexane derivatives (Factors affecting the stability of conformations). Newman projection and Sawhorse formulae, Fischer and flying wedge formulae. Difference between configuration and conformation.

Unit–III **(18 Hrs)**

Alkyl and Aryl Halides

Alkyl Halides – Types of Nucleophilic Substitution (SN^1, SN^2 and SN^i) reactions (mechanism & factors affecting the reactions).Preparation: from alkenes and alcohols.Reactions:hydrolysis,

nitrite & nitro formation, nitrile &isonitrile formation. Williamson's ether synthesis: Elimination vs substitution.

Aryl Halides –Preparation:(Chloro, bromo and iodo-benzene) from phenol, Sandmeyer&Gattermannreactions. Reactions (Chlorobenzene): Aromatic nucleophilic substitution (replacement by –OH group) and effect of nitro substituent. Benzyne Mechanism: KNH_2/NH_3 (or $NaNH_2/NH_3$).Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides.

UNIT IV **(17 hrs)**

Colloidal State

Definition of colloids, Classification of Colloids (on the basis of physical state of dispersed phase and dispersion medium, appearance & solvent affinity), 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 (of thermotropic liquid crystals), structure of nematic and Cholestricphases. Thermography and seven segment cell.

UNIT V **(17 hrs)**

Thermodynamics –II

Second law of thermodynamics – Need for second law, different statements, entropy-definition, physical significance (measure of the disorder of the system & measure of probability), entropy of an ideal gas, entropy changes in isothermal transformation, entropy changes in reversible and irreversible processes. Trouton'srule.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	P. L. Soni	Text Book of inorganic Chemistry	Sultan Chand and Sons	2013
3	B. R. Puri, L. R. Sharma, M. S. Patania	Principles of Physical Chemistry	Vishal Publishing & Co	2017
4	D. Nasipuri	Stereochemistry of Organic Compounds	New Age International Ltd	2004

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	Jagdamba Singh, L. D. S. Yadhav	Advanced Organic Chemistry	PragathiPrakahasan	2013
3	J.D Lee	Concise Inorganic Chemistry	English Language Book Society	2008
4	James E Huheey	Inorganic Chemistry	Pearson India Education Services	2015
5	R. T. Morrison and R. N. Boyd	Organic Chemistry	Pearson India Education Services	2010
6	K. S. Tewari, N. K. Vishnoi	A Textbook of Organic Chemistry	Vikas Publishing House	2017
7	P. S. Kalsi	Stereochemistry	New Age International	2000
8	B. R. Puri, L. R. Sharma, K. K. Kalia	Principles of Inorganic Chemistry	Milestone Publishers and Distributors	2011
9	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

SECTION	WORD LIMIT	MARKS	TOTAL
A - 5 x 2 Marks (No Choice)	One or Two Sentences	10	75
B -5 x 5 Marks (Internal Choice at same CLO Level)	300	25	
C – 5x 8 Marks (Internal Choice at same CLO Level)	600-800	40	

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE23A02	IDC – CHEMISTRY FOR BIOLOGISTS - II (Offered to B.Sc Botany/Zoology)	THEORY	73	2	-	4

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 Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	recall thenomenclature of coordination compounds, types of fuel gases, polymers, synthetic drugs, dyes, catalysis and buffer	K1
CLO2	compare various theories to explain the formation of coordination compounds, uses of different fuels, polymers and drugs. Recognize the theories of kinetics and significance of pH / buffer	K2
CLO3	examinethe applications of chelating compounds, polymers, dyes and catalytic enzymes. Calculate the degree of hydrolysis using various methods	K3
CLO4	Appraise the importance of inorganic metal, inorganic polymers, pH and buffer in the living system. Categorize polymer, drugs based on mode of action and analyze the mechanism of catalytic action	K4

Mapping with Programme Learning Outcomes

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

S- Strong; M-Medium

IDC – CHEMISTRY FOR BIOLOGISTS - II (CE23A02) (73 hrs)
(Offered to B.Sc Botany/Zoology)

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 (15 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 potassiumnitrate. Pesticides - classification with examples.

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

Unit III (15hrs)

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 (14hrs)

Chemical Kinetics and Catalysis

Chemical Kinetics - Definition - order and molecularity - rate of reaction–expression forfirst,

second and third order reactions(derivation not required only equation).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 **(14hrs)**

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 vsstrong base, strong acid vsweak 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 distributionlaw.

Text Books:

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1.	Dr. V.Veeraiyan	Text book of Allied Chemistry	2nd Edn, High mount Publishing house, triplicane, Chennai.	Reprint 2005
2.	B.S.Bahl, ArunBahl and G.D.Tuli	Essentials of Physical Chemistry	S Chand & Company Ltd, New Delhi.	Reprint 2000
3.	B.K.Sharma	Industrial Chemistry	GOEL Publishing House	Reprint 2000

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

SECTION	WORD LIMIT	MARKS	TOTAL
A - 5 x 2 Marks (No Choice)	One or Two Sentences	10	75
B -5 x 5 Marks (Internal Choice at same CLO Level)	300	25	
C – 5x 8 Marks (Internal Choice at same CLO Level)	600-800	40	

COURSE CODE	COURSE NAME	Category	L	T	P	Credit
CE23A04	IDC – ALLIED CHEMISTRY PAPER –II (For B.Sc Physics)	Theory	73	2	-	4

Preamble

To enable the students to

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

Course Outcomes

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

CLO Number	CO Statement	Knowledge Level
CLO1	recall the fundamental subatomic particles, criteria for aromaticity, terms in electrochemistry, mole concept, chemistry of fuels, polymers	**K1**
CLO2	relate the stability of a nucleus, property of different structural and stereo isomers, theories of electrochemistry on conductance measurements, importance of pH and buffers in the living systems, ions responsible for temporary and permanent hardness of water	**K2**
CLO3	apply the laws of nuclear chemistry in calculating nuclear binding energy, element of symmetry for predicting the isomers, principles of chromatographic techniques, relate the structure of polymers on its application	**K3**
CLO4	analyse the modes of radioactive decay, conformational analysis of cyclic and acyclic systems, to solve problems related to conductance, categorize the solution based on its pH,techniques for softening of hard water	**K4**

Mapping with Programme Learning Outcomes

CLOs	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	M	S	S	M	M	M
CLO2	M	S	S	M	M	M
CLO3	M	S	S	M	M	M
CLO4	M	S	S	M	M	M

S-Strong; M-Medium

IDC – Allied Chemistry Paper –II (For B.Sc Physics) CE23A04 (73Hrs)

UNIT I (14 Hrs)

Nuclear Chemistry

Fundamental particles of nucleus, isobars, isotones and isomers, differences between chemical reactions and nuclear reaction, fusion and fission, mass defect, derivation of 1amu = 931 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 alkylationand 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-enoltautomerism, conformational analysis of ethane, n-butane and cyclohexane.

UNIT III (15 Hrs)

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 - determination of degree of dissociation of weak electrolytes, conductometric titrations.

Faraday's law of electrolysis, Galvanic cells:EMF and its origin, standard electrode potentials, electrochemical series and its applications, formation of standard cells, cell reaction and calculation of EMFs, ΔG and spontaneity of a reaction.

UNIT IV (15 Hrs)

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 of 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 the living systems.

Surface chemistry- emulsions, gels - preparation, properties and applications, **Chromatography** – basic principles of column, paper and thin layer chromatography.

UNIT V **(15 Hrs)**

Industrial Chemistry

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

Polymers- classifications, preparation and uses 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., Publishers	2011 4 Edn
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 2013

Pedagogy

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

Course Designers

1. Dr. Sowmya Ramkumar
2. Dr. S. Charulatha

Question Paper Pattern

End Semester Examination

SECTION	WORD LIMIT	MARKS	TOTAL
A - 5 x 2 Marks (No Choice)	One or Two Sentences	10	75
B -5 x 5 Marks (Internal Choice at same CLO Level)	300	25	
C – 5x 8 Marks (Internal Choice at same CLO Level)	600-800	40	

COURSE NUMBER	COURSE NAME	Category	L	T	P	Credit
23PEPS1	PROFESSIONAL ENGLISH FOR PHYSICAL SCIENCES (I B Sc Physics, Chemistry, Mathematics)	AEC	25	5	-	2

Preamble

To enable the students to

- develop the language skills of students by offering adequate practice in professional contexts.
- enhance the lexical, grammatical and socio-linguistic and communicative competence of first year physical sciences students
- focus on developing students' knowledge of domain specific registers and the required language skills.
- develop strategic competence that will help in efficient communication
- sharpen students' critical thinking skills and make students culturally aware of the target situation.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	recognize their own ability to improve their own competence in using the language	K1
CLO2	use language for speaking with confidence in an intelligible and acceptable manner	K2
CLO3	read independently unfamiliar texts with comprehension and understand the importance of reading for life	K3
CLO4	understand the importance of writing in academic life	K3
CLO5	write simple sentences without committing error of spelling or grammar	K3

UNIT 1: COMMUNICATION **5 hours**

Listening: Listening to audio text and answering question
Listening toInstructionss
Speaking: Pair work and small group work.
Reading: Comprehension passages –Differentiate between facts and opinion
Writing: Developing a story with pictures**.**
Vocabulary: Register specific - Incorporated into the LSRW tasks

UNIT 2: DESCRIPTION **5 hours**

Listening: Listening to process description.-Drawing a flow chart.
Speaking: Role play (formal context)
Reading: Skimming/Scanning- Reading passages on products, equipment and gadgets.
Writing: Process Description –Compare and Contrast Paragraph-Sentence Definition and Extended definition- Free Writing.
Vocabulary: Register specific -Incorporated into the LSRW tasks.

UNIT 3: NEGOTIATION STRATEGIES **5 hours**

Listening: Listening to interviews of specialists / Inventors in fields (Subject specific)
Speaking: Brainstorming. (Mind mapping).
Small group discussions (Subject- Specific)
Reading: Longer Reading text.
Writing: Essay Writing (250 words)
Vocabulary: Register specific - Incorporated into the LSRW tasks

UNIT 4: PRESENTATION SKILLS **5 hours**

Listening: Listening to lectures.
Speaking: Short talks.
Reading: Reading Comprehension passages
Writing: Writing Recommendations
Interpreting Visuals inputs
Vocabulary: Register specific - Incorporated into the LSRW tasks

UNIT 5: CRITICAL THINKING SKILLS **5 hours**

Listening: Listening comprehension- Listening for information.
Speaking: Making presentations (with PPT- practice).
Reading: Comprehension passages –Note making.
Comprehension: Motivational article on Professional Competence, Professional Ethics and Life Skills)
Writing: Problem and Solution essay– Creative writing –Summary writing
Vocabulary: Register specific – Incorporated into the LSRW tasks

Textbook

S. No.	Authors	Title of the Book	Publishers	Year of Publication
1	TamilNadu State Council for Higher Education (TANSCHE)	English for Physical Sciences Semester 1	--	--

Reference Books

S. No.	Authors	Title of the Book	Publishers	Year of Publication
1	Sreedharan, Josh	The Four Skills for Communication	Foundation books	2016
2	Pillai, G Radhakrishna, K Rajeevan, P Bhaskaran Nair	Spoken English for you	Emerald	1998
3	Pillai, G radhakrishna, K Rajeevan, P Bhaskaran Nair	Written English for you	Emerald	1998

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE23C03	GENERAL CHEMISTRY PAPER–III	THEORY	58	2	-	4

Preamble

To enable the students to

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

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	describe the extraction and refining methods of metals, examine the concepts of acids and bases, recognize the naming reaction and purification techniques	K1
CLO2	compare the properties of d-block elements, predict the mechanism of oxidation/condensation reactions, identify the ideal & non-ideal solutions	K2
CLO3	illustrate the chemistry of inter halogen compounds, interpret the hardness, softness and properties of dicarboxylic acid, sketch the phase diagram for one/two component system	K3
CLO4	analyze the metallurgy of d block elements, examine the synthesis of aldehydes, ketones, and hydroxy acids	K4

Mapping with Programme Learning Outcomes

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

S-Strong ; M-Medium

GENERAL CHEMISTRY PAPER–III (CE23C03) (58 Hrs)

Unit–I (11 Hrs)

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 Hggroups.

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

Inter halogen compounds: ICl, ClF_3, BrF_5, IF_7 - Preparation, properties, structure and uses.

Unit–II (11 Hrs)

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 (12 Hrs)

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, $KMnO_4$, hypohalite, SeO_2 and per acids. Reduction reactions - H_2/Ni, H_2-Pd-C, $NaBH_4$, $LiAlH_4$, MPV,

Clemmensen and Wolff-Kishner reductions.Condensation reactions with ammonia and its derivatives- **Aldol, Perkin, Knoevenagel, Reformatsky and Cannizaro reactions.**

Unit–IV **(12 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 anduses.**

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 – watersystem.**

Text Books:

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

Reference Books:

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

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

Question Paper Pattern
End Semester Examination

Section	Word Limit	Marks	Total
A - 5 x 2 Marks (No Choice)	One or Two Sentences	10	75
B -5 x 5 Marks (Internal Choice at same CLO Level)	300	25	
C – 5x 8 Marks (Internal Choice at same CLO Level)	600-800	40	

Blended Learning

UNITS	Topic	Contents
I	Preparation, properties, structure and uses - ICl, ClF_3	https://youtu.be/-Bcur3XLDQU
	Preparation, properties, structure and uses - BrF_5, IF_7	https://www.youtube.com/watch?v=Cl9ey2rpIco
II	Electronegativity, hardness and softness	https://www.youtube.com/watch?v=75GXQCq_r1A
	π-bonding contributions	https://www.youtube.com/watch?v=Kju_gywu1WM
III	Aldol, Perkin, Knoevenagel, Reformatsky and Cannizaro reactions.	https://youtu.be/a0e6Pq64yMYhttps://youtu.be/a0e6Pq64yMYhttps://youtu.be/a0e6Pq64yMY https://youtu.be/a0e6Pq64yMY
IV	Hydroxy acids - Tartaric acid and Citric acid - preparation, properties anduses.	https://www.youtube.com/watch?v=x23G-JC4jL0https://www.youtube.com/watch?v=UK08PRtK6Qk
	Active methylene compounds - acetoaceticester, and malonicester- preparation, properties anduses.	https://www.youtube.com/watch?v=1ApGSzDdQnM&t=533s https://www.youtube.com/watch?v=W66zGnXvyy4https://www.youtube.com/watch?v=JgmzmehMiWM
V	Nicotine-water system – Triethylamine - water system.	https://www.youtube.com/watch?v=BmURRyJsK9chttps://www.youtube.com/watch?v=rZWeTR0JqF4
	Formation of compound with congruent melting point- Mg-Zn	https://www.youtube.com/watch?v=XTIpebEOQbchttps://www.youtube.com/watch?v=wc9g_tchL7c
	Incongruent melting point - Ferric chloride – watersystem.	https://www.youtube.com/watch?v=S4tQ0Gp6juohttps://www.youtube.com/watch?v=YyOFH1ZN9Zs

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE23CP2	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 Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Identify the premilinary tests of organic compounds	K1
CLO2	calculate the strength of unknown solutions by titrimetric methods	K4
CLO3	identify the various colorants and adulterants in foods and beverages	K3
CLO4	analyze organic compounds systematically and prepare suitable derivatives	K4

Mapping with Programme Learning Outcomes

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

S-Strong; M-Medium

Chemistry Practical – II (CE23CP2) (90 Hrs)

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

3. Estimation of oxalic acid using standard Mohr's salt solution.
4. Estimation of Mohr's salt solution using standard oxalic acid.

Dichrometry

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

Complexometric titrations

7. Estimation of zinc using EDTA
8. Estimation of magnesium using EDTA

Iodometry

9. Estimation of Potassiumdichromate.

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 Edn.
2.	G H Jeffery, J Bassett, JMendham, R CDenney	Vogel's Textbook of Quantitative Chemical Analysis	Bath Press, Great Britan	1989 5 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 Code	Course Name	Category	L	T	P	Credit
CS23SBGP	SBS I - Gen-AI	Practical	-	1	44	3

Preamble

The objective of this course is to understand the breadth and depth of Generative Artificial Intelligence (Gen AI) and to impart knowledge on its ethical implications, practical applications, and emerging trends.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the fundamental concepts and ethical considerations of Generative AI.	K2
CLO2	Apply AI principles in practical settings using basic AI tools and platforms	K3
CLO3	Develop advanced skills in specialized AI applications such as text analysis, natural language processing, and image recognition.	K3
CLO4	Explore emerging trends in AI, integrating advanced AI tools into diverse professional practices.	K4

Mapping with Programme Learning Outcomes

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

S- Strong; M-Medium

SBS I -Gen-AI - CS23SBGP (45 Hrs)

Unit 1: Introduction to Gen AI (9 hours)

Understanding Gen AI: Definition and scope of Gen AI - Overview of its applications in various fields - Introduction to essential skills needed for Gen AI. Ethical Considerations: Discussion on ethical guidelines and responsible use of AI - Understanding the impact of AI on society and individuals.

Hands-on Activity: Exploring AI Tools

1. Working with appropriate content creation Gen-AI tools to engage with ChatGPT to explore various subjects, simulate interviews, or create imaginative written content.
2. Working with appropriate writing and rephrasing Gen-AI tools to drafting essays on designated topics and refining the content with improved clarity, coherence, and correctness.

Unit 2: Basic AI Concepts (8 hours)

Introduction to AI: Basic concepts and terminology of artificial intelligence - Examples of AI in everyday life - Real-world examples of AI applications in different domains. Machine Learning Basics: Understanding the principles of machine learning - Overview of supervised and unsupervised learning.

Hands-on Activity: Simple AI Projects

1. Working with appropriate educational content creation Gen-AI tools to generate quizzes and flashcards based on classroom material.
2. Working with appropriate language learning Gen-AI tools to practice and enhance language skills through interactive exercises and games across multiple languages.

Unit 3: AI in Practice (9 hours)

Text Analysis and Natural Language Processing (NLP): Introduction to NLP concepts and techniques - Hands-on exercises analyzing text data and extracting insights. Image Recognition and Processing: Basics of image recognition algorithms and techniques - AI Tools for Text and Image Processing

Hands-on Activity: Text and Image Projects

1. Working with appropriate image processing Gen-AI tools to experiment with AI-generated images.
2. Working with appropriate object recognition Gen-AI tools to identify various objects such as text, images, products, plants, animals, artworks, barcodes, and QR codes.

Unit 4: AI for Productivity and Creativity (9 hours)

AI-enhanced Productivity and creativity Tools: Overview of productivity and creativity tools enhanced with AI capabilities - Tips for integrating AI into daily tasks and workflows. AI and Jobs: Exploring how AI impacts jobs and industries - Discussion on opportunities and challenges - Exploration of AI-powered creative tools and applications.

Hands-on Activity: Productivity and Creativity

1. Working with appropriate content creation Gen-AI tools to generate interactive videos / blog posts / art / drawing / music and storytelling experience.
2. Working with appropriate resume generation Gen-AI tools to create professional resumes efficiently.

Unit 5: Future of Gen AI and Final Project **(9 hours)**

Emerging Trends in Gen AI - Applications of Generative AI - Ethical and Societal Impact of Gen AI - Future Directions and Challenges - Case Studies in Generative AI.

Hands-on Activity: Trends in Gen AI

1. Working with appropriate speech generation Gen-AI tools to customize synthetic speech for virtual assistance across different applications.
2. Working with appropriate data analysis Gen-AI tools to perform data analysis, visualization, and predictive modeling tasks.
3. Working with appropriate Gen-AI design tools to simplify the creation of visually appealing presentations.
4. Working with appropriate website builder Gen-AI tools to develop professional websites with AI assistance.

Pedagogy

Demonstration of AI Tools, Lectures and Case studies.

Course Designer

Mrs. S. Ponmalar

Evaluation pattern for Gen-AI

Quiz	: 50 Marks (5 quizzes with each 10 marks)
Case study	: 25 Marks
Online Exam	: 25 Marks (Departments to plan and conduct the exam)
Total	: **100 Marks**

Job Oriented Course

Instrumental Methods of Analysis

JOB1334

40 Hrs

Unit – I **(8 Hrs)**

Sample handling for analytical techniques: Sampling procedure, sampling in different physical state – gases, liquids, solids, sample storage, handling of chemicals & equipments, hazards, safety measures, laboratory hygiene & safety.

Separation techniques: Crystallization, Precipitation, solvent extraction, extraction by chemically active solvents, Continuous extraction, Soxhlet extraction.

Purification Techniques: Recrystallisation, Sublimation, Distillation - Fraction distillation, Steam Distillation, Azeotropic distillation & Vacuum distillation.

Unit II **(8 Hrs)**

Analytical Chemistry: Chemical analysis, Qualitative & Quantitative analysis. Types of chemical analysis – proximate, partial, trace constituents & complete analysis. Analytical balance.

Instrumental methods of chemical analysis: Introduction, analytical perspective, selecting an analytical method, evaluating analytical data.

Method Validation: Precision, bias, linearity, detection limit, robustness, selectivity. Proficiency testing – purpose of inter laboratory tests, benefits of laboratory, laboratory performance. Analysis of PT result – Z – Scores, Youden diagram.

Unit III **(8 Hrs)**

UV-Vis Spectrometer: Radiation source, monochromator, sample cells or cuvette, detectors, general tips, Application of UV.

IR spectrometer: Introduction, Principle, Instrumentation, sampling techniques, solid – pelleting techniques. Liquids and polymers. Interpretation to common functional groups.

Unit IV **(8 Hrs)**

Chromatography – Introduction, types.

HPLC: Types, theory –retention time, capacity factor, retention volume, selectivity, resolution, efficiency, asymmetry. Instrumentation – degassing unit, filters, HPLC pump, HPLC column, mobile phase, detectors – general tips.

Atomic Absorption Spectrometer: Principle, instrumentation and applications.

Sonicator: Sonication principle, description of components, functions of controls and keys. Operation instruction, preparation of Prussian blue using sonication technique

Unit-V **(8 Hrs)**

Iron and steel Industry: Iron-Composition, Ferrous and non-Ferrous alloys.
Testing the purity of steel & testing of iron by Spark method.

Determination of Carbon by combustion method, Determination of Sulphur by volumetric method, Determination of phosphorus by Alkalimetric method, Determination of Silicon by Gravimetric method, Determination of Chromium by persulphate oxidation method.
Analysis of Ferrous and Non-Ferrous alloys by optical Emission Spectrophotometric method. Management of solid waste in Iron and steel industry.

References

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	R. Gopalan, P. S. Subramanium and P. S. Rangarajan	Elements of analytical chemistry	S. Chand and Co,	2004, 3rd edn
2	B. K. Sharma	Instrumental methods of analysis	Goel publication	1996,15th edn
3	H. Kaur	Instrumental methods of chemical analysis	Pragati Publication	4th edition,2008
4	Y. R. Sharma	Elementary Organic Spectroscopy	S.Chand & Co.	Reprint 2009

Practical

20 Hrs

1. Analysis of iron and steel – Analysis of ferrous and non – ferrous alloy – optical emission spectrometry.
2. Determination of carbon by combustion method.
3. Determination of sulphur by volumetric method.
4. Determination of phosphorus by alkalimetric method.
5. Determination of silicon by gravimetric method.
6. Determination of Chromium by persulphate – oxidation method.
7. Determination of nickel by DMG method.
8. Determination of principle components and trace elements in iron and steel.
9. Identification of components of Ink using paper chromatography.
10. Separation of organic mixture using TLC.
11. Separation of mixture of organic compounds by column chromatography.
12. pH measurement of acidic and basic solution.
13. Solvent distillation using Rotavapour.
14. Preparation of Prussian blue by sonication technique.

References:

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	R. Gopalan, P. S. Subramanium and P. S. Rangarajan	Elements of analytical chemistry	S. Chand and Co,	2004, 3rd edn
2	B. K. Sharma	Instrumental methods of analysis	Goel publication	1996,15th edn
3	H. Kaur	Instrumental methods of chemical analysis	Pragati Publication	4th edition,2008
4	Y. R. Sharma	Elementary Organic Spectroscopy	S.Chand & Co.	Reprint 2009

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE23C04	GENERAL CHEMISTRY PAPER - IV	Theory	58	2	-	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 Learning 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 Learning Outcomes

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

S- Strong; M-Medium; L-Low

GENERAL CHEMISTRY PAPER - IV CE23C04 (58 Hrs)

Unit - I **(12 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 dinuclear 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 **(12 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 **(11 Hrs)**

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, Arun Bahl	Organic Chemistry	S.Chand & Co.,	2009 15 Edn
2	R. D Madan	Modern Inorganic Chemistry	S. Chand & Co.,	2011 3 Edn
3	B.R. Puri, L.R. Sharma, M.S. Pathania,	Principles of Physical Chemistry	Vishal Publications	2011 45 Edn
4	B. Srilakshmi	Food Science	NewAge International Pvt., Ltd.,	2003 3 Edn
5	VijayaKhader	Text Book on Food Storage and Preservation	Kalyani Publishers	1999 1 Edn

Reference Books

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

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=m45zQlEQJws
	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-0P7gUIw

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE23CP2	CHEMISTRY PRACTICAL – II	PRACTICAL	-	-	90	5

Preamble

To 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 Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Identify the premilinary tests of organic compounds	K1
CLO2	calculate the strength of unknown solutions by titrimetric methods	K4
CLO3	identify the various colorants and adulterants in foods and beverages	K3
CLO4	analyze organic compounds systematically and prepare suitable derivatives	K4

Mapping with Programme Learning Outcomes

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

S-Strong; M-Medium

Chemistry Practical – II CE23CP2 **(90 Hrs)**

Systematic Analysis of 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 Potassiumdichromate.

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 Edn.
2.	G H Jeffery, J Bassett, JMendham, R CDenney	Vogel's Textbook of Quantitative Chemical Analysis	Bath Press, Great Britan	1989 5 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 CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE23C05	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 Learning 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 Learning Outcomes

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

S-Strong; M-Medium

Inorganic Chemistry CE23C05 (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 &ultratrace elements. Basic chemical reactions in the biological systems and the role of metal ions specially Na^+ , K^+, Mg^{2+}, Ca^{2+} ,

$Cu^{2+/+}$ 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 & Edition
1	H.J. Arniker	Essentials of Nuclear Chemistry	New Age International Pvt Ltd	2011 4 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 Edn
4	Asim K. Das	Bioinorganic Chemistry	Books and Allied Pvt., Ltd.,	2013 Reprint
5	R. D. Madan	Modern Inorganic Chemistry	S.Chand & Co.,	2011 3 Revised Edn

Reference Books:

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

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

COURSE CODE	COURSENAME	CATEGORY	L	T	P	CREDIT
CE23C06	ORGANIC CHEMISTRY	THEORY	58	2	-	4

Preamble

To enable the students to

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

Course Learning Outcomes

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

CLO Number	CLO 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 Learning Outcomes

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

S-Strong; M-Medium

Organic Chemistry CE23C06 (58 Hrs)

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, Terpineol, 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. Nucleophlic 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)**

Reterosynthesis

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). Reterosynthesis 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 & Edition
1	B.S. Bah l & ArunBahl	Advanced Organic Chemistry	S Chand & Co.,	2014 15 Edn
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 11 Edn
4	V.K. Ahluwalia, Renu Aggarwal	Organic Synthesis-Special Techniques	Narosa Publishing House	2012 2 Edn

Reference Books

S.No.	Authors	Title	Publishers	Year of Publication & Edition
1	I.L. Finar	Organic Chemistry Vol II	Pearson Education	2011 5 Edn
2	R.T.Morrison & R.W. Boyd	Organic Chemistry	Pearson Prentice Hall	2011 17 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

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE23C07	PHYSICAL CHEMISTRY	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 Learning Outcomes

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

CLO Number	CLO 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 Learning Outcomes

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

S-Strong ; M-Medium

PHYSICAL CHEMISTRY CE23C07 (58 Hrs)

Unit - I
(11Hrs)

Chemical Kinetics-II

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 **(12 Hrs)**

Photochemistry

Absorption of light and photochemical processes.Differences between thermal and photochemical reactions – Lambert Beer's law. Grotthus-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 **(12 Hrs)**

SurfaceChemistry

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

GroupTheory **(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 & Edition
1.	B.R. Puri, L.R. Sharma, M.S. Pathania	Principles of Physical Chemistry	Vishal Publications	2016 47 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 Edn
4.	A.K Chandra	Quantum Chemistry	Tata McGraw	2017 4 Edn
5.	P.W. Atkins, J. D. Paula	Physical Chemistry	Oxford University Press	2017 11 Edn

Reference Books

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

COURSE CODE	COURSENAME	CATEGORY	L	T	P	CREDIT
CE23E01	POLYMER CHEMISTRY	THEORY	58	2	-	4

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 Learning Outcomes

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

CLO Number	CLO 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 Lerning Outcomes

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

S-Strong ; M-Medium

POLYMER CHEMISTRY CE23E01 (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 Tg.

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 & Edition
1	Fred. W. Billmeyer	Text book of Polymer Science	Wiley Eastern Ltd.,	2009 3 Edn
2	V.R. Gowariker, N.V.Viswanathan, Jayadev Sreedhar	Polymer Science	New Age International Ltd.,	2015 2 Edn

Reference Books:

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

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE23E02	ANALYTICAL CHEMISTRY	THEORY	58	2	-	4

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 Learning 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, nephlometry and turbidimetry	K4

Mapping with Programme Learning Outcomes

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

S-Strong; M-Medium

ANALYTICAL CHEMISTRY CE23E02 (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.

Nephlometry&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 & Edition
1.	R. Gopalan, P. S Subramanium& P. S Rangarajan	Elements of Analytical Chemistry	S. Chand & Co.	2013 & 3rd Edn
2.	B. K Sharma	Instrumental Methods of Analysis	Goel Publishing House	2011& 27th Edn
3.	H. Kaur	Instrumental Methods of Chemical Analysis	PragatiPrakashan	2012 Reprint

Reference Books:

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

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

COURSE CODE	COURSENAME	CATEGORY	L	T	P	CREDIT
CE21AC1	ALC– 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 Learning 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 Learning Outcomes

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

S-Strong; M-Medium

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 nitate, 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 metal.

Pesticides

Classification – Insecticides, fungicides & herbicides. General methods of preparation, application & toxicity. Insect attractants & repellants - Flourine 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 & Edition
1	B.K.Sharma	Industrial Chemistry	Goel Publishing House	2014 3 Edn.
2	M.C. Arora& M. Singh	Industrial Chemistry	Anmol Publications	2004 Reprint

Reference Book:

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

Course Designer:

1. Dr. N. Anusuya

COURSE CODE	COURSENAME	CATEGORY	L	T	P	CREDIT
CE21AC2	ALC-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 Learning 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 Learning Outcomes

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

S-Strong ; M-Medium

ALC - PHARMACEUTICALCHEMISTRY CE21AC2 (Self study)

UNIT I

Basic Concepts of Drugs

Definition- drug, pharmacology, pharmacognosy, pharmacy, therapeutics, toxicology, chemotheraphy, pharmacopeia (BP, IP, USP), national formulary, pharmacophore, bacteria, virus, vaccines, toxoids, primary immunization, additive effect, synergism, antagonism, plaubo, LD_{5O},ED_{50} 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. Psychodelic drugs- LSD and marijuana.

Anaesthetics - Definition – classification - volatile anaesthetics (nitrousoxide, ethers, halohydrocarbons, chloroform, haloethane)- Ferguson principle-intravenous anaesthetics-

structure of thiopental sodium – localanaesthetic 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 $MgS0_4.7H_20$, milk of magnesia, magnesium trisilicate,aluminium hydroxide gel, dihydroxyaluminiumaminoacetate, aluminium acetate and aluminium mono stearate - paroxon -phosphorine, cyclophosphomide – tricyclophos - preparation & uses of thio tepa-sodiumandcoppercacodylates-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, ferrousgluconate, $FeSO_4$, scalepreparation (ferricammoniumacetate) ferrousfumarate, ferroussuccinate & ferrous chlorinate.

UNIT V

Organic Pharmaceutical Aids

Definition, agents for kidney function (aminohippuricacid) –liver function (sulphobrophthalein sodium, rose Bengal), Corneal ulcer detection (Fluorescein sodium), Blood volume determinations (Evansblue) pituitary function (metyrapone),Ointmentbases,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.

Text Books:

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

Reference Books:

S.No	Authors	Title	Publishers	Yearof Publication & Edition
1	G.Patrick	Medicinal Chemistry	Viva Books Pvt., Ltd.,	2002 1 Edn
2	D. Sriram, P.Yogeeswari	Medicinal Chemistry	Pearson Education	2010 2 Edn
3	Jayashree Ghosh	A Text Bookof Pharmaceutical Chemistry	S. Chand &Co.	2012 Revised

Course Designer:

1. Dr.G.Subashini

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE23CP3	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 Learning 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 Learning Outcomes

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

S-Strong; M-Medium

SEMESTER V & VI

Chemistry Practical – III CE23CP3 (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

1.Determination of cell constant

2.Determination of λ_∞ of a strong electrolyte using Debye Huckel Onsager equation.

3.Determination of dissociation constant of a weak acid.

4.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 & Edition
1.	J.A Findlay & Kitchener	Practical Physical Chemistry	Longmann Publication	1973 9 Edn
2.	V.Venkateswaran, R. Veeraswamy& A.R. Kulandaivelu	Basic Principles of Practical Chemistry	S Chand & Co.,	2012 2 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 Edn

Pedagogy: Demonstration and individual Hands on Practicals

Course Designers:

1. Dr. C. Nithya

2. Dr. P. Amutha

Project and Viva Voce (CE23PROJ) **Hours: 60**

Credit: 5

CIA: 25 Marks **ESE: 75 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 –25 marks, External – 75 marks)

Internal	**Total -25 marks**
I Review – Selection of the field of study, Topic & Literature collection	- 5 marks
II Review – Research Design and Data Collection	- 10 marks
III Review – Analysis & Conclusion, Preparation of rough draft	- 10 marks

External	**Total – 75 marks**
Project	**25 marks**
Viva Voce	**50 marks**

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE23SB01	Skill Based Subject Computational Chemistry	THEORY	41	4	-	3

Preamble

To enable the students to understand the basic concepts in computational chemistry, hard and soft drugs & the applications of open source tools in chemistry to stimulate molecular structures

Course Learning 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, recognize the challenges and opportunities in bioinformatics	K4

Mapping with Programme Learning Outcomes

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

S-Strong; M-Medium

Skill Based Subject
Computational Chemistry CE23SB01 (41 Hrs)

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 **(8Hrs)**

Introduction to Molecular Modeling

Molecular Modeling and Pharmacoinformatics in Drug Design, Phases of Drug Discovery,

Molecular interaction

Bond structure and bending angles – electrostatic, vander Waals and non_bonded interactions, hydrogen bonding, Inter and intramolecular interactions: Weak interactions in drug molecules; hydrogen bonding in molecular mechanics

Unit V **(8Hrs)**

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

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

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 Edn
2	KishorArora	Computers Applications in Chemistry	Anmol Publication PvtLtd	2004, 1 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 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