



**DEPARTMENT OF CHEMISTRY** 

# CHOICE BASED CREDIT SYSTEM & OUTCOME BASED EDUCATION SYLLABUS

**BACHELOR OF CHEMISTRY** 

2021 - 2024



#### PROGRAMME LEARNING OUTCOMES (PLO's)

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

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

#### PROGRAMME SPECIFIC OUTCOME (PSO's)

The students at the time of graduation will

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





# **DEPARTMENT OF CHEMISTRY**

2021-2024

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

	IIIA	CE21C02	General Chemistry Paper - II	CC	5	71	4	3	50	50	100	5
	IIIA	CE21CP1	Chemistry Practical I	CC	3	45	-	3	50	50	100	4
	IIIA	PS21A02/ TH21A02	IDC Allied Physics Paper - II IDC Allied Mathematical Statistics II with R	GE	5 8	71 116	4	3	30 50	45 50	75 100	4
	IIIA	PS21AP1	Allied Physics Practical	GE	3	45	-	3	25	25	50	2
	IV		Self Study Online Courses		-	-	-	-	-	-	-	-
	IV	NME19B2/ NME19*A2	Basic Tamil/Advanced Tamil**	AEC	-	-	-	-	-	-	-	-
	V	21PEPS1	Professional English (Science /Management/ Humanities/Commerce)	AEC 3 45 3			50	50	100			
	IIIB	NM12GAW	Foundation Course –1 (General Awareness)		Self study (Online)							Grade
III	Ι	TAM2103/ HIN2103/ FRE2103	Language T/H/F Paper III	Language	6	6 86 4		3	50	50	100	3
	II	ENG2103/ ENG21F3	English Paper-III	English	5	71	4	3	50	50	100	3
	IIIA	CE21C03	Core Paper III	CC	4	56	4	3	50	50	100	4
	IIIA	CE21CP2	Core Practical - II	CC	3	45	-	-	-	-	-	-
	IIIA	TH21A09/ PL21A01/ AS21A01	IDC Allied paper II (without practical) [OR] IDC Allied paper II (with practical)	GE	7 4	101 56	4	3 3	50 30	50 45	100 75	5 4
	IIIA	PL21AP1/ AS21AP1	Allied Practical	GE	3	45	-	-	-	-	-	-

III	CE21SB01	Skill based subject Computational Chemistry-I / Coursera course	SEC	3	43	2	2	-	-	-	-
IIIB	NM 1 NM21EVS	Foundation Course-II (Environmental Studies) *	AECC	-	-	-	-	-	-	-	-
IIIB	NM21UHR	Foundation Course-III (Universal HumanValues and Human Rights) *	AECC	2	26	4	-	-	100	100	2
VI	JOB1334	Job Oriented Course		After 12.30 PM 60 h		GRADE					

CC – Core Courses GE – Generic Elective AEC – Ability Enhancing Course CA – Continuous Assessment ESE - End Semester Examination

#### **QUESTION PAPER PATTERN**

# **CORE & ALLIED PAPERS**

# Continuous Internal Assessment: 50 Marks (Semesters I & II)

BLOOM'S CATEGORY	SECTION	MARKS	TOTAL
<b>K</b> <sub>1</sub>	A – 5 X 2 Marks	10	
K <sub>1</sub> , K <sub>2</sub>	B – 4 X 5 Marks	20	50
K3, K4	C - 2/3 X 10 Marks	20	

#### End Semester Examination: 100 Marks (Semesters I & II)

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

#### Continuous Internal Assessment: 50 Marks (Semester III)

SECTION	MARKS	TOTAL
A – 4 X 2 Marks (No Choice)	08	50
B – 4 X 6 Marks (No Choice)	24	
C - 2 X 9 Marks (Internal Choice at same CLO Level)	18	

#### End Semester Examination: 100 Marks (Semester III)

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

# 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.

#### 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 coordinator & HoD. The students are to undergo training for a period of two weeks at the end of the 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 VALUATION	MARKS	TOTAL
Attendance	10	
Work Diary	15	
Report	50	
Viva-voce	25	100

# WEIGHTAGE ASSIGNED TO VARIOUS COMPONENTS OF

# CONTINUOUS INTERNAL ASSESSMENT (Semesters I - III)

	CIA I	CIA II	Model Exam	Assignment/ Class Notes	Seminar	Quiz	Participation	Application of Knowledge, Innovation & Creativity	Attendance	Max. Marks
Core / Allied	7	7	10	4	5	4	5	5	3	50
SBS	5	5	15	-	_	-	-	-	-	25

# Theory

# Practical

	Model Exam	Lab Performance	Regularity in Record Submission	Attendance	Maximum Marks
Core / Allied	15	24	8	3	50

# **RUBRICS Assignment/ Seminar**

Criteria	4 Marks	3 Marks	2 Marks	1 Mark
<b>Focus</b> 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
<b>Organization:</b> 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
<b>Style:</b> 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

# Maximum - 20 Marks (converted to 4 marks)

# **CLASS PARTICIPATION**

# Maximum - 20 Marks (converted to 5 marks)

Level of Engagement in ClassStudent proactively contributes to class by offering ideas and asks questions once per class.Student proactively contributes to class by offering ideas and asks questions once per class.Student proactively contributes to class by offering ideas and asks questions once per class.Student proactively contributes to class by offering ideas and asks orce per class.Student offering ideas and asks questions once per class.Student offering ideas and asks occasionallyStudent does offering ideas and asking no questionsStudent offering ideas and asking no questionsListening SkillsStudent listens when others talk, both in class. Student incorporates or builds off others.Student student almost in class.Student student occasionallyStudent does nore trans occasionallyStudent others talk, both in groups and in class.Student others talk, both in groups and in class.Student others classStudent others class.BehaviorStudent almost disruptive disruptive during classStudent disruptive disruptive during classStudent is occasionally disruptive behavior during classStudent is occasionally disruptive behavior during classStudent is occasionally disruptive behavior during classStudent is occasionally disruptive behavior during classStudent is almost always disruptive behavior class with class with class withStudent is occasionally disruptive behavior during class	Criteria	5 Marks	4 Marks	3 Marks	2 Marks	1 Mark	Points scored
Student listens when others talk, both in groups and in 	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	
BehaviorStudent almost never displays disruptive behaviorStudent rarely displays displaysStudent occasionally displays disruptive behavior during classStudent displays disruptive behavior during classStudent disruptive behavior during classStudent disruptive behavior during classStudent disruptive behavior during classStudent disruptive behavior during classStudent disruptive behavior during classStudent disruptive behavior during classStudent disruptive behavior during classStudent is behavior during classStudent is classStudent is class <th< th=""><th>Listening Skills</th><th>Student listens when others talk, both in groups and in class. Student incorporates or builds off of the ideas of others.</th><th>Student listens when others talk, both in groups and in class.</br></th><th>Student listens when others talk in groups and in class occasionally</br></br></br></br></br></th><th>Student does not listen when others talk, both in groups and in class.</br></br></br></br></br></th><th>Student does not listen when others talk, both in groups and in class. Student often interrupts when others speak.</br></br></br></br></br></br></br></br></br></th><th></th></th<>	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 	Student 	Student does 	Student does 	
Student isStudent isStudent isStudent isalmost alwaysusuallyoccasionallyrarelyalmost neverprepared forprepared forprepared forprepared forprepared forclass withclass withclass withclass withclass withclass.required classrequiredrequired classmaterialsmaterialsmaterials	Behavior	Student almost never displays disruptive behavior during class	Student rarely displays disruptive behavior during class	Student occasionally displays disruptive behavior during class	Student often displays disruptive behavior during class	Student almost always displays disruptive behavior during class	
materials Total	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.	

### MAPPING OF POs WITH Cos

~ ~ ~ ~ ~ ~ ~ ~	<b>PROGRAMME OUTCOMES</b>										
COURSE	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6					
	COURSE- CE21C01										
CL01	М	Н	Н	Н	Н	М					
CLO2	Н	Н	Н	Н	М	М					
CLO3	Н	Н	Н	Н	Н	Н					
CLO4	М	Н	Н	Н	М	М					
CLO5	Н	Н	Н	Н	Н	Н					
		COU	RSE - CE2	LA01							
CLO1	М	Н	Н	Н	Н	М					
CLO2	М	Н	Н	Н	Н	М					
CLO3	Н	Н	Н	Н	Н	Н					
CLO4	Н	Н	Н	Н	Н	М					
CLO5	Н	Н	Н	Н	Н	Н					
		COU	RSE - CE2	LA03							
CLO1	М	Н	Н	М	М	М					
CLO2	М	Н	Н	М	М	М					
CLO3	М	Н	Н	М	М	М					
CLO4	М	Н	Н	М	М	М					
CLO5	М	Н	Н	М	М	М					
		COU	RSE - CE2	1C02	l						
CLO1	Н	Н	Н	Н	Н	Н					
CLO2	М	Н	Н	Н	М	Н					
CLO3	М	Н	Н	Н	М	Н					
CLO4	Н	Η	Η	Н	Н	Н					
CLO5	Н	Н	Н	Н	Н	Н					
		COU	$\mathbf{RSE} - \mathbf{CE2}$	LA02							
CLO1	Н	Н	Н	Н	Н	Н					
CLO2	Н	Н	Н	Н	Н	Н					
CLO3	Н	Н	Н	Н	Н	Н					
CLO4	Н	Н	Н	Н	Н	Н					

CLO5	Н	Н	Н	Н	Н	Н					
	COURSE - CE21A04										
CLO1	М	Н	Н	М	М	М					
CLO2	М	Н	Н	М	М	М					
CLO3	М	Н	Н	М	М	М					
CLO4	М	Н	Н	М	М	М					
CLO5	М	Н	Н	М	М	М					
COURSE - CE21CP1											
CLO1	Н	Н	Н	Н	Н	Н					
CLO2	Н	Н	Н	Н	Н	Н					
CLO3	Н	Н	Н	Н	Н	Н					
	I	COUR	SE - CE21A	P1							
CLO1	Н	Н	Н	Н	Н	Н					
CLO2	Н	Н	Н	Н	Н	Н					
CLO3	Н	Н	Н	Н	Н	Н					
COURSE - CE21AP2											
CLO1	Н	Н	Н	Н	Н	Н					
CLO2	Н	Н	Н	Н	Н	Н					
CLO3	Н	Н	Н	Н	Н	Н					
CLO4	Н	Н	Н	Н	Н	Н					
		COU	RSE – CE2	1C03							
CLO1	Н	Н	Н	М	Н	М					
CLO2	Н	Н	Н	М	Н	М					
CLO3	Н	М	Н	Н	Н	Н					
CLO4	Н	Н	Н	Н	М	Н					
CLO5	Н	Н	Н	Н	Н	М					
	COURSE – CE21C04										
CLO1	Н	Н	Н	Н	Н	М					
CLO2	Н	Н	Н	Н	Н	М					
CLO3	Н	Н	Н	Н	Н	Н					

CLO4	Н	Н	Н	Н	Н	Н						
	COURSE – CE21CP2											
CL01	Н	Н	Н	Н	Н	М						
CLO2	Н	Н	М	Н	Н	Н						
CLO3	Н	Н	Н	Н	М	Н						
		COU	RSE – CE21	SB01								
CL01	Н	Н	Н	Н	Н	Н						
CLO2	Н	Н	Н	М	Н	Н						
CLO3	Н	Н	Н	Н	Н	Н						
CLO4	Н	Н	Н	М	М	Н						

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

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 4.0 through physical-to-digital-to-physical connection which potentially transform the chemical industry

#### **Course Learning Outcomes**

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

CLO Number	CLO Statement	Knowledge Level
CLO1	understand and recall the principles of quantum mechanics to learn the atomic structure	K1, K2
CLO2	discuss the types of bonding and their theories	K2
CLO3	apply laws of thermodynamics and perform calculations for physical processes involved	К3
CLO4	apply polar effects to explain the properties of organic compounds and	K3
CLO5	appraise Huckel's rule of aromaticity and apply Industry 4.0 to improve the productivity by reducing the risk via various smart technologies	K3, K4

#### Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CL01	М	Н	Н	Н	Н	М
CLO2	Н	Н	Н	Н	М	М
CLO3	Н	Н	Н	Н	Н	Н
CLO4	М	Н	Н	Н	М	М
CLO5	Н	Н	Н	Н	Н	Н

H-High; M-Medium; L-Low

#### GENERAL CHEMISTRY PAPER – I (CE21C01)

#### Unit I

#### **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  $\psi$  and  $\psi^2$  (no derivation required), shapes of s,p,d orbitals. 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

#### (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<sub>3</sub>, NH<sub>3</sub>, H<sub>2</sub>O, CIF<sub>3</sub>, SF<sub>4</sub>, PF<sub>5</sub>, SF<sub>6</sub>.

Concept of resonance and resonating structures for CO<sub>3</sub> 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

#### **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.

(86 Hrs) (17 hrs)

(17 hrs)

#### 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

#### 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<sub>2</sub>, R<sub>2</sub>NH, R<sub>3</sub>N and aniline and stability of alkenes based on hyper conjugation.

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

#### Unit V

#### Aromaticity

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

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

#### **Industry 4.0**

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

#### **Text Books**

S.	Author	Title of the Book	Publishers	Year of
No	numor	The of the book	i ublishers	Publication
1.	Arun Bahl	Advanced Organic	S. Chand Sons	2016
	B. S. Bahl	Chemistry	Company Pvt Ltd	
2.	Jagdamba Singh	Undergraduate Organic	Pragathi Prakahasan	2010
		Chemistry Vol I		
3.	P. L. Soni	Text Book of Inorganic	Sultan Chand and	2013
		Chemistry	Sons	
4.	B. R. Puri, L. R.	Principles of Physical	Vishal Publishing &	2017
	Sharma, M. S.	Chemistry	Со	
	Patania			

# (**18 hrs**)

#### (17 hrs)

5.	Muthukumarasamy	Practical Cheminformatics	Springer	2014
	Karthikeyan and			
	RenuVyas			
6.	P. Kaliraj,	Higher Education for		
	T. Devi,	Industry 4.0 and		
		Transformation to		
		Education 5.0		

#### **Reference Books**

S.	Author	Title of the Book	Publishers	Year of
No				Publication
1.	B. R. Puri, L. R.	Principles of Inorganic	Milestone Publishers	2011
	Sharma, K. K. Kalia	Chemistry	and Distributors	
2.	R. T. Morrison and	Organic Chemistry	Pearson India	2010
	R. N. Boyd		Education Services	
3.	R. D. Madan	Modern Inorganic	S. Chand Sons	2014
		Chemistry	Company Pvt Ltd	
4.	Alasdair Gilchrist.	Industry 4.0: The Industrial		
		Internet of Things, Apress		
		Publications		

#### **Related Online References:**

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

#### **Pedagogy:**

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

#### **Course Designers**

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

# **End Semester Examination**

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

COURSE NUMBER	COURSE NAME	CATEGORY	L	Т	Р	CREDIT
CE21A01	<b>IDC - CHEMISTRY FOR BIOLOGISTS – I</b> (offered to B.Sc Botany & Zoology)	THEORY	56	4	-	4

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 Outcomes**

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

CLO Number	CLO Statement	Knowledge Level
CLO1	recognize the importance of ionic, covalent, hydrogen bonding and relate it to shapes/hybridization of discuss the shapes and hybridization of compounds	K1
CLO2	differentiate aromatic and non-aromatic compounds and appraise isomerism in organic compounds	K2, K3
CLO3	demonstrate the preparation of standard solutions and apply chromatographic techniques	K3
CLO4	analyse the chemistry of amino acids and proteins	K4
CLO5	appraise the importance of solar energy and water treatment techniques	K4

#### Mapping with programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	М	Н	Н	Н	Н	М
CLO2	М	Н	Н	Н	Н	М
CLO3	Н	Н	Н	Н	Н	Н
CLO4	Н	Н	Н	Н	Н	М
CLO5	Н	Н	Н	Н	Н	Н

H- High; M-Medium; L-Low

#### **IDC – CHEMISTRY FOR BIOLOGISTS – I (CE21A01)** (Offered to B.Sc. Botany & Zoology)

(56 hrs)

(11 hrs)

#### UNIT I **Bonding**

Types of bonding - Covalent bond - nature, structure and hybridization of CH<sub>4</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>2</sub> and C<sub>6</sub>H<sub>6</sub> 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 BeCl<sub>2</sub>, H<sub>2</sub>O, NH<sub>3</sub> and PCl<sub>5</sub> based on VSEPR theory.

#### **UNIT II**

#### **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

#### **Analytical Chemistry**

Role and importance of analytical chemistry - principle of volumetric analysis calibration of glass wares, 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**

#### **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  $\alpha$ ,  $\beta$ ,  $\gamma$  amino acids -dipeptide synthesis. Protein - classification according to composition and function, primary and secondary structure, properties and color reactions of proteins.

#### UNIT V

#### 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.

#### (11 hrs)

# (12 hrs)

(11 hrs)

(11 hrs)

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.

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

#### **Text Books:**

#### **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 <sub>1</sub> , K <sub>2</sub>	A-11/13 X 2 MARKS	ONE OR TWO SENTENCES	22	100
K <sub>1</sub> , K <sub>2</sub>	B -5/7 X 6 MARKS	300	30	100
K <sub>3</sub> , K <sub>4</sub>	C - 4/6 X 12MARKS	600-800	48	

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

To enable the students to

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

#### **Course Outcomes**

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

CLO Number	CLO Statement	Knowledge Level	
CLO1	classify organic reactions and predict the geometry of organic	K <sub>2</sub>	
	molecules based on hybridization	IX2	
CLO2	define and recognize the types of chemical bonding with its	K. K.	
	effect on structure and property	<b>K</b> <sub>3</sub> , <b>K</b> <sub>4</sub>	
CLO3	state and apply the laws of thermodynamics to analyze the	K <sub>2</sub> K <sub>4</sub>	
	feasibility of reactions	$\mathbf{K}_{2}, \mathbf{K}_{4}$	
CLO4	explain the basic concepts of chemical kinetics & photo	K	
	chemistry	ix <sub>2</sub>	
CLO5	discuss the phase diagram of simple eutectic system and	K.	
	recognize the typical crystal lattices	<b>IX</b> 4	

#### **Mapping with Programme Outcomes**

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	М	Н	Н	М	М	М
CLO2	М	Н	Н	М	М	М
CLO3	М	Н	Н	М	М	М
CLO4	М	Н	Н	М	М	М
CLO5	М	Н	Н	М	М	М

H- High; M-Medium; L-Low

# (11 Hrs)

(56 Hrs)

#### UNIT I

#### **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<sub>4</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>2</sub>, C<sub>6</sub>H<sub>6</sub> molecules, structure of graphite and diamond.

#### UNIT II **Chemical Bonding**

Types of bonding - Covalent bond - nature, structure and hybridization of CH<sub>4</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>2</sub> and C<sub>6</sub>H<sub>6</sub> 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<sub>2</sub>, H<sub>2</sub>O, NH<sub>3</sub> and PCl<sub>5</sub> based on VSEPR theory. Metallic bonding-semiconductors - intrinsic, extrinsic n-type and p-type semiconductors.

# UNIT III **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

#### **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.

# (11 Hrs)

(11 Hrs)

#### (11 Hrs)

#### UNIT V 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	Highmount	Reprint 2006
		Chemistry	Publishing House,	
			Chennai-14	
2.	B.R.Puri,	Principles of Physical	Jalandhar, New Delhi	Reprint 2019
	L.R.Sharma,	chemistry		
	L.S.Pathania			

#### 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

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

COURSE NUMBER	COURSE NAME	CATEGORY	L	Т	Р	CREDIT
CE21CP1	CHEMISTRY PRACTICAL - I	THEORY	86	4	-	5

To enable the students to

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

#### **Course Outcomes**

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

CLO Number	CLO Statement	Knowledge Level
CLO1	identify, separate the cations into groups and report the acid and basic radicals	K <sub>1</sub> , K <sub>2</sub>
CLO2	estimate the percentage amount of chlorine, carbonates, Mg, Na in bleaching powder, hard water, detergent	$\mathbf{K}_4$
CLO3	estimate the percentage amount of chlorine, carbonates, Mg, Na in bleaching powder, hard water, detergent	$K_4$

#### **Mapping with Programme Outcomes**

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	Н	Н	Н	Н	Н	Н
CLO2	Н	Н	Н	Н	Н	Н
CLO3	Н	Н	Н	Н	Н	Н

H-High; M-Medium; L-Low

#### 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<sup>-</sup>, CO<sub>3</sub><sup>2-</sup>, Br<sup>-</sup>, NO<sub>3</sub><sup>-</sup>, SO<sub>4</sub><sup>2-</sup>, F<sup>-</sup>, BO<sub>3</sub><sup>2-</sup>, C<sub>2</sub>O<sub>4</sub><sup>2-</sup>, CrO<sub>3</sub><sup>2-</sup>, PO<sub>4</sub><sup>3-</sup> Cations : Pb<sup>2+</sup>, Cu<sup>2+</sup>, Zn<sup>2+</sup>, Mn<sup>2+</sup>, Co<sup>2+</sup>, Ni<sup>2+</sup>, Ca<sup>2+</sup>, Ba<sup>2+</sup>, NH<sub>4</sub><sup>+</sup>, Mg<sup>2+</sup>, Cd<sup>2+</sup>, Sr<sup>2+</sup>

#### **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

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 <sup>rd</sup> Edn., 1974
2.	Jain P. C and Jain M	Engineering Chemistry	Dhanpat Rai and Sons	16 <sup>th</sup> edition, 2013
3.	Vogel A. I	Text Book of Practical Organic Chemistry	Prentice Hall	2011, 5 <sup>th</sup> 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	Т	Р	CREDIT
CE21AP1	IDC – CHEMISTRY PRACTICAL FOR BIOLOGISTS (offered to B.Sc. Botany & Zoology)	PRACTICAL	-	-	90	2

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

CLO	CLO Statement	Knowledge
Number		Level
CLO1	define the various terms in volumetric analysis	$K_1$
CLO2	perform the volumetric analysis and estimate the quantity present.	K <sub>2</sub> , K <sub>3</sub>
CLO3	identify and analyse organic compounds	<b>K</b> <sub>3</sub>

#### Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	Н	Н	Н	Н	Н	Н
CLO2	Н	Н	Н	Н	Н	Н
CLO3	Н	Н	Н	Н	Н	Н

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

#### 2. Organic Compound Analysis

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

#### **Text Book:**

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

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

#### Pedagogy

Demonstration and individual hands on Practicals.

#### **Course Designers:**

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

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

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

CLO Number	CLO Statement	Knowledge Level
CLO1	define the various terms in volumetric analysis	$K_1$
CLO2	perform the volumetric analysis and estimate the quantity present.	K <sub>2</sub> , K <sub>3</sub>
CLO3	Calculate the hardness of water samples	${ m K}_4$
CLO4	recall the various terms in conductometric and potentiometric experiments	$K_1$

#### Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	Н	Н	Н	Н	Н	Н
CLO2	Н	Н	Н	Н	Н	Н
CLO3	Н	Н	Н	Н	Н	Н
CLO4	Н	Н	Н	Н	Н	Н

H - High; M-Medium; L-Low

#### IDC – ALLIED CHEMISTRY PRACTICAL (CE20AP2) (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.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 <sup>nd</sup> Edn.
2.	B. Vishwanathan, P.S. Raghavan	Practical Physical Chemistry	Viva Books	2014 Reprint

#### Pedagogy

Demonstration and individual hands on Practicals

#### **Course Designers**

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

COURSE NUMBER	COURSE NAME	CATEGORY	L	Т	Р	CREDIT
CE21C02	GENERAL CHEMISTRY PAPER – II	THEORY	71	4	-	5

To enable the students to

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

#### **Course Outcomes**

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

CO Number	CLO Statement	Knowledge Level
CLO1	recall and appreciate the electronic configurations and general trends of s & p-block elements	K <sub>2</sub> , K <sub>3</sub>
CLO2	Analyze the stereoisomerism in organic compounds- optical/geometrical/conformational isomerism	K <sub>4</sub>
CLO3	Illustrate nucleophilic substitution reactions in alkyl/aryl halides	K <sub>3</sub>
CLO4	examine the properties of suspension, colloids, liquid crystals, and appraise the application of colloids	K <sub>1</sub> , K <sub>4</sub>
CLO5	assess, develop and apply the continuity equation for open and closed systems using second law of thermodynamics	K <sub>4</sub>

**Mapping with Programme Outcomes** 

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	Н	Н	Н	Н	Н	Н
CLO2	М	Н	Н	Н	М	Н
CLO3	М	Н	Н	Н	М	Н
CLO4	Н	Н	Н	Н	Н	Н
CLO5	Н	Н	Н	Н	Н	Н

H-High; M-Medium; L-Low

#### GENERAL CHEMISTRY PAPER – II (CE21C02) (71 Hrs)

#### Unit I

**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 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 and halides group 13 to 16. Hydrides of boron – diboranes and its structure. Basic properties of halogens, interhalogens and poly halides.

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

#### Unit –II

#### **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, diastereomers, threo and erythro diastereomers, meso compounds, resolution of enantiomers, inversion, retension and racemization. Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature. Geometric isomerism – determination of configuration of geometric isomers. 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. Newman projection and Sawhorse formulae, Fischer and flying wedge formulae. Difference between configuration and conformation.

#### Unit–III

#### **Alkyl and Aryl Halides**

**Alkyl Halides** – Types of Nucleophilic Substitution  $(SN^1, SN^2 \text{ and } SN^i)$  reactions. Preparation: from alkenes and alcohols. Reactions: hydrolysis, nitrite & nitro formation, nitrile & isonitrile formation. Williamson's ether synthesis: Elimination vs. substitution.

#### (14hrs)

#### (14hrs)

# (14 Hrs)

**Aryl Halides** – Preparation: (Chloro, bromo and iodo-benzene) from phenol, Sandmeyer & Gattermann reactions. Reactions (Chlorobenzene): Aromatic nucleophilic substitution (replacement by –OH group) and effect of nitro substituent. Benzyne Mechanism: KNH<sub>2</sub>/NH<sub>3</sub> (or NaNH<sub>2</sub>/NH<sub>3</sub>). Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides.

#### **UNIT IV**

#### **Colloidal State**

Definition of colloids, Classification of Colloids, Solids in Liquids (SOLS): Propertieskinetic, 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 Thermodynamics –II

Second law of thermodynamics – Need for second law, different statements, entropydefinition, 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

#### (14 hrs)

(15 hrs)

2.	P. L. Soni	Text Book of inorganic Chemistry	Sultan Chand and Sons	2013
3.	B. R. Puri, L. R. Sharma, M. S. Patania	Principles of Physical Chemistry	Vishal Publishing & Co	2017
4.	D. Nasipuri	Stereochemistry of Organic Compounds	New Age International Ltd	2004

#### **Reference Books**

S. No.	Author	Title of the Book	Publishers	Year of Publication	
1	Arun Bahl	Advanced Organic	S. Chand Sons Company	2009	
	B. S. Bahl	Chemistry	Pvt Ltd,		
2	Jagdamba Singh,	Advanced Organic	Dragathi Drakahasan	2013	
2	L. D. S. Yadhav	Chemistry	i lagaun i lakanasan	2013	
2	IDIaa	Concise Inorganic	English Language Book	2008	
5	J.D Lee	Chemistry	Society	2008	
4	James E Uubeev	Inorgania Chamistry	Pearson India Education	2015	
4	James E Huneey	morganic Chemistry	Services	2015	
5	R. T. Morrison	Organic Chemistry	Pearson India Education	2010	
5	and R. N. Boyd	Organic Chemistry	Services	2010	
6	K. S. Tewari, N.	A Textbook of	Vikas Publishing House	2017	
0	K. Vishnoi	Organic Chemistry	vikas i uonsining mouse	2017	
7	P. S. Kalsi	Stereochemistry	New Age International	2000	
	B. R. Puri, L. R.	Principles of	Milestone Publishers and		
8	Sharma, K. K.	Inorganic Chemistry	Distributors	2011	
	Kana				
9	R D Madan	Modern Inorganic	S. Chand Sons Company	2014	
	Chemistry		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

### End Semester Examination Question Paper Pattern

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

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

To enable the students to

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

#### **Course Learning Outcomes**

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

CLO Number	CLO Statement	Knowledge Level
CLO1	name the coordination compounds and explain its formation using various theories	K1, K2
CLO2	outline the applications of fuels, fertilizers and polymers	K2
CLO3	identify the significane of organic compounds in drugs and dyes	K3
CLO4	analyse the basic concepts of chemical kinetics and industrial applications of catalysis	K4
CLO5	examine the importance of pH and buffers in living systems	K4

#### Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	Н	Н	Н	Н	Н
CLO2	Н	Н	Н	Н	Н
CLO3	Н	Н	Н	Н	Н
CLO4	Н	Н	Н	Н	Н
CLO5	Н	Н	Н	Н	Н

H- High; M-Medium; L-Low

#### IDC – CHEMISTRY FOR BIOLOGISTS - II (CE21A02)

(Offered to B.Sc Botany & Zoology)

(71 hrs)

(15hrs)

#### Unit I

#### **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

#### **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**

#### 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, hyperchromic and hypochromic shifts. Azo dyes, vat dyes, mordant dyes. Food colours- general treatment.

#### (14hrs)

#### (14hrs)

#### Unit IV

#### **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

#### 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
		Text book of Allied	2 <sup>nd</sup> Edn, High mount	Reprint
1.	Dr. V.Veeraiyan	Chemistry	Publishing house,	2005
			triplicane, Chennai.	
	R S Rahl Arun Rahl and	Essentials of	S Chand &	Reprint
2.	G D Tuli	Physical Chemistry	Company Ltd, New	2000
	O.D. Tuli		Delhi.	
2	B.K.Sharma	Industrial Chemistry	GOEL Publishing	Reprint
5.			House	2000

#### **Pedagogy:**

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

#### **Course Designers**

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

# **Question Paper Pattern**

### **End Semester Examination**

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

COURSE NUMBER	COURSE NAME	Category	L	Т	Р	Credit
CE21A04	IDC – ALLIED CHEMISTRY PAPER –II (For B.Sc Physics)	Theory	71	4	-	4

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

CLO Number	CLO Statement	Knowledge Level
CLO1	relate the properties of aromatic compounds and organic reactions	<b>K</b> <sub>4</sub>
CLO2	recognize the basic concepts of nuclear chemistry	K <sub>2</sub>
CLO3	categorize the solution based on its pH	K <sub>4</sub>
CLO4	identify the chemistry of fuels, polymers and plastics	K <sub>1</sub>
CLO5	Define Various term sin electrochemistry and to solve problems	K. K.
	related to conductance	<b>N</b> <sub>1</sub> , <b>N</b> <sub>3</sub>

#### **Mapping with Programme Outcomes**

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	М	Н	Н	М	М	М
CLO2	М	Н	Н	М	М	М
CLO3	М	Н	Н	М	М	М
CLO4	М	Н	Н	М	М	М
CLO5	М	Н	Н	М	М	М

H- High; M-Medium; L-Low

#### UNIT I

### Nuclear Chemistry

Fundamental particles of nucleus, isobars, isotones and isomers, differences between chemical reactions and nuclear reaction, fusion and fission, mass defect, derivation of 1 amu = 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.

IDC – Allied Chemistry Paper –II (Offered to B.Sc. Physics) - CE21A02

### UNIT II

#### **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

#### 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

**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.

#### (14 Hrs)

#### (14 Hrs)

# (14 Hrs)

# (14 Hrs)

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

#### UNIT V

#### **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 <sup>th</sup> Edn
2.	Dr. Veeraiyan V	Text book of Allied Chemistry	Highmount Publishing House, Chennai-14	Reprint 2006
3.	B.R.Puri, L.R.Sharma, L.S.Pathania	Principles of Physical chemistry	Vishal Publishing Co, Jalandhar, New Delhi	Reprint 2013

#### Pedagogy

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

#### **Course Designers**

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

#### (15 Hrs)

# Question Paper Pattern End Semester Examination

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

COURSE NUMBER	COURSE NAME	CATEGORY	L	Т	Р	CREDIT
CE21C03	GENERAL CHEMISTRY PAPER	Theory	56	4	-	4
	– III					

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.
- acquireinsight into phase rule and its applications.

#### **Course Outcomes**

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

CLO Number	CLO Statement	Knowledge Level
CLO1	describe the methods of extraction and refining techniques of metals from their ores, examine the concepts of acids and bases, recognize the different naming reaction, examine the purification techniques	K1
CLO2	compare the properties of d-block elements, discuss the concepts of acids and bases, predict the mechanism of oxidation and condensation reactions, identify the ideal & non-ideal solutions	K2
CLO3	illustrate the chemistry of interhalogen compounds, interpret the electronegativity, hardness and softness, relate the properties of dicarboxylic acid, sketch the phase diagram for one component and two component system	К3
CLO4	analyze the metallurgy of d block elements, examine the synthesis of aldehydes and ketones, categorize the general methods of preparation of hydroxy acids, distinguish one and two component systems based on phase rule	K4

#### Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	Н	Н	Н	Н	Н	М
CLO2	Н	Н	Н	Н	Н	М
CLO3	Н	Н	Н	Н	Н	Н
CLO4	Н	Н	Н	Н	Н	Н

H - High; M-Medium; L-Low

#### **GENERAL CHEMISTRY PAPER – III (CE21C03)** (56Hrs)

#### Unit – I

#### *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, ClF<sub>3</sub>, BrF<sub>5</sub>, IF<sub>7</sub> - Preparation, properties, structure and uses.

#### Unit –II

#### 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. $\pi$ -bonding contributions.

#### Nonaqueous Solvents

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

#### Unit – III

#### (11 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<sub>4</sub>, hypohalite, SeO<sub>2</sub> and per acids.Reduction reactions - H<sub>2</sub>/Ni, H<sub>2</sub>-Pd-C, NaBH<sub>4</sub>, LiAlH<sub>4</sub>, MPV, Clemmensen and Wolff-Kishner reductions.Condensation reactions with ammonia and its derivatives- Aldol, Perkin, Knoevenagel, Reformatsky and Cannizaro reactions.

(11 Hrs)

(11 Hrs)

#### Unit –IV 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

#### 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.Onecomponent 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 &	Organia Chamistry	S.Chand& Co,15th	2000
1.	Arun Bahl	Organic Chemistry	Edn	2009
2	P. D. Madan	Modern Inorganic	S. Chand & Co,	2011
2. K. D M	K. D Wadali	Chemistry	3rdEdn	2011
3.	B.R. Puri,	Principles of Physical	Vishal Publications,	2011
	L.R. Sharma,	Chemistry	45thEdn	
	M.S. Pathania			

#### (12 Hrs)

#### **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 <sup>nd</sup> Edn	2014
2.	R.T. Morrison & R.W. Boyd	Organic Chemistry	Pearson Prentice Hall, 17 <sup>th</sup> Edn	2011
3.	A.petersykes	A Guide book to Mechanism in Organic Chemistry	Pearson Education Ltd, 6 <sup>th</sup> 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

# <u>Question Paper Pattern</u> End Semester Examination: 100 Marks

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

COURSE NUMBER	COURSE NAME	CATEGORY	L	Т	Р	CREDIT
CE21CP2	CHEMISTRY PRACTICAL – II	PRACTICAL	-	-	90	5

Enable the students to

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

#### **Course Outcomes**

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

CLO Number	CLO Statement	Knowledge Level
CLO1	analyze organic compounds systematically and prepare suitable derivatives	K4
CLO2	calculate the strength of unknown solutions by titrimetric methods	K4
CLO3	interpret the various colorants and adulterants in foods and beverages	К3

#### Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	Н	Н	Н	Н	Н	М
CLO2	Н	Н	М	Н	Н	Н
CLO3	Н	Н	Н	Н	М	Н

H - High; M-Medium; L-Low

#### Chemistry Practical – II (CE21CP2)

#### **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 <sup>th</sup> 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 <sup>th</sup> 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	Т	Р	CREDIT
CE21SB01	Skill Based Subject Computational Chemistry I	THEORY	43	2	-	3

Enable the students to

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

#### **Course Outcomes**

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

CLO Number	CLO Statement	Knowledge Level
CLO1	recall the fundamentals of computers and computational chemistry tools	K1
CLO2	identify the biological databases for various application, the DNA sequencing methods, develop chemical structure representations using open source tools	K2
CLO3	sketch GUI display of chemical structure, perform text and structure based searches, determine the relative score made by matching two characters in a sequence alignment	К3
CLO4	analyse chemical structure representations using open source tools, recognize the challenges and opportunities in bioinformatics	K4

### Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	Н	Н	Н	Н	Н	Н
CLO2	Н	Н	Н	М	Н	Н
CLO3	Н	Н	Н	Н	Н	Н
CLO4	Н	Н	Н	М	М	Н

H - High; M-Medium; L-Low

#### Semester III Skill Based Subject Computational Chemistry I (CE21SB01)

Credits: 3

### Unit I

#### Fundamentals of Computers in Chemistry

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

#### Unit II

#### **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

#### **Cheminformatics tools**

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

#### Unit IV

#### **Bioinformatics I**

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

#### Unit V

#### **Bioinformatics II**

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

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

# (43 Hrs)

#### (8 Hrs)

# (8 Hrs)

#### (9 Hrs)

(8 Hrs)

#### (8 Hrs)

#### 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 <sup>nd</sup> Edn
2.	Kishor Arora	Computers Applications in Chemistry	Anmol Publication Pvt Ltd	2004, 1 <sup>st</sup> Edn
3.	Dan E Krane& Michael L Raymer	Fundamental concepts of Bioinformatics	Pearson Education	2003, 1 <sup>st</sup> Edn

#### **Reference books**

S. No.	Authors	Title of the Book	Publishers	Year of Publication
1.	Rajarsha	Computational Approaches in	Wiley India Pvt	2012 1 <sup>st</sup>
	Guha &	Cheminformatics &	Ltd	edition
	Andreas	Bioinformatics		
	Bender			
2.	Sundar	Introduction to Bioinformatics	Himalaya	2002, 1 <sup>st</sup> Edn
	Rajan S		Publishing House	

#### 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