



PSGR Krishnammal College for Women



DEPARTMENT OF CHEMISTRY

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

BACHELOR OF CHEMISTRY

2020 -2023



PROGRAMME OUTCOMES

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

- PO1** : accept the common responsibility to preserve the environment and to contribute to the development of societal concerns.
- PO2** : acquire communication skill- written, verbal and digital
- PO3** : demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating to the subject areas namely organic, inorganic, physical, analytical chemistry, Mathematics, Physics and Biology.
- PO4** : apply such knowledge and understanding to the solution of qualitative and quantitative problems of familiar and unfamiliar.
- PO5** : handle chemical materials safely by taking into account their physical and chemical properties including any specific hazards associated with their use.
- PO6** : conduct standard laboratory procedures for the synthesis and analysis of organic, inorganic systems, monitor, record document in a reliable manner, chemical properties, events and changes by observation and measurement.

PROGRAMME SPECIFIC OUTCOME

The students at the time of graduation will

- PSO1** : possess skills in safe handling of chemicals taking into account their physical and chemical properties
- PSO2** : be able to 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.
- PSO3** : be able to apply the theoretical concepts of instruments that are commonly used in most chemistry fields as well as interpret and use data generated in instrumental chemical analyses.



DEPARTMENT OF CHEMISTRY

2020-2023

SEM	Part	Subject Code	Title of the Paper	Instruction hours/week	Contact hours	Tutorial	Duration of Examination	Examination Marks			Credits
								CA	ESE	TOTAL	
I	I	TAM2001/ HIN2001/ FRE2001	Language T/H/F Paper I	6	86	4	3	40	60	100	3
	II	ENG2001/ ENG20F1	English Paper-I/ Functional English Paper -I	6	86	4	3	40	60	100	3
	IIIA	CE20C01	General Chemistry Paper -I	6	86	4	3	40	60	100	5
	IIIA	CE20CP1	Chemistry Practical - I	3	45	-	-	-	-	-	-
	IIIA	PS20A01/ TH17A01	IDC Allied Physics Paper - I	4	56	4	3	20	55	75	4
			IDC Allied Mathematical Statistics Paper - I	7	101	4	3	40	60	100	5
	IIIA	PS20AP1	Allied Physics Practical	3	45	-	-	-	-	-	-
	IV	NME19B1/ NME19A1/ NME12WS/ NME12AS/ NME12GS/NME 18ES	Basic Tamil / Advanced Tamil / Women Studies/ Ambedhkar Studies/ Gandhian Studies/NEN-Introduction to Entrepreneurship	2/2/ 2	28/26/ 26	2/4/4	-2/-	50/ 50/ 100	50/ 50/-	100/ 100/ 100	2
II	I	TAM2002/ HIN2002/ FRE2002	Language T/H/F Paper - II	6	86	4	3	40	60	100	3

	II	ENG2002/ ENG20F2	English Paper-II / Functional English Paper -II	6	86	4	3	40	60	100	3	
	IIIA	CE20C02	General Chemistry Paper - II	5	71	4	3	40	60	100	5	
	IIIA	CE20CP1	Chemistry Practical I	3	45	-	3	40	60	100	4	
	IIIA	PS20A02/ TH17A02	IDC Allied Physics Paper - II	5	71	4	3	20	55	75	4	
			IDC Allied Mathematical Statistics Paper-II	8	116	4	3	40	60	100	5	
	IIIA	PS20AP1	Allied Physics Practical	3	45	-	3	20	30	50	2	
	IV		Open Course - Self Study Online Courses	-	-	-	-	-	-	-	-	
	IV	NME19B2/ NME19*A2	Basic Tamil/Advanced Tamil**	-	-	-	-	-	-	-	-	
	V		Effective English Communication	2	26	4	2	50	50	100	2	
	IIIB	NM12GAW	Foundation Course –1 (General Awareness)	Self study (Online)								Grade
III	I	TAM2003/ HIN2003/ FRE2003	Language T/H/F Paper III	6	86	4	3	40	60	100	3	
	II	ENG2003/ ENG20F3	English Paper III / Functional English Paper III	5	71	4	3	40	60	100	3	
	IIIA	CE20C03	General Chemistry Paper –III	4	56	4	3	40	60	100	4	
	IIIA	CE20CP2	Chemistry Practical - II	3	45	-	-	-	-	-	-	
	IIIA	CE20SB1	Skill Based Subject – Computational Chemistry I	3	29	1	2	-	-	-	-	
	IIIA	CE20SBP1	Skill Based Subject Practical I - Computational Chemistry Practical I		15	-	-	-	-	-	-	
	IIIA	TH17A09/ PL20A01/ AS17A01	IDC - Allied Maths Paper II	7	101	4	3	40	60	100	5	
			IDC - Allied Botany Paper II/ IDC-Allied Zoology Paper II	5	56	4	3	20	55	75	4	
	IIIA	PL20AP1/ AS17AP1	Allied Practical - Botany/ Zoology	2	45	-	-	-	-	-	-	
	III B	NM10EVS	Foundation Course-II (Environmental Studies)	Self study	-	-	-	-	-	-	-	

	III B	NM14VHR	Foundation Course-III (Value Education and Human Rights)	2	26	4	-	-	-	100	2
	VI	JOB1334	Job Oriented Course		After 12.30 PM		GRADE **				
IV	I	TAM2004/ HIN2004/ FRE2004	Language T/H/F Paper – IV	5	71	4	3	40	60	100	3
	II	ENG2004/ ENG1620F4	English Paper IV/ Functional English Paper IV	6	86	4	3	40	60	100	3
	IIIA	CE20C04	General Chemistry Paper – IV	4	56	4	3	40	60	100	4
	IIIA	CE20CP2	Chemistry Practical II	3	45	-	3	40	60	100	5
	IIIA	CE20SB1	Skill Based Subject –Computational Chemistry I	3	29	1	2	25	75	100	4
	IIIA	CE20SBP1	Skill Based Subject Practical Computational Chemistry Practical - I		15	-	-	40	60	100	2
	IIIA	TH16A14/ PL20A02/ AS16A02	IDC - Allied Maths Paper II IDC - Allied Botany/ Zoology Paper II	7 5	101 56	4 4	3 3	40 20	60 55	100 75	5 4
	IIIA	PL20AP1/ AS16AP1	Allied Botany/ Zoology Practical	2	45	-	3	20	30	50	2
	III B	NM10EVS	Foundation Course-II (Environmental Studies)	2	26	4	2	-	-	100	2
	V	-	**Extension Activities NSS/ NCC/ YRC/ Sports and Games/ Ecowatch/ YiNet/ Rotract	-	-	-	-	-	100	100	1

QUESTION PAPER PATTERN

CORE & ALLIED PAPERS

Continuous Internal Assessment :50 Marks

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

End Semester Examination: 100 Marks (Semesters I-IV)

BLOOM'S CATEGORY	SECTION	WORD LIMIT	MARKS	TOTAL
K ₁ , K ₂	A-11/13 X 2 Marks	One or Two Sentences	22	100
K ₁ , K ₂	B -5/7 X 6 Marks	300	30	
K ₃ , K ₄	C - 4/6 X 12Marks	600-800	48	

VALUE EDUCATION AND HUMAN RIGHTS / WOMEN STUDIES / AMBEDKAR STUDIES / GANDHIAN STUDIES / ENTREPRENEURSHIP / ENVIRONMENTAL STUDIES

Continuous Internal Assessment :50 Marks

SECTION	MARKS	TOTAL
A – 4 / 6 X 5 Marks	20	50
B – 2 /3 X 15 Marks	30	

Value Education and Human Rights & Environmental Studies two internal tests will be conducted for 50 marks each and the total marks secured will be equated to a maximum of 75 marks and 25 marks is allotted for project / group discussion / presentation of a report.

INFORMATION SECURITY

Continuous Internal Assessment :40 Marks

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

FIELD TRAINING – 100 Marks

The students have the option to select any organization – Government / private like industry, R & D organizations, scientific companies, etc., in consultation with the staff co-ordinator&HoD. The students are to undergo training for a period of two weeks at the end of semester IV during vacation. The students must maintain a work diary and prepare report of the training undergone and submit the same to the HoD. On a stipulated date, there will be a viva-voce with internal examiners at the beginning of the semester V

MODE OF EVALUATION	MARKS	TOTAL
Attendance	10	100
Work Diary	15	
Report	50	
Viva-voce	25	

WEIGHTAGE ASSIGNED TO VARIOUS COMPONENTS OF

CONTINUOUS INTERNAL ASSESSMENT

Theory

	CIA I	CIA II	Model Exam	Assignment/ Class Notes	Seminar	Quiz	Class Participation	Library Usage \ Application of Knowledge, Innovation & Creativity	Attendance	Max. Marks
Core / Allied	5	5	6	4	5	4	5	3	3	40
SBS	5	5	15	-	-	-	-	-	-	25

Practical

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

RUBRICS

Assignment/ Seminar

Maximum - 20 Marks (converted to 4 marks)

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

CLASS PARTICIPATION

Maximum - 20 Marks (converted to 5 marks)

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

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

MAPPING OF POs WITH COs

COURSE	PROGRAMME OUTCOMES					
	PO1	PO2	PO3	PO4	PO5	PO6
COURSE - CE20C01						
CO1	M	H	H	H	H	M
CO2	H	H	H	H	M	M
CO3	M	H	H	H	M	M
CO4	M	H	H	H	H	M
CO5	H	H	H	H	H	H
COURSE - CE20A01						
CO1	M	H	H	H	H	M
CO2	M	H	H	H	H	M
CO3	H	H	H	H	H	H
CO4	H	H	H	H	H	M
CO5	H	H	H	H	H	H
COURSE - CE20A03						
CO1	M	H	H	M	M	M
CO2	M	H	H	M	M	M
CO3	M	H	H	M	M	M
CO4	M	H	H	M	M	M
CO5	M	H	H	M	M	M
COURSE – CE20C02						
CO1	H	H	H	H	H	H
CO2	M	H	H	H	M	H
CO3	M	H	H	H	M	H
CO4	H	H	H	H	H	H

CO5	H	H	H	H	H	H
COURSE – CE20A02						
CO1	H	M	M	H	H	H
CO2	M	H	H	M	H	H
CO3	H	H	H	H	H	M
CO4	M	H	H	H	H	H
CO5	H	H	H	H	H	H
COURSE – CE20A04						
CO1	M	H	H	M	M	M
CO2	M	H	H	M	M	M
CO3	M	H	H	M	M	M
CO4	M	H	H	M	M	M
CO5	M	H	H	M	M	M
COURSE – CE20CP1						
CO1	H	H	H	H	H	H
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H
COURSE – CE20AP1						
CO1	H	H	H	H	H	H
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H
COURSE – CE20AP2						
CO1	H	H	H	H	H	H
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H
CO4	H	H	H	H	H	H
COURSE – CE20C03						
CO1	H	H	H	M	H	M

CO2	H	H	H	M	H	M
CO3	H	M	H	H	H	H
CO4	H	H	H	H	M	H
CO5	H	H	H	H	H	M
COURSE – CE20C04						
CO1	H	H	H	H	H	M
CO2	H	H	H	H	H	M
CO3	H	H	M	H	H	H
CO4	H	H	H	M	H	H
CO5	H	H	H	H	H	M
COURSE –CE20CP2						
CO1	H	H	H	H	H	M
CO2	H	H	M	H	H	H
CO3	H	H	H	H	M	H
COURSE – CE20SB1						
CO1	H	H	H	H	H	H
CO2	H	H	H	M	H	H
CO3	H	H	H	H	H	H
CO4	H	H	H	M	M	H
CO5	H	M	H	M	M	H
COURSE– CE20SBP1						
CO1	H	H	H	H	H	H
CO2	H	H	H	H	H	H
CO3	H	H	H	M	H	H
CO4	H	H	H	M	H	H
CO5	H	H	H	M	H	H

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE20C01	GENERAL CHEMISTRY PAPER - I	THEORY	86	4	-	5

Preamble

To enable the students to

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

Course Outcomes

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

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

Mapping with Programme Outcomes

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

H-High; M-Medium; L-Low

GENERAL CHEMISTRY PAPER – I (CE20C01)

(86 Hrs)

Unit I

(17 hrs)

Atomic Structure

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

Periodic Properties

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

Unit II

(17 hrs)

Chemical Bonding & Molecular Structure

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

Concept of resonance and resonating structures for CO_3 and CO .

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

Ionic bonding- Factors influencing the formation of ionic bonding. Ionic crystals NaCl , CsCl . Lattice energy of ionic crystals, statement of Born-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)

Fundamental aspects of Organic reaction mechanisms

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

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

Unit IV

(17 hrs)

Aromaticity

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

Aromatic electrophilic substitution- mechanism of nitration, sulphonation, halogenation, Friedel craft's alkylation, acylation and diazonium coupling - orientation and reactivity of monosubstituted benzene.

Unit V

(18 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.

Text 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	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

Reference Books

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

Pedagogy:

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

Course Designers

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

Question Paper Pattern End Semester Examination

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

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE20A01	IDC - CHEMISTRY FOR BIOLOGISTS – I (offered to B.Sc Botany & Zoology)	THEORY	56	4	-	4

Preamble

To enable the students to

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

Course Outcomes

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

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

Mapping with programme Outcomes

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

H- High; M-Medium; L-Low

IDC – CHEMISTRY FOR BIOLOGISTS - I (CE20A01)

(offered to B.Sc Botany & Zoology)

(56 hrs)

UNIT I

(11 hrs)

Bonding

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

UNIT II

(11 hrs)

Organic reactions and Stereoisomerism

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

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

UNIT III

(11 hrs)

Analytical Chemistry

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

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

UNIT IV

(11 hrs)

Amino acids and Proteins

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

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

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

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

Text Books:

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

Pedagogy:

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

Course Designers

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

**Question Paper Pattern
End Semester Examination**

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

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE20A03	IDC – ALLIED CHEMISTRY PAPER –I (offered to B.Sc Physics)	THEORY	56	4	-	4

Preamble

To enable the students to

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

Course Outcomes

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

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

Mapping with Programme Outcomes

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

H- High; M-Medium; L-Low

IDC – Allied Chemistry Paper –I (CE20A03)

(offered to B.Sc Physics)

(56 Hrs)

UNIT I

(11 Hrs)

Basics of Organic Chemistry

Types of reagents - electrophiles, nucleophiles and free radicals, Classification of reactions - addition, substitution, elimination, condensation, polymerisation and rearrangements,

Polar effects- inductive effect, resonance and hyper-conjugation. Steric effect.

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

UNIT II

(11Hrs)

Chemical Bonding

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

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

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

UNIT III

(11 hrs)

Energetics

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

UNIT IV

(11 Hrs)

Chemical Kinetics & Photochemistry

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

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

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

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

UNIT V

(12 Hrs)

Solutions and Solid State

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

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

Text Books

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

Pedagogy:

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

Course Designers:

Dr.Sowmya Ramkumar

Dr.S.Charulatha

Question Paper Pattern

End Semester Examination

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

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE20C02	GENERAL CHEMISTRY PAPER - II	THEORY	86	4	-	5

Preamble:

To enable the students to

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

Course Outcomes

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

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

Mapping with Programme Outcomes

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

H-High; M-Medium; L-Low

GENERAL CHEMISTRY PAPER – II (CE20C02)

(71 Hrs)

Unit I

(14hrs)

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

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

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

Unit –II

(15hrs)

Stereochemistry of organic compounds

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

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

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

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

Unit–III

(14 Hrs)

Alkyl and Aryl Halides

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

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

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

UNIT IV

(14 hrs)

Colloidal State

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

UNIT V

(14hrs)

Thermodynamics –II

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

Text Books

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

Reference Books

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

Pedagogy:

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

Course Designers

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

Question Paper Pattern

End Semester Examination

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

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE20A02	IDC – CHEMISTRY FOR BIOLOGISTS - II (offered to B.Sc Botany & Zoology)	THEORY	71	4	-	5

Preamble

To enable the students to

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

Course Outcomes

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

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

Mapping with Programme Outcomes

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

H- High; M-Medium; L-Low

IDC – CHEMISTRY FOR BIOLOGISTS - II (CE20A02)

(offered to B.Sc Botany & Zoology)

(71 hrs)

Unit I

(15 hrs)

Coordination and Bioinorganic Chemistry

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

Unit II

(14 hrs)

Industrial Chemistry

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

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

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

Unit III

(14 hrs)

Synthetic drugs and Synthetic dyes

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

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

Unit IV

(14 hrs)

Chemical Kinetics and Catalysis

Chemical Kinetics - Definition - order and molecularity - rate of reaction - expression for first, second and third order reactions. Effect of temperature on reaction rate - Arrhenius equation -

concept of activation energy - Collision theory (elementary treatment only) - failures of Collision theory.

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

Unit V

(14 hrs)

Importance of pH and Buffer

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

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

Text Books:

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

Pedagogy:

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

Course Designers

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

Question Paper Pattern End Semester Examination

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

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE20A04	IDC – ALLIED CHEMISTRY PAPER –II (offered for B.Sc Physics)	THEORY	71	4	-	4

Preamble

To enable the students to

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

Course Outcomes

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

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

Mapping with Programme Outcomes

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

H- High; M-Medium; L-Low

IDC – Allied Chemistry Paper –II (CE20A04)

(offered for B.Sc Physics)

(71 Hrs)

UNIT I

(14 Hrs)

Nuclear Chemistry

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

UNIT II

(14 Hrs)

Organic Chemistry

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

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

UNIT III

(14 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 of conductance measurements - determination of degree of dissociation of weak electrolytes, conductometric titrations.

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

UNIT IV**(14 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 and redox titration.

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

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

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

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

UNIT V**(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 applications of PVC, Teflon, Polyethylene & bakelite, synthesis, properties and uses of silicones.

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

Text Books

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

Pedagogy

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

Course Designers

Dr.Sowmya Ramkumar

Dr.S.Charulatha

Question Paper Pattern
End Semester Examination

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

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE20CP1	CHEMISTRY PRACTICAL - I	THEORY	86	4	-	5

Preamble

To enable the students to

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

Course Outcomes

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

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

Mapping with Programme Outcomes

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

H-High; M-Medium; L-Low

Chemistry Practical – I (CE20CP1)**(90 Hrs)****Credits: 4**

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

The following cations and anions may be given

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

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

GROUP EXPERIMENTS:

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

Text Book

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

Reference book:

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

Pedagogy:

Demonstration and individual hands on practical's

Course Designers

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

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE20AP1	IDC –CHEMISTRY PRACTICAL FOR BIOLOGISTS (offered to B.Sc Botany & Zoology)	PRACTICAL	-	-	90	2

Preamble

To enable the students to

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

Course Outcomes

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

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

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

IDC –CHEMISTRY PRACTICAL FOR BIOLOGISTS (CE20AP1)

(offered to B.Sc Botany & Zoology)

(90hrs)

1. Volumetric Analysis

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

2. Organic Compound Analysis

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

Text Book:

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

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

Pedagogy

Demonstration and individual hands on Practicals.

Course Designers:

Dr.R.Revathi

Dr.N.Anusuya

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE20AP2	IDC – ALLIED CHEMISTRY PRACTICAL (offered for B.Sc Physics)	PRACTICAL	-	-	90	2

Preamble

To enable the students to

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

Course Outcomes

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

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

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

IDC – ALLIED CHEMISTRY PRACTICAL (CE20AP2) (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 Mohr's salt solution.
- vi. Estimation of potassium permanganate using standard oxalic acid.
- vii. Estimation of hardness of water (temporary and permanent).

2. Conductivity Experiments

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

3. Potentiometric Titration

1. Acid - base
2. Redox titration

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

Reference Books

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

Pedagogy

Demonstration and individual hands on Practicals

Course Designers

Dr.Sowmya Ramkumar

Dr.S.Charulatha

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE20C03	GENERAL CHEMISTRY PAPER - III	Theory	56	4	-	4

Preamble

To enable the students to

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

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	describe the methods of extraction and refining techniques of metals from their ores, properties of d-block elements and the chemistry of interhalogen compounds	K2, K4
CO2	examine the different approaches and concepts of acids and bases	K2, K4
CO3	analyze the reaction mechanism of aldehydes and ketones	K4
CO4	examine the preparation, properties and uses of carboxylic acids and esters	K2, K4
CO5	identify the ideal & non-ideal solutions and their purification techniques, distinguish one and two component systems based on phase rule	K2, K3

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

Unit – I

(11Hrs)

d-block elements

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

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

Inter halogen compounds

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

Unit –II

(11Hrs)

Acids and Bases

Definitions, different approaches - Arrhenius theory, Bronsted - Lowry theory, solvent system concept, Lewis concept. Relative strength of acids and bases, acidity and basicity of solvolysis reaction, HSAB – Principle, application & limitations of HSAB concept. Symbiosis, theoretical basis of hardness and softness. Electronegativity, hardness and softness. π -bonding contributions.

Nonaqueous Solvents

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

Unit – III

(11Hrs)

Carbonyl Compounds

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

Unit –IV

(11 Hrs)

Carboxylic acids and their functional derivatives

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

Hydroxy acids - Tartaric acid and Citric acid -preparation, properties and uses.

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

Unit –V

(12 Hrs)

Solutions of Non electrolytes

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

Phase Equilibria

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

Text Books:

S. No.	Authors	Title of the Book	Publishers	Year of Publication
1	B.S. Bahl & Arun Bahl	Organic Chemistry	S.Chand & Co, 15 th Edn	2009
2	R. D Madan	Modern Inorganic Chemistry	S. Chand & Co, 3 rd Edn	2011
3	B.R. Puri, L.R. Sharma, M.S. Pathania	Principles of Physical Chemistry	Vishal Publications, 45 th Edn	2011
4	Wahid.U.Malik, G.D.Tuli & R.D.Madan	Selected Topics in Inorganic Chemistry	S. Chand & Co., 30 th Edn.	2010

Reference Books:

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

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

Course Designers:

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

Question Paper Pattern**End Semester Examination: 100 Marks**

BLOOM'S CATEGORY	SECTION	WORD LIMIT	MARKS	TOTAL
K ₁ , K ₂	A-11/13 X 2 Marks	One or Two Sentences	22	100
K ₁ , K ₂	B -5/7 X 6 Marks	300	30	
K ₃ , K ₄	C - 4/6 X 12Marks	600-800	48	

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE20C04	GENERAL CHEMISTRY PAPER - IV	Theory	56	4	-	4

Preamble

To enable the students to

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

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	reproduce the extraction and properties of lanthanides and actinides	K1
CO2	illustrate the theories of coordination compounds, evaluate the crystal field splitting for tetrahedral and octahedral compounds	K2, K5
CO3	explain the preparation, properties and uses of nitro compounds, amines and diazonium salts	K5
CO4	classify the food additives and examine their functions	K2, K5
CO5	recognize the various theories of kinetics and analyze the kinetics of fast reactions	K2, K4

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

Unit – I**(11Hrs)****Lanthanides and Actinides**

Lanthanides: Lanthanide series, abundance and natural isotopes, similarity in properties, occurrence, oxidation states, chemical properties of Ln(III) cations, magnetic properties. lanthanide contraction. Extraction of lanthanides from Monazite, separation of individual lanthanides by Ion exchange method.

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

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

Unit – II**(12Hrs)****Coordination Chemistry**

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

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

Unit – III**(11 hrs)****Nitrocompounds, Amines and Diazonium Salts**

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

Amines

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

Diazonium salts: Preparation from aromatic amines, reactions - conversion to benzene and phenol.

Unit – IV

(11 hrs)

Chemical Kinetics-I

Empirical laws and experimental aspects – order and molecularity of reactions. Setting up and solving simple differential equations for zero, first, second & third order reactions. Derivation for half-life periods of first, second, third and zero order. Determination of order of reactions. Arrhenius equation & concept of energy of activation. Collision theory & derivation of rate constant for bimolecular reactions-theory of absolute reaction rates- derivation for the rate constant in terms of partition functions.

UNIT V

(11Hrs)

Introduction to Food Science

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

Food Additives

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

Food Adulteration and Testing

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

Text Book:

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

Reference Book:

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

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

Course Designers:

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

Question Paper Pattern

End Semester Examination: 100 Marks

BLO OM'S CATEGORY	SECTION	WORD LIMIT	MARKS	TOTAL
K ₁ , K ₂	A-11/13 X 2 Marks	One or Two Sentences	22	100
K ₁ , K ₂	B -5/7 X 6 Marks	300	30	
K ₃ , K ₄	C - 4/6 X 12Marks	600-800	48	

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE20CP2	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 colourants and adulterants in foods and milk/milk products

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	analyze organic compounds systematically and prepare suitable derivatives	K4
CO2	estimate the strength of unknown solutions by titrimetric methods	K5
CO3	identify the colourants and adulterants in foods and beverages	K3

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

Systematic Analysis - Organic Compounds

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

Volumetric Analysis

Acidimetry and Alkalimetry

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

Permanganimetry

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

Dichrometry

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

Complexometric titrations

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

Iodometry

1. Estimation of Potassium dichromate.

Qualitative Analysis of Natural Food Colours (Group Experiments)

Caramel, Cochineal, Turmeric, Annatto, Chlorophyll and Betanin

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

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

Text Book:

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

Reference Books:

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

Pedagogy: Demonstration and individual hands on practical

Course Designers

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

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE20SB1	Skill Based subject Computational Chemistry-I	THEORY	56	4	-	4

Preamble

Enable the students to

- understand the basic concepts in computational chemistry
- appraise the applications of open source tools in chemistry
- acquire knowledge on fundamentals of bioinformatics

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	apply the basic concepts of computational chemistry	K3
CO2	sketch GUI display of chemical structure, perform text and structure based searches	K3
CO3	develop chemical structure representations using open source tools	K3
CO4	recognise the challenges and opportunities in bioinformatics	K5
CO5	apply the biological databases for various application	K3

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

Semester III & IV
Skill Based subject
Computational Chemistry I (CE20SB1)

Credits: 4

(56 Hrs)

Unit I

(11 Hrs)

Fundamentals of Computers in Chemistry

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

Unit II

(11 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, canonical representation of molecular structures. Structure & substructure searching.

Unit III

(12 Hrs)

Cheminformatics tools

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

Unit IV

(11 Hrs)

Bioinformatics I

Introduction to Bioinformatics: - History, Scope, importance, challenges and opportunities. DNA sequencing method: -Maxam and Gilbert method, Sanger's method. Protein sequencing method- X-ray diffraction method.

Unit V

(11 Hrs)

Bioinformatics II

Classification of biological databases - Sequence database – nucleic acids database (NCBI, DDBJ & EMBL), protein database (PDB, SwissProt). Structure database (CATH, SCOP),

literature database (Pubmed); file formats of GenBank, SwissProt, PDB; data retrieval- *Entrez and SRS*. Application of bioinformatics in various fields.

Textbooks:

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

Reference books:

S.No	Authors	Title of the Book	Publishers	Year of Publication
1	Rajarsha Guha & Andreas Bender	Computational approaches in cheminformatics & bioinformatics	Wiley India Pvt Ltd	2012 1 st edition
2	Sundar Rajan S	Introduction to Bioinformatics	Himalaya Publishing House	2002, 1 st Edn
3	K Mani	Bioinformatics for Beginners	KalaiKathirAchc hagam	2002, 1 st Edn

Pedagogy:

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

Course Designers:

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

Question Paper Pattern

End Semester Examination

SECTION	MARKS	TOTAL
A- 4 / 6 X 5 Marks	20	50
B – 2 / 3 X 15 Marks	30	

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE20SBP1	Skill Based Subject Practical - Computational Chemistry Practical –I	PRACTICAL	-	-	30	2

Preamble

Enable the students to

- understand the essential features and tools of cheminformatics
- design chemical structures using chemical softwares
- recognise the molecular properties of chemical compounds

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	construct chemical structures using open source tool	K5
CO2	sketch out the code for chemical structures	K5
CO3	infer the hypothetical properties of chemical structures	K4
CO4	analyze the data obtained through optimisation	K4
CO5	demonstrate the most important databases for bioinformatics	K3

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

Semester III & IV
Skill Based Subject Practical - I
Computational Chemistry Practical - I (CE20SBP1)

Credits: 2

(30 Hrs)

1. Graphical User Interface Display - Draw chemical structures using open source tools: Chem Sketch, Chem Draw, G Chempaint, MOPAC, Avogadro and Marvin Sketch
2. Code for reading a molecule, checking their number of atoms and writing a smile string
3. Interconversion of name / SMILES code to structure and vice-versa using Chemdraw.
4. Optimisation and molecular properties of chemical structures – molecular formula, molecular weight, composition, molar volume, density and specific refractivity using Chem sketch.
5. Conversion of 2D to 3D structures
6. Output in different file formats – SDF file, mol File, XYZ coordinates, PDB

Textbook:

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

Pedagogy:

Demonstration, Hands on training

Course Designers:

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