



PSGR KRISHNAMMAL COLLEGE FOR WOMEN
College of Excellence
(An Autonomous Institution, Affiliated to Bharathiar University)
(Reaccredited with 'A' Grade by NAAC, An ISO 9001:2008 Certified Institution)
Peelamedu, Coimbatore-641004



DEPARTMENT OF CHEMISTRY

CHOICE BASED CREDIT SYSTEM & OUTCOME BASED EDUCATION SYLLABUS

BACHELOR OF CHEMISTRY

2016 - 2019



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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.



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DEPARTMENT OF CHEMISTRY

2016-2019

SE M	Part	Subject Code	Title of the Paper	Instruction hours/week	Contact hours	Tutorial	Duration of Examination	Examination Marks			Credits
								CA	ESE	TOT AL	
I	I	TAM1601/ HIN1601/	Language T/H/F Paper I	6	86	4	3	40	60	100	3
	II	ENG1601/ ENG16F1	English Paper-I/Functional English Paper -I	6	86	4	3	40	60	100	3
	IIIA	CE16C01	General Chemistry Paper -I	6	86	4	3	40	60	100	5
	IIIA	CE16CP1	Chemistry Practical - I	3	45	-	-	-	-	-	-
	IIIA	PS16A01/ TH16A01	IDC Allied Physics Paper - I	4	56	4	3	20	55	75	4
			IDC Allied Mathematical	7	101	4	3	40	60	100	5
	IIIA	PS16AP1	Allied Practical Physics	3	45	-	-	-	-	-	-
	IV	NME16B1/ NME16A1/ NME12WS/	Basic Tamil /Advanced Tamil /	2/	28/			50/		100/	2
			Women Studies/Ambedhkar	2/	26/	2/4/4	-/2/-	50/	50/	100/	
			Studies/ Gandhian Studies	2	26			100	50/-	100	
II	I	TAM1602/ HIN1602/	Language T/H/F Paper - II	6	86	4	3	40	60	100	3

	II	ENG1602/ ENG16F2	English Paper-II /Functional English Paper -II	6	86	4	3	40	60	100	3	
	IIIA	CE16C02	General Chemistry Paper - II	5	71	4	3	40	60	100	5	
	IIIA	CE16CP1	Chemistry Practical I	3	45	-	3	40	60	100	4	
	IIIA	PS16AO2/ TH16A02	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	PS16AP1	Allied Physics Practical	3	45	-	3	20	30	50	2	
	IV		Open Course - Self Study Online Courses	-	-	-	-	-	-	-	-	
	IV	NME16B2/A 2	Basic Tamil/Advanced Tamil**	-	-	-	-	-	-	-	-	
	V		Effective English Communication	2	26	4	2	50	50	100	2	
	IIIB	NM12GAW	Foundation Course –I (General Awareness)	Self study (Online)								Grade
III	I	TAM1603/ HIN1603/	Language T/H/F Paper III	6	86	4	3	40	60	100	3	
	II	ENG1603/ ENG16F3	English Paper III / Functional English Paper III	5	71	4	3	40	60	100	3	
	IIIA	CE16C03	General Chemistry Paper –III	4	56	4	3	40	60	100	4	
	IIIA	CE16CP2	Chemistry Practical - II	3	45	-	-	-	-	-	-	
	IIIA	TH16A09/ APL16A01/	IDC - Allied Maths Paper I	7	101	4	3	40	60	100	5	
	IIIA	PL16AP1/ AS16AP1	Allied Practical-Botany/Zoology	2	45	-	-	-	-	-	-	
	IV	SB13BC01	Skill Based Subject- Biochemistry I	3	29	1	2	-	-	-	-	
	IV	SB13BCP1	Skill Based Subject Practical- Biochemistry Practical-I		15	-	-	-	-	-	-	

	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		GRA DE*				
IV	I	TAM1604/ HIN1604/	Language T/H/F Paper – IV	5	71	4	3	40	60	100	3
	II	ENG1604/ ENG16F4	English Paper IV/ Functional English Paper IV	6	86	4	3	40	60	100	3
	IIIA	CE16C04	General Chemistry Paper – IV	4	56	4	3	40	60	100	4
	IIIA	CE16CP2	Chemistry Practical II	3	45	-	3	40	60	100	5
	IIIA	TH16A14/ PL16A02/	IDC - Allied Maths Paper II	7	101	4	3	40	60	100	5
	IIIA	PL16AP1/ AS16AP1	Allied Botany/Zoology Practical	2	45	-	3	20	30	50	2
	IV	SB13BC01	Skill Based Subject- Biochemistry-I	3	29	1	2	25	75	100	4
	IV	SB13BCP1	Skill Based Subject Practical- Biochemistry Practical-I		15	-		40	60	100	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
V	IIIA	CE16C05	Paper - V Inorganic Chemistry	4	56	4	3	40	60	100	4
	IIIA	CE16C06	Paper - VI Organic Chemistry	4	56	4	3	40	60	100	4
	IIIA	CE16C07	Paper VII Physical Chemistry	4	56	4	3	40	60	100	4
	III A	CE16 E01	AOS - I Polymer Chemistry	4	56	4	3	40	60	100	5

	IIIA	CE16E02	AOS-II Optional Analytical Chemistry	4	56	4	3	40	60	100	5
	III A	CE16AC1	ALC I – Optional Agro Industrial Chemistry	Self Stud	-	-	3	25	75	100*	5*
	III A	CE16AC2	ALC II-Optional Pharmaceutical Chemistry	Self Stud	-	-	3	25	75	100*	5*
	IIIA	CE15CP3	Chemistry Practical -III	5	-	-	-	-	-	-	-
	III A	CE16Proj	Project & Viva Voce	4	-	-	-	20	80	100	5
	VI	NM13IS1	Information Security	2	26	4	-	-	-	Grade	-
	IV	SB13BC02	Skill Based Subject - Biochemistry II	3	-	-	-	-	-	-	-
	IV	SB13BCP2	Skill Based Subject Practical – Biochemistry II		-	-	-	-	-	-	-
	III A		Comprehensive Examination	-	-	-	1	-	-	-	Grade
	VI		Supportive Course	After 3pm							
	VI		Field Training	-	-	2 week			100	100	2
VI	III A	CE16C08	Paper – VIII Organic Chemistry	6	86	4	3	40	60	100	5
	III A	CE16C09	Paper –IX Physical Chemistry	5	71	4	3	40	60	100	5
	III A	CE16C10	Paper –X Physical Methods and	6	86	4	3	40	60	100	5
	III A	CE16E03	AOS-III Dye Chemistry	5	71	4	3	40	60	100	4
	IIIA	CE16E04	AOS-IV Optional Novel Inorganic Solids								
	IIIA	CE16AC3	ALCIII – Optional Food Chemistry and	Self Stud	-	-	3	25	75	100*	5*
	IIIA	CE16AC4	ALC IV- Optional Leather Chemistry	Self Stud	-	-	3	25	75	100*	5*
	III A	CE15CP3	Chemistry Practical - III	5.	150	-	6	40	60	100	5

IV	SB13BC02	Skill Based Subject - Biochemistry II	3	-	-	3	25	75**	100	4
IV	SB13BCP2	Skill Based Subject Practical – Biochemistry II	-	30	-	3	40	60	100	2
									3800	140

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 (I & II Semester)

BLOOM'S CATEGORY	SECTION	WORD LIMIT	MARKS	TOTAL
K ₁	A-15 X 2 Marks	One or two sentences	30	100
K ₁ , K ₂	B - 6/8 X 5 Marks	250	30	
K ₃ , K ₄	C - 4/6 X 10 Marks	500	40	

End Semester Examination: 100 Marks (III to VI Semester)

BLOOM'S CATEGORY	SECTION	WORD LIMIT	MARKS	TOTAL
K ₁	A-12 / 15 X 2 Marks	One or two sentences	24	100
K ₁ , K ₂	B - 6/8 X 6 Marks	250	36	
K ₃ , K ₄	C - 4/6 X 10 Marks	500	40	

SKILL BASED SUBJECT**Continuous Internal Assessment: 25 Marks**

SECTION	MARKS	TOTAL
A – 4 / 6 X 4 Marks	16	25
B – 1 / 2 X 9 Marks	9	

End Semester Examination: 50 Marks

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

ADVANCED LEARNERS COURSE (ALC)**Continuous Internal Assessment: 50 Marks**

BLOOM'S CATEGORY	SECTION	MARKS	TOTAL
K3, K4	A – 4 / 6 X 5 Marks	20	50
K4, K5	B – 2 / 3 X 15 Marks	30	

End Semester Examination: 75 Marks

BLOOM'S CATEGORY	SECTION	MARKS	TOTAL
K3, K4	A-5/8X5=25 Marks	25	75
K4, K5	B – 5/8X10=50 Marks	50	

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	

PROJECT

Group Project and Viva Voce

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

Area of Work

Synthetic Organic Chemistry, Coordination Chemistry, Corrosion Studies, Environmental Chemistry, Polymer Chemistry, Phytochemistry, Nanochemistry, Physical Chemistry.

Methodology

Each project should contain the following details:

Brief introduction on the topic

Review of Literature

Materials and Methods

Results and Discussions – evidences in the form of figures, tables and photographs

Conclusion / Summary

Bibliography

The above contents should not exceed 50 pages

Internal Assessment: 20 Marks

Review	Mode of Evaluation	Marks	Total
I	Selection of the field of study, Topic & Literature Collection	5	20
II	Research Design and Data Collection	10	
III	Analysis & Conclusion, Preparation of rough draft	5	

External Assessment: 80 Marks

Mode of Evaluation	Marks	Total
Project Report		
Relevance of the topic to academic / society	10	60
Objectives	10	
Experimental Design	20	
Expression of Results and Discussion	20	
Viva Voce		
Presentation	10	20
Discussion	10	

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	Attendance	Max. Marks
Core / Allied	5	5	6	4	5	4	5	3	3	40
SBS	5	5	15	-	-	-	-	-	-	25
ALC		10	15	-	-	-	-	-	-	25
Information Security	40	40		10		10				100

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 behavior	Student rarely displays disruptive behavior	Student occasionally displays disruptive behavior	Student often displays disruptive behavior	Student almost always displays disruptive	

	during class	during class	during class	during class	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 - CE16C01						
CO1	H	M	H	M	H	M
CO2	H	M	H	M	H	M
CO3	H	M	H	M	M	H
CO4	H	M	H	M	M	H
CO5	H	M	H	M	M	H
COURSE - CE16A01						
CO1	H	M	H	M	M	M
CO2	H	M	H	M	M	M
CO3	H	M	H	M	M	M
CO4	H	M	H	M	M	M
CO5	H	M	H	M	M	M
COURSE - CE16C02						
CO1	H	H	H	H	H	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	H
CO4	H	H	H	M	M	M
CO5	H	H	H	M	M	M
COURSE - CE16A02						
CO1	H	H	H	M	M	M
CO2	H	H	H	M	M	M
CO3	H	H	H	M	M	M
CO4	H	H	H	M	M	M
COURSE - CE16CP1						
CO1	H	H	H	H	H	H
CO2	H	H	H	H	H	H
COURSE - CE16AP1						
CO1	H	H	H	H	H	H
CO2	H	H	H	H	H	H

CO3	H	H	H	H	H	H
COURSE - CE16C03						
CO1	H	H	H	H	H	M
CO2	H	H	H	H	H	M
CO3	H	H	H	H	H	H
CO4	H	H	H	H	H	H
CO5	H	H	H	H	H	M
COURSE - CE16C04						
CO1	H	H	H	M	M	M
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H
CO4	H	H	H	H	H	H
CO5	H	H	H	H	H	H
COURSE - CE16CP2						
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
CO5	H	H	H	H	H	H
COURSE - CE16C05						
CO1	H	H	H	M	M	M
CO2	H	H	H	H	H	M
CO3	H	H	H	H	H	M
CO4	H	H	H	H	H	H
CO5	H	H	H	H	H	H
COURSE - CE16C06						
CO1	H	H	H	M	H	M
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H
CO4	H	H	H	M	H	H
CO5	H	H	H	H	H	H
COURSE - CE16C07						

CO1	H	H	H	H	H	H
CO2	H	M	H	H	M	H
CO3	H	M	H	H	M	M
CO4	H	M	H	H	M	M
CO5	H	M	H	H	H	H
COURSE - CE16E01						
CO1	H	H	H	M	M	M
CO2	H	H	H	M	M	M
CO3	H	H	H	H	M	H
CO4	H	H	H	H	H	H
CO5	H	H	H	M	H	M
COURSE -CE16E02						
CO1	H	H	H	H	H	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	H
CO4	H	H	H	H	M	H
CO5	H	H	H	H	M	H
COURSE - CE16AC1						
CO1	H	H	H	H	H	H
CO2	H	H	H	H	M	M
CO3	H	H	H	M	M	M
CO4	H	H	H	H	M	H
CO5	H	H	H	H	M	H
COURSE - CE16AC2						
CO1	H	H	H	M	M	M
CO2	H	H	H	M	M	M
CO3	H	H	H	M	M	M
CO4	H	H	H	M	M	M
CO5	H	H	H	M	M	M
COURSE - CE15CP3						
CO1	H	M	H	H	H	H
CO2	H	M	H	H	H	H

CO3	H	M	H	H	H	H
CO4	H	M	H	H	H	H
CO5	H	H	H	H	H	H
COURSE - CE16C08						
CO1	H	H	M	H	H	H
CO2	H	H	M	H	H	H
CO3	H	H	M	H	H	H
CO4	H	H	M	H	H	H
CO5	H	H	M	H	H	H
COURSE - CE16C09						
CO1	H	M	H	H	M	H
CO2	H	M	H	H	M	H
CO3	H	M	H	H	M	H
CO4	H	M	H	H	M	H
CO5	H	M	H	H	M	H
COURSE - CE16C10						
CO1	H	M	H	H	H	H
CO2	H	M	H	H	H	H
CO3	H	M	H	H	H	H
CO4	H	M	H	H	H	H
CO5	H	M	H	H	H	H
COURSE - CE16E03						
CO1	H	M	H	H	M	M
CO2	H	M	H	M	M	M
CO3	H	M	H	H	H	H
CO4	H	M	H	H	H	H
CO5	H	M	H	M	M	M
COURSE - CE16E04						
CO1	H	H	H	M	M	H
CO2	H	H	H	M	M	H
CO3	H	H	H	M	M	H
CO4	H	H	H	M	M	H

CO5	H	H	H	M	M	H
COURSE - CE16AC3						
CO1	H	H	H	H	M	H
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	M
CO4	H	H	H	H	H	M
CO5	H	H	H	H	H	H
COURSE - CE16AC4						
CO1	H	H	H	M	H	M
CO2	H	H	H	M	H	M
CO3	H	H	H	M	M	M
CO4	H	H	H	M	M	M
CO5	H	H	H	M	M	M

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE16C01	GENERAL CHEMISTRY PAPER - I	THEORY	86	4	-	5

Preamble

To enable the students to

- understand the basic concepts in chemistry
- learn about the theories of bonding in molecules and their physical significance
- learn about the chemistry of s & p - block elements and Noble gases
- gain knowledge about the polar effects and their importance in affecting the properties of compounds
- understand the terms in 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	define and recognize the types of chemical bonding	K ₁
CO2	examine and discuss the properties of s and p block elements	K ₁ , K ₂
CO3	distinguish the nature of organic compounds based on their polar effects	K ₂
CO4	define and relate the laws in physical chemistry	K ₁
CO5	state and apply first law of thermodynamics, perform calculations for physical processes	K ₃ , K ₄

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

Unit I

(17 hrs)

Chemical Bonding

Covalent bonding - Valence bond theory and its limitations, Hybridisation - Types of overlap of atomic orbitals. Valence shell electron pair repulsion theory (VSEPR) to NH_3 , H_2O , ClF_3 , SF_4 . Bond strength and bond energy. Percentage of ionic character from dipole moment and electronegativity differences.

Ionic bonding- Factors influencing the formation of ionic bond. Ionic crystals NaCl , CsCl . Lattice energy of ionic crystals, Born-Landé equation, Born-Haber cycle, Fajans rule. Co-ordinate covalent bond- Formation of hydronium ion. Comparison between ionic, covalent and coordinate bonding. Hydrogen bonding-Types with examples.

Unit II

(17 hrs)

S & P block elements

s-block elements-Position of alkali metals and alkaline earth metals in the periodic table and their general characteristics- Electronic configuration, physical state, atomic volume, ionic radii, density, ionization energy, electropositive character, reducing properties and oxidation state. p-block elements: Anomalous behaviour of Li and diagonal relation between Li & Mg.

Position of group III-A elements in the periodic table and general characteristics – Physical and chemical properties. Anomalous properties of B and diagonal relationship between B & Si. Chemistry of noble gases- Chemical properties of Noble gases, Chemistry of Xenon, Structure and bonding in Xenon compounds

Unit III

(17 hrs)

Polar effects

Inductive effect, comparing acid strengths – Halogen substituted acids. Basic strength of RNH_2 , R_2NH , R_3N and aniline. Mesomeric effect ($-\text{CN}$, CO). Resonance effect- conditions for resonance, resonance energy calculation. Hyperconjugation, Baker - Nathan effect, Hyper conjugative structures of toluene, ethylbenzene and iso-propylbenzene. Stability of primary, secondary and tertiary free radicals and primary, secondary and tertiary carbonium ions. Steric effect-examples and effect on reactivity.

Cycloalkanes

Nomenclature, methods of formation, chemical reactions, Baeyer's strain theory and its limitations.

Unit IV

Gaseous state

(17 hrs)

Derivation of gas laws from kinetic theory of gases, Gay-Lussac's law, Charles law, Boyle's law, and Dalton's law of partial pressure. Maxwell Boltzmann distribution of molecular velocities (derivation not needed). RMS, MP and Average velocities- Kinetic energy from Maxwell Boltzmann law-Problems.

Quantum mechanics

de-Broglie equation, Heisenberg's uncertainty principle, Compton effect, Photoelectric effect, Schrodinger wave equation (Fundamentals only). Applications to particle in one-dimensional box, Orbit and Orbitals, significance of Ψ and Ψ^2 .

MO theory

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

Unit V

Thermodynamics

(18 hrs)

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	Authors	Title of the Book	Publishers	Year of Publication
1	P. L. Soni	Text book of inorganic Chemistry	S.Chand & Co	2000 Reprint
2	B.S. Bahl & Arun Bahl,	Advanced organic chemistry	S.Chand&Co	2009 Reprint
3	P.L. Soni	Text book of organic Chemistry	S.Chand & Co	1998, reprint

4	B.R. Puri, L.R. Sharma, M.S. Pathania	Principles of Physical chemistry	Vishal Publications	2012, 45 th Edn.
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Reference Books:

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	R. D Madan	Modern Inorganic chemistry	S.Chand & Co	2011, 3 rd Edn
2	R.T. Morrison & R.W. Boyd	Organic chemistry	Pearson Hall Prentice	2011, 17 th Edn
3	B.S Bhal, Tuli G.D and Arun Bhal	Essentials of Physical Chemistry	S.Chand & Co	2009

Pedagogy:

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

Course Designers:

1. Dr. D. Nalini
2. Mrs. F. Therasa Rani

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE16C02	GENERAL CHEMISTRY PAPER - II	THEORY	71	4	-	5

Preamble

To make the students to

- understand the fundamentals of analytical chemistry
- gain knowledge about the mechanism of substitution and elimination reactions
- understand the importance of second law of thermodynamics
- know the types of colloids and liquid crystals

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	classify different analytical methods and apply to quantitative and qualitative analysis	K ₂ , K ₃
CO2	predict the types of reactions and reaction mechanism	K ₂
CO3	distinguish between aromatic and non-aromatic compounds	K ₂
CO4	examine the properties of colloids and liquid crystals and associate with their applications	K ₁ , K ₃
CO5	analyse the feasibility of the reaction	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	M	H
CO3	H	H	H	H	M	H
CO4	H	H	H	M	M	M
CO5	H	H	H	M	M	M

H - High; M-Medium; L-Low

General Chemistry Paper IICE16C02

(71 hrs)

UNIT I

(14 hrs)

Analytical Chemistry

Role of analytical chemistry, classification of analytical methods - Classical & Instrumental. Types of instrumental analysis, selecting an analytical method, neatness and cleanliness, laboratory operations and practices, safety in analytical laboratory. Analytical balance, techniques of weighing, errors, volumetric glasswares, cleaning and calibration of glasswares. Sample preparations-dissolution and decomposition, equivalent weight, normality, molality, molarity.

UNIT II

(14hrs)

Alkyl and aryl halides

Nomenclature, methods of formation, chemical reaction, mechanism of nucleophilic substitution of alkyl halides, SN^2 , SN^1 and SN^i reactions with energy profile diagram. Methods of formation of aryl halides, nuclear and side chain reactions. Mechanism of elimination reactions of alkyl halides- E^1 , E^2 and E^1cB . Orientation of elimination- Saytzeff & Hofmann rules.

UNIT III:

(14 hrs)

Benzene

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

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

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

(15 hrs)

Thermodynamics

Second law of thermodynamics - Need for second law, 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	Authors	Title of the Book	Publishers	Year of Publication
1	R.Gopalan, P.S.Subramanian, K.Rengarajan	Elements of Analytical chemistry	Sultan Chand & Sons	1986, I Edn.
2	B.S. Bahl & Arun Bahl,	Advanced organic chemistry	S.Chand&Co	2009 Reprint
3	P.L. Soni	Text book of organic Chemistry	S.Chand & Co	1998, reprint
4	B.R. Puri, L.R. Sharma, M.S. Pathania	Principles of Physical chemistry	Vishal publications	2012, 45 th Edn.

Reference Books:

S.No.	Authors	Title of the Book	Publishers	Year of Publication
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1	Douglas A.Skoog., Donald M.West, F.James Holler Stanely R.Crouch	Fundamentals of analytical chemistry	Cengage Learning India Pvt Ltd	2009, 8 th Edn
2	R.T. Morrison & R.W. Boyd	Organic chemistry	Pearson Hall Prentice	2011, 17 th Edn
3	B.S Bhal,Tuli G.D and Arun Bhal	Essentials of Physical Chemistry	S.Chand & Co	2009

Pedagogy:

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

Course Designers:

1. Mrs.N.Shyamala Devi
2. Mrs.F.Therasa Rani

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE16A01	IDC – Allied Chemistry Paper –I	Theory	56	4	-	4

Preamble

To enable the students to

- gain knowledge about the theories of chemical bonding, aromaticity and isomerism.
- learn the chemistry of amino acids and proteins
- understand the different terms in phase rule and its applications
- study the application of solar energy and different water treatment techniques

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	define and recognize the types of bonding	K ₁ ,K ₂
CO2	differentiate aromatic and aliphatic compounds, identify the isomerism of the compounds	K ₁ , K ₂
CO3	relate the chemistry of amino acids and proteins with biological functions	K ₃
CO4	explain the phase diagram of simple eutectic system	K ₂
CO5	recognize the importance of solar energy and water treatment techniques	K ₁

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

UNIT – I

Bonding (11Hrs)

Covalent bonding – Orbital overlap, hybridization and geometry of CH₄, C₂H₄, C₂H₂, C₆H₆ molecules. Hydrogen bonding - Inter and intra molecular, nature and its effect on structure and properties. Metallic bonding, Vander Waal's forces. Structure of graphite and diamond.

UNIT – II

Organic reactions and stereoisomerism (11Hrs)

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

Stereoisomerism Geometrical and optical isomerism. Conformation - a simple treatment of n-butane and cyclohexane. Tautomerism – Keto-enol tautomerism.

UNIT- III

Amino acids & Proteins (11 Hrs)

Amino acids – Classification, preparation of α - amino acids - Gabriel phthalimide synthesis, Erlen Meyer azlactone synthesis. Properties of α - amino acids. Action of heat on α , β , γ amino acids. Peptide synthesis. Proteins - Classification according to composition and functions, properties of proteins, colour reactions.

UNIT – IV

Solutions & Phase rule (11 Hrs)

Liquid in liquid type, Raoult's law for ideal solutions. Positive and negative deviation from Raoult's law – Reasons and examples. Fractional distillation and azeotropic distillation.

Definitions of terms - Phase, component, degree of freedom. Phase rule. Application of phase rule to water system. Reduced phase rule and its application to a simple eutectic system (Pb-Ag). Freezing mixtures.

UNIT – V

Solar energy & Water treatment (12 Hrs)

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 - Zeolite process & demineralization process. Purification of water for domestic purpose - Disinfection by chlorine, ozone & UV light.

Text Books:

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	V.Veeraiyan, A.N.S.Vasudevan	Text book of Allied Chemistry	Highmount Publishing House, 1 st Edn	Reprint 2005
2	P.C Jain & Monika Jain	Engineering chemistry	Dhanpat Rai Publishing Co Pvt Ltd.	Reprint 2003

Pedagogy:

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

Course Designers:

1. Dr. D. Nalini
2. Dr. G. Selvi

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE16A02	IDC – Allied Chemistry Paper –II	Theory	71	4	-	4

Preamble

To enable the students to

- learn about coordination complexes and fertilizers.
- learn the chemistry of dyes and drugs.
- understand the basics of chemical kinetics, catalysis and electrochemistry

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	identify, classify and name the coordination compounds	K ₁ , K ₂
CO2	recognize the chemical compounds used in fertilizers, polymer, dyes and drugs.	K ₁
CO3	explain the basic concepts of chemical kinetics and photochemistry and to calculate the order of the reaction.	K ₂ , K ₄
CO4	define the various terms in electrochemistry and to solve problems related to conductance and pH.	K ₁ , K ₃

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

IDC – Allied Chemistry Paper –II CE16A02 (71Hrs)

Unit – I (14Hrs)

Coordination Chemistry

Nomenclature - Mononuclear complexes. Theories- Werner, Sidgwick-EAN rule, Pauling theory - Postulates and examples. Chelation and its importance with reference to EDTA in analytical chemistry. Biological role of Chlorophyll and Hemoglobin.

Unit – II (14Hrs)

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.

Polymers- Classifications. Preparation and uses of PVC, Teflon & Polyethylene. Inorganic Polymers - Synthesis, properties and uses of silicones.

Unit III (14Hrs)

Synthetic drugs & Synthetic dyes

Introduction, classification of drugs – based on chemical structure and therapeutic action, 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, two examples and side effects.

Introduction, chromophore, auxochrome, chromogen, bathochromic, hypsochromic, hyperchromic and hypochromic shifts. Azo dyes, Vat dyes, Mordant dyes. Food colours- General treatment.

Unit IV (14Hrs)

Chemical Kinetics & Photochemistry

Order of reactions and their determination. Activation energy, effect of temperature on reaction rate. Catalysis- types, mechanism of catalytic action, industrial applications. Emulsions and gels - Preparation, properties and applications.

Beer's law, Beer - Lambert law, Grother's - Draper Law, Stark - Einstein's law of photochemical equivalence, quantum yield.

Unit V

(15Hrs)

Electrochemistry

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

pH - Definition, determination by indicator method. Buffer solutions - types, buffer action, pH of buffer solutions. Importance of pH and buffers in the living systems.

Text Books:

S.No	Authors	Title of the Book	Publishers	Year of Publication
1	V.Veeraiyan, A.N.S.Vasudevan	Text book of Allied Chemistry	Highmount Publishing House, 1 st Edn	Reprint 2005
2	Rajbir Singh,	Synthetic drugs	Mittal Publications, 1 st Edn.	2002

Pedagogy:

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

Course Designers:

1. Mrs. P. Kanchana
2. Dr. N. Aruna Devi

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE16CP1	Chemistry Practical – I	Practical	-	-	90	4

Preamble

To enable the students to

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

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	identify and report the acid radicals	K ₁ , K ₂
CO2	separate the cations into groups and to identify them	K ₁ , 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

H - High; M-Medium; L-Low

Chemistry Practical – ICE16CP1 (90 Hrs)

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+}

Text Books:

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

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

Pedagogy:

Demonstration and individual hands on practical's

Course Designers:

1. Dr. N. Muthulakshmi Andal
2. Dr. G.Selvi
3. Mrs. F. Therasa Rani

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE16AP1	IDC – ALLIED CHEMISTRY – PRACTICAL	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

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

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 Books:

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

Reference Books:

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	Reprint 1996
2	A.I. Vogel	A text book of quantitative inorganic analysis	Longman publishers.	6 th Edn., 2009

Pedagogy:

Demonstration and individual hands on practicals

Course Designers:

1. Mrs. V.Hemapriya
2. Mrs. N. Shyamala Devi
3. Mrs.K.Kalaiselvi

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE16C03	GENERAL CHEMISTRY PAPER - III	Theory	56	4	-	4

Preamble

To enable the students to

- gain knowledge about the different methods of extraction of metals from their ores.
- learn the concepts of coordination chemistry.
- familiarize the organic name reactions and study of acids.
- acquire knowledge about 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	identify the methods of extraction and refining techniques of metals from ores and discuss the properties and structure of interhalogen compounds	K1, K2
CO2	interpret the theories of coordination compounds and calculate the CFSE values for tetrahedral/ octahedral compounds	K3, K4
CO3	analyse the reactions of aldehydes / ketones and examine the relevant name reactions	K4
CO4	discuss the preparation/properties/uses of dicarboxylic acids and hydroxy acids	K2
CO5	distinguish and sketch the one and two component systems based on phase rule	K3, 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	H	H	H	H
CO4	H	H	H	H	H	H
CO5	H	H	H	H	H	M

H - High; M-Medium; L-Low

GENERAL CHEMISTRY PAPER – III CE16C03

(56 Hrs)

UNIT I

(11 Hrs)

Metallurgy

General methods of extraction - Concentration, gravity separation, froth flotation, magnetic separation, chemical and electrolytic methods. Refining - Zone refining, Van Arkel refining and electrolytic refining. Extraction of Ti, V, Ni and Cu

Inter halogen compounds - ICl, ClF₃, BrF₅, IF₇ - Preparation, properties and structure.

UNIT II

(11 Hrs)

Co-ordination Chemistry

Introduction -Types of ligands, co-ordination number, nomenclature of metal complexes, theories of coordination compounds -Werner's Theory, Sidgwick's theory, Valence bond theory, Crystal field theory - Postulates. Calculation of CFSE, splitting of d-orbitals in tetrahedral and octahedral complexes. Comparison of VBT & CFT.

UNIT III

(11 Hrs)

Aldehydes and Ketones

Reactions of aldehydes and ketones, nucleophilic addition of Grignard reagent, Aldol condensation, mixed aldol condensation, Perkin, Knoevenagel, Claisen, Dieckman, Reformatsky reactions. Reactions with LiAlH₄ and NaBH₄ -Wolf Kishner and MPV reductions - Cannizaro, crossed Cannizaro, Reimer-Tiemann, Gattermann, Schotten - Baumann reaction of phenol and aniline.

UNIT IV

(11 Hrs)

Dicarboxylic acids- OxalicMalonic, Glutaric, Adipic acid - Preparation with mechanism, properties and uses. Unsaturated acid: Acrylic acid and Crotonic acid - Preparation, Properties and uses.

Hydroxy acids - Tartaric acid, citric acid - Preparation and properties.

Dienes- Dienes - Nomenclature and classification of dienes - Isolated, conjugated and cumulated dienes. Polymerization - 1,2 and 1,4 addition, Diel's - Alder reaction.

UNIT V**(12 Hrs)****Phase Equilibria and Phase rule**

Phase rule - Phase, component, degree of freedom. Derivation of Gibb's phase rule. Phase equilibria - Condition for equilibrium, stability of phase of a pure substance - Pressure dependence of U and T curves. Phase equilibria in one component system - Sulphur, Water and Carbon dioxide systems. Phase diagrams for two component system – Construction and thermal analysis of phase diagrams of Pb-Ag, Bi-Cd and Na-K systems. Congruent System -Ferric chloride - water system, Non-congruent system - Sodium sulphate- 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

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

Course Designers:

1. Dr. N.Muthulakshmi Andal
2. Dr.N.Arunadevi

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE16C04	GENERAL CHEMISTRY PAPER - IV	Theory	56	4	-	4

Preamble

To enable the students to

- gain knowledge about Lanthanides, Actinides and Concepts of Acids and Bases
- learn the Synthesis and properties of phenols, esters and amines.
- acquire knowledge about the food additives and adulterants

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	reproduce the extraction of lanthanides and its characteristics	K1
CO2	examine the different approaches and concepts of acids and bases	K3
CO3	classify the food additives and discuss their functions	K2
CO4	discuss the preparation, properties and uses of esters, aromatic amines and compare the reactions of amines	K3, K4
CO5	classify the ideal & non-ideal solutions & discuss their applications	K2

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

UNIT I**(11hrs)****Lanthanides and Actinides**

Position of Lanthanides in the periodic table, occurrence of Lanthanides, extraction from Monazite, separation of individual Lanthanides (by Ion exchange method). General properties of Lanthanides, Lanthanide contraction - Consequences. Position of Actinides in the periodic table. Comparison of properties of Lanthanides and Actinides. Updation of periodic table from Web

UNIT II**(11 Hrs)****Acids and bases**

Definitions, different approaches - Arrhenius concepts, 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. Electro negativity, hardness and softness. π Bonding contributions.

UNIT III**(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, Functions and uses of food additives- Classification of food additives- 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.

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.

UNIT IV**(11 Hrs)****Amines**

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

Esters

Nomenclature, isomerism in esters, methods of preparation- Esterification, alcoholysis of acid chlorides and acid anhydrides, silver salt method, Tischenko reaction. Physical and chemical properties, uses of esters. Malonic ester - Preparation, properties and synthetic uses

UNIT V**(12hrs)****Solutions**

Ideal and non-ideal solutions - Raoult's law, vapour pressure of non-ideal solutions, fractional distillation of binary liquid solutions, distillation of immiscible liquids, Azeotropic distillation, solubility of partially miscible liquids - Phenol - water system, Nicotine-water system. Nernst distribution law and its applications. Colligative properties - Relative lowering of vapour pressure, elevation of boiling point, depression of freezing point and osmotic pressure - Measurements and their applications.

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	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,
6	Alex V Ramani	Food Chemistry	MJP publishers	2009

Reference Books:

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

Pedagogy:

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

Course Designers:

1. Mrs. N. Shyamala Devi
2. Dr. N. Arunadevi

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE16CP2	Chemistry Practical – II	Practical	-	-	90	5

Preamble

To enable the students to practically

- identify functional groups in organic compounds qualitatively
- prepare organic compounds
- determine the boiling point / melting point of components
- prepare standard solution

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	analyze organic compounds	K4
CO2	develop skills in the synthesis of organic compounds	K5
CO3	develop the skill to prepare standard solutions	K5
CO4	determine m.pt/b.pt of organic compounds	K5

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

Systematic analysis - organic compounds

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

Preparation of the following compounds:

- (i) m-dinitro benzene (nitration)
- (ii) p-bromoacetanilide (bromination)
- (iii) Benzoic acid from Benzaldehyde (oxidation)
- (iv) Salicylic acid from methyl salicylate (Hydrolysis)
- (v) Benzanilide from aniline (Benzoylation)

Determination of Melting / Boiling points**Preparation of standard solutions**

- (i) oxalic acid
- (ii) potassium dichromate
- (iii) Ferrous Ammonium Sulphate

Spectrophotometric Determination of Antioxidants

- i) Determination of BHA
- ii) Determination of BHT

Qualitative Analysis of Natural Food Colours

Caramel, Cochineal, Turmeric, Annatto, Chlorophyll and Betanin

Text Books:

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

Reference Books:

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	A.I Vogel	A text book of Quantitative Inorganic Analysis	ELBS & Longmann, Green and co Ltd,	5 th Edn 1997

2	Brian S Furniss, Antony J Hannaford, Peter.W.G.Smith Austin R. Tachell	Vogel's Textbook of Practical organic Chemistry	Pearson	5 th Edition Reprint 1997
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	2011

Pedagogy: Demonstration and individual Hands on Practicals

Course Designers:

1. Dr. A. Kiruthika
2. Mrs. Sowmya Ramkumar

Skill Based subject
III & IV Semester
Biochemistry – I (SB13BC01)

Credits: 4 **(58 Hrs)**

Objectives:

To enable the students to learn

- the basic concepts in biochemistry
- the biological importance of carbohydrates, peptides & lipids

Unit I **(12 Hrs)**

Introduction to Biochemistry

Chemistry of tissues and foods, digestion, absorption, respiration, blood, cell membrane, tissue metabolism, glands of internal secretion, excretion. Biochemical disorders and diseases, importance of biochemistry in medicine (Basic concepts only).

Cell

Medical and biological importance of cell – molecular components of cell, Eukaryotic cell – Structure and functions. Cell membrane, Nucleus, Nucleolus, Mitochondria, Lysosomes, Endoplasmic reticulum, Ribosome, Centriols, Cytosol. Separation of structural units of a cell. Cell cycle and cell death (Elementary concepts only).

Unit II **(12 Hrs)**

Carbohydrates

Definition, medical and biological importances, classification, monosaccharides, disaccharides – occurrence and biological importance.

Carbohydrates in cell membranes – qualitative test for identification of carbohydrates – clinical orientation of carbohydrates.

Unit III **(12 Hrs)**

Amino Acids

Classification of amino acids – based on structure, based on polarity, based on nutritional classification, based on their metabolic fate. Properties – physical and chemical, Non - saturated aminoacids.

Unit IV**(11 Hrs)****Peptides**

Structural determination, separation and identification of amino acids in peptides – paper, thin layer, electrophoresis, ion- exchanger. Classification of proteins – simple, conjugated, derived. Biological importance of proteins.

Unit V**(11 Hrs)****Lipids**

Definition, medical and biological importances, classification. Simple lipids – Fats, oils & wax. Compound lipids – Phospholipids, glycolipids, sulpholipids, lipoproteins, and steroids. Derived lipids – Fatty acids, alcohols other than glycol, glycerides.

Substances associated with lipids – Carotenoids, Tocopherols, Vitamins – A, D, E, K and Steroids (Names only). Important tests – clinical orientation.

Reference Books:

S.No	Authors	Title of the book	Publishers	Year of publication
1	Ambika Shanmugam	Fundamentals of biochemistry for medical students	Wolters Kluwer Health(India)	2005, Seventh edition
2	Dr. A.C. Deb	Fundamentals of biochemistry	Central Book Agency (P) Ltd., Kolkata	2004, Eighth edition
3	N. Mallikarjuna Rao,	Medical Biochemistry	New Age International (P) Ltd., New Delhi	2006, second edition
4	U. Satyanarayana	Biochemistry	Books and Allied (P) Ltd., Kolkata	2002, Second edition

Semester III & IV
Skill Based Subject Practical
Biochemistry Practical – I (SB13BCP1)

Credits: 2

(30 Hrs)

Qualitative Analysis:

Qualitative analysis of Carbohydrates (Mono, Di and Poly saccarides), Amino acids, Proteins and Lipids.

Quantitative Analysis

1. Estimation of Ascorbic acid
2. Estimation of Glycine by formal titration
3. Determination of Acid value of fats
4. Estimation of Ca in milk.

Chromatography: (Group Experiments)

1. Identification of amino acids by TLC.

Reference Books:

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	Beedu Sashidhar Tao, Vijay Deshpande	Experimental Biochemistry- A student companion	I. K. International (P)m Ltd	2007, First edn
2	David T Plummer	An Introduction to Practical Biochemistry	Tata McGraw Hill	2007, third edn

Environmental Studies (NM10EVS)

Credit: 2

26 hrs & 4hrs Tutorial

ESE: 75 hrs

CA: 25 marks

Unit I

3hrs

The multidisciplinary nature of environmental studies – Definition, scope and importance. Need for public awareness.

Unit II

3hrs

Renewable and non-renewable resources

Natural resources and associated problems.

- a) Forest resources: use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams – benefits and problems.
- c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer – pesticide problem, water logging, salinity, case studies.
- e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.
- f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
 - Role of an individual in conservation of natural resources
 - Equitable use of resources for sustainable lifestyles

Unit III

3hrs

Ecosystems – Concept of an ecosystem – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession

– Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem : (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans. estuaries)

Unit IV

3hrs

Biodiversity and its conservation – Introduction – definition : genetic, species and ecosystem diversity – Biogeographical classification of India – Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega – diversity nation – Hot-spots of biodiversity – Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

Unit V

4hrs

Environmental Pollution – Definition – Causes, effects and control measures of : (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution. (e) Noise pollution (f) Thermal and electromagnetic pollution (g) Nuclear hazards

Solid waste management: Causes, effects and control measures of urban and industrial wastes - Role of an individual in prevention of pollution - Pollution case studies - Disaster management: floods, earthquake, cyclone and landslides

Unit VI

3hrs

Social issues and the environment –

From unsustainable to sustainable development - Urban problems related to energy - Water conservation, rain water harvesting, watershed management - Resettlement and rehabilitation of people ; its problems and concerns, case studies. - Environmental ethics : Issues and possible solutions - Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies - Wasteland reclamation - Consumerism and waste products - Environment protection act - Air (prevention and control of pollution act) - Water

(Prevention and control of pollution) act - Wildlife protection act - Forest conservation act - Issues involved in enforcement of environment legislation - Public awareness

Unit VII

3hrs

Human population and the environment -Population growth, variation among nation - Population explosion – Family Welfare programme - Environment and human health - Human Rights - Value Education - HIV/AIDS - Women and child welfare - Role of information technology in Environment – Remote sensing application , Global Positioning Systems (GPS) - Case studies

Unit VIII

4hrs

Field work – Visit to a local area to document environmental grassland / hill / mountain.

Visit to a local polluted site – Urban / Rural / Industrial / agricultural - Study of common plants, insects, birds- Study of simple ecosystems-pond, river, hill slopes, etc. (Field work equal to 5 lecture hours)

Contact Hours: 26hrs

Tutorial Hour: 4hrs

References

1. Agarwal.K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email: [maping@icenet.net\(R\)](mailto:maping@icenet.net(R))
3. Brunner.R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.480p
4. Clark.R.S, Marine Pollution, Clanderson Press Oxford (TB)
5. Cunningham.V.P, Cooper, T.II.Gorhani.E & Hepworth.M.T, 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai 1196p
6. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
7. Down to Earth, Centre for Science and Environment (R)

8. Gleick.H.P, 1993, Water in crisis, Pacific Institute for Studies in Dev. Environment & Security, Stockholm Env. Institute Oxford Univ. Pres 173 p
9. Hawkins.R.E, Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay ®
10. Heywood.V.II & Watson.R.T.1995, Global Biodiversity Assessment. Cambridge Univ.Press 11.10p
11. Jadhav.II & Bhosale.V.M.1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
12. Mekinney.M.I & Schoeh.R.M 1996, Environmental Science systems & Solutions, Web enhanced edition 639p.
13. Mhaskar.A.K, Matter Hazardous, Techno-Science Publications (TB)
14. Miller.T.G. Jr., Environmental Science, Wadsworth Publishing Co,(TB)
15. Odum.E.P 1971, Fundamentals of Ecology, W.B.Saunders Co. USA. 574p
16. Rao.M.N & Datta.A.K. 1987, Waste Water treatment, Oxford & IBM Publ. Co. Pvt. Ltd. 345 p.
17. Sharma.B.K. 2001, Environmental Chemistry, Goel Publ. House, Meerut
18. Survey of the Environment, The Hindu (M)
19. Townsend.C, Harper.J and Michael Begon, Essentials of Ecology, Blackwell Science (TB)
20. Trivedi.R.K, Handbook of Environmental Laws, Rules, Guidelines, compliances and Standards, Vol I and II Enviro Media (R).
21. Trivedi.R.K and P.K.Goel, Introduction to air pollution, Techno-Sciences Publications (TB)
22. Wagner.K.D., 1998, Environmental Management. W.B.Saunders Co., Philadelphia, USA 499p
(M) Magazine, (R) Reference, (TB) Textbook

VALUE EDUCATION AND HUMAN RIGHTS (NM14VHR)

III SEMESTER

2 Credits

(30 Hrs)

(26 hrs – Theory & 4 hrs Tutorial)

UNIT I

Education systems in India-Introduction, ancient systems of education- colonial system of education- value erosion-personal level, family level, societal level, national level, global level.

Personal values and family values- Introduction- types and importance of personal values- Family values: definition- types of family- types of family values.

Universal values: Meaning - nature of values- need for value education to the students – Dharma, truth, non-violence, love and peace.

UNIT II

Human excellence: Meaning- importance- factors induce human excellence.

Social values and responsibilities towards society-Meaning, types of social values-community values- responsibilities towards society/community- care for the troubled and alleviation of poverty- impact of globalization on values-negative and positive impact.

UNIT III

Human Rights: Meaning, Definition, characteristics-evolution-Nature and Scope-Theories of Human Rights: Natural Rights- Legal rights and Historical theory of rights.

UNO and Human Rights- UNO and International Human Rights, enforcement of human rights upto world war II, Universal Declaration of Human Rights ,importance of UDHR, International covenants on Civil and Political rights.

UNIT IV

Women's Rights: Rights of women and children-world scenario- Indian context- role of government and non government organisations in solving women's problem.

Children's Rights: Introduction- issues related to child rights- constitutional provisions- instruments on the rights of children.

Contemporary issues in human rights: female infanticide- child labour- steps towards elimination of child labour- human rights of older persons- transgender and human rights.

UNIT V

Indian Constitution and Human Rights-Right to Education- Protection of Human Rights: Amnesty International- National Human Rights Commission -State Human Rights Commission Public Interest litigation (PIL) -Right to Information Act (RTI)- Case studies.

Reference Books:

1. K. Mohanasundaram, Human Rights: Theories and Practice, New Delhi: Concept Publishers, 2013
2. P.C.Sinha, India's Human Rights Regime – Part I, New Delhi: Kanishka Publishers, 2003).
3. Rachana Kaushal, Women and Human Rights in India, Kaveri book (New Delhi: Kaveri Book).
4. Dr.(Mrs) Sivagami Paramasivam, Human Rights – A study (Salem: Thai Pathippagam).
5. Biswarwarjan Mohanti, Dynamics of Political Theory ,New Delhi: Atlantic Publishers , 2010).
6. Abdur Rahman Asshaha, Islamic Concepts of Human Rights ,Delhi: Sipra Publications, 2004).

Job Oriented Course
Instrumental Methods of Analysis

JOB1334

(40 Hrs)

Unit I

(8 Hrs)

Sample Handling for Analytical Techniques

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

Separation Techniques

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

Purification Techniques

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

Unit II

(8 Hrs)

Analytical Chemistry

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

Instrumental Methods of Chemical Analysis

Introduction, analytical perspective, selecting an analytical method, evaluating analytical data.

Method Validation

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

Unit III

(8 Hrs)

UV-Vis Spectrophotometer

Radiation source, monochromator, sample cells or cuvette, detectors, general tips, Application of UV.

IR Spectrophotometer

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

Unit IV

(8 Hrs)

Chromatography – Introduction, types.

HPLC

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

Atomic Absorption Spectrometer

Principle, instrumentation and applications.

Sonicator

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

Unit V

(8 Hrs)

Iron and Steel Industry

Iron-Composition, Ferrous and non-Ferrous alloys. Testing the purity of steel & testing of iron by Spark method. Determination of Carbon by combustion method, Determination of Sulphur by volumetric method, Determination of phosphorus by Alkalimetric method,

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

Reference Books:

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

Instrumental Methods of Analysis (JOB1334)

Practical

(20 Hrs)

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

Reference Books:

S.No	Authors	Title of the Book	Publishers	Year of Publication
1	R. Gopalan, P. S. Subramaniam and P. S. Rangarajan	Elements of Analytical Chemistry	S. Chand and Co	2004, 3 rd edn
2	B. K. Sharma	Instrumental Methods of Analysis	Goel publication	1996, 15 th edn

3	H. Kaur	Instrumental Methods of Chemical Analysis	Pragati Publication	2008, 4 th edn
4	Y. R. Sharma	Elementary Organic Spectroscopy	S.Chand & Co	Reprint 2009

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE16C05	PAPER V - INORGANIC CHEMISTRY	THEORY	56	4	-	4

\Preamble

Enable the students to

- familiarize with metals, alloys and types of conductors
- acquire knowledge about isotopes and nuclear reactions
- understand the nature of solvents
- gain vivid insight into Bioinorganic Chemistry/Nanotechnology

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	reproduce the properties/structure of metals, types of alloys and conductors	K1
CO2	examine various nuclear reactions, models, radioactive decay and uses of radio isotopes	K3
CO3	discuss the structure, properties of metal ions in biology	K2
CO4	appraise the reactions pertaining to ionizing/non-ionizing solvents	K4
CO5	relate the types of nanoparticles and understand their applications	K3

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

PAPER – V INORGANIC CHEMISTRY (CE16C05)

(56 Hrs)

UNIT I

(11Hrs)

Metals and Alloys

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

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

UNIT II

(11 Hrs)

Radioactive Isotopes

Introduction-composition of nucleus and nuclear forces-Nuclear stability-Mass defect-Binding energy- Packing fraction, n/p ratio, Magic numbers. Nuclear reactions.Nuclear models-Liquid Drop/ Shell and Collective models.Q-value –threshold energy- Cross section. Modes of Radioactive Decay- Half-life period

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

Artificial Radioactivity

Artificial transmutation of new elements.Synthesis of Radioisotopes.Radioactive series - $4n+1$, $4n+2$, $4n+3$.Nuclear reactors - Working Principle and Instrumentation.Atomic PowerProjects in India. Safety measures, disposal of Reactor wastes – Radioactive pollution. Detection and Measurement of Radioactivity- Geiger-Muller Counter.

Unit III

(11 Hrs)

Bioinorganic Chemistry

Metal ions in biology and their vital role in the active site, Structure and functions of metallo proteins and enzymes.Structure & characteristic features of Haemoglobin and myoglobin – Chlorophyll.

Elements of Life: Essential major, trace & ultratrace elements. Basic chemical reactions in the biological systems and the role of metal ions specially Na^+ , K^+ , Mg^{2+} , Ca^{2+} , $\text{Cu}^{2+/+}$ and Zn^{2+} transport across biological membranes - Na^+ & K^+ ion pump, ionophores

UNIT IV

(11 Hrs)

Solvents

Classification of solvents - Solubility of compounds. Effect of temperature on solubility - Role of H_2O as solvent, chemical structure and solubility - General behaviour - Properties of ionizing solvents - Types of reactions in solvents - Specific non-aqueous solvents - Protonic solvents, NH_3 , HF . Aprotic solvents - SO_2 , BrF_3 . molten salt, carbonic solvents - ethanol, ether.

UNIT V

(12 hrs)

Nanotechnology

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

Text Books:

S.No.	Authors	Title	Publishers	Year of Publication
1.	H.J. Arniker	Essentials of Nuclear Chemistry	New Age International Pvt. Ltd. Publishers	2011 4 th Edn.
2.	B. Viswanathan	Nanomaterials	Narosa Publishing House	2014 Reprint
3.	Wahid U.Malik, G.D. Tuli, R.D.Madan	Selected Topics in Inorganic Chemistry	S.Chand & Co. Ltd	2010 30 th Edn.
4.	Asim K. Das	Bioinorganic Chemistry	Books and Allied (Pvt) Ltd.	2013 Reprint
5.	P.B.Janardhan, B.Shivashankar	Text Book of Inorganic Chemistry	Oxford & IBH Publication &Co.	1978

Reference Books:

S.No.	Authors	Title	Publishers	Year of Publication
1.	James.E.Huhey, Ellen.A.Keiter, Richard L Keiter, Okhil K.Medhi	Inorganic Chemistry - Principle Structure and Reactivity	Pearson Publishers	2011 9 th Edn.
2.	Richard Booker, Earl Boysen	Nanotechnology	John Wiley	2005 1 st Edn.
3.	Mark Ratner, Daniel Ratner	Nanotechnology: A Gentle Introduction to the Next Big Idea	Pearson Education	2008 1 st Edn.
4.	Esmarch .S. Gilreath	Fundamental Concepts of Inorganic Chemistry	Mc Graw- Hill	1976 Revised Edn.

Pedagogy:

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

Course Designers:

1. Dr. P. Kanchana.
2. Dr. N. Muthulakshmi Andal.

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE16C06	PAPER VI- ORGANIC CHEMISTRY	THEORY	56	4	-	4

Preamble

To enable the students to

- learn the chemistry of terpenoids, alkaloids and polynuclear hydrocarbons
- understand the conformation and stereochemistry of organic compounds
- acquire knowledge about synthesis and applications of organometallic compounds
- familiarize about retrosynthesis and green chemistry

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	classify and identify the structures of terpenoids and alkaloids	K2, K3
CO2	illustrate the preparation, properties and uses of polynuclear aromatic hydrocarbons	K2
CO3	analyse the conformation of organic compounds and apply the concepts of stereoisomerism to organic compounds	K4, K3
CO4	apply the utility of organometallic compounds for the synthesis of various organic compounds	K3
CO5	employ retrosynthesis to design synthetic routes of organic compounds and learn about green technologies	K3

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

PAPER VI- ORGANIC CHEMISTRY [CE16C06]

(56 Hrs)

UNIT I

(11Hrs)

Terpenoids

Classification, nomenclature, occurrence and general methods of structural determination, isoprene rule, general methods of structural elucidation and synthesis as applied to Geraniol, α -Terpineol, α -Pinene, Menthol and Dipentene.

UNIT II

(11Hrs)

Alkaloids

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

UNIT III

(11Hrs)

Fused polynuclear aromatic hydrocarbons and conformational analysis

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

Conformation

Conformational nomenclature- eclipsed, staggered, gauche and anti, dihedral angle, torsion angle, energy barrier of rotation –potential energy diagram. Relative stability of conformers on the basis of steric effect, dipole-dipole interaction, hydrogen bonding. Conformational analysis of Ethane, Propane, n-Butane, Haloethane. Conformations of Cyclohexane - Axial and Equatorial bonds and conformations of mono and disubstituted Cyclohexanes.

UNIT IV

(11Hrs)

Stereochemistry

Concepts and 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, retention and racemization. Relative and absolute configuration, sequence rules, D & L and R-S systems of nomenclature.

Optical activity in compounds without asymmetric carbon atoms - biphenyls, allenes and spiranes. Stereoselectivity, stereospecificity, partial asymmetric synthesis.

Geometrical isomerism- Determination of configuration of geometric isomers. E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds.

UNIT V

(12Hrs)

Organometallic Compounds

Organomagnesium compounds - Grignard reagents -Formation, structure and chemical reactions.

Retro-synthesis

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

Green Chemistry

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

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

Text Books:

S.No.	Authors	Title	Publishers	Year of Publication
1	B.S. Bahl & Arun Bahl	Advanced Organic Chemistry	S.Chand & Co.	2014 15 th Edn. Revised
2	I.L. Finar	Organic Chemistry Vol I	Pearson India	2012 6 th Edn.
3	Jagdamba Singh & L.D.S. Yadav	Organic Synthesis	Pragati Prakashan	2016 Reprint 11 th Edn.

4	V.K. Ahluwalia, Renu Aggarwal	Organic Synthesis- Special techniques	Narosa Publishing House	2012 Reprint 2 nd Edn.
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Reference Books:

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

Pedagogy:

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

Course Designers:

1. Dr. S. Chitra
2. Dr.V.Hemapriya

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE16C07	PAPER-VII-PHYSICAL CHEMISTRY	THEORY	56	4	-	4

Preamble

To enable the students to

- learn about the theories of conductance
- understand the basic principles and applications of electrochemical cells
- gain knowledge about the electrochemical corrosion and ionic equilibria in solutions

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	discuss and derive the theories/laws of conductance	K2
CO2	calculate the transport number of ions, solubility products and strength of acids	K3
CO3	construct the electrochemical cell and apply the electrolytic cell reaction to calculate enthalpy, entropy and free energy	K4, K3
CO4	appraise the pH, valency, equilibrium constant for a given electrolyte and examine the mechanism of electrochemical corrosion	K4, K3
CO5	analyze the types of solutions based on pH and predict suitable indicators for the volumetric titrations	K4, K2

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

UNIT I**(11hrs)****Theories of Conductance**

Conduction in metals & in solutions - Migration of ions - Kohlrausch's law. Determination of equivalent conductance at infinite dilution of weak electrolytes. Arrhenius theory of dissociation. Ostwald's dilution law. An elementary treatment of Debye-Huckel theory. Activity coefficients of electrolytes- activity coefficient, mean ionic activity coefficient, Ionic strength, Debye-Huckel theory of mean ionic coefficient.

UNIT II**(11 Hrs)****Conductance Measurements**

Conductance at high fields and high frequencies. Transport number - Definition, determination by Hittorff's method and moving boundary method. Determination of degree of dissociation of weak acid. Determination of solubility and solubility product of sparingly soluble salt.

Conductometric titrations - strong acid vs strong base, weak acid vs strong base, strong acid vs weak base, mixture of acids vs strong base.

UNIT III**(11 Hrs)****Electrochemical Cells**

Electromotive force & its measurements - standard cells - cell reaction & EMF convention for cell representation & sign of EMF. Standard & Single electrode potentials - Calculation of cell EMF from single electrode potentials. Thermodynamics & EMF - ΔH , ΔS & equilibrium constant K of a reaction from EMF data - Thermodynamics of electrode potentials - Nernst equation. Classification of Electrodes - Electrochemical cells - Chemical cells with/without transference - Concentration cells with/without transference - Liquid junction potential - use of salt bridge.

UNIT IV**(11 Hrs)****Application of EMF Measurements**

Determination of pH - using glass electrode - quinhydrone electrode. Calculation of valency of ions, equilibrium constant of an electrochemical reaction, determination of solubility

of sparingly soluble salts. Potentiometric titrations, polarization. Hydrogen overvoltage - Measurement and applications. Electrochemical corrosion – passivity, mechanism, types - Prevention - methods involved.

UNIT V

(12 Hrs)

Ionic Equilibria

Ionisation constants of weak acids and weak bases - Ionic product of water, pH, pOH, pKa, buffer solutions - Generalized concepts of acids and bases. Hydrolysis of salts of weak acids & strong bases, strong acids & weak bases, weak acids & weak bases. Henderson's equation - Theory of indicators - Solubility and solubility product - Common ion effect - Application of solubility product in analytical chemistry.

Text Books:

S.No	Authors	Title	Publishers	Year of Publication
1	B.R. Puri, L.R. Sharma, M.S. Pathania	Principles of Physical Chemistry	Vishal Publications	2010 44 th Edn.
2	P.L. Soni, O.P. Dharmarha & U.N. Dash	Text Book of Physical Chemistry	Sultan Chand & Co.	2016 Revised

Reference Books:

S.No	Authors	Title	Publishers	Year of Publication
1	Gurdeep Raj	Advanced Physical Chemistry	Goel Publishing House	2014 34 th Edn.
2	S. Glasstone	Introduction to Electrochemistry	East-West Press (Pvt) Ltd.	2014 Revised
3	W.J. Moore	Physical Chemistry	Longmans Publications	1999 Reprint 5 th Edn.

Pedagogy:

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

Course Designers:

1. Ms. E. Kayalvizhy

2. Dr. G. Selvi

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE16E01	AOS-I POLYMER CHEMISTRY	THEORY	56	4	-	4

Preamble

Enable the students to

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

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	classify the types of polymers and recognize the basic concepts	K2
CO2	illustrate the mechanisms of polymerization	K3
CO3	appraise the stereochemistry of polymers	K4
CO4	calculate the molecular weight of polymers by various methods	K3
CO5	illustrate the different polymer processing techniques	K3

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

UNIT I**(11Hrs)****Polymers**

Basic concepts such as monomers, polymers, polymerization, degree of polymerization, classification of polymers.

Plastics - Definition, thermoplastic, thermosetting plastics, reinforced plastic.

Elastomers - Definition, natural and synthetic rubber, smoked rubber, reclaimed rubber, foam rubber, spongy rubber, laminate rubber.

Adhesives - Definition, thermosetting and thermo resins.

Polymerisation techniques – Bulk, solution, suspension and emulsion polymerization.

UNIT II**(11Hrs)****Mechanisms of Polymerization**

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

UNIT III**(11Hrs)****Polymer Stereochemistry**

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

UNIT IV**(11Hrs)****Polymer Characterization**

Molecular Weights-definition - Determination of molecular weights by End Group Assay, Ebullioscopy, Cryoscopy, Osmotic Pressure, Vapour Pressure, Light Scattering-Refractive Index increment, Ultracentrifuge and Viscosity methods.

UNIT V**(12Hrs)****Polymer Technology**

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

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

Text Books:

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

Reference Books:

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

Pedagogy:

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

Course Designers:

1. Ms. E. Kayalvizhy

2. Dr. P. Kanchana

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE16E02	AOS-II (OPTIONAL) – ANALYTICAL CHEMISTRY	THEORY	56	4	-	5

Preamble

To enable the students to

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

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	explain the theories of gravimetric and volumetric analyses	K2
CO2	compare the principles of thermal methods of analyses and illustrate their applications	K4, K5
CO3	outline the principles and applications of flame photometry and polarimeter	K2
CO4	elaborate the theories and industrial importance of atomic absorption spectroscopy	K6
CO5	summarize the principles, applications and working of polarography, nephelometry and turbidimetry	K2, K6

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

AOS-II (OPTIONAL) - ANALYTICAL CHEMISTRY (CE16E02) (56 Hrs)

UNIT I (11Hrs)

Gravimetric and Volumetric Methods of Analysis

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

UNIT II (11Hrs)

Thermal Methods of Analysis

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

UNIT III (11Hrs)

Polarimetry & flame photometry

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

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

UNIT IV (11Hrs)

Atomic Absorption Spectroscopy

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

UNIT V**(12Hrs)****Electroanalytical Methods**

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

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

Fluorimetry - Principle and applications

Text Books:

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

Reference Books:

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

Pedagogy:

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

Course Designers:

1. Dr. S. Jone Kirubvathy

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE16AC1	ALC– I (OPTIONAL)- AGROINDUSTRIAL CHEMISTRY	THEORY		SELF STUDY		5

Preamble

To enable the students to

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

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	examine the water quality parameters and identify appropriate treatment process	K3, K4
CO2	analyze the functions of odoriferous substances in perfumes and apply the methods of extraction of perfumes	K3, K4
CO3	summarize the preparation and uses of fertilizers and pesticides	K6
CO4	appraise the chemistry of sugars and estimate them	K5
CO5	identify and determine the significant parameters of oils, fats and waxes	K3, K5

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

ALC –I AGROINDUSTRIAL CHEMISTRY [CE16AC1]

UNIT I

Water Sources for Agriculture

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

UNIT II

Synthetic Perfumes

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

Natural Perfumes

Production of natural perfumes, flower perfumes, fruit flavours.

UNIT III

Fertilizers

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

Pesticides

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

UNIT IV

Chemistry of Sugar and Fermentation

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

UNIT V

Oils, Fats and Waxes

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

Text Books:

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

Reference Books:

S.No.	Authors	Title	Publishers	Year of Publication
1	S.S.Dara	Textbook of Engineering Chemistry	S.Chand & Co.	2014 3 rd edition

2	P. C. Jain & M.Jain	Engineering Chemistry	Dhanpat Raj Publishing Company Pvt Ltd	2009 18 th Edn
3	B. Srilakshmi	Food Science	New Age International (Pvt) Ltd.	2015 6 th edition

Course Designers:

1. Dr. G. Selvi
2. Mrs. Sowmya Ramkumar

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE16AC2	ALC-II (OPTIONAL) PHARMACEUTICAL CHEMISTRY	THEORY		Self-study		5

Preamble

To enable the students to

- understand the basic concepts of chemistry and routes of drug administration
- acquire knowledge about medically important compounds and cardiovascular drugs
- know the role of synthetic drugs and organic pharmaceutical aids

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	identify the chemistry of drug molecules	K3
CO2	illustrate the routes of drug administration	K4
CO3	appraise the different types of synthetic drugs	K5
CO4	analyse the medical importance of compounds	K4
CO5	justify the importance of organic compounds in pharmaceuticals	K5

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

ALC-II (OPTIONAL) - PHARMACEUTICAL CHEMISTRY [CE16AC2]

(Self-study)

UNIT I

Basic Concepts of Drugs

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

UNIT II

Synthetic Drugs - I

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

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

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

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

UNIT III

Synthetic Drugs – II

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

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

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

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

UNIT IV

Medicinally Important Compounds

Al, P, As, Hg & Fe. Uses of $MgSO_4 \cdot 7H_2O$, milk of magnesia, magnesium trisilicate, aluminium hydroxide gel, dihydroxy aluminium aminoacetate, aluminium acetate and aluminium monostearate - paroxon -phosphorine, cyclophosphomide – tricyclophos - preparation & uses of thiotepa - sodium and copper cacodylates - preparation and uses of aromatic areseicals (carbosone, tryparsamide, acetarsonide, neoarsphenamine, oxophenarisine) $HgCl_2$ / HgI_2 & $Hg(CN)_2$ as disinfectants - importance of organic mercury compounds, structure & uses of thiomersal, netromersal merbromine & mersalyl acids, ferrous gluconate, $FeSO_4$, scale preparation (ferric ammonium acetate) ferrous fumarate, ferrous succinate & ferrous chlorinate.

UNIT V

Organic Pharmaceutical Aids

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

AIDS

Causes of HIV, Propagation, Prevention & Treatment.

Cardiovascular Drugs

Definition & names of following drugs - Cardiotonic drugs, Antiarrhythmic drugs, Antihypertensive drugs, Antianginal agents, Vasodilators, Lipids lowering agents, Sclerosing agents.

Text Books:

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

Reference Books:

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

Course Designers:

1. Mrs. S. Charulatha

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE15CP3	CHEMISTRY PRACTICAL – III	THEORY	-	-	150	5

Preamble

To enable the students to

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

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	examine the strength of unknown solutions by titrimetry methods	K1
CO2	construct and analyze phase diagrams	K5
CO3	calculate the rate of reactions	K4
CO4	estimate DO, TDS etc., in the water samples	K2
CO5	synthesize organic compounds by microwave technique and construct their structure using cheminformatics tools	K5

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

SEMESTER V & VI

Chemistry Practical – III [CE15CP3]

(150 Hrs)

Volumetric Analysis

Acidimetry and Alkalimetry

1. Estimation of sulphuric acid using standard oxalic acid.
2. Estimation of sodium hydroxide using standard sodium carbonate.
3. Estimation of sodium carbonate and bicarbonate in a given mixture

Permanganometry

1. Estimation of oxalic acid using standard Mohr's salt solution.
2. Estimation of Mohr's salt solution using standard oxalic acid.
3. Estimation of Calcium by direct and indirect methods.

Dichrometry

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

Iodometry & Iodimetry:

1. Estimation of Potassium dichromate.

Physical Chemistry Experiments

1. Rate constant of methyl acetate – Acid Hydrolysis
2. Determination of partition coefficient of Iodine between CCl_4 & water.
3. Critical solution temperature of phenol – water system.
4. Effect of impurity on the CST of phenol – water system.
5. Determination of concentration of the given NaCl/Succinic acid from the study of CST -
phenol – water system.
6. Phase diagram – simple eutectic system.

Conductivity Experiments

1. Determination of cell constant
2. Determination of λ_{∞} of a strong electrolyte using Debye Huckel Onsager equation.
3. Determination of dissociation constant of a weak acid.

4. Conductometric titration-Acid – Base

Potentiometric Titration

1. Acid - Base

2. Redox titration

Gravimetric Determination of the following using sintered glass crucible

1. Ba as BaCrO_4

2. Ca as $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$

Water Quality Parameter Analysis

1. Alkalinity

2. Hardness

3. Chloride

4. Dissolved Oxygen

5. TDS, TSS, TS and pH of the given water samples

One pot Microwave Synthesis

i) 2,3-diphenyl quinoxaline

ii) Dibenzal propanone

Cheminformatics

Connection Tables and Linear Notations-SMILES coding

Text Books:

LAB MANUAL - Prepared by Faculty, Department of Chemistry, PSGR Krishnammal College for Women.

Reference Books:

S.No.	Authors	Title	Publishers	Year of Publication
1	A.J. Findlay & Kitchener	Practical Physical Chemistry	Longmann Publication	1973 9 th Edn.
2	V.Venkateswaran, R. Veeraswamy & A.R. Kulandaivelu	Basic Principles of Practical Chemistry	S.Chand & Co.	2012 Reprint 2 nd Edn.
3	B. Vishwanathan, P.S. Raghavan	Practical Physical Chemistry	Viva Books	2014 Reprint
4	A.I Vogel	A Text Book of Quantitative Inorganic Analysis	ELBS & Longmann , Green & Co. Ltd.	2011 9 th Edn.
5	Andrew R. Leach, Valerie J. Gillet	An Introduction to Cheminformatics	Springer Netherlands	2009 Reprint
6	Rashmi Sanghi, M.M. Srivastava	Green Chemistry: Environment Friendly Alternatives	Narosa Publishing House	2012 Reprint 4 th Edn.
7	Meena Bhandari, Seema Raj	Practical Approach to Green Chemistry	International Journal of Pharmacy and Pharmaceutical Sciences	9(4), 2017, ISSN- 0975- 1491.

Pedagogy: Demonstration and individual Hands on Practicals

Course Designers:

1. Dr. V. Hemapriya
2. Dr. N. Arunadevi

Skill Based subject
V & VI Semester
Biochemistry – II
(SB13BC02)

Credits: 4

(58 Hrs)

Objectives:

To enable the students to understand the

- ❖ significance of pH and buffers in living systems
- ❖ role of enzymes in metabolic process
- ❖ uses of biochemical

Unit I

(12 Hrs)

pH& buffers: Acidity and alkalinity, pH – definition, variation in pH and interpretation, determination pH –Henderson – Hasselbatch equation, Effect of temperature.

Buffers – definition, principle, determination of pH of buffer, uses of buffers, buffer system of blood, buffers of tissue fluids and tissues. Acid base balance. Role of lungs and kidneys in pH regulation by means of buffers

Unit II

(12 Hrs)

Enzymes: Properties, classification, mechanism of enzyme action, co-enzyme, mechanism of coenzyme action, examples of coenzyme, factors influencing enzyme action- Temperature, pH concentration of enzymes, concentration of substrate- Michaleis-Menton equation, state of oxidation, effect of light and radiation and temperature.

Unit III

(12 Hrs)

Metabolism: Introduction, types of metabolic reactions, methods employed to study metabolism. Metabolism of carbohydrates – reactions of citric acid cycle. Lipids – metabolism, catabolism and excretion of cholesterol. Protein metabolism – general pathway of protein metabolism.

Unit IV**(11 Hrs)**

Energy requirements of the body: Introduction, measurement of energy value of food, direct and indirect method, total heat production, significance of RQ.

Basal metabolism – definition, conditions of BMR. Factors influencing BMR, measurement, significance. Caloric requirement, well balanced diet.

Unit V**(11 Hrs)**

Uses of Biochemicals: Industrial, drug and food uses of biochemicals – carbohydrates – food uses, non – food uses & pharmaceuticals. Lipids - food uses & non – food uses. Proteins - food uses & non – food uses.

Reference Books

S.No	Authors	Title of the book	Publishers	Year of publication
1	Ambika Shanmugam	Fundamentals of biochemistry for medical students	Wolters Kluwer Health(India)	2005 , seventh edition
2	DR. A.C. Deb,	Fundamentals of biochemistry	Central Book Agency (P) Ltd., Kolkata	2004, Eighth edition.
3	N. Mallikarjuna Rao,	Medical Biochemistry	New Age International (P) Ltd., New Delhi	2006 , second edition
4	U. Satyanarayana	Biochemistry	Books and Allied (P) Ltd., Kolkata	2002, Second edition.

Semester V & VI
Skill Based Subject Practical
Biochemistry Practical – II
(SB13BCP2)

Credits: 2

(30 Hrs)

Titrimetry:

1. Protein by Lowry method
2. Glucose by *o*-toluidine method
3. Spectro photometric method of determination of molar absorption co-efficient of amino acid.

Calorimetry:

1. Estimation of amino acid by Ninhydrin method
2. Estimation of protein by Biuret method
3. Estimation of Phosphorus by Fiske & Subberow method.
4. Estimation of Urea by DAM – TSC method.

Biochemical Preparation:

1. Preparation of Starch from potato
2. Preparation of Casein from milk
3. Preparation of Lactalbumin from milk
4. Preparation of Albumin from egg

pH measurements:

Preparation and measurement of pH of standard buffers- Acetate, Phosphate, Carbonate and Borate.

References:

S.No	Authors	Title of the Book	Publishers	Year of Publication
1	Beedu Sashidhar Tao, Vijay Deshpande	Experimental Biochemistry- A student companion	I. K. International (P)m Ltd	2007, First edn.
2	David T Plummer	An Introduction to Practical Biochemistry	Tata McGraw Hill	2007, third edn.

Project with Viva Voce [CE16PROJ]

(75 Hrs)

Credit: 5

CIA: 20 Marks

ESE: 80 Marks

Total: 100 Marks

Objectives

To make the students to

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

Group Project and Viva Voce

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

Area of Work

Synthetic Organic Chemistry, Coordination Chemistry, Corrosion Studies, Environmental Chemistry, Polymer Chemistry, Phytochemistry, Nanochemistry, Physical Chemistry.

Methodology

Each project should contain the following details:

Brief introduction on the topic

Review of Literature

Materials and Methods

Results and Discussions – evidences in the form of figures, tables and photographs

Conclusion / Summary

Bibliography

The above contents should not exceed 50 pages

Evaluation : Total - 100 Marks (Internal – 20 marks, External – 80 marks)

Internal

Total - 20 marks

I Review – Selection of the field of study, Topic & Literature Collection - 5 marks

II Review – Research Design and Data Collection - 10 marks

III Review – Analysis & Conclusion, Preparation of rough draft - 5 marks

External

Total – 80 marks

Project

Total – 60 marks

Relevance of the topic to the academic / society - 10 Marks

Objectives - 10 Marks

Experimental Design - 20Marks

Expression of Results and Discussion - 20 Marks

Viva Voce

Total – 20 marks

Presentation - 10 Marks

Discussion - 10 Marks

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE16C08	PAPER –VIII ORGANIC CHEMISTRY	THEORY	86	4	-	5

Preamble

To enable the students to

- understand the mechanism of rearrangements
- learn the chemistry of heterocyclic compounds, vitamins, drugs and chemotherapeutics
- acquire knowledge about amino acids, peptides and proteins
- gain insight into cheminformatics

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	reproduce the preparation/properties and uses of heterocyclic compounds	K1
CO2	classify the types of carbohydrates, discuss the preparation, properties and structures of mono & disaccharides	K2, K4
CO3	recognize and analyze the mechanisms of various molecular rearrangements	K2, K4
CO4	categorize the types of drugs and illustrate the structures of vitamins	K4
CO5	develop skills in the computer representation of chemical structures	K3

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

UNIT I

(17Hrs)

Heterocyclic Compounds

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

UNIT II

(17Hrs)

Carbohydrates

Classification and nomenclature, preparation and properties of monosaccharides (Glucose and Fructose), interconversion of Glucose and Fructose, chain lengthening & chain shortening of aldoses, configuration of monosaccharides. Open chain structure & cyclic structure of D (+) Glucose. Introduction to disaccharides, properties, structure of Maltose and Sucrose. Polysaccharides – Starch & Cellulose (without involving structure determination).

UNIT III

(17Hrs)

Molecular Rearrangements

Types of rearrangements – Nucleophilic, electrophilic & free radical, inter and intramolecular. Normal and cross-over products- migrating aptitude of groups. Pinacol – pinacolone, Claisen (ortho and para rearrangement), Beckmann, Hofmann, Curtius, Benzilic acid & Lossen rearrangements, Baeyer-Villiger oxidation, Hydroperoxide rearrangement & Dakin reaction.

UNIT IV

(17Hrs)

Vitamins and Drugs

Vitamins - Introduction, importance of vitamins, structural elucidation, synthesis, deficiency diseases & sources of Retinol, Thiamine, Riboflavin & Ascorbic acid.

Drugs- Introduction, classification, lethal dose, chemistry & application of sulpha drugs, antimalarials, amoebicidal drugs, antiseptics, antipyretics, analgesics & antibiotics, structure & uses of Pencillin, Streptomycin, Tetracycline and Chloromycetin.

UNIT V

(18Hrs)

Amino acids, Peptides and Proteins

Aminoacids – definition, classification, preparation – amination of halogen acids, Gabriel Phthalimide synthesis, Strecker synthesis, Erlenmeyer Azlactone synthesis. Reactions of α - amino acid – reactions of amino and carboxylic groups, action of heat on α , β and γ - amino acids.

Polypeptides - Nomenclature, synthesis – Bergaman & Fischer methods, Solid State peptide synthesis, N- terminal and C- terminal analysis of peptides .

Proteins –classification, properties & tests. Primary, secondary & tertiary structures. Colour reactions, denaturation & importance.

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.Representation of 3D molecular structures-Introduction.

Text Books:

S.No.	Authors	Title	Publishers	Year of Publication
1.	B.S. Bahl & Arun Bahl	Advanced Organic Chemistry	S.Chand &Co	2012 5 th Edn.
2.	Ashutosh Kar	Medicinal Chemistry	New Age International	2007 4 th Edn.

3.	Andrew R. Leach & Valerie J. Gillet	Introduction to Cheminformatics	Springer	2009 Reprint
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Reference Books:

S.No.	Authors	Title	Publishers	Year of Publication
1.	O.P. Agarwal	Organic Chemistry Natural Products, Vol.I	Goel Publishers	2013 42 th Edn.
2.	O.P. Agarwal	Organic Chemistry Natural Products, Vol.II	Goel Publishers	2014 41 th Edn.
3.	I.L. Finar	Organic Chemistry Vol.II	Pearson Education	2011 5 th 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.V.Hemapriya
2. Dr.N.Arunadevi

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE16C09	PAPER –IX PHYSICAL CHEMISTRY	Theory	71	4	-	5

Preamble

Enable the students to

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

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	interpret the fundamental concepts of kinetics and derive the rate constants of various order of reactions	K2
CO2	recognize the various theories of kinetics and analyze the kinetics of fast reactions	K2, K4
CO3	identify the different symmetry elements	K3
CO4	compare Freundlich and Langmuir adsorption isotherms and summarize the theories and applications of catalysis	K4, K2
CO5	understand the different photophysical/photochemical processes and their laws	K2

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

PAPER –IX PHYSICAL CHEMISTRY [CE16C09]

(71Hrs)

UNIT I

Chemical Kinetics-I

(14 Hrs)

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 II

Chemical Kinetics-II

(14 Hrs)

Significance of free energy of activation and entropy of activation. Theories of unimolecular reactions – Lindemann's theory, Hinshelwood Theory. Complex thermal reactions - Simultaneous, reversible, consecutive & chain reactions – The hydrogen-oxygen reaction – Explosion, conditions, consequences. Fast reactions – Stopped flow & Flash photolysis techniques.

UNIT III

Photochemistry

(15 Hrs)

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

UNIT IV

(14 Hrs)

Surface Chemistry

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

isotherms only. Catalysis – Types, theories – intermediate adsorption theory, modern adsorption theory, industrial applications.

UNIT V

Group Theory

(14 Hrs)

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

Text Books:

S.No.	Authors	Title	Publishers	Year of Publication
1.	B.R. Puri, L.R. Sharma, M.S. Pathania	Principles of Physical Chemistry	Vishal Publications	2010 44 th Edn
2.	P.L. Soni, O.P. Dharmarha & U.N. Dash	Text Book of Physical Chemistry	Sultan Chand & Co.	2016 Revised
3.	S. Swarnalakshmi, T. Saroja, R. M. Ezhilarasi	A Simple Approach to Group Theory in Chemistry	University Press Publishers	2008 1 st Edn.

Reference Books:

S.No.	Authors	Title	Publishers	Year of Publication
1.	Arun Bahl, B. S. Bahl, G. D. Tuli	Essentials of Physical Chemistry	S. Chand & Co.	2014 5 th Edn.

2.	Gurdeep Raj	Advanced Physical Chemistry	Goel Publishing House	2002 27 th Edn.
3.	K.J. Laidler	Chemical Kinetics	Pearson Education Pvt. Ltd	2007 3 rd Edn.
4.	K. V. Raman	Group Theory and its Applications to Chemistry	Tata McGraw-Hill Publishing Co.	1994 Reprint 3 rd Edn.

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

Course Designers:

1. Dr. D. Nalini
2. Dr. S. Jone Kirubavathy

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE16C10	PAPER –X PHYSICAL METHODS AND CHEMICAL STRUCTURE	Theory	86	4	-	5

Preamble

Enable the students to

- gain knowledge about the fundamental concepts of various spectroscopy
- understand the basic principles of XRD
- familiarize the crystalline point groups and space groups
- learn the basic principles and applications of different chromatographic techniques

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	understand the fundamental concepts of electromagnetic spectrum and identify the selection rules	K2
CO2	reproduce the differences between IR and Raman spectra and calculate λ_{\max}	K1, K3
CO3	predict the structures of molecular compounds based on NMR and Mass spectroscopic techniques	K2
CO4	analyze the XRD data for various crystal systems	K4
CO5	examine the significance and applications of various chromatographic techniques	K4

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

PAPER-X PHYSICAL METHODS AND CHEMICAL STRUCTURE [CE16C10]

(86 Hrs)

UNIT I

(17 Hrs)

Fundamental Concepts

Regions of Electromagnetic spectrum & properties of electromagnetic radiations-Concept of Frequency, wavelength, wave number-Molecular energy levels, types of changes induced by the interaction of matter with electromagnetic radiation.

Microwave Spectroscopy

Theory (for diatomic molecule as rigid rotor), selection rules-isotopic substitution, intensity of spectral lines, instrumentation, application.

IR Spectroscopy

Theory for diatomic molecule as simple harmonic and anharmonic oscillator, selection rule, vibrational frequencies - Vibrational modes of H₂O and CO₂. Applications – molecular constitution and hydrogen bonding.

UNIT II

(17 Hrs)

Raman Spectroscopy

Rayleigh and Raman Scattering - Stokes and antistokes lines.Classical theory, instrumentation - block diagram – comparison of IR and Raman spectroscopic techniques-Mutual exclusion principle and its applications.

UV –Visible Spectroscopy

Franck –Condon principle, Types of electronic transitions in organic molecules, Woodward Fieser rules for calculation of λ_{\max} of conjugated dienes, unsaturated ketones, predissociation. Determination of dissociation energy – Birge –Sponer method.

UNIT III

(17 Hrs)

NMR Spectroscopy

NMR-principle, instrumentation-NMR active nuclei, chemical shift- δ and τ scale&factors affecting chemical shift.Splitting of signals-spin-spin splitting.NMR spectrum of simple

molecules such as Acetone, Anisole, Benzaldehyde, Ethyl acetate, Ethylamine, Ethylbromide, Toluene and Isopropylphenyl ketones, solvents used.

Mass Spectrometry

Basic Principles-Instrumentation-Representation of Mass spectra-Molecular ion-Identification of parent ion-Isotopic peaks-Determination of molecular formula-meta stable peak.General fragmentation-Mc Lafferty, Retro Diels Alder rearrangements.Mass spectra of ethylbenzene, acetophenone & 1-propanol.

UNIT IV

(17 Hrs)

X –ray Diffraction

Fundamentals, Bragg's equation, powder & rotating crystal methods. Determination of lattice types, X-ray diffraction data for cubic crystal system - NaCl, KCl, CsCl, Diamond and Graphite. Bravais lattices, Miller indices & labeling of planes, symmetry properties, crystallographic point groups & space groups.

UNIT V

(18 Hrs)

Chromatography

Column Chromatography – Principle, types of adsorbents, column preparation, elution, recovery of substances & applications

Paper Chromatography – Principle, solvents used, development of chromatogram, ascending, descending, radial paper chromatography & applications. Paper electrophoresis – separation of amino acids.

Thin Layer Chromatography - principle, choice of adsorbents and solvents, preparation of chromatographic plates, R_f values - factors affecting and its significance.

Text Books:

S.No.	Authors	Title	Publishers	Year of Publication
1.	C. N. Banwell, E. M. McCash	Fundamentals of Molecular Spectroscopy	Tata McGraw Hill	2016 4 th Edn.
2.	B.R. Puri, L.R. Sharma, M.S. Pathania	Principles of Physical Chemistry	Vishal Publications	2010 44 th Edn
3.	V. K. Srivatsava	Introduction to Chromatography	S.Chand & Co.	1981 2 nd Edn.
4.	Y.R Sharma	Elementary Organic Spectroscopy	S.Chand & Co.	2015 Reprint 5 th Edn.

Reference Books:

S.No.	Authors	Title	Publishers	Year of Publication
1.	P.W Atkins	Physical Chemistry	Oxford University Press	2014 10 th Edn.
2.	Jag Mohan	Organic Spectroscopy, Principles and Applications	Alpha Science International Ltd	2004 2 nd Edn.
3.	B K Sharma	Instrumental Methods of Chemical Analysis	Goel Publishing House	2011 24 th Edn.
4.	Anthony R West	Solid State Chemistry and its Applications	Wiley Student Edition	2014 2 nd Edn.

Pedagogy:

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

Course Designers:

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

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE16E03	AOS – III DYE CHEMISTRY	THEORY	71	4	-	4

Preamble

Enable the students to

- familiarize the theories of colour and constitution/classification of dyes
- acquire knowledge about the process of dyeing
- gain vivid insight into the types of dyes-their synthesis, characteristics/applications
- understand about pigments and their uses in paints

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	relate the types of theories onto colour and constitution	K1
CO2	classify dyes based on structure and applications	K4
CO3	examine the synthesis and applications to various types of dyes - azo, di&triphenyl methane, phthalein dyes	K2
CO4	classify the types of organic and inorganic pigments -their applications in paints	K3
CO5	list the applications of dyes in different areas	K2

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

AOS –III DYE CHEMISTRY [CE16E03](71 Hrs)

UNIT I

(14 Hrs)

Fundamental Concepts

Colour and constitution: Colour of substances - Complementary colours- theories of colour and constitution- Otto - Witt theory- chromophores, auxochromes, bathochromic shift, hypsochromic shift. Quinonoid theory, modern theories - valence bond theory and molecular orbital theory.

Classification of Dyes - Chemical classification & classification according to applications-Process of dyeing.

UNIT II

(14 Hrs)

Azo Dyes

Azo Dyes - Principles of azo coupling - Mechanism of diazotization - Coupling with amines & phenols. Monoazo & bisazo dyes - Synthesis & applications. Tautomerism in azo dyes.

Chemistry of Dyestuff Intermediates: Primaries, Intermediates, manufacture of Intermediates- Aliphatic compounds (alcohols, halogen compounds, carboxylic acids and esters, aldehydes & ketones, amines)

UNIT III

(14 Hrs)

Di and Triphenyl Methane Dyes

Synthesis and applications of diphenylmethane dyes - Auramin'O', Auramin G. Triphenyl methane dyes - leuco bases - pseudo bases - dye salts; amino triphenyl methane dyes - Malachite Green, Rosaniline & Crystal Violet. Hydroxy triphenyl methane dyes - Aurin, Chrome Violet.

Phthalein Dyes

Phenolphthalein, phenosulpho-phthalein.xanthene dyes, acid xanthene dyes - Fluorescein, Eosin, Erythrocin. Xanthhydrol basic xanthene dyes - Rhodamine - B, Rhodamine-G, pyronine-G.

UNIT IV**(14 Hrs)****Supplementary Dyes**

Synthesis & applications of quinone imine dyes - indophenols, indamines. Azine dyes - safranin -T, oxazine dyes, Meldola's blue, gallocyanine. Thiazine dyes-methylene blue. Thiazole dyes - pumiline, thioflavin-T. Cyanine dyes - quinoline blue - astrazone pink FG, astrazone yellow 3G. Phthalocyanine dyes, acridine dyes. Indigo and thioindigo.

UNIT V**(15 Hrs)****Pigments**

Requirements of a pigment – Organic / inorganic pigments & their uses in paints. Reactions of dyes with fibre & water. Fluorescent Brightening Agents. Applications of dyes in other areas – Medicine, chemical analysis, cosmetics, colouring agents, foods and beverages.

Text Books:

S.No.	Authors	Title	Publishers	Year of Publication
1.	Gurdeep .R. Chatwal	Synthetic Dyes	Himalaya Publishing House (Pvt) Ltd.	2016 4 th Edn.
2.	B.K.Sharma	Industrial Chemistry	Goel Publishing House	2008 14 th Edn.
3.	O.D.Thyagi, M. Yadav	A Text Book of Synthetic Dyes	Anmol Publication (Pvt) Ltd.	2002 2 nd Edn.

Reference Books:

S.No.	Authors	Title	Publishers	Year of Publication
1.	NIIR Board	The Complete Technology Book on Dyes and Dye Intermediates	National Institute of Industrial Research, New Delhi	2004
2.	Pope Sine	Synthetic Dyes	Neha Publishers	2016 1 st Edn.
3.	Rajbir Singh	Synthetic Dyes	Mittal Publications	2002 1 st Edn.
4.	E.N. Abrahart	Dyes and their Intermediates	Edward Arnold Publishers	1977 2 nd Edn

Pedagogy:

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

Course Designers:

1. Dr. N. Muthulakshmi Andal
2. Mrs.N.Shyamala Devi

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE16E04	AOS – IV NOVEL INORGANIC SOLIDS	Theory	71	4	-	4

Preamble

Enable the students to

- reproduce the methods of synthesizing inorganic solids and learn their importance
- understand the classification, composition and applications of nano materials
- gain knowledge about applications of engineering materials and polymer composite materials.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	appraise the various techniques for the synthesis of inorganic materials	K4
CO2	classify the of functional inorganic nanomaterials	K4
CO3	categorize the application of engineering materials for construction purpose	K4
CO4	examine the classification and importance of composites	K3
CO5	appraise the use of polymers in industry	K4

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

AOS - IV – NOVEL INORGANIC SOLIDS [CE16E04]

Unit I

(14 Hrs)

Synthesis of Inorganic Solids

Conventional heat & beat methods, Co-precipitation, Hydrothermal, Ion-exchange & Intercalation methods.

Technologically Important Inorganic Solids

Solid electrolytes – Cationic & anionic. Mixed Inorganic Pigments – coloured solids, white and black pigments. Molecular materials & chemistry – one dimensional metals, molecular magnets, inorganic liquid crystals.

Unit II

(14 Hrs)

Nanomaterials

Overview of nanostructures & nanomaterials: Classification, preparation of gold & silver nanoparticles, self-assembled nanostructures-control of nanoarchitecture-one dimensional control. Carbon nanotubes & inorganic nanowires. Bio-inorganic nanomaterials, DNA & nanomaterials, natural & artificial nanomaterials, bionanocomposites.

Unit III

(14 Hrs)

Engineering Materials for Mechanical Construction

Introduction, composition, mechanical & fabricating characteristics, applications of various types of cast irons, plain carbon and alloy steels, copper, aluminium & their alloys - duralumin, brasses & bronzes, cutting tool materials, super alloys, thermoplastics & thermosets.

Unit IV

(14 Hrs)

Composite Materials

Introduction, limitations of conventional engineering materials, role of matrix in composites, classification, matrix materials, reinforcements, metal-matrix composites, polymer-matrix composites, fibre-reinforced composites, environmental effects & applications.

Unit V**(15 Hrs)****Special Polymers**

Conducting polymers - Introduction, conduction mechanism, polyacetylene, polyparaphenylene & polypyrrole, applications. Ion-exchange resins & their applications. Ceramics & Refractory: Introduction, classification, properties, raw materials, manufacturing & applications.

Text Books:

S.No	Authors	Title	Publishers	Year of Publication
1.	Peter Atkins, Tina Overton, Jonathan Rourke, Mark Weller & Fraser Armstrong	Shriver & Atkins Inorganic Chemistry	Oxford University Press	2012 4 th Edn.
2.	Ulrich Muller	Inorganic Structural Chemistry	John Wiley & Sons	2007 2 nd Edn.

Reference Books:

S.No	Authors	Title	Publishers	Year of Publication
1.	C.P.Poole & F.J.Owens	Introduction to Nanotechnology	John Wiley & Sons	2010 1 st Edn.
2.	G.E.Rodger	Inorganic and Solid State Chemistry	Cengage Learning	2002
3.	Faiz Mohammed	Speciality Polymers: Materials and Applications	I.K.International Publishing (Pvt) Ltd.	2007
4.	D.M. Adam	Inorganic Solids: Introduction to Concepts in Solid-State Structural Chemistry	Wiley-Blackwell	1974 1 st Edn

Course Designers:

1. Mrs. S. Charulatha

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE16AC3	ALC-III (OPTIONAL) - FOOD CHEMISTRY AND TECHNOLOGY	Theory		Self Study		5

Preamble

Enable the students to

- learn the functions of food and different techniques for water purification
- understand the functions of food constituents and its method of analysis
- study the manufacturing process of modern foods and constituents of beverages
- gain knowledge about the importance of balanced diet
- study the need for food preservation and specific standards in quality control

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	analyse food groups and apply various techniques in water purification process	K4
CO2	generalize important food constituents and its classification	K5
CO3	analyze the methods of manufacturing modern food and constituents of beverages	K4
CO4	appraise the importance of balanced diet and identify the consequences of malnutrition	K4
CO5	examine food preservation methods and standards of quality control	K3

Mapping with Programme Outcomes

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

H - High; M-Medium; L-Low

ALC-III (OPTIONAL) - FOOD CHEMISTRY AND TECHNOLOGY [CE16AC3]

Self Study

UNIT I

Food

Source, functions of food – food groups – food guide – basic five food groups, Usage of the food guide – food in relation to health – objectives of cooking

Water

Specification of drinking water-Purification processes – Ion exchangers, reverse osmosis, activated charcoal treatment. Use of chlorination, ozone & UV light disinfection. Water borne diseases – Microbiological examination, sources and detection.

UNIT II

Food Constituents and Analysis

Proteins

Analysis of proteins – Principles in the determination of moisture content, ash content , nitrogen content – Kjeldahl's method. Separation of proteins by electrophoresis.

Enzymes

Enzymes used in food processing. Enzymic & non-enzymic browning - Measurement of enzyme activity- principles.

Carbohydrates

Classification, structure, processing & storage. Principles involved in the analysis of carbohydrates – Glucose, starch, Benedict's, Anthrone and Neilson–Somoyogi methods.

Minerals and Vitamins

Minerals - Sources, functions, bioavailability & deficiency of the following minerals - Calcium, iron, iodine, fluorine, sodium & potassium (elementary treatment). Vitamins - sources, classification, functions & deficiencies of fat- soluble vitamins – (A, D, E and K), water-soluble vitamins – (C, thiamin, niacine, riboflavin, B complex - B₆, Folic acid & B₁₂).

UNIT III

Modern Food & Beverages

Modern Food -Mushroom cultivation and types, spirulina composition. Snack foods. Production of bread, bun and biscuits - Raw materials, methods and machinery required. Candy manufacturing, Caramelization, Fast foods, Instant foods, Dehydrated foods. Oleoresin of spices, Condiments.

Beverages -Soft drinks, soda, fruit juices and alcoholic beverages (types and content of alcohol) examples, Carbonation. Composition of soft drinks.Addiction to alcohol, Social problems.

UNIT IV

Nutrition

Calorific value of food stuff – RQ of food (Respiratory quotient of food) – basal metabolic rate – factors influencing BMR (Basal Metabolic Rate), specific dynamic action (SDA) of food.

Balanced Diet

Energy requirements of individuals – diet and its components – protein requirements – biological & supplementary value of proteins. Diseases associated with protein malnutrition. Nutritional value of carbohydrates – Fibers in the diet, dietary sugars – nutritional aspects of lipids.

UNIT V

Methods of Food Preservation and Quality Control

Microbial Growth

Growth curve of bacteria.Effects of environmental factors on growth of microorganisms – pH, water activity, oxygen availability, temperature.Beneficial effect of micro organisms. Food borne illness – bacteria, virus, moulds and parasites (any two illness each).

Food Preservation and Processing

Food deterioration, methods of preservation and processing.

Quality Control

Specifications and standards – PFA, FPO, FDA, drug license, WHO standards, ISI specifications, packing and label requirements, essential commodities act, consumer protection act, AGMARK.

Text Books:

S.No.	Authors	Title	Publishers	Year of Publication
1.	B. Srilakshmi	Food Science	New Age International Publishers	2014 7 th Edn.
2.	B. Siva Sankar	Food Processing and Preservation	Hall of India (Pvt)Ltd	2004 1 st Edn.
3.	S. Ramakrishnan, K.G. Prasannan & R. Rajan	Text Book of Medical Biochemistry	Orient Black Swan Publishers	2001 3 rd Revised Edn.
4.	N. Shakuntala Manay, M. Shadaksharaswamy	Foods: Facts and Principles	New Age International Publishers	2008 3 rd Edn.

Reference Books:

S.No.	Authors	Title	Publishers	Year of Publication
1.	M. Swaminathan	Advanced Text Book on Food and Nutrition Vol. I & II	Bapcco Ltd.	2015
2.	Norman N. Potter & Joseph H. Hotchkiss	Food Science	CBS Publishers	2007

3.	Lillian Hoagland Meyer	Food Chemistry	Reinhold Publishers	2008 3 rd Edn.
4.	Owen R. Fennema	Food Science	Marcel Dekker Publishers	2007 4 th Edn.
5.	M. R. Adams & Maurice O. Moss	Food Microbiology	RSC Publishers	2007 3 rd Edn.

Course Designers:

1. Dr. R. Revathi

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
CE16AC4	ALC-IV (OPTIONAL) - LEATHER CHEMISTRY	Theory		Self Study		5

Preamble

Enable the students to

- study the structure and composition of hides and skin
- understand the chemistry behind tanning and its types
- learn different methods of dyeing leather and fixation
- gain knowledge about the pollution problems caused by different types of tannery effluents

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	relate the basic principles involved in pre tanning of skins and hides	K3
CO2	classify the methods of tanning	K4
CO3	compare and contrast Al, Zr and Te tanning with chrome tanning	K5
CO4	explain different process involved in curing	K4
CO5	appraise and utilize the techniques used for treating tannery effluents.	K5

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	H	H	M	M	M
CO4	H	H	H	M	M	M
CO5	H	H	H	M	M	M

H - High; M-Medium; L-Low

ALC-IV (OPTIONAL) – LEATHER CHEMISTRY [CE16AC4]

Self Study

UNIT I

Basic Principles and Leather Constituents

Introduction, chief process involved in leather manufacture - elementary knowledge about the structure and composition of hides and skins. Proteins and their characteristics. Anatomy and histology of protein constituents of leather (an elementary concept). Basic principles involved in pre-tanning such as soaking, liming, delimiting, bathing, pickling and depickling.

UNIT II

Tanning Methods and Applications

Types of tanning – vegetable and mineral tanning – classification, factors and physio-chemical principles involved, fixation of vegetable tanning. Synthetic tanning – classifications, general methods of manufacture and its uses.

UNIT III

Chemistry and Preparation of Tanning Agents

Preparation and chemistry of chrome tanning liquids, reduction, oxidation and hydrolysis of chrome liquids. Effects of adding tanning agents – Role of pH in the reaction of chromium complexes with hide proteins. Factors governing chrome tanning- chemistry of neutralization process. A brief survey of chemistry of tanning like Al, Zr and Te salts & their relative merits in contrast with chrome tanning. Chemistry of combination of tannages involving vegetable tanning, aldehydes, chrome & other tanning agents.

UNIT IV

Curing and Dyeing Methods

Chemical methods of curing & preservation - hides & skins in acid & alkaline solutions. Principles of analytical methods employed in curing, liming, delimiting, bathing, pickling. Analysis of vegetable tanning materials & extract. Process of dyeing leather – use of mordant, dyeing, auxiliaries such as leveling, wetting and dispersing agents – dye fixations.

UNIT V

Animal Wastes and Treatment Processes

Animal by-products – their collection, handling & preservation methods (hair, blood, bones, glands, keratinous materials & their utilization). Tannery effluents & treatment -Types of water pollution – physical, chemical, physiological & biological. Different types of tannery effluents & waste- beam-house waste, liquors, tanning & finishing yard waste liquors, solid waste – origin & disposal.

Text Books:

S.No.	Authors	Title	Publishers	Year of Publication
1.	P.C.Jain & Monika Jain	Engineering Chemistry	Dhanpat Rai Publishing Co., (Pvt) Ltd	2016 16 th Edn.
2.	Jayashree Ghosh	Fundamental Concepts of Applied Chemistry	S.Chand & Co. Ltd.	2010
3.	B.K.Sharma	Industrial Chemistry	Goel Publishing House	2008 14 th Edn.

Reference Books:

S.No.	Authors	Title	Publishers	Year of Publication
1.	Anthony D.Covington	Tanning Chemistry: The Science of Leather	RSC Publishing	2011
2.	O'Flaherty, Fred, William T.Roddy & Robert M. Lollar	The Chemistry and Technology of Leather	Reinhold Publishing Co.	1956 1 st Edn.

Course Designers:

1. Dr. R. Revathi