PSGR Krishnammal College for Women

DEPARTMENT OF CHEMISTRY

CHOICE BASED CREDIT SYSTEM &

OUTCOME BASED CURRICULAR FRAMEWORK

BACHELOR OF SCIENCE IN CHEMISTRY

2024-2027

PROGRAMME LEARNING OUTCOMES (PLO's)

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

PLO1 : accept the common responsibility to preserve the environment and to contribute to the development

PLO2 : acquire in depth knowledge on core concepts of theoretical and practical chemistry to the subject areas namely organic, inorganic, physical, analytical and computational chemistry

PLO3 : attain communication skill- written, verbal, logical and digital

PLO4 : explore the relative choice of Generic Electives (GE), Skill Enhancement Courses (SEC) and Ability Enhancement Courses (AEC)

PLO5 : enhance the ability to execute Laboratory procedures of organic, inorganic and physical systems and setting standard procedures

PLO6 : apply the understandings and the knowledge gained, to solve the quantitative and qualitative problems and to emerge as potential entrepreneur.

PROGRAMME SPECIFIC OUTCOME (PSO's)

The students at the time of graduation will

PSO1 : possess skills in safe handling of chemicals taking into account their physical and chemical properties.

PSO2 : 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 – 2024-27 BATCH and onwards

SEMESTER I

SEM	Part	Course Code	Title of the Paper	Course Type	Instruction hours/week	Contact hours	Tutorial Hours	Duration of Examination	Examination Marks			Credits
									CA	ESE	TOTAL	
I	I	TAM2301/ HIN2301/ FRE2301	Language I – Tamil Paper I/ Hindi Paper I/ French Paper I	Language	6	88	2	3	25	75	100	3
	II	ENG2301	English Paper-I	English	6	88	2	3	25	75	100	3
	III	CE23C01	General Chemistry Paper -I	CC	6	88	2	3	25	75	100	5
	III	CE23CP1	Chemistry Practical - I	CC	3	45	-	-	-	-	-	-
	III	PS24A01/ TH23A12	Physics Paper - I / Mathematics for Physics	GE	4 7	58 103	2 2	3 3	20 25	55 75	75 100	4 5
	III	PS23AP1	Physics Practical	GE	3	45	-	-	-	-	-	-
	Non Tamil Students											
	IV	NME23B1/ NME23A1	Basic Tamil I / Advance Tamil I	AEC	2	28	2	-	100	-	100	2
	Students with Tamil as Language											
	IV	NME23ES	Introduction to Entrepreneurship	AEC	2	30	-	-	100	-	100	
I-V	VI	24BONL1 24BONL2 24BONL3	Online Course 1 Online Course 2 Online Course 3	ACC	-	-	-	-	-	-	-	
I-V	VI	COM15SER	Community Services 30 Hrs									

PSGR
Krishnammal College for Women

DEPARTMENT OF CHEMISTRY
CHOICE BASED CREDIT SYSTEM (CBCS) &
LEARNING OUTCOME BASED CURRICULAR FRAMEWORK (LOCF)
SYLLABUS & SCHEME OF EXAMINATION
B.Sc., CHEMISTRY
2024-27 BATCH, SEMESTER II

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	
II	I	TAM2302 / HIN2302 / FRE2302	Tamil Paper II / Hindi Paper II / French 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
	III	CE23C02	General Chemistry Paper - II	CC	6	88	2	3	25	75	100	5
	III	CE23CP1	Chemistry Practical I	CC	3	45	-	3	25	75	100	4
	III	PS24A02/ TH24A18	Physics Paper - II / Mathematics Elementary to Advanced	GE	5 8	73 118	2 2	3 3	20# 25	55# 75	75# 100	4 5
	III	PS23AP1	Physics Practical	GE	3	45	-	3	15$	35$	50$	2
	IV	NME23B2/ NME23A2*	Basic Tamil II / Advanced Tamil II	AEC	-	-	-	-	100	-	100	Gr.
	IV	NM24UHR	Universal Human Values and Human Rights	AECC	2	30	-	-	100	-	100	2
I-II	VI	NM23GAW	General Awareness	AEC	SS	-	-	-	100	-	100	Gr.
I-IV	VI	COM15SER	Community Services 30 Hours	GC	-	-	-	-	-	-	-	
I-V	VI	24BONL1 24BONL2 24BONL3	Online Course 1 Online Course 2 Online Course 3	ACC	-	-	-	-	-	-	-	

CC –Core Courses
GE –Generic Elective
AEC – Ability Enhancement Course
ACC – Additional Credit Course
L- Language
* After class hours

CA – Continuous Assessment
ESE - End Semester Examination
AECC – Ability Enhancement Compulsory Course
GC - General Courses
E - English

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
2024 - 2027 BATCH - SEMESTER III

Sem	Part	Course Code	Title of the Course	Course Type	Instruction hours/week	Contact hours	Tutorial	Duration of Examination	Examination Marks			Credits
									CA	ESE	TOTAL	
III	I	TAM2303/ HIN2303/ FRE2303	Tamil Paper III/ Hindi Paper III/ French Paper III	L	6	88	2	3	25	75	100	3
	II	ENG2403	English Paper III	E	5	73	2	3	25	75	100	3
	III	CE24C03	General Chemistry Paper III	CC	4	58	2	3	25	75	100	4
	III	CE23CP2	Chemistry Practical II	CC	3	45	-	-	-	-	-	-
	III	TH24A19/	Mathematics for Sciences I /	GE	7	103	2	3	25	75	100	5
	III	PL24A01/	Fundamentals of Botany I /		5	73	2	3	20*	55*	75	4
		AS23A01	Invertebrata & Chordata		5	73	2	3	20*	55*	75	4
	III	PL23AP1/ AS23AP1	Botany Practical / Zoology Practical	GE	2	30	-	-	-	-	-	-
	III	CS23SBGP	Gen-AI	SEC	3	44	1	-	100	-	100	3
	IV	NM23DTG	Design Thinking	AEC	2	30	-	-	100	-	100	2
I-III	VI	COM15SER	Community Services 30 Hours	GC	-	-	-	-	-	-	-	-

I-V	VI	24BONL1 24BONL2 24BONL3	Online Course I Online Course II Online Course III	ACC	-	-	-	-	-	-	-	-

L - Language
E - English
CC – Core Courses
CA – Continuous Assessment
GE – Generic Elective
ESE–End Semester Examination
AEC – Ability Enhancement Courses
ACC – Additional Credit Courses
SEC – Skill Enhancement Courses
GC- General Courses
*CA conducted for 25 and converted to 20, ESE conducted for 75 and converted to 55

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**

CA - 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 Allied (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

Advance 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**

Universal Human values and Human Rights

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

End Semester Examination – Question Paper Pattern and Distribution of Marks

Language and English

Section A 10 x 1 (10 out of 12)	: 10 Marks
Section B 5 x 5 (5 out of 7)	: 25 Marks (250 words)
Section A 4 x 10 (4 out of 6)	: 40 Marks (600 - 700 words)
Total	**: 75 Marks**

Core and Allied

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

Criteria for Attendance:

3 Marks

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

COURSE CODE	COURSE NAME	CATEGO	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 thermo chemistry
- explore Industry 4.0through physical-to-digital-to-physical connection which potentially transform the chemical industry

Course Learning Outcomes

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 usi thermodynamics	K2
CLO3	examine the periodic properties, strength of bonding, and apply principles in identifying reaction mechanism. Apply laws thermodynamics and learn the physical processesinvolved.Practic understand the concepts of Industry 4.0	K3
CLO4	Analyze and perform calculations on periodic properties, Aromati bonding theories, thermodynamic and thermochemistry principles.	K4

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

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, Carbanions and free radicals-Formation, structure and stability. Inductive Effect, Electromeric Effect, Resonance and Hyper conjugation, (Baker - Nathan effect), Steric effect-examples and effect on reactivity.Comparison of acid strength-halogen substituted acids. Basic strength of RNH_2, R_2NH, R_3N 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. N	Author	Title of the Book	Publishers	Year of Publication & Edition
1	ArunBahl B. S. Bahl	Advanced Organic Chemistry	S. Chand Sons Com Pvt Ltd	2016 Reprint
2	Jagdamba Singh	Undergraduate Organic Chemis Vol I	Pragathi Prakahasan	2010 3rd Edn
2	P. L. Soni	Text Book of Inorganic Chemis	Sultan Chand and Sons	2013 Reprint
4	B. R. Puri, L. R. Sharma S. Patania	Principles of Physical Chemistr	Vishal Publishing & Sons	2017 47th Edn
5	P. Kaliraj, T. Devi,	Higher Education for Industry 4 and Transformation to Educatio 5.0		

Reference Books

S. N	Author	Title of the Book	Publishers	Year of Publication & Edition
1	B. R. Puri, L. R. Sharma K. Kalia	Principles of Inorganic Chemist	Milestone Publishers and Distributors	2011 & 32 Edn
2	R. T. Morrison and R. N Boyd	Organic Chemistry	Pearson India Educa Services	2010 & 6th Edn
3	R. D. Madan	Modern Inorganic Chemistry	S. Chand Sons Com Pvt Ltd	2014 & 3rd Edn
4	Alasdair Gilchrist.	Industry 4.0: The Industrial Inte of Things, Apress Publications		

Related Online References:

1. Introduction to Industry 4.0 and Industrial Internet of Things by Prof.SudipMishra,IITKharagpur.

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
CE24A01	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	Recall the types of bonding , organic reagents, aminoacids and d the terms involved in analytical /environmental chemistry	K1
CLO2	Understand the concept of hybridization, classify aromatic/ aromatic compounds, aminoacids/proteins and demonstrate preparation of standard solutions.	K2
CLO3	Interpret the structure & stereo isomerism of organic compo and illustrate the importance of chromatogra 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 process 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 (CE24A01)
(offered to B.Sc Botany / Zoology) (58 hrs)

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 -principle of volumetric analysis - calibration of glasswares, standardization - experimental requirements -concentration units (normality and molarity) –types and preparation of standard solutions (primary and secondary standards). 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 Boo	Publishers	Year of Publication & Edition
1.	Dr. V. Veeraiyan	Textbook of Allied Chemistry	High mount Publis house, triplic Chennai.	Reprint 2006
2.	R. Gopalan. P.S. Subramani and K. Rengarajan	Elements of Analyti Chemistry	Sultan Chand & Sons Educational Publisher New Delhi	Reprint 2013
3.	ArunBahl B. S. Bahl	Advanced Organic Chemistry	S. Chand Sons Comp Pvt Ltd,	Reprint 2009
4.	P.C Jain & Monika Jain	Engineering chemis	DhanpatRai Publishin 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
CE24A03	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 Learning 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 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 bondin 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 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 solu	K3
CLO4	analyze the nature of the organic molecule based on its hybridization, electronic effect, pr 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 cry 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 (For B.Sc Physics) CE24A03 (58 Hrs)

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 & Edition
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, 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	CATEGOR	L	T	P	CREDIT
CE23CP1	**CHEMISTRY PRACTICAL - I**	PRACTICAL	**-**	**-**	**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 Learning 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	K4
CLO2	Measure the pH of different solutions	K2
CLO3	estimate the percentage amount of chlorine, carbonates, Mg, Na in bleaching powder, hard water, detergent	K3
CLO4	Prepare different buffer solutions	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

Chemistry Practical – I (CE23CP1) (90 Hrs)

Credits: 4

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

The following cations and anions may be given

Anions : Cl^-, CO_3^{2-}, Br^-, NO_3^-, SO_4^{2-}, F^-, BO_3^{3-}, $C_2O_4^{2-}$, CrO_4^{2-}, PO_4^{3-}

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

GROUP EXPERIMENTS:

2. (i) Estimation of available chlorine in bleaching powder
(ii) Estimation of hardness of water

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

Text Book

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

Reference book:

S.No	Authors	Title of the Book	Publishers	Year of Publication & Edition
1	V. V. Ramanujam	Inorganic semi micro qualitative analysis,	The National Publishing Co.	2012 & 1st Edn.
2	Jain P. C and Jain	Engineering Chemistry	Dhanpat Rai and Sons	2013 & 16th edn
3	Vogel A. I	Text Book of Practical Organic Chemistry	Prentice Hall	2011& 5th edn
4	Khosla B D, Garg Gulati A	Senior Practical Physical Chemistry	R Chand & Co	2011 Reprint

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
CLO4	Analyze the functional groups and report the confirmatory test	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 PRACTICAL FOR BIOLOGISTS (CE23AP1)

(offered to B.Sc Botany /Zoology) (90hrs)

1. Volumetric Analysis

i. Estimation of sodium hydroxide using standard sodium carbonate.

ii. Estimation of Carbonate, bicarbonate mixture using sodium hydroxide

iii. Estimation of hydrochloric acid using standard oxalic acid.

iv. Estimation of oxalic acid using standard sulphuric acid.

v. Estimation of ferrous sulphate using standard 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 Boo	Publishers	Year of Publication & Edition
1	N.S.Gnanapragasam, G.Ramamurthy	Organic Chemistry Manual	S.Viswanathan Print & Publishers Pvt Ltd	2011 & 3rd Edn.,
2	A.I. Vogel	A text book of quantitative inorgan analysis	Longman publishers	2011 & 12thEdn.,

Pedagogy

Demonstration and individual hands on Practicals.

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

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

3. Potentiometric Titration

1. Acid - base
2. Redox titration

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

Reference Books

S.N	Authors	Title of the Book	Publishers	Year Publication & Edition
1	V.Venkateswaran, R. Veeraswamy& A.R. Kulandaivelu	Basic Principles of Practical Chemistry	S.Chand& Co.	2012 Reprint
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

SEMESTER – I - FOUNDATION COURSE

INTRODUCTION TO ENTREPRENEURSHIP

SUBJECT CODE: NME23ES

CREDITS: 2

TOTAL HOURS: 30 hrs **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) **(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 CODE	COURSE NAME	Category	L	T	P	Credit	Category
CE23C02	GENERAL CHEMISTRY PAPER - II	Theory	88	2	-	5	Theory

Preamble

To enable students to study 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, differences of nucleophilic substitution and elimination reactions, gain knowledge on the types, properties of colloids and liquid crystals, learn the concepts of second 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, 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 **(18 hrs)**

s-block and p-block elements

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 and p block elements.

Unit II **(18 hrs)**

Stereochemistry of organic compounds

Concepts of isomerism, types of isomerism. Optical isomerism – elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, properties of diastereomers, threo and erythron diastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization. Relative and absolute configuration, sequence rules, D & L, 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 of chloro, bromo and iodobenzene from phenol, Sandmeyer & Gattermann reactions. Reactions of 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 cholestric phases. 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's rule. Entropy as a function of T and V, entropy as a function of T and P. Entropy of mixing of ideal gas. General conditions of equilibrium and spontaneity-conditions of equilibrium and spontaneity under constraints, definition of A and G, physical

significance of A and G. Maxwells relations. Temperature and pressure dependence of G, Gibbs – Helmholtz equation.

Text Books

S. No	Author	Title of the Book	Publishers	Year of Publication
1	Arun Bahl B. S. Bahl	A Text Book of Organic Chemistry	S. Chand Sons Company Pvt Ltd.,	2016 22 Edn
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 & Company	2023 48 Edn
4	D. Nasipuri	Stereochemistry of Organic Compounds	New Age International Ltd.,	2020 4 Edn

Reference Books

S. No	Author	Title of the Book	Publishers	Year of Publication
1	Arun Bahl B. S. Bahl	Advanced Organic Chemistry	S. Chand Sons Company Pvt Ltd.,	2009 5 Edn
2	Jagdamba Singh, L. D. S. Yadhav	Advanced Organic Chemistry	Pragathi Prakahasan	2016 2 Edn
3	J.D Lee	Concise Inorganic Chemistry	English Language Book Society	2008 5 Edn
4	James E Huheey	Inorganic Chemistry	Pearson India Education Services	2006 4 Edn
5	R. T. Morrison and R. N. Boyd	Organic Chemistry	Pearson India Education Services	2010 7 Edn
6	K. S. Tewari, N. K. Vishnoi	A Textbook of Organic Chemistry	Vikas Publishing House	2017
7	P. S. Kalsi	Stereochemistry	New Age International	2006 7 Edn
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. S. Jone Kirubavathy**
2. **Dr. R. Revathi**

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE24A02	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 along with their significance in bioinorganic chemistry, analyze the chemistry behind in fuels, fertilizers and polymers, gain knowledge about the functions of various drugs & key concepts in the chemistry of dyes, understand the basic concepts of chemical kinetics, catalysis and recognize the importance of pH & buffer systems.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	recall the nomenclature 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	examine the 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	S	S	S
CLO4	S	S	S	S	S

S-Strong; M-Medium;

CHEMISTRY FOR BIOLOGISTS - II CE24A02 (73 hrs)
(Offered to B.Sc Botany/Zoology)

Unit I **(15 hrs)**

Coordination and Bioinorganic Chemistry

Nomenclature - mononuclear complexes. Theories- Werner, Sidgwick - 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 potassium nitrate. Pesticides - classification with examples.

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

Unit III **(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 for first, 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 vs strong base, strong acid vs weak base, weak acid vs weak base) - hydrolysis constant (K_h) - relation between K_h, K_a and K_w - degree of hydrolysis and determination - indirect method, electrical conductance method (Bredig's method), freezing point depression and from distribution law.

Text Books:

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1.	V.Veeraiyan	Text book of Allied Chemistry	Highmount Publishing house, Chennai.	2005, 1 Edn
2.	B. S. Bahl, Arun Bahl, G. D. Tuli	Essentials of Physical Chemistry	S. Chand & Co., Pvt., Ltd., New Delhi.	2012
3.	B. K. Sharma	Industrial Chemistry	GOEL Publishing House	2014,17 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. R. Revathi
2. Dr. N. Anusuya

COURSE CODE	COURSE NAME	Category	L	T	P	Credit
CE24A04	CHEMISTRY PAPER – II (for B.Sc Physics)	Theory	73	2	-	4

Preamble

To enable the students to understand the key concepts including aromaticity, isomerism, nuclear chemistry, basics of electrochemistry, surface chemistry, fuels, polymers and water treatment methods

Course Learning Outcomes

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

CLO Number	CLO 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	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
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;

Chemistry Paper – II CE24A04 (for B.Sc Physics) (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-Crafts alkylation and acylation.

Isomerisms - optical isomerism, elements of symmetry, polarized light and optical activity, isomerism of lactic acid and tartaric acid, racemisation and resolution, Geometrical isomerism - cis-trans isomerism, keto-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 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. V. Veeraiyan	Text book of Allied Chemistry	Highmount Publishing House, Chennai.	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

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
CE24C03	GENERAL CHEMISTRY PAPER III	THEORY	58	2	-	4

Preamble

To enable the students to learn about the metallurgy of d-block elements in context to modern and ancient India, the chemistry of inter halogen compounds, acids and bases, the organic reactions of aldehydes, ketones, carboxylic acids, esters and 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 CE24C03 (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 Hg groups.

Metallurgy

Extraction, properties and uses of V and W. Metallurgy of Fe, Cu, Zn and Hg in ancient India.

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,lemmensen 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 and uses.

Unit–V **(12 Hrs)**

Solutions of Non electrolytes

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

Phase Equilibria

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

Text Books:

S.No.	Authors	Title	Publishers	Year & Edition
1	B.S. Bahl C. 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

Reference Books:

S.No.	Authors	Title	Publishers	Year & Edition
1	B. S. Bahl C. ArunBahl	Essentials of Physical Chemistry	S. Chand & Co	2014 22 Edn
2	R.T. Morrison R.W. Boyd	Organic Chemistry	Pearson Prentice Hall	2011 17 Edn
3	A. Peter Sykes	A Guide book to Mechanism in Organic Chemistry	Pearson Education Ltd.,	2009 6 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

UNITS	Topic	Contents
I	Preparation, properties, structure and uses -ICl, ClF_3	https://youtu.be/-Bcur3XLDQU
	Preparation, properties, structure and uses - BrF5, IF_7	https://www.youtube.com/watch?v=EiMNS7-eX1M
II	Electronegativity, hardness and softness	https://www.youtube.com/watch?v=75GXQCq_r1A
	Bonding contributions	https://www.youtube.com/watch?v=Kju_gywu1WM
III	Aldol,Perkin, Knoevenagel, Reformatsky and Cannizaro reactions	https://www.youtube.com/watch?v=a0e6Pq64yMY https://www.youtube.com/watch?v=h6GCHWvODGA https://www.youtube.com/watch?v=Ww97wJEIoNo&t=1322s https://www.youtube.com/watch?v=T5Nf97xXMkY
IV	Hydroxy acids - Tartaric acid and Citric acid - preparation, properties anduses.	https://www.youtube.com/watch?v=x23G-JC4jL0
	Active methylene compounds - acetoaceticester, and malonicester- preparation, properties anduses.	https://www.youtube.com/watch?v=1ApGSzDdQnM&t=533s https://www.youtube.com/watch?v=W66zGnXvyy4 https://www.youtube.com/watch?v=JgmzmehMiWM
V	Nicotine-water system – Triethylamine- water system.	https://www.youtube.com/watch?v=BmURRyJsK9c https://www.youtube.com/watch?v=rZWeTR0JqF4
	Formation of compound with congruent melting point- Mg-Zn	https://www.youtube.com/watch?v=XTIpebEOQbc https://www.youtube.com/watch?v=wc9g_tchL7c
	Incongruent melting point - Ferric chloride – watersystem.	https://www.youtube.com/watch?v=S4tQ0Gp6juo https://www.youtube.com/watch?v=YyOFH1ZN9Zs

COURSE CODE	COURSE TITLE	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	PLO6
CLO1	S	S	S	S	S	M
CLO2	S	S	M	S	S	S
CLO3	S	S	S	S	M	S
CLO4	S	S	S	S	M	S

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

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

Permanganimetry

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

Dichrometry

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

Complexometric titrations

Estimation of zinc using EDTA
Estimation of magnesium using EDTA

Iodometry

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 & Edition
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, J. Mendham, R. C. Denney	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 2 Edn

Pedagogy: Demonstration and individual hands on practical

Course Designers

Dr. N. Arunadevi
Dr. G. Subashini
3.

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
CS23SBGP	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 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

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

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