

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS)

Reaccredited with “B++” Grade by NAAC

(Affiliated to Periyar University)

SALEM – 16



PG & RESEARCH DEPARTMENT OF CHEMISTRY

CHOICE BASED CREDIT SYSTEM (CBCS)

LEARNING OUTCOME BASED CURRICULUM FRAMEWORK

(LOCF)

B.Sc.CHEMISTRY

2026-2029 BATCH

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INTRODUCTION

Science is central to energy production, healthcare, new material development for electronics and other applied fields and environmental protection. Chemistry is the study of composition and transformation of matter. Bachelor's degree in chemistry is the culmination of in-depth knowledge of Inorganic, Organic and Physical Chemistry and specialized courses such as Biochemistry, Spectroscopy, Pesticide Chemistry, Forensic Science, Inherited knowledge in Cosmetic Chemistry, Food Chemistry, Dairy Chemistry and so on. Thus, this programme inculcates learners in building a solid foundation for higher studies in Chemistry. The hands-on experience the students gain in practical's enables the students to apply theory to solve problems in everyday life, think critically and innovatively. An aptitude for research is instilled through project work and industrial internship.

Students completing this programme will be able to present the concepts of Chemistry clearly and precisely. They can find solutions to solve problems that mankind is facing today. They can interpret data and present their findings to both scientific community as well as laymen can work as a team and evolve to become an entrepreneur.

The completion of this programme will also enable the learners to join teaching profession, conducting research in Industry and Government run research labs. A B.Sc., chemistry student has the option to diversify to other branches such as Biochemistry, Biotechnology and Forensic Science etc. They have employability opportunities in public and private sector jobs in Energy, Pharmaceutical, Food, Cosmetic industries etc...

**LEARNING OUTCOME-BASED CURRICULUM FRAMEWORK GUIDELINES
BASED REGULATIONS FOR UNDER GRADUATE PROGRAMME**

Programme:	B.Sc. Chemistry
Programme Code:	UCH
Duration:	3 Years [UG]
Programme Outcomes:	PO1 : Disciplinary Knowledge have firm subject knowledge required for higher studies, professional and applied courses. PO2 : Problem Solving Skill apply basic practical skills & technical knowledge along with domain knowledge of different subjects in the science & humanities stream. PO3 : Critical Thinking/ Analytical Reasoning develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity. PO4 : Digital literacy employ appropriate digital tools and techniques in analysing data and creative design. PO5 : Employment/ Entrepreneurship Skill gain competence to pursue higher learning, research and to opt for job opportunities or entrepreneurship. PO6 : Leadership Quality interact effectively with others displaying leadership and team spirit. PO7 : Contribution to Society demonstrate responsibility as citizens for national development through community outreach, wellness of self and a sustainable environment. PO8 : Research and Development inculcate creativity in academics and research PO9 : Self directed learning apply digital tools to collect, analyse and interpret data and present scientific findings. PO10: Life long Learning exhibit competence in educational, industrial and research pursuits that contribute towards the holistic development of self and community.
Programme Specific Outcome (PSOs)	PSO1- Disciplinary Knowledge Gain in-depth knowledge of the fundamental concepts in all disciplines of chemistry. PSO2 – Scientific Reasoning Capability to integrate the basics of chemistry and advanced topics and analytical skills in organic, inorganic and physical chemistry. PSO3 – Multicultural Competence Imbibe leadership qualities to work individually and within a team in organizing curricular, co-curricular and extracurricular activities. PSO4 – Professional Ethics/ Entrepreneurship Skill Apply the concepts of chemistry to solve problems in the community, entrepreneurial and research pursuits. PSO5 – Self Directed Learning Gain competence to pursue higher education and career opportunities in chemistry and allied fields.

Highlights of the Revamped Curriculum

- Student-centric, meeting the demands of industry & society, incorporating industrial components, hands-on training, skill enhancement modules, industrial project and project with viva-voce, exposure to entrepreneurial skills, training for competitive examinations, sustaining the quality of the core components and incorporating application-oriented content wherever required.
- The core subjects include latest developments in the education and scientific front, advanced programming packages allied with the discipline topics, practical training for providing solutions to industry/ real life situations. The curriculum also facilitates peer learning with advanced chemistry topics in the final semester, catering to the needs of stakeholders with research aptitude.
- The curriculum is designed so as to strengthen the Industry-Academia interface to provide more job opportunities for the students.
- The internship during the second-year vacation will help the students gain valuable work experience that connects classroom knowledge to real world experience and to narrow down and focus on the career path.
- Project with viva-voce component in the fifth semester enables the students to apply conceptual knowledge to practical situations. The state of art technologies in conducting experiments in a scientific and systematic way and arriving at a precise solution is ensured. Such innovative provisions of the industrial training, project and internships will give students an edge over their counterparts in the job market.
- State-of-the-Art techniques from the streams of multi-disciplinary, cross disciplinary and inter-disciplinary nature are incorporated as elective courses.

Value additions in the Revamped Curriculum:

Semester	Newly introduced Components	Outcome/ Benefits
I	Foundation Course To ease the transition of learning from higher secondary to higher education, providing an overview of the pedagogy of learning chemical concepts.	• Instill confidence among students • Create interest for the subject
I, II, III, IV	Skill Enhancement Course (Discipline centric/ Generic/ Entrepreneurial)	• Industry ready graduates • Skilled human resource • Students are equipped with knowledge about food chemistry • Inculcating Indian Knowledge system to gain insight into cosmetic chemistry • Training on entrepreneurial skills enable the students gain knowledge and exposure in the competitive world. • Discipline centric skill will improve the technical knowledge of analytical instruments. • Students gain knowledge about forensic science
V&VI	Elective course An open choice of topics categorized under Discipline Centric	• Strengthening the domain knowledge • Introducing the stakeholders to the State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter-disciplinary nature • Emerging topics in biochemistry, industrial chemistry, fundamentals of spectroscopy and pharmaceutical chemistry are introduced. • Exposure to industry moulds students into solution providers • Generates Industry ready graduates • Employment opportunities enhanced
Extra Credits: For Advanced Learners		• To cater to the needs of peer learners / research aspirants.
Skills acquired from the Courses		• Knowledge, Problem Solving, Analytical ability and Professional Competency.

Credit Distribution for UG Programme

Sem I	Credit	Hr.	Sem II	Credit	Hr.	Sem III	Credit	Hr.	Sem IV	Credit	Hr.	Sem V	Credit	Hr.	Sem VI	Credit	Hr.
1.1 Part1. Language–Tamil	3	6	2.1 Part.1 Language–Tamil	3	6	3.1 Part.1. Language–Tamil	3	6	4.1 Part.1. Language–Tamil	3	6	5.1 Core Course–CC IX	4	5	6.1 Core Course–CC XIII	4	6
1.2 Part.2 English	3	6	2.2 Part.2 English	3	6	3.2 Part .2 English	3	6	4.2 Part.2 English	3	6	5.2 Core Course–CCX	4	4	6.2 Core Course–CC XIV	4	6
1.3 Core Course–CCI	5	5	2.3 Core Course–CC III	4	4	3.3 Core Course–CC V	5	5	4.3 Core Course–CC VII	5	5	5.3. Core Course CC -XI	4	5	6.3 Core Course–CC XV	4	6
1.4 Core Course–CC II	3	4	2.4 Core Course–CC IV	3	3	3.4 Core Course–CC VI	3	4	4.4 Core Course–CCVIII	3	3	5.4. Core Course–CC-XII	2	3	6.4 Elective -Discipline Specific-IV	3	5
1.5 Elective I Generic	5	5	2.5 Elective II Generic	5	5	3.5 Elective -Discipline Specific I	5	5	4.5 Elective -Discipline Specific II	5	5	5.5. Core Course – Project with viva-voce	4	5	6.5 Elective Discipline Specific -V	3	5
1.6 Skill Enhancement Course SEC-1	2	2	2.6 Skill Enhancement Course SEC-2	2	2	3.6 Skill Enhancement Course SEC-4, (Entrepreneurial Skill)	1	1	4.6 Skill Enhancement Course SEC-6(IKS)	2	2	5.6 Elective - Discipline Specific III	4	6	6.6 Extension Activity	1	-
1.7 Skill Enhancement -(Foundation Course)	2	2	2.7 Skill Enhancement Course–SEC-3	2	2	3.7 Skill Enhancement Course SEC-5	2	2	4.7 Skill Enhancement Course SEC-7	2	2	5.7 Value Education	2	2	6.7 Professional Competency Skill	2	2
			2.8 Disaster Management	1	2	3.8 E.V.S. 3.9 Health & Wellness	- 1	1 -	4.8 E.V.S	2	1	5.8 Summer Internship	2	-			
	23	30		23	30		23	30		25	30		26	30		21	30

Total– 141 Credits

Consolidated Semester wise and Component wise Credit distribution

Parts	Sem I	Sem II	Sem III	Sem IV	Sem V	Sem VI	Total Credits
Part I	3	3	3	3	-	-	12
Part II	3	3	3	3	-	-	12
Part III	13	13	13	13	22	18	92
Part IV	4	4	4	6	4	3	25
Total	23	23	23	25	26	21	141

Part I, II, and Part III components will be separately taken into account for CGPA calculation and classification for the undergraduate programme and the other component. Part IV has to be completed during the duration of the programme as per the norms, to be eligible for obtaining the UG degree.

Total Credits: 141

EXTRA CREDITS FOR EXTRA SKILLS

Total Extra Credits-28 (20 % of the total credits)

B.Sc. CHEMISTRY
CURRICULUM DESIGN AND SCHEME OF EXAMINATION
(APPLICABLE TO STUDENTS ADMITTED DURING THE ACADEMIC
YEAR 2026-27)

SEMESTER-I

Part	Course Code	Course Title	Course Type	Hrs. /Week L/T/P	Credits	CIA	ESE	TOTAL
I	26ULTC1 26ULHC1 26ULSC1	Tamil/Hindi/ Sanskrit –I	Language	6	3	30	70	100
II	26ULEC1	English–I	English	6	3	30	70	100
III	26UCHCC1	General Chemistry-I	Core Course -I	5	5	30	70	100
	26UCHCCQ1	Core Practical- I: Quantitative Inorganic Estimation (Titrimetry) and Inorganic Preparations	Core Course - II	4	3	40	60	100
	26UCHMGEC1	Theory of Equations and Differential Calculus	Generic Elective	5	5	30	70	100
IV	26UCHSEC1	Food Chemistry	Skill Enhancement Course-I (NME)	2	2	30	70	100
	26UCHSEFC	Foundation Chemistry	Foundation Course	2	2	30	70	100
Total				30	23			
*Extra Skills (Out of College Hours)						*Credits	*Marks	
Articulation and Idea Fixation						-	-	
Physical Fitness Practice						-	-	
Society Connect Activity						-	-	

***Extra credits are given for Extra Skills and courses qualified in MOOC/ NPTEL**

SEMESTER-II

Part	Course Code	Course Title	Course Type	Hrs. / Week L/T/P	Credits	CIA	ES E	TOTAL
I	26ULTC2/ 26ULHC2/ 26ULSC2	Tamil/Hindi/ Sanskrit-II	Language	6	3	30	70	100
II	26ULEC2	English–II	English	6	3	30	70	100
III	26UCHCC2	General Chemistry-II	Core Course -III	4	4	30	70	100
	26UCHCCQ2	Core Practical-II: Qualitative Organic Analysis and Preparation of Organic Compounds	Core Course -IV	3	3	40	60	100
	26UCHMGEC2	Integral Calculus and Laplace Transform	Elective – II (GE)	3	3	30	70	100
	26UCHMGECQ	Theory of Equations and Laplace Transform using sage Math-Practical		2	2	40	60	100
IV	26UCHSEC2	Dairy Chemistry	Skill Enhancement Course-II (NME)	2	2	30	70	100
	26UCHSEC3	Inherited Knowledge in Cosmetic Chemistry	Skill Enhancement Course-III (Indian Knowledge System)	2	2	30	70	100
	26UDMT	Disaster Management		2	1			
Total				30	23			
*Extra Skills (Out of College Hours)						*Credits	*Marks	
Articulation and Idea Fixation						1	100	
Physical Fitness Practice						-	-	
Society Connect Activity						1	-	

***Extra credits are given for Extra Skills and courses qualified in MOOC/ NPTEL**

SEMESTER-III

Part	Course Code	Course Title	Course Type	Hrs. /Week L/T/P	Credits	CIA	ESE	TOTAL
I	26ULTC3/ 26ULHC3/ 26ULSC3	Tamil/Hindi/ Sanskrit-III	Language	6	3	30	70	100
II	26ULEC3	English-III	English	6	3	30	70	100
III	26UCHCC3	General Chemistry-III	Core Course- V	5	5	30	70	100
	26UCHCCQ3	Core Practical- III Qualitative Inorganic Analysis	Core Course - VI	4	3	40	60	100
	26UCHPGEC3	Physics-I	Elective -III (GE)	3	3	30	70	100
	26UCHPGECQ1	Physics Practical-I		2	2	40	60	100
IV	26UCHSEC4	Entrepreneurial Skills in Chemistry (Entrepreneurial Skill)	Skill Enhancement Course -IV	1	1	30	70	100
	26UCHSEC5	Pesticide Chemistry	Skill Enhancement Course -V	2	2	-	-	-
	26UEVSC	Environmental Studies	EVS	1	-	30	70	100
	26UHAWQ	Health and Wellness			1			
Total				30	23			
*Extra Skills (Out of College Hours)						*Credits	*Marks	
Life skill –Course I: Communication Skill						1	100	
Articulation and Idea Fixation						-	-	
Physical Fitness Practice						-	-	
Society Connect Activity						-	-	

***Extra credits are given for Extra Skills and courses qualified in MOOC/ NPTEL**

SEMESTER-IV

Part	Course Code	Course Title	Course Type	Hrs./ Week L/T/P	Cred its	CIA	ESE	TOTAL
I	26ULTC4/ 26ULHC4/ 26ULSC4	Tamil/Hindi/ Sanskrit-IV	Language	6	3	30	70	100
II	26ULEC4	English-IV	English	6	3	30	70	100
III	26UCHCC4	General Chemistry-IV	Core Course- VII	5	5	30	70	100
	26UCHCCQ4	Physical Chemistry Practical- I	Core Course -VIII	3	3	40	60	100
	26UCHPGEC4	Physics-II	Elective -IV (GE)	3	3	30	70	100
	26UCHPGECQ2	Physics Practical-II		2	2	40	60	100
IV	26UCHSEC6	Instrumental methods of Chemical Analysis	Skill Enhancement Course -VI	2	2	30	70	100
	26UCHSEC7	Forensic Science	Skill Enhancement Course -VII	2	2	30	70	100
	26UEVSC	Environmental Studies	EVS	1	2	30	70	100
Total				30	25			
*Extra Skills (Out of College Hours)						*Credits	*Marks	
Life skill- Course II: Professional Skills						1	100	
Articulation and Idea Fixation						1	100	
Physical Fitness Practice						1	-	
Society Connect Activity						1	-	

***Extra credits are given for Extra Skills and courses qualified in MOOC/ NPTEL**

SEMESTER-V

Part	Course Code	Course Title	Course Type	Hrs. /Week L/T/P	Credits	CIA	ESE	TOTAL
III	26UCHCC5	Organic Chemistry-I	Core Course- IX	5	4	30	70	100
	26UCHCC6	Inorganic Chemistry-I	Core Course- X	4	4	40	60	100
	26UCHCC7	Physical Chemistry-I	Core Course- XI	5	4	30	70	100
	26UCHCCQ5	Physical Chemistry Practical-II	Core Course- XII	3	2	40	60	100
	26UCHPVV	Project and Viva-voce	PROJECT and VIVA-VOCE	5	4	30	70	100
	26UCHDSEC1 A/ 26UCHDSEC1B	Biochemistry / Advanced Material Chemistry	ELECTIVE-I (DS)	3	2	30	70	100
	26UCHDSEC2 A/ 26UCHDSEC2B	Industrial Chemistry / Textile Chemistry	ELECTIVE-II (DS)	3	2	30	70	100
IV	26UVEN	Value Education	Value Education	2	2	30	70	100
	26UCHI	Summer Internship	Summer Internship	-	2	30	70	100
Total				30	26			
*Extra Skills (Out of College Hours)						*Credits	* Marks	
Life skill –Course III :Leadership Skills						1	100	
Physical Fitness Practice						-	-	
Society Connect Activity						-	-	

***Extra credits are given for Extra Skills and courses qualified in MOOC/ NPTEL**

SEMESTER VI

Part	Course Type	Course Title	Course Code	Hours per week (L/T/P)	Credits	CIA	ESE	TOTAL
III	26UCHCC8	Organic Chemistry-II	Core Course- XIII	5	3	30	70	100
	26UCHCC9	Inorganic Chemistry-II	Core Course- XIV	4	3	30	70	100
	26UCHCC10	Physical Chemistry-II	Core Course- XV	5	3	30	70	100
	26UCHCCQ6	Gravimetric Estimation Practical	Core Course- XVI	5	3	40	60	100
	26UCHDSEC3A / 26UCHDSEC3B /	Fundamentals of Spectroscopy/ Nano science	ELECTIVE-III	5	3	30	70	100
	26UCHDSEC4A / 26UCHDSEC4B	Pharmaceutical Chemistry/ Polymer science	ELECTIVE-IV	4	3	30	70	100
IV	26UCHPCSQ	Computer Applications in Chemistry- Practical	Professional Competency Skill	2	2	40	60	100
V	26UCHEX	Extension Activity	Extension Activity	-	1			
		Total		30	21			
*Extra Skills (Out of College Hours)							*Credits	*Marks
Life skill –Course IV: Leadership Skills							1	100
Physical Fitness Practice							-	-
Society Connect Activity							1	-

***Extra credits are given for Extra Skills and courses qualified in MOOC/ NPTEL**

PEDAGOGICAL APPROACHES

TEACHING LEARNING STRATEGIES

- a) Chalk and talk
- b) Group-Learning and Teaching
- c) Individual Learning/ Self-Study
- d) Game Based Learning
- e) Technology Based Learning
- f) Peer Teaching
- g) Learning Through Problem solving
- h) Project Based Learning

METHODS OF EVALUATION AND ASSESSMENT

Methods of Evaluation-Theory		
Internal Evaluation	Continuous Internal Assessment Test	30 Marks
	Assessment Components	
	Model Examination and Attendance	
External Evaluation	End Semester Examination	70 Marks
	Total	100 Marks
Methods of Evaluation-Practical		
Internal Evaluation	Laboratory work assessment (best 2 out of 3)	40 Marks
	Viva-voce/ Lab quiz, Class Performance	
External Evaluation	End Semester Examination	60 Marks
	Record	
	Total	100 Marks
REVISED BLOOMS LEVEL		
BL1	Exhibits memory of previously learned material by recalling fundamental facts, terms, basic concept and answers about the selection.	
BL2	Demonstrate understanding of parts and Idea free organizing, comparing, translating, interpreting, giving descriptors and stating main ideas.	
BL3	Solve problems in new situation by applying acquired knowledge, facts, techniques and rules in different or new way.	
BL4	Examine and break information into parts by identifying motives or causes. Make inference and find evidence to support generalizations.	
BL5	Present and depend opinion by making judgement about information, Validity of ideas or quality of work based on a set of criteria.	
BL6	Compile information together into different way by combining elements in A new pattern or proposing alternative solutions.	

Evaluation Pattern

An academic year is divided into two semesters. The first semester is from June/ July to November/ December and the second semester is from November/ December to April/ May. A semester consists of 90 working days.

Evaluation consists of both Continuous Internal Assessment (CIA) and End Semester Examinations (ESE). The entire Undergraduate and Postgraduate Programmes offered by our college have various assessments for continuous internal evaluation. Relevant types of internal assessment are developed suiting the needs and requirements of each specific course. The various assessment components are quiz, snap test, viva-voce, seminar, listening comprehension, reading comprehension, problem solving, map reading, group discussion, panel discussion, assignment, field visit, poster presentation, open book test, writing composition, case study, online test, Book Review, Projects etc.

The CIA marks are read out and signed by the students in the respective classes on the day specified in the calendar. CIA is mandatory for all the students.

Internal Assessment Modes (Theory Course)

Any six of the assessment components	15 marks
Cycle Test(2)	5 marks
Model Examination	5 marks
Attendance	5 marks
Total	30 marks

Internal Assessment Modes (Practical Course)

Laboratory work assessment (best 2 out of 3)	20 marks
Viva-voce/ Lab quiz	10 marks
Class Performance	10 marks
Total	40 marks

Society Connect Project (UG & PG)

Project Assessment	10 marks
Presentation and feedback from the society	10 marks
Participation in discussion	10 marks
Total	30 marks

Internal Assessment Modes (Project)

Project Assessment	15 marks
Participation in discussion	10 marks
Presentation	5 marks
Total	30 marks

PASSING MINIMUM

The candidate shall be declared to have passed the examination if the candidates secure not less than 28 marks out of 70 marks in the semester examination in each theory course and in total (CIA mark + Theory ESE) not less than 40 marks.

The candidates shall be declared to have passed the examination if she secures not less than 40 marks in total (CIA mark + Practical Examination mark) with minimum of 24 marks out of 60 marks in the Practical Examination conducted by the University. There is no passing minimum for the record notebook. However, submission of the record notebook is necessary. Candidate who does not obtain the required minimum marks for a pass in a Course/Practical shall be declared Re-Appear (RA) and the candidate has to appear and pass the same at a subsequent appearance.

Theory Course (Revised Bloom's Taxonomy)

Question Paper Model for UG

Intended Learning Skills	Maximum 70 marks Passing Minimum:40% Duration: Three hours
Memory Recall / Example / Counter Example / Knowledge about the Concept / Understanding	Part-A ($20 \times 1 = 20$ marks) Answer ALL questions Each question carries 1 marks
	Four questions from each UNIT
	Questions 1 to Questions 20
Description/ Application (problem)	Part-B ($5 \times 4 = 20$ marks) Answer ALL questions Each question carries 4 marks
	Either-or-Type Both parts of each question from the same Unit
	Questions 21(a) or 21(b) to Questions 25(a) to 25(b)
Analysis/ Create/ Evaluation	Part- C ($3 \times 10 = 30$ marks) Answer ANY THREE questions Each question carries 10 marks
	There shall be FIVE questions covering all the five units
	Question 26 to Question 30

Each question should carry course outcomes and cognitive level,

For instance:

1. [CO1: BL₂] Question
2. [CO3: BL₁] Question

SEMETER WISE INDEX

Semester	Course	Course Code	Page No.
I	General Chemistry-I	26UCHCC1	1
I	Core Practical-I: Quantitative Inorganic Estimation (Titrimetry) and Inorganic Preparations	26UCHCCQ1	5
I	Theory of Equations and Differential Calculus	26UCHMGEC1	8
I	Food Chemistry	26UCHSEC1	10
I	Foundation Chemistry	26UCHSEFC	12
II	General Chemistry-II	26UCHCC2	15
II	Core Practical- II: Qualitative Organic Analysis and Preparation of Organic Compounds	26UCHCCQ2	19
II	Integral Calculus and Laplace Transform	26UCHMGEC2	22
II	Theory of Equations and laplace Transform using sage Math-Practical	26UCHMGECQ	24
II	Dairy Chemistry	26UCHSEC2	26
II	Inherited Knowledge in Cosmetic Chemistry	26UCHSEC3	29
III	General Chemistry-III	26UCHCC3	32
III	Core Practical- III: Qualitative Inorganic Analysis	26UCHCCQ3	36
III	Physics-I	26UCHPGEC3	38
III	Physics Practical-I	26UCHPGECQ1	41
III	Entrepreneurial Skills in Chemistry	26UCHSEC4	42
III	Pesticide Chemistry	26UCHSEC5	44
IV	General Chemistry-IV	26UCHCC4	47
IV	Physical Chemistry Practical- I	26UCHCCQ4	51
IV	Physics-II	26UCHPGEC4	53
IV	Physics Practical-II	26UCHPGECQ2	56
IV	Instrumental methods of Chemical Analysis	26UCHSEC6	57

IV	Forensic Science	26UCHSEC7	60
V	Organic Chemistry-I	26UCHCC5	63
V	Inorganic Chemistry-I	26UCHCC6	67
V	Physical Chemistry-I	26UCHCC7	71
V	Physical Chemistry Practical-II	26UCHCCQ5	75
V	Biochemistry	26UCHDSEC1A	78
V	Advanced Material Chemistry	26UCHDSEC1B	82
V	Industrial Chemistry	26UCHDSEC2A	85
VI	Textile Chemistry	26UCHDSEC2B	89
VI	Organic Chemistry-II	26UCHCC8	93
VI	Inorganic Chemistry-II	26UCHCC9	97
VI	Physical Chemistry-II	26UCHCC10	101
VI	Gravimetric Estimation Practical	26UCHCCQ6	105
VI	Fundamentals of Spectroscopy	26UCHDSEC3A	107
VI	Nanoscience	26UCHDSEC3B	111
VI	Pharmaceutical Chemistry	26UCHDSEC4A	115
VI	Polymer science	26UCHDSEC4B	119
VI	Computer Applications in Chemistry- Practical	26UCHPCSQ	123

Title of the Course	GENERAL CHEMISTRY-I						
Course No.	Core Course – I						
Category	Core	Year	I	Credits	5	Course Code	26UCHCC1
		Semester	I				
Instructional hours per week	Lecture	Tutorial		Lab Practice		Total	
	4	1		-		5	
Prerequisites	Higher secondary chemistry						
Objectives of the course	The course aims at giving an overall view of the • various atomic models and atomic structure • wave particle duality of matter • periodic table, periodicity in properties and its application in explaining the chemical behavior • nature of chemical bonding, and fundamental concepts of organic chemistry.						
Course Outline	UNIT-I 15 Hours Atomic structure and Periodic trends History of atom (J.J.Thomson, Rutherford); Moseley’s Experiment and Atomic number, Atomic Spectra; Black-Body Radiation and Planck’s quantum theory - Bohr’s model of atom; The Franck-Hertz Experiment; Interpretation of H- spectrum; Photoelectric effect, Compton effect; Dual nature of Matter- De- Broglie wavelength-Davisson and Germer experiment, Heisenberg’s Uncertainty Principle; Electronic Configuration of Atoms and ions - Hund’s rule, Pauli’ exclusion principle and Aufbau principle; Numerical problems involving the core concepts. UNIT-II 15 Hours Introduction to Quantum mechanics Classical mechanics, Wave mechanical model of atom, distinction between a Bohr orbit and orbital; Postulates of quantum mechanics; probability interpretation of wave functions, formulation of Schrodinger wave equation (derivation not needed) - Probability and electron density-visualizing the orbitals -probability density and significance of Ψ and Ψ^2. Modern Periodic Table Cause of periodicity; Features of the periodic table; classification of elements - Periodic trends for atomic size- Atomic radii, Ionic, crystal and Covalent radii; ionization energy, electron affinity, electro negativity-electro negativity scales, applications of electro negativity. Problems involving the core concepts						

	UNIT-III 15 Hours Structure and bonding - I Ionic bond Lewis dot structure of ionic compounds; properties of ionic compounds; Energy involved in ionic compounds; Born Haber cycle - lattice energies, Madelung constant; relative effect of lattice energy and solvation energy; Ion polarisation - polarising power and polarizability; Fajans' rules - effects of polarisation on properties of compounds; problems involving the core concepts. Covalent bond Shapes of orbitals, overlap of orbitals - σ and π bonds; directed valency - hybridization; VSEPR theory - shapes of molecules of the type AB_2, AB_3 and AB_4. Partial ionic character of covalent bond - dipole moment, application to molecules of the type A_2, AB and AB_2. Percentage ionic character - numerical problems based on calculation of percentage ionic character. UNIT-IV 15 Hours Structure and bonding - II VB theory application to hydrogen molecule; concept of resonance - resonance structures of some inorganic species - CO_2, NO_2, CO_3^{2-}, NO_3^-; limitations of VBT; MO theory - bonding, antibonding and nonbonding orbitals, bond order; MO diagrams of H_2, O_2, O_2^+, N_2, HF, CO. Magnetic characteristics, comparison of VB and MO theories. Coordinate bond: Definition, Formation of BF_3, NH_3 - properties Band theory - mechanism of conduction in solids; conductors, insulator, semiconductor - types, applications of semiconductors Weak Chemical Forces - Vander Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interactions, Instantaneous dipole-induced dipole interactions. Repulsive forces; Hydrogen bonding and its types. UNIT-V 15 Hours Basic concepts in Organic Chemistry and Electronic effects Types of bond cleavage - heterolytic and homolytic; reagents and substrates; types of reagents - electrophiles, nucleophiles, free radicals; reaction intermediates - carbanions, carbocations, carbenes, arynes and nitrynes. Inductive effect - reactivity of alkyl halides, acidity of halo acids, basicity of amines; inductomeric and electromeric effects. Resonance - resonance energy, conditions for resonance - acidity of phenols, basicity of aromatic amines, stability of carbonium ions, carbanions and free radicals. Hyperconjugation - stability of alkenes, bond length, orienting effect of methyl group, dipole moment of aldehydes and nitromethane. Artificial Intelligence: Introduction-objectives and importance of AI in science. Mentioning of AI tools.
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Extended Professional Component (is a part of internal component only, not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved. (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Madan, R. D. and Sathya Prakash, <i>Modern Inorganic Chemistry</i>, S. Chand and Company: New Delhi, 2nd Ed., 2003. 2. Rao, C.N. R. <i>University General Chemistry</i>, Macmillan Publication: New Delhi, 2000. 3. Puri, B. R. and Sharma, L. R. <i>Principles of Physical Chemistry</i>, Vishal Publishing Company: Jalandhar, 38th Ed., 2002. 4. Bruce, P. Y. and Prasad K. J. R. <i>Essential Organic Chemistry</i>, Pearson Education: New Delhi, 2008. 5. Dash U.N, Dharmarha OP, Soni P.L. Textbook of Physical Chemistry, Sultan Chand & Sons: New Delhi, 2016.
Reference Books	1. Maron, S. H. and Prutton C. P. <i>Principles of Physical Chemistry</i>, CBS Publishers and Distributors, India, 4thEd., 2017. 2. Lee, J. D. <i>Concise Inorganic Chemistry</i>, Black Well Ltd., London, 5th Ed., 2006. 3. Gurudeep Raj, <i>Advanced Inorganic Chemistry</i>, Goel Publishing House: Meerut, 26thEd., 2001. 4. Atkins, P.W. & Paula, J. <i>Physical Chemistry</i>, Oxford University Press:New York, 10th Ed., 2014. 5. Huheey, J. E. <i>Inorganic Chemistry: Principles of Structure and Reactivity</i>, Pearson, 5th Ed., 2022.
Website and e-learning source	1) https://onlinecourses.nptel.ac.in 2) http://www.mikeblaber.org/oldwine/chm1045/notes_m.htm 3) http://www.ias.ac.in/initiat/sci_ed/resources/chemistry/Inorganic.html 4) https://swayam.gov.in/course/64-atomic-structure-and-chemical-bonding 5) https://www.chemtube3d.com/ 6) https://www.geeksforgeeks.org/artificial-intelligence/ 7) https://onlinecourses.nptel.ac.in/e-learning/preview/noc22_cs56

Course Outcomes (for Mapping with POs and PSOs)**On completion of the course the students should be able to****CO1:** describe the concepts of atomic structure and atomic spectra**CO2:** summarize the principles of quantum mechanics and periodic trends of elements.**CO3:** apply the concepts of ionic and covalent bonding to predict molecular geometry.**CO4:** analyse chemical bonding using VB and MO theories and intermolecular forces.**CO5:** outline the fundamentals of organic chemistry, electronic effects and importance of AI and its tools.**CO-PO mapping (Course Articulation matrix)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	M	M	S	S	S
CO 2	S	S	S	S	M	M	S	S	S	S
CO 3	S	S	S	S	M	M	M	S	S	S
CO 4	S	S	S	S	M	M	M	S	S	S
CO 5	S	S	S	S	M	M	S	S	S	S

S – Strong, M – Medium, L– Low**Level of Correlation between PSO's and CO's**

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	13	15	15
Weighted percentage of Course Contribution to PSO	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low**Board of Studies Date: 17.06.2026**

Title of the Course	QUANTITATIVE INORGANIC ESTIMATION (TITRIMETRY) AND INORGANIC PREPARATIONS						
Course No.	Core Course-II: Core Practical-I						
Category	Core	Year	I	Credits	3	Course Code	26UCHCCQ1
		Semester	I				
Instructional hours per week	Lecture	Tutorial		Lab Practice		Total	
	1	-		3		4	
Prerequisites	Higher Secondary Chemistry						
Objectives of the course	This course aims at providing knowledge on - laboratory safety - handling glasswares - Quantitative estimation - preparation of inorganic compounds						
Course Outline	UNIT I (Not for Examination) 10 Hours						
	Chemical Laboratory Safety in Academic Institutions Introduction - importance of safety education for students, common laboratory hazards, assessment and minimization of the risk of the hazards, prepare for emergencies from uncontrolled hazards; concept of MSDS; importance and care of PPE; proper use and operation of chemical hoods and ventilation system; fire extinguishers-types and uses of fire extinguishers, demonstration of operation; chemical waste and safe disposal.						
	Common Apparatus Used in Quantitative Estimation (Volumetric) Description and use of burette, pipette, standard flask, measuring cylinder, conical flask, beaker, funnel, dropper, clamp, stand, wash bottle, watch glass, wire gauge and tripod stand.						
	Principle of Quantitative Estimation (Volumetric) Equivalent weight of an acid, base, salt, reducing agent, oxidizing agent; concept of mole, molality, molarity, normality; primary and secondary standards, preparation of standard solutions; theories of acid-base, redox, complexometric, iodimetric and iodometric titrations; indicators – types, theory of acid–base, redox, metal ion and adsorption indicators, choice of indicators.						
	UNIT II 25 Hours						
	Quantitative Estimation(Volumetric) Acidimetry and Alkalimetry Estimation of hydrochloric acid using standard oxalic acid Estimation of sodium hydroxide using standard sodium carbonate						

	Permanganometry Estimation of oxalic acid using standard ferrous ammonium sulphate Estimation of ferrous iron using standard oxalic acid Dichrometry Estimation of ferric alum using standard dichromate (external indicator) Estimation of ferrous iron using standard ferrous sulphate (internal indicator-diphenyl amine) Iodometry Estimation of copper in copper sulphate using standard dichromate
	UNIT III 25 Hours Complexometry Estimation of Zn and Mg using EDTA Estimation of hardness of water Estimations Estimation of iron in iron tablets Estimation of ascorbic acid Preparation of Inorganic compounds- Potash alum Tetraammine copper(II) sulphate Microcosmic salt Mohr's Salt
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. <i>Basic Principles of Practical Chemistry</i> , Sultan Chand: New Delhi, 2 nd Ed., 2012. 2. Nad, A. K, Mahapatra, B.& Ghoshal, A, <i>An advanced course in Practical Chemistry</i> , New Central Book Agency: Kolkata, 3 rd Ed., 2007.
Reference Books	1. Mendham, J, Denney, R. C, Barnes, J. D, Thomas, M, Sivasankar, B, <i>Vogel's Textbook of Quantitative Chemical Analysis</i> , 6 th Ed., Pearson Education Ltd: New Delhi, 2000.
Website and e-learning source	1) http://www.federica.unina.it/agraria/analytical-chemistry/volumetricanalysis 2) https://chemdictionary.org/titration-indicator/
Course outcomes (For mapping with POs and PSOs) On successful completion of the course the students should be able to CO1: explain the basic principles involved in titrimetric analysis and inorganic preparations. CO2: compare the methodologies of different titrimetric analysis. CO3: calculate the concentrations of unknown solutions in different ways and develop the skill to estimate the amount of a substance present in a given solution. CO4: assess the yield of different inorganic preparations CO5: identify the end point of various titrations.	

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	S	S	S	S	S	S
CO 2	S	S	S	S	S	S	S	S	S	S
CO 3	S	S	S	S	S	S	S	S	S	S
CO 4	S	S	S	S	S	S	S	S	S	S

S – Strong, M – Medium, L– Low

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date: 02.05.2023

Title of the Course		THEORY OF EQUATIONS AND DIFFERENTIAL CALCULUS (I B.Sc. Chemistry)					
Course No.		Elective – I (GE)					
Category	ELECTIVE COURSE	Year	I	Credits	5	Course Code	26UCHMGE C1
		Semester	I				
Instructional Hours per week		Lecture	Tutorial		Lab Practice		Total
		5	-		-		5
Prerequisite		12 th Standard Mathematics					
Objectives of the Course		1. To acquire knowledge in a theory of equations, Differential calculus, and Differential equations. 2. To understand the method of solving algebraic equations using the transformation of equations. 3. To promote problem-solving ability in differential equations.					
Course Outcomes: Students will be able to CO1: Identify the relation between roots and coefficients, imaginary and irrational roots, symmetric functions, and reciprocal equations to analyze polynomial equations and evaluate algebraic solutions CO2: Explain equation transformations, Descartes' rule of signs, Horner's method and Newton's method to apply numerical techniques and assess polynomial roots. CO3: Describe tangents, pedal equations, angle of intersection and radius of curvature to examine plane curves and justify geometrical properties. CO4: Interpret second-order differential equations, particular integrals, linear homogeneous equations and variation of parameters to apply analytical methods and validate mathematical solutions. CO5: Discuss partial differential equations, complete, singular and general solutions, standard types and Lagrange's linear equations to analyze solution methods and evaluate mathematical results.							
Course Outline		Unit - I Theory of Equations Relation between the roots and coefficients of an equation, Imaginary and irrational roots, Symmetric functions of the roots of an equation in terms of its coefficients (up to cubic equations), and Reciprocal equation. Chapter 6 (Page No: 6.2 - 6.37) 15 Hours					
		Unit - II Transformation of equation (Definition only), Multiplication of roots by m (Definition only), Diminishing the roots of an equation, Removal of a term, Descartes’ rule of sign, Descartes’s rule of signs for negative roots of an equation, Horner’s method, Newton’s method of evaluating a real root correct to given decimal places. Chapter 6 (Page No: 6.38 - 6.67) 15 Hours					

Unit - III**15 Hours****Differential Calculus**

The angle between the radius vector and the tangent, Angle of the intersection of two curves, the Length of a perpendicular from the pole to the Tangent, Pedal equation, The Cartesian formula for the radius of curvature, and the Parametric formula for the radius of curvature.

Chapter 10 & 11(Page No: 10.1 - 10.23, 11.1 - 11.22)

	Unit – IV 15 Hours Ordinary Differential Equations Second order differential equations with constant coefficients, finding particular integral for the function $f(x)e^{ax}$, $\cos ax$, $\sin ax$, $\sinh ax$, $\cosh ax$, x^m , $e^{ax}v$ where v is any function of x , Linear homogeneous equation and Variation of parameter. Chapter 23 & 24 (Page No: 23.1 - 23.32, 24.1 - 24.23)
	Unit – V 15 Hours Partial Differential Equations Elimination of arbitrary constants, Elimination of arbitrary functions, Definitions - complete solution, singular solutions, General solutions, Standard types, Lagrange's linear partial differential equations (Charpit's method to be excluded). Chapter 26 (Page No: 26.1 - 26.40, 26.44 - 26.58)
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	P.R. Vittal - Allied Mathematics, Margham Publications, Chennai-17
Reference Books	T.K.Manicavachagam Pillai, Natarajan & K.S. Ganapathy - Algebra Volume-I, Viswanathan Publishers, Pvt. Ltd, 2004.
Web resources	1. http://www.universityofcalicut.info/SDE/VI%20Sem.%20B.Sc%20Maths%20-%20Additional%20Course%20in%20lie%20of%20Project%20-Theory%20of%20equations%20&%20fuzzy%20set.pdf 2. https://sol.du.ac.in/pluginfile.php/4111/mod_resource/content/1/B.A.%20st%20m%204_1-7_.pdf

Title of the Course	FOOD CHEMISTRY						
Course No.	Skill Enhancement Course-I						
Category	NME	Year	I	Credits	2	Course Code	26UCHSEC1
		Semester	I				
Instructional hours per week	Lecture	Tutorial		Lab Practice		Total	
	2	-		-		2	
Prerequisites	Higher secondary chemistry						
Objectives of the course	This course aims at giving an overall view of the • Types of food • Food adulteration and poisons • Food additives and preservation						
Course Outline	UNIT-I Food Adulteration						6 Hours
	Sources of food, types, advantages and disadvantages- Food Adulteration-contamination of wheat, rice, milk, butter etc. with clay stones, water and toxic chemicals- common adultrants, ghee adulteration and their detection; Detection of adulterated foods by simple analytical techniques.						
	UNIT-II Food Poison						6 Hours Food
	Poisons- natural poisons (alkaloids-nephrotoxin)- pesticides, (DDT, BHC, Malathion, Monocrotophos)- Chemical poisons- First aid for poison consumed victims.						
	UNIT III Food additives						6 Hours Food
	additives- artificial sweeteners- Saccharin- Cyclamate, and Aspartate. Food flavours- esters, aldehydes and heterocyclic compounds – food colours-emulsifying agents- preservatives- leavening agents; Baking powder- yeast-tastemakers- MSG- vinegar.						
	UNIT-IV Beverages						6 Hours
	Beverages-soft drinks-soda-fruit juices - alcoholic beverages-examples. Carbonation-addiction to alcohol - diseases of liver and social problems.						
	UNIT-V Vitamins and Minerals						6 Hours
	Vitamins- A, C, K, E, B ₁ , B ₂ and B ₆ , sources, requirements, deficiency diseases; Minerals- important minerals- Na, K, Mg, Fe, S and P, sources, functions, requirements and deficiency diseases.						

Recommended Text	1. Jayashree Ghosh. A, <i>Text Book of Pharmaceutical Chemistry</i> , S. Chand, & Co 3 rd Ed., 2003. 2. Jayashree Ghosh, <i>Fundamental Concepts of Applied Chemistry</i> , S. Chand & Co 1 st Ed., 2006.
Reference Books	1. Belitz, H. D, Werner Grosch, Food Chemistry Springer Science and Buisness Media, 4th Ed, 2009. 2. Swaminathan M, Food Science and Experimental Foods, Ganesh and Company, 1979. 3. Hasenhuettl, Gerard. L, & Hartel, Richard. W., Food Emulsifiers and their Applications Springer New York 2nd Ed. 2008. 4. Belitz, H. D, Grosch, W, Schieberle, P, Food chemistry, Springer, 4th revised and Extended Ed, 2009. 5. John, M, deMan John W, Finley, W. Jefferey Hurst, ChangYong Lee, Principles of Food Chemistry, Springer, 4th Ed, 2018.
Website and e-learning source	1) https://gcwgandhinagar.com/econtent/document/1589361321Unit%20V%20Food%20adulteration.pdf 2) https://ccsuniversity.ac.in/bridge-library/pdf/Toxicology-2704-Health-&-hygiene-open-elec-Unit-III-Food-Poisoning-types-symptoms-treatments.pdf 3) https://egyankosh.ac.in/bitstream/123456789/73121/1/Unit-7.pdf 4) https://ccsuniversity.ac.in/bridge-library/pdf/FST-Paper%20II%20Food%20Beverages-%20IV-Semester.pdf 5) https://egyankosh.ac.in/bitstream/123456789/12390/1/Unit-9.pdf
Course Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to CO1: explain about food adulteration- contamination of wheat, rice, milk, butter. CO2: identify food poisons like natural poisons (alkaloids-nephrotoxin), pesticides, DDT, BHC, Malathion, Monocrotophos CO3: describe food additives, artificial sweeteners, saccharin, cyclamate and aspartate in the food industries CO4: classify beverages and illustrate their importance CO5: outline the sources of vitamins and minerals and its significance	

Board of Studies Date: 02.05.2023

Title of the Course	FOUNDATION CHEMISTRY						
Course No.	Foundation Course						
Category	SEFC	Year	I	Credits	2	Course Code	26UCHSEFC
		Semester	I				
Instructional hours per week	Lecture	Tutorial		Lab Practice		Total	
	2	-		-		2	
Prerequisites	Higher secondary chemistry						
Objectives of the course	The Course aims to make the students to • Understand the lab safety measures • Outline the basic concepts of organic chemistry • Describe the importance of periodic table • Explain the fundamentals of physical properties • Understand the importance of redox chemistry						
Course Outline	UNIT I 6 Hours						
	Chemistry Lab-General Awareness and First Aid Techniques						
	Safety in chemistry lab- introduction to laboratory glass wares-storage and handling of chemicals-carcinogenic chemicals - handling of ethers - toxic and poisonous chemicals.						
	Burns and damages due to organic substances- acids, alkalies - burns in the eye-inhalation of toxic vapours-hazardous chemicals-dealing with bromine, phenol and hot objects.						
	UNIT II 6 Hours						
	Introduction to Organic Chemistry						
	Catenation-Classification - Homologous Series - General Molecular Formula- Functional Groups - General and IUPAC Nomenclature - Modern concept of bonding in organic molecules, sp^3 , sp^2 and sp hybridization in carbon by taking methane, ethane and benzene as examples.						
	UNIT III 6 Hours						
	Introduction to Inorganic Chemistry						
	Atomic orbitals and concept of atomic orbitals - shape of s,p and d orbitals- periodic table and the classification of elements - Electronic configuration of elements up to atomic number 30, Types of Chemical bonds - Schematic Illustration of bonds.						
	UNIT IV 6 Hours						
	Introduction to Physical Chemistry						
	Units - Fundamental units - derived units and SI Units - Significant Figures- States of matter - types - properties of solids, liquids and gases - solid state - types of solids - amorphous and crystalline solids - properties of liquids and gases.						

	UNIT V Basic concepts of Redox Chemistry Definition - oxidation and reduction reactions-calculation of oxidation numbers-Equivalent weight-definition-calculation of equivalent weight of acids, bases and salts. Reduction potential and electrochemical series.	6 Hours
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.	
Recommended Text Books	1. Puri, B.R. Sharma , L.R. and Kalia, K.C. <i>Principles of Inorganic Chemistry</i> , 33 rd Edition, Milestone Publishers and Distributors, New Delhi, India, 2020. 2. Arun Bahl, B.S. Bahl, <i>A Text Book of Organic Chemistry</i> , 22 nd Edition, S. Chand & Co, 2019. 3. Puri, B.R. Sharma, L.R. & Pathania, M.S. <i>Principles of Physical Chemistry</i> , 48 th Edition, Vishal Publishing Co, 2020.	
Website and e-learning source	1) https://onlinecourses.nptel.ac.in 2) http://www.mikeblaber.org/oldwine/chm1045/notes_m.htm 3) http://www.ias.ac.in/initiat/sci_ed/resources/chemistry/Inorganic.html 4) https://swayam.gov.in/course/64-atomic-structure-and-chemical-bonding 5) https://www.chemtube3d.com/	
Course Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to CO1: explain safety measures and first aid techniques in chemical laboratory CO2: assign the nomenclature of organic compounds based on IUPAC CO3: classify different types of bonds in compounds and explain the atomic structure CO4: describe on fundamental units and different states of matter CO5: outline the concepts of oxidation and reduction reactions		

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	M	M	M	M	S	S	S
CO3	S	S	S	M	M	M	M	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

S – Strong, M – Medium, L– Low

Level of Correlation Between PSO's and CO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date: 02.05.2023

Title of the Course	GENERAL CHEMISTRY-II						
Course No.	Core Course -III						
Category	Core	Year	I	Credits	4	Course Code	26UCHCC2
		Semester	II				
Instructional hours per week	Lecture		Tutorial		Lab Practice		Total
	4		1		-		4
Prerequisites	General Chemistry I						
Objectives of the course	This course aims at providing an overall view of the • chemistry of acids, bases and ionic equilibrium • properties of s and p-block elements • chemistry of hydrocarbons • applications of acids and bases • compounds of main block elements and hydrocarbons						
Course Outline	UNIT-I 15 Hours Acids, bases and Ionic equilibria Concepts of Acids and Bases - Arrhenius concept, Bronsted-Lowry concept, Lewis concept; Relative strengths of acids, bases and dissociation constant; ionic product of water, pH scale, pH of solutions; Degree of dissociation, common ion effect, factors affecting degree of dissociation. Buffer solutions - types, mechanism of buffer action in acid and basic buffer, Henderson - Hasselbach equation. Salt hydrolysis - salts of weak acids and strong bases, weak bases and strong acids, weak acids and weak bases - hydrolysis constant, degree of hydrolysis and relation between hydrolysis constant and degree of hydrolysis; Solubility product - determination and applications; numerical problems involving the core concepts.						
	UNIT-II 15 Hours Chemistry of s - Block Elements Hydrogen: Position of hydrogen in the periodic table. Alkali metals: Comparative study of the elements with respect to oxides, hydroxides, halides, carbonates and bicarbonates. Diagonal relationship of Li with Mg. Preparation, properties and uses of NaOH, Na ₂ CO ₃ , KBr, KClO ₃ , alkaline earth metals. Anomalous behaviour of Be. Chemistry of p- Block Elements (Group 13 & 14) Preparation and structure of diborane and borazine - Chemistry of borax - Extraction of Al and its uses - Alloys of Al. Comparison of carbon with silicon - Carbon-di-sulphide - Preparation, properties, structure and uses - Per carbonates, per monocarbonates and per dicarbonates.						

	UNIT-III 15 Hours Chemistry of p- Block Elements (Group 15-18) General characteristics of elements of Group 15; chemistry of $\text{H}_2\text{N}-\text{NH}_2$, NH_2OH. Chemistry of structure of PH_3, PCl_3 - oxy acids of phosphorous (H_3PO_3 and H_3PO_4). General properties of elements of Group - 16 - Structure and allotropy of elements - chemistry of ozone - Classification and properties of oxides - oxides of sulphur and selenium - Oxy acids of sulphur (Caro's and Marshall's acids). Chemistry of Halogens: General characteristics of halogen with reference to electro-negativity, electron affinity, oxidation states and oxidizing power. Peculiarities of fluorine. Halogen acids (HF, HCl, HBr and HI), oxides and oxy acids (HClO_4). Inter-halogen compounds (ICl, ClF_3, BrF_5 and IF_7). Noble gases: Position in the periodic table. Preparation, properties and structure of XeF_2, XeF_4 and XeOF_4. UNIT-IV 15 Hours Hydrocarbon Chemistry-I Alkenes Nomenclature, general methods of preparation - Mechanism of β - elimination reactions - E_1 and E_2 mechanism - Hofmann and Saytzeff rules. Reactions of alkenes - addition reactions - mechanisms - Markownikoff's rule, Kharasch effect, oxidation reactions - hydroxylation, epoxidation, ozonolysis. Alkadienes Nomenclature - classification - isolated, conjugated and cumulated dienes; stability of conjugated dienes; mechanism of electrophilic addition to conjugated dienes - 1, 2 and 1, 4 additions; free radical addition to conjugated dienes - Diels-Alder reactions. Alkynes Nomenclature; general methods of preparation, properties and reactions; acidic nature of terminal alkynes and acetylene, polymerisation and isomerisation. Cycloalkanes: Nomenclature, Relative stability of cycloalkanes, Bayer's strain theory and its limitations. Conformational analysis of cyclohexane. Geometrical isomerism in cyclohexanes. UNIT-V 15 Hours Hydrocarbon Chemistry – II Benzene: Source, structure of benzene, stability of benzene ring, molecular orbital picture of benzene, aromaticity, Huckel's $(4n+2)$ rule and its applications. Electrophilic substitution reactions - General mechanism of aromatic electrophilic substitution - nitration, sulphonation, halogenation, Friedel-Craft's alkylation and acylation. Polynuclear Aromatic hydrocarbons: Naphthalene - nomenclature, Haworth synthesis; physical properties, reactions - electrophilic substitution reaction, nitration, sulphonation, halogenation, Friedel - Crafts acylation and alkylation. Anthracene - synthesis by Elbs reaction, Diels - Alder reaction and
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	Haworth synthesis; physical properties; reactions - Diels - Alder reaction, preferential substitution at C-9 and C-10; uses.
Extended Professional Component (is a part of internal component only, not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Puri B. R., Sharma L. R., <i>Principles of Physical Chemistry</i>, Vishal Publishing Company, Jalandhar. 38th Ed., 2002. 2. Puri B. R., Sharma L. R., Kalia K. C., <i>Principles of Inorganic Chemistry</i>, Milestone Publishers & Distributors, 31st Ed., 2013. 3. Madan R. D., Sathya Prakash, <i>Modern Inorganic Chemistry</i>, S.Chand and Company, New Delhi., 2nd Ed., 2003. 4. Sathya Prakash, Tuli G. D., Basu S. K. & Madan R. D., <i>Advanced Inorganic Chemistry</i>, S.Chand and Company, New Delhi., 17th Ed., 2003. 5. Bahl B. S. & Arul Bhal, <i>Advanced Organic Chemistry</i>, S.Chand and Company, New Delhi., 3rd Ed., 2003. 6. Tewari K. S., Mehrothra S. N. & Vishnoi N. K., <i>Text book of Organic Chemistry</i>, Vikas Publishing House, New Delhi, 2nd Ed., 1998.
Reference Books	1. Maron, S. H. and Prutton C. P. <i>Principles of Physical Chemistry</i>, CBS Publishers and Distributors, India, 4th Ed., 2017. 2. Barrow G. M., <i>Physical Chemistry</i>, Tata McGraw Hill, New Delhi. 5th Ed., 1992. 3. Lee, J. D. <i>Concise Inorganic Chemistry</i>, Black Well Ltd., London, 5th Ed., 2006. 4. Huheey, J. E. <i>Inorganic Chemistry: Principles of Structure and Reactivity</i>, Pearson, 5th Ed., 2022. 5. Gurudeep Raj, <i>Advanced Inorganic Chemistry Vol – I</i>, Goel Publishing House, Meerut. 26th Ed., 2001. 6. Agarwal O. P., <i>Reactions and Reagents in Organic Chemistry</i>, Goel Publishing House, Meerut. 5th Ed., 2015.
Website and e-learning source	https://onlinecourses.nptel.ac.in/http://cactus.dixie.edu/smbblack/chem1010/lecture_notes/4B.html http://www.auburn.edu/~deruija/pdareson.pdfhttps://swayam.gov.in/course/64-atomic-structure-and-chemical-bonding MOOC components http://nptel.ac.in/courses/104101090/ Lecture 1: Classification of elements and periodic properties

	http://nptel.ac.in/courses/104101090/
	Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to CO1: explain the concept of acids, bases and ionic equilibria; periodic properties of s and p block elements, preparation and properties of aliphatic and aromatic hydrocarbons CO2: discuss the periodic properties of s and p- block elements, reactions of aliphatic and aromatic hydrocarbons and strength of acids CO3: classify hydrocarbons, types of reactions, acids and bases, examine the properties s and p-block elements, reaction mechanisms of aliphatic and aromatic hydrocarbons CO4: explain theories of acids, bases and indicators, buffer action and important compounds of s-block elements CO5: assess the application of hard and soft acids indicators, buffers, compounds of s and p- block elements and hydrocarbons

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	S	S	S	S
CO2	S	S	S	S	S	M	S	S	S	S
CO3	S	S	S	S	S	S	M	S	S	S
CO4	S	S	S	M	M	M	M	S	S	S
CO5	S	S	S	M	S	S	S	M	S	S

S – Strong, M – Medium, L– Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	2	2	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	14	14	15
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date: 02.11.2023

Title of the Course	QUALITATIVE ORGANIC ANALYSIS AND PREPARATION OF ORGANIC COMPOUNDS						
Course No.	Core Course – IV: Core Practical -II						
Category	Core	Year	I	Credits	3	Course Code	26UCHCCQ2
		Semester	II				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	1	-	3		3		
Prerequisites	General Chemistry II						
Objectives of the course	This course aims at providing knowledge on - laboratory safety - handling glass wares - analysis of organic compounds - preparation of organic compounds						
Course Outline	UNIT I (Not for Examination)						10 Hours
	Safety rules, symbols and first-aid in chemistry laboratory. Basic ideas about Bunsen burner, its operation and parts of the flame. Chemistry laboratory glassware –basic information and uses						
	UNIT II						25 Hours
	Qualitative Organic Analysis Preliminary examination, detection of special elements - nitrogen, sulphur and halogens Aromatic and aliphatic nature, Test for saturation and unsaturation, Identification of functional groups using solubility tests Confirmation of functional groups - monocarboxylic acid, dicarboxylic acid - monohydric phenol, polyhydric phenol - aldehyde, ketone, ester - carbohydrate (reducing and non-reducing sugars) - primary, secondary, tertiary amine - monoamide, diamide, thioamide - anilide, nitro compound Preparation of derivatives for functional groups						
	UNIT III						25 Hours
	Preparation of Organic Compounds - Nitration - Picric acid from Phenol - Halogenation - p-Bromo acetanilide from Acetanilide - Oxidation - Benzoic acid from Benzaldehyde - Methyl benzoate to Benzoic acid - Salicylic acid from Methyl Salicylate - Hydrolysis of Benzamide to Benzoic Acid						

	Separation and Purification Techniques (Not for Examination) i) Purification of organic compounds by crystallization (from water / alcohol) and distillation ii) Determination of melting and boiling points of organic compounds. iii) Steam distillation - Extraction of essential oil from citrus fruits/eucalyptus leaves. Chromatography (Group experiment - Not for Examination) Separation of amino acids by Paper Chromatography (i) Thin Layer Chromatography - mixture of sugars / plant pigments /permanganate/ dichromate. (ii) Column Chromatography - extraction of carotene, chlorophyll and xanthophyll from leaves / separation of anthracene - anthracene picrate.
Reference Books	1. Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. <i>Basic Principles of Practical Chemistry</i>, Sultan Chand: New Delhi, 2nd Ed., 2012. 2. Manna, A.K. <i>Practical Organic Chemistry</i>, Arunabha Sen, Books and Allied (P) LTD: Kolkata, 2018. 3. Gurtu, J. N; Kapoor, R. <i>Advanced Experimental Chemistry (Organic)</i>, Sultan Chand: New Delhi, 1987. 4. Furniss, B. S.; Hannaford, A. J.; Smith, P. W. G.; Tatchell, A.R. <i>Vogel's Textbook of Practical Organic Chemistry</i>, Pearson: India, 5th Ed., 1989.
Website and e-learning source	https://www.vlab.co.in/broad-area-chemical-sciences
Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to CO1: observe the physical state, odour, colour and solubility of the given organic compound. CO2: identify the presence of special elements and functional group in an unknown organic compound performing a systematic analysis. CO3: compare mono and dicarboxylic acids, primary, secondary and tertiary amines, mono and diamides, mono and polyhydric phenols, aldehyde and ketone, reducing and non-reducing sugars and explain the reactions behind it. CO4: exhibit a solid derivative with respect to the identified functional group.	

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M

S – Strong, M – Medium, L– Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date: 02.11.2023

Title of the Course		INTEGRAL CALCULUS AND LAPLACE TRANSFORM (FOR I B.Sc. CHEMISTRY)					
Course No.		ELECTIVE II (GE)					
Category	ELECTIVE COURSE	Year	I	Credits	3	Course Code	26UCHMGEC2
		Semester	II				
Instructional Hours per week		Lecture	Tutorial	Lab Practice		Total	
		3	-	-		3	
Prerequisite		12 th Standard Mathematics					
Objectives of the Course		1. To acquire the knowledge in integral calculus, Fourier series and Laplace transform 2. To understand the method of doing problems using the above concepts. 3. To analyse is the different methods of solving differential equations using the Laplace transform					
Course Outcomes: Students will be able to CO1: learn the notions of multiple integrals and Laplace transforms CO2: Understand the change of order of integration, Fourier coefficients, odd and even functions and solved related problems. CO3: analyse the properties of integration to evaluate double and triple integrals and Fourier series. CO4: interpret the properties of Laplace transform, inverse Laplace transform and solve the related problems. CO5: apply Laplace transform and inverse Laplace transform to solve the differential equations							
Course Outline		Unit – I (Hours: 9) Integral Calculus Multiple Integrals, Evaluation of double integrals, Double integral in polar co- ordinates. Chapter 20 (sections 20.1-20.17)					
		Unit – II (Hours: 9) Triple integrals, Change of order of integration. applications of double and triple integrals to area volume and centroid. Chapter 20 (sections 20.18 -20.44)					
		Unit – III (Hours: 9) Fourier Series Definition, Finding Fourier series for a given periodic function with period 2π , Fourier series for odd and even functions. Chapter 21 (sections 21.1-21.40)					
		Unit – IV (Hours: 9) Laplace Transform Definition, Laplace transform of elementary functions, Linearity property, shifting property, Change of Scale property, Laplace transform of derivatives. Chapter 27 (sections 27.1-27.20)					
		Unit – V (Hours: 9) Inverse Laplace transform, solving differential equations using Laplace transform. (Simultaneous equations are to be excluded).					

	Chapter 27 (sections 27.23-27.57) (Section 5: Examples 1-10 only, Exercise 4: 1-26 only)
Skills acquired from the course	Knowledge, Problem-Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	P.R.Vittal, Allied Mathematics, Margham Publications, Chennai-1
Reference Books	S. Narayanan and T. K. Manicavachagam Pillay, Calculus - Volume III, S. Viswanathan (Printers and Publishers), Pvt., Ltd, 2011.
Web resources	1. https://nptel.ac.in

Title of the Course		THEORY OF EQUATIONS AND LAPLACE TRANSFORM USING SAGE MATH- PRACTICAL (FOR I B.Sc CHEMISTRY)					
Course No.		EC – PRACTICAL					
Category	ELECTIVE COURSE	Year	I	Credits	2	Course Code	26UCHMGECQ
		Semester	II				
Instructional Hours per week		Lecture	Tutorial	Lab Practice		Total	
		-	-	2		2	
Prerequisite		Basic knowledge in data and representations					
Objectives of the Course		The main objectives of this course are: 1. To work with interpolation and approximation methods in finding roots using SageMath. 2. To utilize SageMath to perform symbolic and numerical integration. and Laplace Transforms					
Course Outcomes: Students will be able to CO1: learn the notions of approximation of solutions, Laplace transforms, inverse Laplace transform and basic operations, commands within SageMath CO2: understand the fundamental principles of ordinary differential equations and numerical integrations using SageMath to solve them accurately CO3: apply the Laplace, Inverse Laplace Transforms to solve linear differential equations in SageMath. CO4: analyze the application of SageMath in solving differential equations in simplifying and solving complex problems. CO5: evaluate multiple integrals, and non-linear equations with accuracy using SageMath while demonstrating critical thinking skills							
Course Outline		Unit I: Theory of Equations Problems on Finding the roots of the equations using the SageMath. (Page No: 139-140)					
		Unit II: Non-Linear Equations Numerical Solution: Location of solutions of Algebraic equations and Iterative Approximation Methods using SageMath. (Page No: 263-278)					
		Unit III: Multiple integral Available Integration Functions, Multiple Integrals using SageMath (Page No: 305-317)					
		Unit IV: Laplace Equations Solving problems on Laplace transforms using SageMath (Page No: 225)					
		Unit V: Inverse Laplace Transforms					

	Solving problems on Inverse Laplace transformations using SageMath (Page No: 226)
Skills acquired from the course	Computational Mathematics with SageMath
Web resources	https://archive.nptel.ac.in/courses/111/106/111106149/

Title of the Course	DAIRY CHEMISTRY						
Course No.	Skill Enhancement Course-II						
Category	NME	Year Semester	I II	Credits	2	Course Code	26UCHSEC2
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	2	-	-		2		
Prerequisites	Higher secondary chemistry						
Objectives of the course	This course aims at providing an overall view of the • chemistry of milk and milk products • processing of milk • preservation and formation of milk products.						
Course Outline	UNIT I 6 Hours						
	Composition of Milk Milk-definition-general composition of milk- constituents of milk - lipids, proteins, carbohydrates, vitamins and minerals - physical properties of milk - colour, odour, acidity, specific gravity, viscosity and conductivity -Factors affecting the composition of milk - adulterants, preservatives with neutralizer-examples and their detection- estimation of fat, acidity and total solids in milk. Comparison of A1 and A2 milk						
	UNIT II 6 Hours						
	Processing of Milk Microbiology of milk - destruction of micro - organisms in milk, physico – chemical changes taking place in milk due to processing - boiling, pasteurization – types of pasteurization -Bottle, Batch and HTST (High Temperature Short Time) – Vacuum pasteurization – Ultra High Temperature Pasteurization.						
	UNIT III 6 Hours						
	Major Milk Products Cream - definition - composition - chemistry of creaming process - gravitational and centrifugal methods of separation of cream -. Butter - definition -composition - theory of churning – desi butter - salted butter, estimation of acidity and moisture content in butter. Ghee - major constituents - common adulterants added to ghee and their detection - rancidity- definition - prevention - antioxidants and synergists - natural and synthetic. Perspectives for food technology and health benefits of A2 milk and milk products.						

	UNIT IV 6 Hours Special Milk Standardised milk - definition - merits - reconstituted milk - definition - flow diagram of manufacture - Homogenised milk - flavoured milk – vitaminized milk - toned milk -Incitation milk - Vegetable toned milk - humanized milk – condensed milk - definition, composition and nutritive value.
	UNIT V 6 Hours Fermented and other Milk Products Fermented milk products – fermentation of milk - definition, conditions, cultured milk - definition of culture - example, conditions - cultured cream, butter milk - Bulgarious milk -acidophilous milk – Yoheer - Indigeneous products- khoa and chhena definition - Ice cream -definition-percentage composition-types-ingredients-manufacture of ice-cream, stabilizers – emulsifiers and their role-milk powder-definition-need for making milk powder- drying process-types of drying. Milk based health food.
Recommended Text	1. Bagavathi Sundari K, <i>Applied Chemistry</i>, MJP Publishers, 1st Ed, 2006. 2. Rangappa K.S, Acharya K. T, <i>Indian Dairy Products</i>, Asia Publishing House New Delhi, 1974. 3. Mathur M.P, Datta Roy D, Dinakar P, <i>Text book of Dairy Chemistry</i>, Indian Council of Agricultural Research, 1st Ed, 2008. 4. Saurav Singh, <i>A Text book of dairy chemistry</i>, Daya Publishing house, 1st Ed, 2013. 5. Choudhary P. L, <i>Text book of Dairy Chemistry</i>, Bio-Green book Publishers, 2021.
Reference Books	1. Robert Jenness, Patom S, <i>Principles of Dairy Chemistry</i>, S. Wiley, New York, 2005. 2. Wond F.P, <i>Fundamentals of Dairy Chemistry</i>, Springer, Singapore, 2006. 3. Sukumar De, <i>Outlines of Dairy Technology</i>, Oxford University Press, New Delhi, 1980. 4. Fox P.F, Mcsweeney P.L.H, <i>Dairy Chemistry and Biochemistry</i>, Springer, 2nd Ed, 2016. 5. Fox P.F, Uniacke-Lowe T, McSweeney P.L.H, OMahony J.A, <i>Dairy Chemistry and Biochemistry</i>, Springer, 2nd Ed, 2015.
Website and e-learning source	1. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://egyankosh.ac.in/bitstream/123456789/62021/1/Milk%20Composition%20and%20its%20Constituents.pdf 2. https://www.researchgate.net/publication/278785108_Composition_and_nutritional_value_of_raw_milk

Course Learning Outcomes (for Mapping with POs and PSOs)**On completion of the course the students should be able to**

- CO 1:** discuss about general composition of milk – constituents and its physical properties.
- CO 2:** describe pasteurization of milk and various types of pasteurization -Bottle, Batch and Ultra High Temperature Pasteurization.
- CO 3:** distinguish between cream and butter, their composition and how to estimate fat in cream and Ghee
- CO 4:** explain about homogenized milk, flavoured milk, vitaminised milk and toned milk.
- CO 5:** summarize different types of drying process of milk.

Board of Studies Date: 02.11.2023

Title of the Course	INHERITED KNOWLEDGE IN COSMETIC CHEMISTRY						
Course No.	Skill Enhancement Course-III (Indian Knowledge System)						
Category	SEC	Year Semester	I II	Credits	2	Course Code	26UCHSEC3
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	2	-	-		2		
Prerequisites	Higher secondary Chemistry						
Objectives of the course	This course aims at familiarizing the students with • formulations of various types of cosmetics and their significance • hair, skin and dental care • makeup preparations and personal grooming						
Course Outline	UNIT I 6 Hours Skin care: Ancient and modern perspective Indian Knowledge system for cosmetics- Dinacharya for healthy skin, ayurvedic formulations for skin care- cosmetic tailams, Ghritas and Kosta etc. Nutrition of the skin, skin care and cleansing of the skin; face powder – ingredients; creams and lotions – cleansing, moisturizing all purpose, skin tonics – key ingredients, skin lightness.						
	UNIT II 6 Hours Ancient formulations for Hair care and Dental care Sanskrit origin of shampoo, types of shampoo- traditional and modern- powder, cream, liquid and gel, ingredients; tips from ancient Indian system for hair care- Kayakalpa-vettiver bath. Dental care -Dantashauscha- Neem and babul sticks, Oil pulling, Tooth pastes – ingredients – mouth wash.						
	UNIT III 6 Hours Types of Make up Base – foundation – types – ingredients; lipstick-ancient Indian origin, eyeliner, mascara, eye shadow, concealers, rouge.						
	UNIT IV 6 Hours Natural and Synthetic Perfumes Indian perfume Industry-attars- -essential oils- Medicinal values of herbal products, some important perfume oil, dhavana oil, musk, ambrette oil, champaka oil and oil of vettiver, synthetic – classification emphasizing characteristics –esters – alcohols – aldehydes – ketones.						
	UNIT V 6 Hours Traditional Beauty treatments Mukhabhyangam(gentle facial massage)- Facials - types – advantages – disadvantages; face packs – harmless face pack formulations from ancient Indian origin types- multani mitti face pack, turmeric face pack; bleach - types – advantages– disadvantages; eyelash tinting; perming-types; hair colouring and dyeing.						

Recommended Text	1. Akanksha Garud, <i>Text Book of Cosmetics</i> , Pragati Educational Publishers, 2012. 2. Sharma B.K., <i>Industrial Chemistry</i> , Goel Publishing House, Meerut, 13 th Ed., 2002. 3. Bedi, Tanuja and Vyas, <i>A Handbook of Aromatic and Essential Oil Plants</i> , Agrobios, India, 1 st Ed, 2008.
Reference Books	1. George Howard, <i>Principles and Practice of Perfumery and Cosmetics</i> , Stanley Thornes, Chetltenham, UK 1987. 2. Gaurav Kumar Sharma, Jayesh Gadiya, Meenakshi Dhanawat, <i>Textbook of Cosmetic Formulations</i> , 1 st Ed, 2018.
Website and e-learning source	1. http://www.khake.com/page75.html Net.foxsm/list/284 2. https://oms.bdu.ac.in/ec/admin/contents/66_P16CHE4B_2020063010232422.pdf 3. https://tnou.ac.in/wp-content/uploads/2022/12/Beautician-SLM_compressed.pdf 4. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2825132/#:~:text=Hair%20dyes%2C%20fragrant%20hair%20rinses,chores%20to%20be%20reliously%20pursued.

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: recall the composition of various cosmetic products

CO2: explain chemical aspects and applications of hair care and dental care and skin care products.

CO3: categorize chemical aspects and applications of perfumes and skin care products.

CO4: analyze the methods of beauty treatments, their advantages and disadvantages.

CO5: summarize the hazards of cosmetic products.

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	S	M	S	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	M	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	M	S	S	S	S	S	S	M	S

S – Strong, M – Medium, L– Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date: 02.11.2023

Title of the Course	GENERAL CHEMISTRY – III						
Course No.	Core Course V						
Category	Core	Year	II	Credits	5	Course Code	26UCHCC3
		Semester	III				
Instructional hours per week	Lecture	Tutorial	Lab Practice			Total	
	4	1	-			5	
Prerequisites	General Chemistry – I and II						
Objectives of the course	This course aims to provide a comprehensive knowledge on - the physical properties of gases, liquids, solids and X-ray diffraction of solids. - fundamentals of nuclear chemistry and nuclear waste management. - applications of nuclear energy. - basic chemistry of halo-organic compounds, phenol and other aromatic alcohols. - preparation and properties of phenols and alcohols.						
Course Outline	UNIT I 15 Hours Gaseous state Kinetic molecular model of a gas: postulates and derivation from the kinetic gas equation; The Maxwell - Boltzmann distribution of speed of molecules - average, root mean square and most probable velocity and average kinetic energy, law of equipartition of energy, degrees of freedom and molecular basis of heat capacities. Collision frequency; collision diameter; mean free path. Real gases: Deviations from ideal gas behaviour, compressibility factor, Z, and its variation with pressure for different gases. Equations of states for real gases- Vander Waal's equation; Virial equation; Boyle temperature; law of corresponding states - liquefaction of gases; numerical problems involving the core concepts.						
	UNIT-II 15 Hours Liquid and Solid State Properties of Liquids - Surface tension, viscosity and their applications. Crystalline and amorphous - differences - geometry, isotropy and anisotropy, melting point; isomorphism, polymorphism. Symmetry elements - plane, centre and axis; Miller indices, unit cells and space lattices; classification of crystal systems; Bravais lattices; X - ray diffraction - Bragg's equation Packing in atomic solids - simple cubic, body centered cubic, face centered and hexagonal close packing; Co-ordination number in typical structures - NaCl, CsCl, ZnS, TiO₂; comparison of structure and properties of diamond and graphite;. numerical problems involving core concepts Defects in solids - stoichiometric and nonstoichiometric defects. Liquid crystals - classification and applications						

	UNIT-III 15 Hours Nuclear Chemistry Natural radioactivity – α, β and γ rays; half-life period; Fajan-Soddy group displacement law; Geiger-Nattal rule; isotopes, isobars, isotones, mirror nuclei, iso diaphers; nuclear isomerism; radioactive decay series; magic numbers; units - Curie, Rutherford, Roentgen; nuclear stability - neutron- proton ratio; binding energy; packing fraction; mass defect. Simple calculations involving mass defect and B.E., decay constant and $t_{1/2}$ and radioactive series. Isotopes - uses - tracers - determination of age of rocks by radiocarbon dating. (Problems to be worked out) Nuclear energy; nuclear fission and fusion - major nuclear reactors in India; radiation hazards, disposal of radioactive waste and safety measures.
	UNIT-IV 15 Hours Halogen derivatives Aliphatic halogen derivatives Nomenclature and classes of alkyl halides - physical properties, Chemical reactions. Nucleophilic substitution reactions - SN_1, SN_2 and SN_i mechanisms. Di and Tri Halogen derivatives: Nomenclature, classification, preparation, properties and applications. Aromatic halogen compounds Nomenclature, preparation, properties and uses Mechanism of nucleophilic aromatic substitution - benzyne intermediate. Aryl alkyl halides Nomenclature, benzyl chloride - preparation - properties and uses Alcohols: Nomenclature, classification, preparation, properties, uses; test for hydroxyl groups. Oxidation of diols by per iodic acid and lead tetraacetate.
	UNIT-V 15 Hours Phenols Nomenclature; classification, Preparation from diazonium salts, cumene, Dow's process, Raching process; properties - acidic character and effect of substitution on acidity. Reactions - Fries, Claisen rearrangement, Electrophilic substitution reactions, Reimer - Teimenn, Kolbe, Schmidt, Gatermann synthesis, Libermann reaction. Resorcinol and picric acid – preparation, properties and uses. Aromatic alcohols Nomenclature, benzyl alcohol - methods of preparation - hydrolysis, reduction of benzaldehyde, Cannizzaro reaction, Grignard synthesis, physical properties - Reactions with sodium, phosphorus pentachloride, thionyl chloride, acetic anhydride and hydrogen iodide.

Extended Professional Component (is a part of internal component only, not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Puri, B.R, Sharma, L.R. and Pathania, M.S. <i>Principles of Physical Chemistry</i>, 46th Ed, Vishal Publishing, 2020. 2. Puri, B.R. Sharma L.R. and Kalia K.C., <i>Principles of Inorganic Chemistry</i>, Milestone Publishers and Distributors, New Delhi, 13th Ed, 2009. 3. Soni P.L. and Mohan Katyal, <i>Textbook of Inorganic Chemistry</i>, Sultan Chand & amp; Sons, 20th, 2006. 4. Jain, M. K. Sharma S. C, <i>Modern Organic Chemistry</i>, Vishal Publishing, 4th Ed, 2003. 5. Mukherji, S.M. and Singh S.P., <i>Reaction Mechanism in Organic Chemistry</i>, Laxmi Publications., 3rd Ed, 2007.
Reference Books	1. Graham Solomons T. W., <i>Organic Chemistry</i>, John Wiley & amp; Sons, Global Ed, Wiley India, 2017. 2. Carey Francis A., <i>Organic Chemistry</i>, Tata McGraw-Hill Education Pvt., Ltd., New Delhi, 7th Ed, 2009. 3. Finar I. L., <i>Organic Chemistry Volume 1</i>, Pearson Education India, England, 6th Ed , 2002. 4. Soni P. L. and Chawla H. M. - <i>Text Book of Organic Chemistry</i>, New Delhi, Sultan Chand & Sons, 29th Ed 2007. 5. Lee J.D., <i>Concise Inorganic Chemistry</i>, Blackwell Science, 5th Ed, 2005.
Website and e-learning source	MOOC components https://nptel.ac.in/courses/10410410 1 Solid state chemistry https://nptel.ac.in/courses/10310607 1 Nuclear industries and safety https://nptel.ac.in/courses/10410611 9s Introduction to organic chemistry

Course Learning Outcomes (for Mapping with POs and PSOs)**On completion of the course the students should be able to****CO1:** explain the kinetic properties of gases by using mathematical concepts.**CO2:** describe the physical properties of liquid and solids; identify various types of crystals.**CO3:** outline the concepts of nuclear chemistry and nuclear energy.**CO4:** discuss the nomenclature, preparation and properties of halo organic compounds and alcohols.**CO5:** illustrate the preparation and properties of phenol and benzyl alcohol.**CO-PO Mapping (Course Articulation Matrix)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

S – Strong, M – Medium, L– Low**Level of Correlation between PSO's and CO's**

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low**Board of Studies Date: 23.04.2024**

Title of the Course	QUALITATIVE INORGANIC ANALYSIS						
Course No.	Core Course- VI: Core Practical-III						
Category	Core	Year Semester	II III	Credits	3	Course Code	26UCHCC Q3
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	1	-	3		4		
Prerequisites	General chemistry						
Objectives of the course	To develop the skill on systematic analysis of simple inorganic salts and mixture of salts.						
Course Outline	Semi - Micro Qualitative Analysis 1. Analysis of simple acid radicals: Carbonate, Sulphide, Sulphate, Thiosulphite, Chloride, Bromide, Iodide, Nitrate 2. Analysis of interfering acid radicals: Fluoride, Oxalate, Borate, Phosphate, Arsenate, Arsenite. 3. Elimination of interfering acid radicals and identifying the group of basic radicals 4. Analysis of basic radicals (group wise): Lead, Copper, Bismuth, Cadmium, Tin, Antimony, Iron, Aluminium, Arsenic, Zinc, Manganese, Nickel, Cobalt, Calcium, Strontium, Barium, Magnesium, Ammonium 5. Analysis of a mixture - I to VI containing two cations and two anions (of which one is interfering type)						
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.						
Recommended Text	Reference Books: Venkateswaran V, Veeraswamy R. and Kulandivelu A. R., Basic Principles of Practical Chemistry, Sultan Chand & Sons, New Delhi, 2 nd Ed, 1997.						
Website and e-learning source	https://www.vlab.co.in/broad-area-chemical-sciences						
Course Learning Outcomes (for Mapping with POs and PSOs)							
On successful completion of the course the students should be able to CO 1: acquire knowledge on the systematic analysis of Mixture of salts. CO 2: identify the cations and anions in the unknown substance. CO 3: identify the cations and anions in the soil and water and to test the quality of water. CO 4 : assess the role of common ion effect and solubility product							

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S

S – Strong, M – Medium, L– Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date: 23.04.2024

Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
26UCHPGEC3	PHYSICS - I	Generic				3	3	75

COURSE	GENERIC ELECTIVE-I
COURSE TITLE	PHYSICS - I
CODE	26UCHPGEC3
CREDITS	3
HOURS	3
COURSE OBJECTIVES	To impart basic principles of Physics that which would be helpful for students who have taken programmes other than Physics.

UNITS	COURSE DETAILS
UNIT-I	WAVES, OSCILLATIONS AND ULTRASONICS: simple harmonic motion (SHM) – composition of two SHMs at right angles (periods in the ratio 1:1) – Lissajous figures – uses – laws of transverse vibrations of strings – determination of AC frequency using sonometer (steel and brass wires) – ultrasound – production – piezoelectric method – application of ultrasonics: medical field – lithotripsy, ultrasonography – ultrasono imaging- ultrasonics in dentistry – physiotherapy, ophthalmology – advantages of noninvasive surgery – ultrasonics in green chemistry.
UNIT-II	PROPERTIES OF MATTER: <i>Elasticity:</i> elastic constants – bending of beam – theory of non- uniform bending – determination of Young’s modulus by non-uniform bending – energy stored in a stretched wire – torsion of a wire – determination of rigidity modulus by torsional pendulum <i>Viscosity:</i> streamline and turbulent motion – critical velocity – coefficient of viscosity – Poiseuille’s formula – comparison of viscosities – burette method, <i>Surface tension:</i> definition – molecular theory – droplets formation–shape, size and lifetime – COVID transmission through droplets, saliva – drop weight method – interfacial surface tension.
UNIT-III	HEAT AND THERMODYNAMICS: Joule-Kelvin effect – Joule-Thomson porous plug experiment – theory – temperature of inversion – liquefaction of Oxygen– Linde’s process of liquefaction of air– liquid Oxygen for medical purpose– importance of cryocoolers – thermodynamic system – thermodynamic equilibrium – laws of thermodynamics – heat engine – Carnot’s cycle – efficiency – entropy – change of entropy in reversible and irreversible process.
UNIT-IV	ELECTRICITY AND MAGNETISM: potentiometer – principle – measurement of thermoemf using potentiometer –magnetic field due to a current carrying conductor – Biot-Savart’s law – field along the axis of the coil carrying

	current – peak, average and RMS values of ac current and voltage – power factor and current values in an AC circuit – types of switches in household and factories– Smart wifi switches- fuses and circuit breakers in houses
UNIT-V	DIGITAL ELECTRONICS AND DIGITAL INDIA: logic gates, OR, AND, NOT, NAND, NOR, EXOR logic gates – universal building blocks – Boolean algebra – De Morgan’s theorem – verification – overview of Government initiatives: software technological parks under MeitY, NIELIT- semiconductor laboratories under Dept. of Space – an introduction to Digital India
TEXT BOOKS	1. R.Murugesan (2001), Allied Physics, S. Chand & Co, New Delhi. 2. Brijlal and N.Subramanyam (1994), Waves and Oscillations, Vikas Publishing House, New Delhi. 3. Brijlal and N.Subramaniam (1994), Properties of Matter, S.Chand & Co., New Delhi. 4. J.B.Rajam and C.L.Arora (1976). Heat and Thermodynamics (8th edition), S.Chand & Co., New Delhi. 5. R.Murugesan (2005), Optics and Spectroscopy, S.Chand & Co, New Delhi. 6. A.Subramaniyam, Applied Electronics 2nd Edn., National Publishing Co., Chennai.
REFERENCE BOOKS	1. Resnick Halliday and Walker (2018). Fundamentals of Physics (11thedition), 2. John Willey and Sons, Asia Pvt. Ltd., Singapore. 3. V.R.Khanna and R.S.Bedi (1998), Text book of Sound 1st Edn. Kedharnaath Publish & Co, Meerut. 4. N.S.Khare and S.S.Srivastava (1983), Electricity and Magnetism 10thEdn., Atma Ram & Sons, New Delhi. 5. D.R.Khannaand H.R. Gulati (1979). Optics, S. Chand & Co.Ltd., New Delhi. 6. V.K.Metha (2004). Principles of electronics 6th Edn. S.Chand and company.
WEB LINKS	1. https://youtu.be/M_5KYncYNyc 2. https://youtu.be/ljJLJgIvaHY 3. https://youtu.be/7mGqd9HQ_AU 4. https://youtu.be/h5jOAw57OXM 5. https://learningtechnologyofficial.com/category/fluid-mechanics-lab/ 6. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.htmlhttps://www.youtube.com/watch?v=gT8Nth9NWPMhttps://www.youtube.com/watch?v=9mXOMzUruMQ&t=1shttps://www.youtube.com/watch?v=m4u-SuaSu1s&t=3shttps://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work
Board of Studies Date : 02.05.2023	

COURSE OUTCOMES:

At the end of the course, the student will be able to:

COURSE OUTCOMES	CO1	Explain types of motion and extend their knowledge in the study of various dynamic motions analyze and demonstrate mathematically. Relate theory with practical applications in medical field.
	CO2	Explain their knowledge of understanding about materials and their behaviors and apply it to various situations in laboratory and real life. Connect droplet theory with Corona transmission.
	CO3	Comprehend basic concept of thermodynamics concept of entropy and associated theorems able to interpret the process of flow temperature physics in the background of growth of this technology.
	CO4	Articulate the knowledge about electric current resistance, capacitance in terms of potential electric field and electric correlate the connection between electric field and magnetic field and analyze the mathematically verify circuits and apply the concepts to construct circuits and study them.
	CO5	Interpret the real life solutions using AND, OR, NOT basic logic gates and intend their ideas to universal building blocks. Infer operations using Boolean algebra and acquire elementary ideas of IC circuits. Acquire information about various Govt. programs/ institutions in this field.

COURSE	GENERIC ELECTIVE –I
COURSE TITLE	PHYSICS PRACTICAL - I
CODE	26UCHPGECQ1
CREDITS	2
HOURS	2
COURSE OBJECTIVES	Apply various physics concepts to understand Properties of Matter and waves, set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results
ANY Seven only 1. Young's modulus by non-uniform bending using pin and microscope 2. Young's modulus by non-uniform bending using optic lever, scale and telescope 3. Rigidity modulus by static torsion method. 4. Rigidity modulus by torsional oscillations without mass 2. Surface tension and interfacial Surface tension – drop weight method 3. Comparison of viscosities of two liquids – burette method 4. Specific heat capacity of a liquid – half time correction 5. Verification of laws of transverse vibrations using sonometer 6. Calibration of low range voltmeter using potentiometer 7. Determination of thermos emf using potentiometer 8. Verification of truth tables of basic logic gates using ICs 9. Verification of De Morgan's theorems using logic gate ICs. 10. Use of NAND as universal building block. <i>Note</i> : Use of digital balance permitted	
Board of Studies Date : 02.05.2023	

Title of the Course	ENTREPRENEURIAL SKILLS IN CHEMISTRY						
Course No.	Skill Enhancement Course -IV						
Category	NME	Year	II	Credits	1	Course Code	26UCHSE C4
		Semester	III				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	-	-	1		1		
Prerequisites	General Chemistry						
Objectives of the course	The course aims at providing training to ● develop entrepreneur skills in students ● to provide hands on experience to prepare and develop products ● develop start ups						
Course Outline	UNIT -I						
	Food Chemistry Food adulteration-contamination of food items with clay stones, water and toxic chemicals -Common adulterants. Food additives, Natural and synthetic anti-oxidants, glazing agents (hazardous effect), food colourants, Preservatives, leavening agents, Baking powder and baking soda, yeast, MSG, vinegar. Dyes Classification – Natural, synthetic dyes and their characteristics – basic methods and principles of dyeing						
	UNIT II						
	Hands on Experience (Students can choose any four) Detection of adulterants in food items like coffee, tea, pepper, chilli powder, turmeric powder, butter, ghee, milk, honey etc., by simple techniques. Preparation of Jam, squash and Jelly, Gulkand, cottage cheese. Preparation of products like candles, soap, detergents, cleaning powder, shampoos, pain balm, tooth paste/powder and disinfectants in small scale. Extraction of oils from spices and flowers. Testing of water samples using testing kit. Dyeing – cotton fabrics with natural and synthetic dyes Printing – tie and dye, batik.						
Skills acquired from this course	Entrepreneurial skills.						
Recommended Text	1. George S &Muralidharan V, (2007) Fibre to Finished Fabric – A Simple Approach, Publication Division, University of Madras, Chennai. 2. Appaswamy G P, A Handbook on Printing and Dyeing of Textiles. 3. Michael Scotter, Food Additives and Contaminants.						

Reference Books	Shyam Jha, Rapid detection of food adulterants and contaminants (Theory and Practice), Elsevier, e Book ISBN 9087128004289, 1 st Ed, 2015
Website and e-learning source	https://www.vlab.co.in/broad-area-chemical-sciences https://hal.archives-ouvertes.fr/hal-00680179 , 2012
Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to CO 1: identify adulterated food items by doing simple chemical tests. CO 2: prepare cleaning products and become entrepreneurs CO 3: educate others about adulteration and motivate them to become entrepreneurs.	

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S

S – Strong, M – Medium, L– Low

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
Weightage	6	6	6	6	6
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date: 23.04.2024

Title of the Course	PESTICIDE CHEMISTRY						
Course No.	Skill Enhancement Course -V						
Category	SEC	Year	II	Credits	2	Course Code	26UCHSEC5
		Semester	III				
Instructional hours per week	Lecture	Tutorial	Lab Practice			Total	
	2	-	-			2	
Prerequisites	Fundamentals in chemistry						
Objectives of the course	This course aims to providing the students ● knowledge about the various types of pesticides and their toxicity. ● to understand the accumulation of pesticides in the form of residues and its analysis. ● knowledge on choice of alternate and eco-friendly pesticides.						
Course Outline	Unit I Introduction: History of pesticides. Chemistry of Pesticides: Brief introduction to classes of pesticides (Chemical class, targets), structures, chemical names, physical and chemical properties. Toxicity of pesticides: Acute and chronic toxicity in mammals, birds, aquatic species etc. Methods of analysis of pesticides. Insecticides: Classification and study of following insecticides with respect to structure, chemical name, physical properties, chemical properties, synthesis, degradation, metabolism, formulations, Mode of action, uses, toxicity. Organophosphates and Phosphothionates: Acephate, Chlorpyriphos, Monocrotophos, and parathion-methyl. Organochlorine – Endosulfan, heptachlor; Carbamate: Cartap hydrochloride, Methomyl, Propoxur.						
	Unit II Pesticides residues: Introduction- application of agrochemicals, dissemination pathways of pesticides, causes of pesticide residues, remedies. Pesticides residues in atmosphere- entry into atmosphere, action of pesticides, effects on environments. Pesticides residues in water - entry into water systems, action and effect in aquatic environment. Pesticides residues in soil. Entry into soil, absorption, retention and transport in soil, effects on microorganism, soil condition and fertility, decomposition and degradation by climatic factors and microorganism. Pesticide Residues effect and analysis: Effects of pesticides residue on human life, birds and animals- routes for exposure to pesticides, action of pesticides on living system. Analysis of pesticides residues- sample preparation, extraction of pesticides residues (soil, water and vegetables/fruits) simple methods and schemes of analysis, multi-residue analysis.						

	Unit III Biopesticides: Pheromones, attractants, repellents – Introduction, types and application (8- Dodecen-1-ol, 10-cis-12-hexadecadienoic, Trimedlure, Cue-lure, methyl eugenol, N,N- Diethyl-m-toluamide, Dimethyl phthalate, Icaridin). Baits- Metaldehyde, Iron (II) phosphate, Indoxacarb, Zinc Phosphide, Bromadiolone.
Extended Professional Component (is a part of internal component only, not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Handa S K. <i>Principles of pesticide chemistry</i>. Agrobios (India); 2012. 2. Matolcsy G, Nádas M, Andriská V. <i>Pesticide chemistry</i>. Elsevier; 1989. 3. Miyamoto J. and Kearney P. C. <i>Pesticide Chemistry Human Welfare and the Environment</i> vol. IV <i>Pesticide Residue and Formulation Chemistry</i>, Pergamon press, 1985. 4. Cremling R, <i>Pesticides</i>, John Wiley, 1979.
Reference Books	1. Roy N. K., <i>Chemistry of Pesticides</i>. CBS Publisher & Distributors P Ltd; 1st Ed. 2010. 2. Nollet L.M., Rathore H.S., <i>Handbook of pesticides: methods of pesticide residues analysis</i>. CRC press; 2016. 3. Ellerbrock R.H., <i>Pesticide Residues: Significance, Management and Analysis</i>, 2005
Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to CO 1: Identify the pesticides and their toxicity with respect to structure and category. CO 2: explain the preparation and property of pesticides CO 3: investigate the pesticide residues, prevention and care CO 4: demonstrate the extraction and analytical methods of pesticide residues CO 5: make awareness to the public on bio-pesticides	

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	S
CO2	S	S	S	S	M	S	S	M	M	S
CO3	S	S	S	M	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S
CO5	S	M	S	S	S	S	S	S	M	S

S – Strong, M – Medium, L– Low

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to PSOs	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date: 23.04.2024

Title of the Course	GENERAL CHEMISTRY-IV						
Course No.	Core Course -VII						
Category	Core	Year	II	Credits	5	Course Code	26UCHCC4
		Semester	IV				
Instructional hours per week	Lecture	Tutorial	Lab Practice	Total			
	5	-	-	5			
Prerequisites	General Chemistry III						
Objectives of the course	This course aims to provide a comprehensive knowledge on - thermodynamic concepts on chemical processes and applied aspects. - thermochemical calculations - transition elements with reference to periodic properties and group study of transition metals. - the organic chemistry of ethers, aldehydes, ketones and carboxylic acids.						
Course Outline	UNIT I Thermodynamics I Terminology - Intensive, extensive properties, state, path functions; isolated, closed and open systems; isothermal, adiabatic, isobaric, isochoric, cyclic, reversible and irreversible processes; First law of thermodynamics - Concept and significance of heat (q), work (w), internal energy (E), enthalpy (H); calculations of q, w, E and H for reversible expansion of ideal gases under isothermal conditions; relation between heat capacities (C_p & C_v); Joule Thomson effect- inversion temperature. Thermochemistry - heats of reactions, standard states; effect of temperature (Kirchhoff's equations) and pressure on enthalpy of reactions; Hess's law and its applications; Measurement of heat of reaction - Zeroth law of thermodynamics-Absolute Temperature scale.						
	UNIT II Thermodynamics II Second Law of thermodynamics - Limitations of first law, spontaneity and randomness; Carnot's cycle; Concept of entropy, entropy change for reversible and irreversible processes, entropy of mixing. Calculation of entropy changes of an ideal gas with changes in temperature, volume and pressure. Free energy and work functions - Need for free energy functions, Gibbs free energy, Helmholtz free energy - their variation with temperature, pressure and volume, criteria for spontaneity; Gibbs-Helmholtz equation – derivations and applications; Maxwell relationships, thermodynamic equations of state; Thermodynamics of mixing of ideal gases, Ellingham Diagram-application. Third law of thermodynamics - Nernst heat theorem; Applications of third law - evaluation of absolute entropies from heat capacity measurements, exceptions to third law.						

	UNIT III General Characteristics of d-block elements 15 Hours Transition Elements- Electronic configuration - General periodic trend variable valency, oxidation states, stability of oxidation states, colour, magnetic properties, catalytic properties and tendency to form complexes. Comparative study of transition elements and non transition elements – comparison of II and III transition series with I transition series. Group study of Titanium, Vanadium, Chromium, Manganese, Iron, Cobalt, Nickel and Zinc groups
	UNIT IV Ethers and Epoxides 15 Hours Nomenclature, isomerism, general methods of preparations, reactions involving cleavage of C-O linkages, alkyl group and ethereal oxygen. Zeisel's method of estimation of methoxy group. Reactions of epoxides with alcohols, ammonia derivatives and LiAlH₄ Aldehydes and Ketones Nomenclature, structure and reactivity of aliphatic and aromatic aldehydes and ketones; general methods of preparation and physical properties. Nucleophilic addition reactions, base catalysed reactions with mechanism- Aldol, Cannizzaro's reaction, Perkin reaction, Benzoin condensation, Haloform reaction, Knoevenagel reaction. Oxidation of aldehydes. Reduction: Clemmensen reduction, Wolf - Kishner reduction, Meerwein - Ponnordorf Verley reduction, reduction with LiAlH₄ and NaBH₄. Addition reactions of unsaturated carbonyl compounds: Michael addition.
	UNIT V Carboxylic Acids: Nomenclature, structure, preparation and reactions of aliphatic and aromatic monocarboxylic acids. Physical properties, acidic nature, effect of substituent on acidic strength. HVZ reaction, Claisen ester condensation, Bouveault Blanc reduction, decarboxylation, Hunsdiecker reaction. Formic acid-reducing property. Carboxylic acid Derivatives: Preparations of aliphatic and aromatic acid chlorides, esters, amides and anhydrides. Nucleophilic substitution reaction at the acyl carbon of acyl halide and anhydride. Schotten - Baumann reaction, Claisen condensation, Dieckmann and Reformatsky reactions and Curtius rearrangement. Active methylene compounds: Keto - enol tautomerism. Preparation and synthetic applications of diethyl malonate and ethyl acetoacetate Halogen substituted acids - nomenclature; preparation by direct halogenation, iodination from unsaturated acids, alkyl malonic acids Hydroxy acids - nomenclature; preparation from halo, aldehydic and ketonic acids, ethylene glycol - Action of heat on α, β and γ hydroxy acids.

Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/JAM /TNPSC others to be solved (To be discussed during the tutorial hours).
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Puri B.R. & Sharma L.R., <i>Principles of Physical Chemistry</i>, Vishal Publishing Ltd, India, 49th Ed., 2020. 2. Kapoor K. L. <i>A Textbook of Physical chemistry</i>, (volume-2 and 3), Macmillan, India Ltd, 3rd Ed., 2009. 3. Soni P.L. & Mohan Katyal, <i>Textbook of Inorganic Chemistry</i>, Sultan Chand & Sons, 12th Ed., 2006. 4. Jain M. K. & Sharma S. C. <i>Modern Organic Chemistry</i>, Vishal Publishing, 4th reprint, 2003. 5. Mukherji, S.M. and Singh S.P., <i>Reaction Mechanism in Organic Chemistry</i>, Laxmi Publications., 3rd Ed, 2007.
Reference Books	7. Maron, S. H. and Prutton C. P. <i>Principles of Physical Chemistry</i>, CBS Publishers and Distributors, India, 4thEd., 2017. 8. Lee, J. D. <i>Concise Inorganic Chemistry</i>, Black Well Ltd., London, 5th Ed., 2006. 9. Gurudeep Raj, <i>Advanced Inorganic Chemistry</i>, 26th Ed., Goel Publishing House: Meerut, 2001. 10. Atkins, P.W. & Paula, J. <i>Physical Chemistry</i>, 10th Ed., Oxford University Press:New York, 2014. 11. Huheey, J. E. <i>Inorganic Chemistry: Principles of Structure and Reactivity</i>, Pearson, 5th Ed., 2022.
Website and e-learning source	MOOC components 1. https://nptel.ac.in/courses/112102255 Thermodynamics 2. https://nptel.ac.in/courses/104101136 Advanced transition metal chemistry 3. https://testbook.com/chemistry/aldehydes-ketones 4. https://chem.libretexts.org/Reactions_of_Epoxides_-_Ring-opening 5. https://archive.nptel.ac.in/courses/112/106/112106133/

Course Outcomes

On completion of the course the students should be able to

CO1: explain the terms, processes, first law of thermodynamics and thermochemical calculations.

CO2: discuss the second and third law of thermodynamics and their applications.

CO3: investigate the chemistry of transition elements with respect to various periodic properties and group wise discussions.

CO4: discuss the fundamental organic chemistry of ethers, epoxides and carbonyl compounds including named organic reactions.

CO5: discuss the chemistry and named reactions related to carboxylic acids and their derivatives, active methylene compounds, halogen substituted acids and hydroxy acids.

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	S	S	S	S
CO2	S	S	S	S	M	M	S	S	M	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S
CO5	S	S	S	S	S	S	S	S	M	S

S – Strong, M – Medium, L– Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date: 04.11.2024

Title of the Course	PHYSICAL CHEMISTRY PRACTICAL - I						
Course No.	Core Course-VIII: Core Practical-IV						
Category	Core	Year	II	Credits	3	Course Code	26UCHCCQ4
		Semester	IV				
Instructional hours per week	Lecture	Tutorial	Lab Practice			Total	
	-	-	3			3	
Prerequisites	General Chemistry						
Objectives of the course	The course aims at providing an understanding of - the laboratory experiments in order to understand the concepts of physical changes in chemistry - the rates of chemical reactions - colligative properties and adsorption isotherm						
Course Outline	UNIT-I Chemical kinetics 1. Determination of rate constant of acid catalysed hydrolysis of an ester (methyl acetate (or) ethyl acetate). 2. Determination of order of reaction between iodide and persulphate (initial rate method). 3. Polarimetry: Determination of rate constant of acid catalysed inversion of cane sugar Thermochemistry 4. Determination of heat of neutralisation of a strong acid by a strong base. 5. Determination of heat of hydration of copper sulphate						
	UNIT II Electrochemistry Conductometry 6. Determination of cell constant 7. Determination of equivalent conductance of strong electrolyte 8. Determination of dissociation constant of acetic acid Potentiometry 9. Potentiometric titration of HCl against NaOH						
	UNIT III Colligative property 10. Determination of molecular weight of an organic compound by Rast method using naphthalene or diphenyl as solvent 11. Determination of molar depression constant Kf of the given solvent.						
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.						

Reference Books	1. Sindhu, P.S. <i>Practicals in Physical Chemistry</i> , Macmillan India : New Delhi, 2005. 2. Khosla, B. D. Garg, V. C.; Gulati, A.; <i>Senior Practical Physical Chemistry</i> , R. Chand : New Delhi, 2011. 3. Gupta, Renu, <i>Practical Physical Chemistry</i> , 1 st Ed.; New Age International: New Delhi, 2017.
Website and e-learning source	https://www.vlab.co.in/broad-area-chemical-sciences
Course Outcomes On completion of the course the students should be able to CO1: describe the principles and methodology for the practical work CO2: explain the procedure, data and methodology for the practical work. CO3: apply the principles of electrochemistry, kinetics for carrying out the practical work. CO4: demonstrate laboratory skills for safe handling of the equipment and chemicals	

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	S	S	S
CO2	M	S	S	S	M	S	S	S	M	S
CO3	S	S	S	M	S	S	S	S	S	M
CO4	S	S	S	S	S	S	S	S	M	M

S – Strong, M – Medium, L– Low

Level of Correlation between PSO's and CO's

CO / PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date: 04.11.2024

Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
26UCHPGEC4	PHYSICS –II	Elective - II	2	1	-	3	3	70
COURSE OBJECTIVES	To understand the basic concepts of optics, modern Physics, Relativity, quantum physics, semiconductor physics and electronics							

UNITS	COURSE DETAILS
UNIT-I	OPTICS: Interference – interference in thin films – colors of thin films – air wedge – determination of diameter of a thin wire by air wedge – diffraction – diffraction of light– normal incidence – experimental determination of wavelength using diffraction grating (no theory) – polarization – polarization by double reflection – Brewster’s law – optical activity – application in sugar industries
UNIT-II	ATOMIC PHYSICS: Atom models – Bohr atom model – mass number – atomic number – nucleons – vector atom model – various quantum numbers – Pauli’s exclusion principle – electronic configuration – periodic classification of elements – Bohr magneton – Stark effect – Zeeman effect (elementary ideas only).
UNIT-III	NUCLEAR PHYSICS: Nuclear models – magic numbers – shell model – nuclear energy – mass defect – binding energy – radioactivity – uses – half life - radio isotopes and uses – nuclear fission – energy released in fission – chain reaction - atom bomb - nuclear fusion – thermonuclear reactions – differences between fission and fusion (elementary ideas only).
UNIT-IV	INTRODUCTION TO RELATIVITY AND GRAVITATIONAL WAVES: Frame of reference – postulates of special theory of relativity – Galilean transformation equations – Lorentz transformation equations – derivation – length contraction – time dilation – twin paradox – mass-energy equivalence.
UNIT-V	SEMICONDUCTOR PHYSICS: p-n junction diode – forward and reverse biasing – characteristic of diode – zener diode – characteristic of zener diode – voltage regulator – full wave bridge rectifier.

TEXT BOOKS	1. R.Murugesan (2005), Allied Physics, S.Chand & Co, New Delhi. 2. K.Thangaraj and D.Jayaraman (2004), Allied Physics, Popular Book Depot, Chennai. 3. Brijlal and N.Subramanyam (2002), Text book of Optics, S.Chand & Co, New Delhi. 4. R.Murugesan (2005), Modern Physics, S.Chand & Co, New Delhi. 5. A.Subramaniyam Applied Electronics, 2nd Edn., National Publishing Co., Chennai.
REFERENCE BOOKS	1. Resnick Halliday and Walker (2018), Fundamentals of Physics, 11th Edn., John Willey and Sons, Asia Pvt. Ltd., Singapore. 2. D.R.Khanna and H.R. Gulati (1979). Optics, S.Chand & Co.Ltd., New Delhi. 3. A.Beiser (1997), Concepts of Modern Physics, Tata Mc Graw Hill Publication, New Delhi. 4. Thomas L. Floyd (2017), Digital Fundamentals, 11th Edn., Universal Book Stall, New Delhi. 5. V.K.Metha (2004), Principles of electronics, 6th Edn. , S.Chand and Company, New Delhi.
WEBLINKS	1. https://www.berkshire.com/learning-center/delta-p-facemask/https://www.youtube.com/watch?v=QrhxU47gtj4https://www.youtube.com/watch?time_continue=318&v=D38BjgUdL5U&feature=emb_logo 2. https://www.youtube.com/watch?v=JrRrp5F-Qu4 3. https://www.validyne.com/blog/leak-test-using-pressure-transducers/ 4. https://www.atoptics.co.uk/atoptics/blsky.htm - 5. https://www.metoffice.gov.uk/weather/learn-about/weather/optical-effects
Board of Studies Date : 02.11.2023	

COURSE OUTCOMES:

At the end of the course, the student will be able to

COURSE OUTCOMES	CO1	Explain the concepts of interference diffraction using principles of super position of waves and rephrase the concept of polarization based on wave patterns
	CO2	Outline the basic foundation of different atom models and various experiments establishing quantum concepts. Relate the importance of interpreting improving theoretical models based on observation.
	CO3	Summarize the properties of nuclei, nuclear forces structure of atomic nucleus and nuclear models. Solve problems on decay rate half-life and mean-life. Interpret nuclear processes like fission and fusion. Understand the importance of nuclear energy in nuclear field.

	CO4	To describe the basic concepts of relativity like equivalence principle, inertial frames and Lorentz transformation. Extend their knowledge on concepts of relativity and vice versa.
	CO5	Summarize the working of semiconductor devices like junction diode, Zener diode, transistors and full wave bridge rectifier.

Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
26UCHPGECQ2	PHYSICS PRACTICAL- II	Elective	-	-	2	2	2	60

COURSE	Elective Course (GE)
COURSE TITLE	PHYSICS PRACTICAL – II
CREDITS	2
COURSE OBJECTIVES	1. Apply the concepts of Light, electricity and magnetism and waves, 2. Set up experiments to verify theories, quantify and analyse the observations. 3. To do error analysis and correlate results
Any Eight - Radius of curvature of lens by forming Newton's rings - Thickness of a wire using air wedge - Wavelength of mercury lines using spectrometer and grating - Refractive index of material of the lens by minimum deviation - Refractive index of liquid using liquid prism - Determination of AC frequency using sonometer - Specific resistance of a wire using PO box - Thermal conductivity of poor conductor using Lee's disc - Determination of figure of merit table galvanometer - Determination of Earth's magnetic field using field along the axis of a coil - Characterisation of Zener diode - Construction of Zener/IC regulated power supply - Construction of AND, OR, NOT gates using diodes and transistor - NOR gate as a universal building block	

Board of Studies Date: 02.11.2023

	UNIT V Separation and purification techniques 6 Hours Principle of Solvent Extraction and Liquid- Liquid Extraction, Chromatography: Column, TLC, Paper - Principle, Choice of adsorbents, solvents, preparation of Column and elution - development of chromatograms and Rf value.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Vogel, Arthur I: <i>A Test book of Quantitative Inorganic Analysis</i> (Rev. by G.H. Jeffery and others) 5th Ed., The English Language Book Society of Longman, 1989. 2. Gopalan R., Subramanian P. S. and Rengarajan K., <i>Elements of Analytical Chemistry</i>, Sultan Chand, New Delhi, 2007. 3. Skoog, Holler & Crouch, <i>Principles of Instrumental Analysis</i>, Cengage Learning, 6th Indian Reprint, 2017. 4. Speyer R., <i>Thermal Analysis of Materials</i>, CRC Press, 1993. 5. Day R.A. & Underwood A.L., <i>Quantitative Analysis</i>, 6th Ed., Prentice Hall of India Private Ltd., New Delhi, 1993
Reference Books	1. Skoog D. A., West D. M. & Holler F. J., <i>Analytical Chemistry: An Introduction</i>, 10th Ed., Cengage Learning India Pvt. Ltd., 2022. 2. Dash U N, <i>Analytical Chemistry; Theory and Practice</i>, Sultan Chand and sons Educational Publishers, New Delhi, 2011. 3. Christian, Gary D; <i>Analytical Chemistry</i>, 6th Ed., John Wiley & Sons, New York, 2004. 4. Mikes, O. & Chalmes, R.A. <i>Laboratory Handbook of Chromatographic & Allied Methods</i>, Elles Harwood Ltd. London 6. Jeffery G.H., Bassett J., Mendham J. & R.C. Denney, <i>Vogel's Textbook of Quantitative Chemical Analysis</i>, 6th Ed., Pearson Education, 2000

Website and e-learning sources	1. http://www.epa.gov/rpdweb00/docs/marlap/402-b-04-001b-14-final.pdf 2. http://eric.ed.gov/?id=EJ386287 3. http://www.sjsu.edu/faculty/watkins/diamag.htm 4. http://www.britannica.com/EBchecked/topic/108875/separation-and-purification 5. http://www.chemistry.co.nz/stoichiometry.htm
Course Outcomes On completion of the course the students should be able to CO1: apply error analysis in the calibration and use of analytical instruments, explain theory, instrumentation and application of flame photometry and atomic absorption spectrometry. CO2: explain theory, instrumentation and application of UV visible and Infrared spectroscopy. CO3: able to discuss instrumentation, theory and applications of thermal and electrochemical techniques. CO4: explain the use of chromatographic techniques in the separation and identification of mixtures. CO5: explain preparation of solutions, stoichiometric calculations.	

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

S – Strong, M – Medium, L– Low

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date : 04.11.2024

Title of the Course	FORENSIC SCIENCE						
Course No.	Skill Enhancement Course -VII						
Category	SEC	Year	II	Credits	2	Course Code	26UCHSEC7
		Semester	IV				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	2	-	-		2		
Prerequisites	General Chemistry						
Objectives of the course	This course aims at giving an overall view of • crime detection through analytical instruments • forgery and its detection • medical aspects involved						
Course Outline	UNIT I						
	Poisons 6 Hours Poisons - types and classification - diagnosis of poisons in the living and the dead -clinical symptoms - Heavy metal contamination (Hg, Pb, Cd) of sea foods - use of neutron activation analysis in detecting arsenic in human hair.						
	UNIT-II						
	Crime Detection 6 Hours Accidental explosion during manufacture of matches and fireworks (as in Sivakasi). Human bombs - possible explosives (gelatin sticks and RDX) - metal detector devices and other security measures for VVIP-composition of bullets and detecting powder burns.						
	UNIT-III						
	Forgery and Counterfeiting 6 Hours Documents - different types of forged signatures - writing deliberately modified - uses of ultraviolet rays -comparison of type written letters – checking silver line water mark in currency notes – alloy analysis using AAS to detect counterfeit coins – detection of gold purity in 22 carat ornaments – detecting gold plated jewels -authenticity of diamond.						
	UNIT-IV						
	Tracks and Traces 6 Hours Tracks and traces - small tracks and police dogs - foot prints - costing of foot prints -residue prints, walking pattern or tyre marks – miscellaneous traces and tracks – glass fracture - tool marks - paints - fibres - Analysis of biological substances - blood, semen, saliva, urine and hair - detecting steroid consumption in athletes and racehorses.						

	UNIT-V Medical Aspects 6 Hours Metabolite analysis using mass spectrum - Gas chromatography-Arson -natural fires and arson - burning characteristics and chemistry of combustible materials -nature of combustion. Ballistics - classification - internal and terminal ballistics -laboratory examination of barrel washing and detection of powder residue by chemical tests.
Recommended Text	1. Iqbal S.A, Liviu .M, <i>Textbook of forensic chemistry</i>, Discovery publishing house private limited, 2011. 2. Kelly M. Elkins, <i>Introduction to Forensic Chemistry</i>, CRC Press, Taylor & Francis Group, 2019. 3. Javed I. Khan, Thomas J. Kennedy, Donnell R. Christian, Jr., <i>Basic principles of Forensic chemistry</i>, Humana Press, 1st Ed, 2012. 4. Bapuly A.K, <i>Forensic Science – Its application in crime investigation</i>, Paras Medical Publisher, Hyderabad 2006. 5. Sharma B.R. <i>Scientific Criminal Investigation</i>, Universal Law Publishing Co. Pvt. Ltd, New Delhi 2006.
Reference Books	1. Richard Saferst in and Criminalistics-An Introduction to Forensic Science (College Version), Sopfestein, Printice Hall, 8th Ed. 2. Suzanne Bell, <i>Forensic Chemistry</i>, Pearson, 2nd international Ed, 2014. 3. Jay Siegel, <i>Forensic chemistry: Fundamentals and applications</i>, Wiley- Blackwell, first edition, 2015. 4. Max M. Houck & Jay A. Segal, <i>Fundamentals of Forensic Science</i>, Elsevier Academic press 2006. 5. Henry C. Lee, Timothy Palmbach, Marilyn T. Miller, Henry Lee's Crime Scene Book Elsevier Academic press 2006
Website and e-learning source	1. http://www.library.ucsb.edu/ist/03-spring/internet.html 2. http://www.wonder how to.com/topic/forensic-science/
Course Outcomes On completion of the course the students should be able to CO 1: describe the types of poisons and classification of poisons in the living and the dead organisms. CO 2: get awareness on Human bombs, possible explosives (gelatin sticks and RDX) and metal detector devices. CO 3: detect the forgery documents, different types of forged signatures CO4: gain the knowledge in identification and analysis of biological substances - blood, saliva, hair etc., CO 5: have an exposure on handling fire explodes.	

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	S	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	S	M	S
CO5	S	M	S	S	S	S	S	M	M	S

S – Strong, M – Medium, L– Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date: 04.11.2024

Title of the Course	ORGANIC CHEMISTRY – I						
Course No.	Core Course- IX						
Category	Core	Year Semester	III V	Credits	4	Course Code	26UCHCC5
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	4	1	-		5		
Prerequisites	General Chemistry I, II, III and IV						
Objectives of the course	This course aims to provide an understanding of • stereoisomerism in chirals and geometric isomerism in olefins, conformations of ethane and butane • preparation and properties of aromatic and aliphatic nitro compounds and amines • preparation of different dyes, food colour and additives • preparation and properties of five membered heterocycles like pyrrole, furan and thiophene • preparation and properties of six membered heterocycles like pyridine, quinoline and isoquinoline.						
Course Outline	UNIT I Stereochemistry Fischer Projection, Newmann and Sawhorse Projection formulae and their interconversions; Geometrical isomerism:cis–trans, syn-anti isomerism, E/Z notations. Optical Isomerism: Optical activity, specific rotation, asymmetry, enantiomers, distereoisomers, meso structures - molecules with one and two chiral centres, racemisation- methods of racemisation; resolution- methods of resolution. C.I.P rules. R and S notations for one and two chirality (stereogenic) centres. Molecules with no asymmetric carbon atoms – allenes and biphenyls. Conformational analysis of ethane and butane. UNIT II Chemistry of Nitrogen Compounds – I Nitroalkanes Nomenclature, isomerism, preparation from alkyl halides, halo acids, alkanes; physical properties; reactions – reduction, halogenations, Grignard reagent, Pseudo acid character. Nitro - aci nitro tautomerism. Aromatic nitro compounds Nomenclature, preparation – nitration, from diazonium salts, physical properties; reactions - reduction of nitrobenzene in different medium, Electrophilic substitution reactions, TNT.						

	Amines: Aliphatic amines Nomenclature, isomerism, preparation – Hofmanns’ degradation reaction, Gabriel’s phthalimide synthesis, Curtius Schmidt rearrangement. Physical properties, reactions – alkylation, acylation, carbylamine reaction, Mannich reaction, oxidation, basicity of amines. UNIT III Chemistry of Nitrogen Compounds – II Aromatic amines – Nomenclature, preparation – from nitro compounds, Hofmann’s method; Schmidt reaction, properties - basic nature, ortho effect; reactions – alkylation, acylation, carbylamine reaction, reaction with nitrous acid, aldehydes, oxidation, Electrophilic substitution reactions, diazotisation and coupling reactions; sulphanilic acid - zwitter ion formation. Distinction between primary, secondary and tertiary amines - aliphatic and aromatic Diazonium compounds Diazomethane, Benzene diazonium chloride - preparations and synthetic applications Dyes Theory of colour and constitution; classification based on structure and application; preparation –Martius yellow, aniline yellow, methyl orange, alizarin, indigo, malachite green.
	UNIT IV Heterocyclic compounds Nomenclature and classification. General characteristics - aromatic character and reactivity. Five-membered heterocyclic compounds Pyrrole – preparation - from succinimide, Paal Knorr synthesis; reactions – reduction, basic character, acidic character, electrophilic substitution reactions, ring opening. Furan – preparation from mucic acid and pentosan; reactions – hydrogenation, reaction with oxygen, Diels Alder reactions, formation of thiophene and pyrrole; Electrophilic substitution reaction. Thiophene synthesis - from acetylene; reactions –reduction; oxidation; electrophilic substitution reaction.

	UNIT V Six-membered heterocyclic compounds Pyridine – synthesis - from acetylene, Physical properties; reactions - basic character, oxidation, reduction, electrophilic substitution reactions; nucleophilic substitution- uses Condensed ring systems Quinoline – preparation - Skraup synthesis and Friedlander's synthesis; reactions – basic nature, reduction, oxidation; electrophilic substitutions; nucleophilic substitutions – Chichibabin reaction Isoquinoline – preparation by the Bischler – Napieralski reaction, reduction, oxidation; electrophilic substitution
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Jain, M. K & Sharma, S.C. <i>Modern Organic Chemistry</i>, 7th Ed.; Vishal Publications: New Delhi, 2020. 2. Mukherji S.M & Singh S. P, <i>Reaction Mechanism in Organic Chemistry</i>, Macmillan India Ltd., 3rd Ed, 2009. 3. ArunBahl & Bahl B. S, <i>Advanced organic chemistry</i>, New Delhi, S.Chand& Company Pvt. Ltd., Multicolour Ed, 2012. 4. Soni P.L & Chawla H.M, <i>Text Book of Organic Chemistry</i>, Sultan Chand & Sons, New Delhi, 29th Ed, 2007. 5. Pillai C.N, <i>Text Book of Organic Chemistry</i>, Universities Press (India) Private Ltd., 2009.
Reference Books	1. Morrison R.T & Boyd R.N, <i>Organic Chemistry</i>, Pearson Education, Asia, 6th Ed, 2012. 2. Graham Solomons T.W, <i>Organic Chemistry</i>, John Wiley & Sons, 11th Ed, 2012. 3. Carey Francis A, <i>Organic Chemistry</i>, Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 7th Ed, 2009. 4. Finar I. L, <i>Organic Chemistry</i>, Vol. (1& 2), England, Wesley Longman Ltd, 6th Ed, 2006. 5. Joule J.A & Smith G.F, <i>Heterocyclic Chemistry</i>, Wiley, 5th Ed, 2010.
Website and e-learning sources	1. www.epgpathshala.nic.in 2. www.nptel.ac.in 3. http://swayam.gov.in Virtual Textbook of Organic Chemistry

Course Outcomes**On completion of the course the students should be able to****CO1:** assign RS notations to chirals, EZ notations to olefins and explain conformations of ethane and butane.**CO2:** explain the preparation and properties of nitro compounds and aliphatic amines**CO3:** analyse the chemistry of aromatic amines and their derivatives.**CO4:** discuss the preparation and properties of pyrrole, furan and thiophene.**CO5:** outline the preparation and properties of pyridine, quinoline and isoquinoline.**CO-PO Mapping (Course Articulation Matrix)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	S	S	S	M
CO2	M	S	S	M	S	M	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	M	S	M	M	S	S	M
CO5	S	M	S	M	S	M	M	S	S	M

S – Strong, M – Medium, L– Low**Level of Correlation between PSO's and CO's**

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	2	3	3
CO5	3	3	2	3	3
Weightage	15	15	12	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low**Board of Studies Date: 16.04.2025**

Title of the Course	INORGANIC CHEMISTRY -I						
Course No.	Core Course- X						
Category	Core	Year	III	Credits	4	Course Code	26UCHCC6
		Semester	V				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	4	-	-		4		
Prerequisites	General Chemistry I, II, III and IV						
Objectives of the course	The course aims to provide knowledge on • nomenclature, isomerism and theory of coordination compounds, and chelate complexes • crystal field theory, magnetic properties, stability of complexes and Jahn Teller effect • preparation and properties of metal carbonyls • General characteristics of Lanthanoids and actinoids • preparation and properties of inorganic polymers						
Course Outline	UNIT I Co-ordination Chemistry - I IUPAC Nomenclature of coordination compounds, Isomerism in coordination compounds. Werner’s coordination theory – effective atomic number –interpretation of geometry and magnetic properties by Pauling’s theory – geometry of co-ordination compounds with co-ordination number 4 & 6. Chelates – types of ligands forming chelates – stability of chelates, applications of chelates in qualitative and quantitative analysis– application of DMG and oxine in gravimetric analysis –estimation of hardness of water using EDTA, metal ion indicators. Role of metal chelates in living systems – haemoglobin and chlorophyll. UNIT II Co-ordination Chemistry - II Crystal field theory –Crystal field splitting of energy levels in octahedral and tetrahedral complexes, Crystal field stabilization energy (CFSE), spectrochemical series - calculation of CFSE in octahedral and tetrahedral complexes - factors influencing the magnitude of crystal field splitting, crystal field effect on ionic radii, lattice energies, heats of ligation with water as a ligand (heat of hydration), interpretation of magnetic properties, spectra of [Ti(H₂O)₆]³⁺ - Jahn – Teller effect. Stability of complexes in aqueous solution, stability constants- factors affecting the stability of a complex ion, thermodynamic and kinetic stability (elementary idea). Comparison of VBT and CFT.						

	UNIT III Organometallic compounds Metal Carbonyls Mono and polynuclear carbonyls, General methods of preparation of carbonyls – general properties of binary carbonyls – bonding in carbonyls – structure and bonding in carbonyls of Ni, Fe, Cr, Co, Mn, Ru and Os. EAN rule as applied to metal carbonyls. Ferrocene-Methods of preparation, physical and chemical properties UNIT IV Inner transition elements (Lanthanoids and Actinoids) General characteristics of f-block elements - Comparative account of lanthanoids and actinoids - Occurrence, Oxidation states, Magnetic properties, Colour and spectra - Lanthanoids and Actinoids, Separation by ion-Exchange and Solvent extraction methods - Lanthanoids contraction- Chemistry of thorium and Uranium-Occurrence, Ores, Extraction, properties and uses - Preparation, Properties and uses of ceric ammonium sulphate, thorium dioxide and uranyl acetate. UNIT V Inorganic polymers General properties – classification of inorganic polymers based on element in the backbone (Si, S, B and P) - preparation and properties of silicones (polydimethylsiloxane and polymethylhydrosiloxane) phosphorous based polymer (polyphosphazines and polyphosphonitrilic chloride), sulphur based polymer (polysulfide and polymeric sulphur nitride), boron based polymers (borazine polymers) – industrial applications of inorganic polymers.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

Recommended Text	1. Puri B. R., Sharma L R., Kalia K C, <i>Principles of Inorganic Chemistry</i>, Volume 10., Vishal Publishing CO. Delhi, 2024. 2. Satya Prakash, Tuli G. D., Basu S. K., Madan R. D., <i>Advanced Inorganic Chemistry</i>, Volume 1, 18th Ed., S. Chand & Co., New Delhi, 2020. 3. Lee J. D., <i>Concise Inorganic Chemistry</i>, 5th Ed., Black Well Ltd, London, 2006. 4. Malik W. V, Tuli G. D., Madan R. D., <i>Selected Topics in Inorganic Chemistry</i>, S. Chand and Company Ltd, 2010. 5. De, A. K. <i>Text book of Inorganic Chemistry</i>, New Age International Pvt Ltd, 7th Ed., 2018.
Reference Books	1. Madan R D, Sathya Prakash, <i>Modern Inorganic Chemistry</i>, 2nd Ed., S.Chand and Company, New Delhi, 2019. 2. Gopalan R, <i>Inorganic Chemistry for Undergraduates</i>, 1st Ed., University Press (India) Private Limited, Hyderabad, 2009. 3. Sivasankar B, <i>Inorganic Chemistry</i>, 1st Ed., Pearson Publication, Chennai, 2013. 4. Alan G. Sharp, <i>Inorganic Chemistry</i>, 2nd Ed., Pearson Prentice Hall Publication, 2004. 5. Peter Atkins, Tina Overton, Jonathan Rourke and Mark Weller, <i>Inorganic Chemistry</i>, Oxford University Press, 6th Ed., 2014.
Website and e-learning source	1. www.epgpathshala.nic.in 2. www.nptel.ac.in 3. http://swayam.gov.in
Course Outcomes On completion of the course the students should be able to CO1: interpret isomerism, Werner's Theory and stability of chelate complexes CO2: analyse crystal field theory, magnetic properties and spectral properties of complexes. CO3: demonstrate preparation and properties of metal carbonyls CO4: organize a comparative study and characteristic properties of lanthanoids and actinoids CO5: examine properties and uses of inorganic polymers of silicon, sulphur, boron and Phosphorous	

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	M	S	S	S
CO2	S	S	S	S	S	M	S	S	S	S
CO3	S	S	S	S	S	M	S	S	S	S
CO4	S	S	S	S	M	M	M	S	S	S
CO5	S	S	S	S	S	M	S	S	S	S

S – Strong, M – Medium, L– Low

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	3	3	3	3	3
CO3	3	3	3	2	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	14	14	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date: 16.04.2025

Title of the Course	PHYSICAL CHEMISTRY -I						
Course No.	Core Course- XI						
Category	Core	Year	III	Credits	4	Course Code	26UCHCC7
		Semester	V				
Instructional hours per week	Lecture	Tutorial	Lab Practice			Total	
	4	1	-			5	
Prerequisites	General Chemistry I, II, III and IV						
Objectives of the course	The course aims at providing an overall view of • fugacity, activity and partial molar properties • chemical kinetics and different types of chemical reactions • adsorption, homogeneous and heterogeneous catalysis • colloids and macromolecules • photochemistry, fluorescence and phosphorescence						
Course Outline	UNIT I Thermodynamics - III Entropy change in irreversible process-Clasius inequality Concept of fugacity, activity and activity coefficient (determination not necessary)- standard states for solids, liquids and gases. Concept of ionic strength- activity coefficient of strong electrolytes-Debye-Huckel limiting law (derivation not necessary) Experimental verification. Partial molar properties - chemical potential, Gibbs-Duhem equation, variation of chemical potential with temperature and pressure, Duhem-Margules equation.						
	UNIT II Chemical Kinetics Rate of reaction - Average and instantaneous rates, factors influencing rate of reaction - molecularity of a reaction - rate equation - order of reaction. order and molecularity of simple reactions, Rate laws - Rate constants - derivation of rate constants for zero, first order, second and third order (equal initial concentration) - Derivation of time for half change with examples. Methods of determination of order of Volumetry, manometry and polarimetry. Effect of temperature on reaction rate - temperature coefficient - concept of activation energy - Arrhenius equation. Theories of reaction rates - Collision theory - derivation of rate constant of bimolecular gaseous reaction - Failure of collision theory. Lindemann's theory of unimolecular reaction. Theory of absolute reaction rates - Derivation of rate constant for a bimolecular reaction - significance of entropy and free energy of activation. Comparison of collision theory and ARRT. Complex reactions - reversible and parallel reactions (no derivation and only examples)						

	UNIT-III Surface Chemistry Adsorption - Chemical and physical adsorption and their general characteristics- distinction between them - Different types of isotherms - Freundlich and Langmuir Adsorption isotherms and their limitations - BET theory (derivation not required), kinetics of enzyme catalysed reaction - Michaelis- Menten and Briggs- Haldene equation - Lineweaver- Burk plot - inhibition - reversible - competitive, noncompetitive and uncompetitive (no derivation of rate equations) Catalysis - general characteristics of catalytic reactions, auto catalysis, promoters, negative catalysis, poisoning of a catalyst - theories of homogenous and heterogeneous catalysis - Kinetics of Acid - base and enzyme catalysis.
	UNIT-IV Colloidal Chemistry Colloids: Types of Colloids, Characteristics of Colloids (Lyophilic and Lyophobic sols), Preparation of Sols - Dispersion methods, aggregation methods, Properties of Sols - Optical properties, Electrical properties - Electrical double layer, Electro Kinetic properties- Electro-osmosis, Electrophoresis, Coagulation or precipitation, Stability of sols, Emulsions, Gels - preparation of Gels, Applications of colloids. Macromolecules: Molecular weight of Macromolecules - Number average molecular weight and weight average molecular weight.
	UNIT-V Photochemistry Laws of photo chemistry - Lambert - Beer, Grotthus - Draper and Stark - Einstein. Quantum efficiency. Photochemical reactions - rate law - Kinetics of $\text{H}_2\text{-Cl}_2$, $\text{H}_2\text{-Br}_2$ and decomposition of HI reactions, comparison between thermal and photochemical reactions. Fluorescence - applications including fluorimetry - sensitised fluorescence, phosphorescence - applications - chemiluminescence and photosensitisation - examples -Chemistry of Vision - 11 cis retinal - colour perception of vision.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

Recommended Text	1. Puri B.R & Sharma L.R, <i>Principles of Physical Chemistry</i>, Shoban Lal Nagin Chand and Co., 48th Ed, 2021. 2. Peter Atkins, and Julio de Paula, James Keeler, <i>Physical Chemistry</i>, Oxford University press, International 11th Ed, 2018. 3. ArunBahl, Bahl B.S & Tuli G.D, <i>Essentials of Physical Chemistry</i>, S, Chand & Co, 28th Ed 2019. 4. Dogra S.K & Dogra S, <i>Physical Chemistry through Problems</i>: New Age International, 4th Ed, 2015. 5. Rajaram J & Kuriacose J.C, <i>Thermodynamics</i>, ShobanLalNagin Chand and CO., 1986.
Reference Books	1. Rajaram J & Kuriacose J.C, <i>Chemical Thermodynamics</i>, Pearson, 1st Ed, 2020. 2. Keith J. Laidler, <i>Chemical kinetics</i>, 3rd Ed, Pearson, 2003. 3. Atkins P.W & Julio de Paula, <i>Physical Chemistry</i>, Oxford University press, 7th Ed, 2002. 4. Kapoor K.L, <i>A Textbook of Physical Chemistry</i>, McGraw Hill , 6th Ed, 2019. 5. Puri B.R , Sharma L.R & Pathania M.S, <i>Principles of Physical Chemistry</i>, Shobanlal Nagin Chand and Co. Jalendhar, 41st , Ed, 2001
Website and e-learning source	1. https://nptel.ac.in 2. https://swayam.gov.in 3. www.epgpathshala.nic.in

Course Outcomes

On completion of the course the students should be able to

CO1: explain the concepts of fugacity, activity and partial molar quantities.

CO2: predict the rate and order of the reaction, demonstrate the effect of temperature on reaction rate.

CO3: compare Freundlich and Langmuir adsorption isotherms, and differentiate between homogenous and heterogeneous catalysis.

CO4: demonstrate the types and characteristics of colloids, preparation of sol and emulsions and determine the molecular weights of macromolecules.

CO5:utilize the concepts of photochemistry in fluorescence, phosphorescence, chemiluminescence and color perception of vision.

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	S	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	S	S	M
CO4	S	S	S	S	S	S	S	S	M	M
CO5	S	M	S	S	S	S	S	S	M	S

S – Strong, M – Medium, L– Low

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date: 16.04.2025

Title of the Course	PHYSICAL CHEMISTRY PRACTICAL – II						
Course No.	Core Course- XII						
Category	Core	Year	III	Credits	2	Course Code	26UCHCCQ 5
		Semester	V				
Instructional hours per week	Lecture	Tutorial	Lab Practice			Total	
	-	-	3			3	
Prerequisites	Theoretical knowledge on Physical Chemistry						
Objectives of the course	This course aims at providing • basic principles of physical chemistry experiments • hands on experience in carrying out the experiments						
Course Outline	UNIT-I Phase diagrams 1. Simple eutectic - determination of eutectic temperature and composition of naphthalene - diphenyl amine or naphthalene -diphenyl system 2. Determination of transition temperature of a salt hydrate. 3. Determination of upper critical solution temperature of phenol - water system 4. Effect of an electrolyte on miscibility temperature of phenol - water system 5. Determination of concentration of sodium chloride using phenol-sodium chloride system						
	UNIT-II Distribution law 6. Determination of the distribution coefficient of iodine between carbon tetrachloride (or) benzene and water 7. Determination of equilibrium constant of the reaction $\text{I}_2 + \text{I}^- \rightleftharpoons \text{I}_3^-$ 8. Determination of concentration of the given potassium iodide solution using the above equilibrium constant.						
	UNIT-III Electro chemistry 9. Conductometric titration of hydrochloric acid against sodium hydroxide 10. Conductometric titration of mixture of acids against sodium hydroxide 11. Potentiometric titration of ferrous ion against potassium dichromate						

Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Reference Books	1. Sindhu, P.S. <i>Practicals in Physical Chemistry</i> , Macmillan India : New Delhi, 2005. 2. Khosla, B. D. Garg, V. C.; Gulati, A. <i>Senior Practical Physical Chemistry</i> , R. Chand : New Delhi, 2011. 3. Gupta, Renu, <i>Practical Physical Chemistry</i> , 1st Ed.; New Age International : New Delhi, 2017. 4. J. B. Yadav, <i>Advanced Practical Physical Chemistry</i> , Goel Publishing House, 2001. 5. Venkateswaran, V, Veeraswamy, R. & Kulandivelu, A.R. <i>Basic Principles of Practical Chemistry</i> , Sultan Chand & Sons: New Delhi, 2 nd Ed., 1997.
Website and e-learning source	https://www.vlab.co.in/broad-area-chemical-sciences
Course Outcomes On completion of the course the students should be able to CO1: Describe the principles and methodology for the practical work. CO2: Explain the procedure, data and methodology for the practical work CO3: Apply the principles of phase rule and electrochemistry for carrying out the practical work CO4: Demonstrate laboratory skills for safe handling of the equipment and chemicals	

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	S	S	S
CO2	M	S	S	S	M	S	S	S	M	S
CO3	S	S	S	M	S	S	S	S	S	M
CO4	S	S	S	S	S	S	S	S	M	M

S – Strong, M – Medium, L– Low

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date: 16.04.2025

Title of the Course	BIOCHEMISTRY						
Course No.	Elective- I (DS)						
Category	Elective	Year Semester	III V	Credits	2	Course Code	26UCHDS EC1A
Instructional hours per week	Lecture 3	Tutorial -	Lab Practice -		Total 3		
Prerequisites	Organic Chemistry – I						
Objectives of the course	The course aims at providing knowledge on • relationship between biochemistry and medicine, composition of blood • structure and properties of amino acids, peptides, enzyme, vitamins and proteins • biological functions of proteins, enzymes, vitamins and hormones • biochemistry of nucleic acids and lipids metabolism of lipids						
Course Outline	UNIT I Logic of Living Organisms Relationship of Biochemistry and Medicine Blood - Composition of Blood, Blood Coagulation – Mechanism. Hemophilia and Sickle Cell Anaemia- Definition, Maintenance of pH of Blood – Bicarbonate Buffer, Acidosis, Alkalosis.						
	UNIT II Peptides and Proteins Amino acids – nomenclature, classification – essential and Nonessential; Synthesis - Gabriel Phthalimide, Strecker; properties – zwitter ion and isoelectric point, electrophoresis and reactions. Peptides – peptide bond – nomenclature – synthesis of simple peptides – solution and solid phase. Determination of structure of peptides, N-terminal analysis – Sanger’s & Edmann method; C-terminal analysis - Enzymic method. Proteins – classification based on composition, functions and structure; properties and reactions – colloidal nature, coagulation, denaturation, renaturation; colour tests for proteins; definition of structure of proteins – primary, secondary, tertiary and quaternary.						
	UNIT III Enzymes and Vitamins Nomenclature and classification, characteristics, factors influencing enzyme activity – mechanism of enzyme action – Lock and key hypothesis, Koshland’s induced fit model. Vitamins as coenzymes – functions of TPP, lipoic acid, NAD, NADP, FMN, FAD, folic acid, biotin, cyanocobalamin.						

	UNIT IV Nucleic Acids Components of nucleic acids - nitrogenous bases, structure of nucleosides and nucleotides, DNA- structure & functions; RNA – structure - functions; biosynthesis of proteins Hormones Adrenalin and thyroxine — chemistry, structure and functions (No structure elucidation).
	UNIT V Lipids Occurrence, biological significance of fats, classification of lipids. Simple lipids – Oils and fats, chemical composition, properties, reactions – hydrolysis, hydrogenation, trans-esterification, saponification, rancidity; analysis of oils and fats – saponification number, iodine number, acid value, R.M. value. Distinction between animal and vegetable fats. Compound lipids – Lipoproteins - VLDL, LDL, HDL, chylomicrons – biological significance. Cholesterol – occurrence, structure, test.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Bahl, B. S & Bhal, A. <i>A Textbook of Organic Chemistry</i>, 22nd Ed.; S. Chand: New Delhi, 2019. 2. Jain, M. K & Sharma, S.C. <i>Modern Organic Chemistry</i>, 7th Ed.; Vishal Publications: New Delhi, 2020. 3. Shanmugam, A. <i>Fundamentals of Biochemistry for Medical Students</i>, 6th Ed.; Published by the author, 1999. 4. Veerakumari, L. <i>Biochemistry</i>, 1st Ed.; MJP Publications: Chennai, 2004. 5. Jain, J. L.; <i>Fundamentals of Biochemistry</i>, 7th Ed.; S. Chand: New Delhi, 2016.

Reference Books	1. Conn, E. E.; Stumpf, P. K. <i>Outline of Biochemistry</i> , 5 th Ed.; Wiley Eastern: New Delhi, 2002. 2. West, E. S.; Todd, W. R.; Mason, H. S.; Van Bruggen, J. T. <i>Text Book of Biochemistry</i> , 4 th Ed.; Macmillan: New York, 2017. 3. Lehninger, A. L. <i>Principles of Biochemistry</i> , 8 th Ed.; CBS Publisher: Delhi, 2021. 4. Rastogi, S. C. <i>Biochemistry</i> , 2 nd Ed.; Tata McGraw-Hill: New Delhi, 2003. 5. Chatterjea, M. N & Shinde, R. <i>Textbook of Medical Biochemistry</i> , 5 th Ed.; Jaypee Brothers: New Delhi, 2002.
Website and e-learning source	1) http://library.med.utah.edu/NetBiochem/nucacids.html 2) http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/E/EnzymeKinetics.html 3) https://swayam.gov.in/courses/4384-biochemistry Biochemistry https://onlinecourses.nptel.ac.in/noc19_cy07/preview Experimental Biochemistry
Course Outcomes On completion of the course the students should be able to CO1: explain the molecular logic of living organisms, composition of blood and blood coagulation. CO2: discuss the synthesis and properties of amino acids and peptides, structure of peptides and proteins. CO3: summarize the factors influencing enzyme activity and vitamins as coenzymes. CO4: illustrate the structure and functions of nucleic acids and hormones. CO5: outline the properties and biological significance of lipids.	

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	M	S	S	M	S	S	S	S	S
CO3	S	M	S	S	M	S	S	S	S	S
CO4	S	S	S	S	M	S	S	S	S	S
CO5	S	S	S	S	M	S	S	S	S	S

S – Strong, M – Medium, L– Low

Level of Correlation between PO and CO

CO /PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date: 16.04.2025

Title of the Course	ADVANCED MATERIALS CHEMISTRY						
Course No.	ELECTIVE-I (DS)						
Category	Core	Year	III	Credits	2	Course Code	26UCHDSEC1B
		Semester	V				
Instructional hours per week	Lecture	Tutorial		Lab Practice		Total	
	3	-		-		3	
Prerequisites	General chemistry – I,II,III,IV						
Objectives of the course	The course aims at giving an overall view • To get a basic idea about crystal structure and its determination • To comprehend about electrolytes, conductors and insulators • To understand about the metallic glasses and biomaterials. • To get a basic idea for synthesis and characterisation of nanoparticles						
Course Outline	UNIT-I Crystal structure of solids Fundamental of lattices, unit cell, atomic coordinates, Bravais lattices, Types of close packing, packing efficiency, radius ratios; few important crystal structures. Synthesis of Inorganic solids; solid state, solution phase and vapor phase synthesis; precipitation, hydrothermal, sol-gel, surfactantbased synthesis.Growth of single crystals. Crystal structure determination by X-ray diffraction, d-spacing formula, symmetrically absent reflections, Multiplicities, Scattering of X-rays by an atom and a crystal. Single crystal and powder diffraction. Electro and neutron diffraction. Concept of reciprocal lattice. Electron microscopy techniques. UNIT-II Ionic conductivity and solid electrolytes Types of ionic crystals- alkali halides- alkali earth fluoride- simple stoichiometric oxides. Types of ionic conductors: Halide ion conductors- oxide ion conductors Solid electrolytes-Preparation by sol gel method- Applications. Crystal defects in solids-line and plane defects-point defects- Schottky and Frenkel defects. Electronic properties and band theory:metals,semiconductors-inorganic solids - colour, magnetic and optical properties. UNIT-III Electromagnetic materials Magnetic materials - types of magnetic materials -diamagnetism-paramagnetism, ferromagnetism. Ferrites: preparation and their applications in microwave-floppy disk-magnetic bubble memory and applications. Insulating material: Classification - on the basis of temperature- Blymer insulating materials and ceramic insulating materials. Ferro electric materials: Examples-applications of ferroelectrics.						

	UNIT-IV Metallic glasses and biomaterials Metallic glasses:- introduction- composition, properties and application. Shape memory alloys: Introduction- examples- application of SMA- advantages and disadvantages. Biomaterials: Introduction – metals and alloys in biomaterials- ceramic biomaterials, composite biomaterials- polymer biomaterials. UNIT-V Nanomaterials Nanomaterial fundamentals Synthesis: Bottom-up vs. Top-down Methods. Solution phase synthetic methods Synthesis of nanowires and nanotubes by CVD and MOCVD method. Nanomaterials Characterization: XRD of nanomaterials, Electron microscopy (SEM, TEM, HRTEM and EDX) of nanomaterials, Nanomaterial properties and applications: Magnetic properties of nanoparticles Magnetic nanoparticles as MRI contrast agents. Composite materials: Introduction- types.
Extended Professional Component (is a part of internal component only, not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved. (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. West, A. R., <i>Solid State Chemistry and its Applications</i>, 2nd Ed., John Wiley & Sons, 2014. 2. Raghavan, V.R., <i>Material Science and Engineering</i>, 6th Ed., Printice Hall India Ltd, 2015. 3. Klabunde, K.J., <i>Nanoscale Materials in Chemistry</i>, 2nd Ed., John Wiley and Sons, 2009.
Reference Books	1. Guo, Z., & Tan, L., <i>Fundamentals and Applications of Nanomaterials</i>, 1st Ed., London Publication, 2009. 2. Drago, R. S., <i>Physical Methods for Chemists</i>, 2nd Ed., Saunders College Publication, 2016.
Website and e-learning source	1. https://www.sciencedirect.com/topics/engineering/composite-materials 2. https://www.researchgate.net/publication/328273842_Sol-gel_processing_of_solid_electrolytes_for_li-ion_batteries
Course Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to CO1: explain the crystal structure and its parameters.	

CO2: outline the concepts of ionic conductivity, crystal defects and electronic properties
CO3: classify the types of electromagnetic materials and their application
CO4: describe about the metallic glasses and biomaterials
CO5: choose the suitable nanomaterials based on their applications

CO-PO mapping (Course Articulation matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	M	M	M	L	S	L	S
CO 2	S	S	S	M	M	S	M	M	M	S
CO 3	S	S	S	M	S	S	M	S	M	S
CO 4	S	S	S	M	S	S	M	S	S	S
CO 5	S	S	S	M	S	S	S	S	S	S

S – Strong, M – Medium, L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	13	15	15
Weighted percentage of Course Contribution to PSO	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date : 16.04.2025

Title of the Course	INDUSTRIAL CHEMISTRY						
Course No.	Elective- II (DS)						
Category	Elective	Year	III	Credits	2	Course Code	26UCHDS EC2A
		Semester	V				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	3	-	-		3		
Prerequisites	General Chemistry I,II, III and IV						
Objectives of the course	This course is designed to provide knowledge on • classifications and characteristics of fuels • preparation of cosmetics • manufacture of sugar, paper, cement and leather and food processing • applications of abrasives, lubricants and other industrial products • intellectual property rights						
Course Outline	UNIT I Survey of Indian Industries and mineral resources in India Fuels: Classification, characteristics of fuels. Solid fuels: coal - classification; analysis of coal- proximate analysis and ultimate analysis; calorific value-determination. Liquid fuels: Petroleum - characteristics; Gasoline aviation petrol-knocking in internal combustion engines, antiknock agents; unleaded petrol-octane number, cetane number. Gaseous fuel: advantages over solid and liquid fuels; water gas, producer gas, carburetted water gas - preparations - uses. Natural gas: LPG-composition, advantages, application; gobar gas-production, composition, advantages, application. Propellants – rocket fuels (basic idea)						
	UNIT II Cosmetics Skin care: powders, ingredients; creams and lotion-cleansing, moisturising, all purpose shaving cream, sunscreen. Dental care: tooth pastes – ingredients. Hair care: shampoos-types, ingredients; conditioners-types, ingredients. Perfumes: natural-plant origin-parts of the plant used, chief constituents; animal origin-ambergries and musk; synthetic-classification- esters-amylsalicylate alcohols- terpeneols- and nerol; ketones-muskone, coumarin; aldehydes-vanilin.						

	Soaps and Detergents Soaps-properties, manufacture of soap-batch process; types-transparent soap, toilet soap, and liquid soap – ingredients. Detergents-definition, properties-cleansing action; soapless detergents- anionic, cationic and non-ionic (general idea only); uses of detergents as surfactants. Biodegradability of soaps and detergents. UNIT III Sugar Industry Manufacture from sugar cane; recovery of sugar from molasses; testing and estimation of sugar. Food Preservation and processing Food spoilage – causes; Food preservation - methods – high temperature, low temperature, drying, radiation; Food additives – preservatives, flavours, colours, anti-oxidants, sweetening agents; hazards of using food additives; Food standards – Agmark and Codex alimentarius. UNIT IV Abrasives Definition, characteristics, types-natural and synthetic; natural abrasives – diamond, emery and quartz – composition, uses; synthetic abrasives – carborundum, aluminium carbide, boron carbide, boron nitride, synthetic graphite – composition and uses. Leather Industry Structure and composition of skin, hide; Manufacture of leather – pre- tanning process – curing, liming, beating, pickling; methods of tanning- vegetable, chrome – one bath, two bath process; finishing. Paper Industry Manufacture of pulp - mechanical, chemical processes; sulphate pulp, rag pulp; manufacture of paper- beating, refining, filling, sizing, colouring, calendaring; cardboard. UNIT V Lubricants Definition, classification-liquid, semi-solid, solid and synthetic; properties-viscosity index, flash point, cloud point, pour point, aniline point drop point; greases-properties, types; cutting fluids. Cement Industry Cement – types, raw materials; manufacture-wet process, constituent of cement, setting of cement; properties of cement-quality, setting time, soundness, strength; mortar, concrete, RCC; curing and decay of concrete.
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	Intellectual Property Rights Introduction to Intellectual Property Rights – Patents - Factors for patentability - Novelty, Non obviousness, Industrial applications - Patent offices in India: Trademark - Types of trademarks- Certification marks, logos, brand names, signatures, symbols and service marks
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Sharma, B.K. <i>Industrial Chemistry</i>, 9th Ed.; Goel Publishing House: Meerut, 1998. 2. Wilkinson, J.B.E. Moore, R.J. <i>Harry's Cosmetology</i>, 7th Ed.; Chemical Publishers : New York, 1982. 3. Alex V. Ramani, <i>Food Chemistry</i>, MJP publishers: Chennai, 2009. 4. Jayashree Ghosh, <i>Applied Chemistry</i>, S. Chand : New Delhi, 2006. 5. Srilakshmi, B. <i>Food Science</i>, 4th Ed.; New Age International Publication, 2005.
Reference Books	1. Jain, P.C.; Jain, M. <i>Engineering Chemistry</i>, 16th Ed.; Dhanapet Rai: Delhi, 1992 2. George Howard, <i>Principles and Practice of Perfumes and Cosmetics</i>, Stanley Theron, Cheltenham: UK, 1987. 3. Thankamma Jacob, <i>Foods, Drugs and Cosmetics - A Consumer Guide</i>, Macmillan : London, 1997. 4. Shankuntala Manay, N.; Shadaksharaswamy, M. <i>Food Facts and Principles</i>, 3rd Ed.; New Age Publication, 2008. 5. Neeraj Pandey, Khushdeep Dharni, <i>Intellectual Property Rights</i>, PHI Learning, 2014.
Website and e-learning source	1. http://www.sciencecases.org/irradiation/irradiation_notes.asp 2. http://discovery.kcpc.usyd.edu.au/9.5.5/ 3. https://www.wipo.int/about-ip/en/ 4. www.nptel.ac.in 5. http://swayam.gov.in

Course Outcomes**On completion of the course the students should be able to****CO1:** summarize the properties of fuels which include petroleum, water gas, natural gas and propellents**CO2:** outline the preparation, properties of cosmetic products, soaps and detergents.**CO3:** discuss about manufacture of sugar, food spoilages and food additives..**CO4:** explain properties of abrasives, manufacture of leather and paper.**CO5:** comprehend lubricants, cement and intellectual property rights.**CO-PO Mapping (Course Articulation Matrix)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

S – Strong, M – Medium, L– Low**Level of Correlation between PSO and CO**

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low**Board of Studies Date: 16.04.2025**

Title of the Course	TEXTILE CHEMISTRY						
Course No.	ELECTIVE-II (DS)						
Category	Core	Year	III	Credits	2	Course Code	26UCHDSEC2B
		Semester	V				
Instructional hours per week	Lecture	Tutorial		Lab Practice		Total	
	3	-		-		3	
Prerequisites	General Chemistry I, II, III, IV						
Objectives of the course	The course aims at giving an overall view - To gain knowledge about desirable properties of textile fibres - To offer the basic idea about the synthetic fibres. - To learn the principles of bleaching and dyeing.						
Course Outline	UNIT-I Vegetable fibres and animal fibres: Definition- classification of textile fibres- essential and desirable properties of textile fibres-physical and chemical properties, Jute- purification; physical and chemical properties of jute, silk and wool. UNIT-II Regenerated and synthetic fibres Rayon- different types of rayon and their sources- manufacture of viscose rayon- physical and chemical properties- acetate rayon- manufacture- properties, cuprammonium rayon- manufacture and properties. Manufacture -properties and uses of polyamides-polyester-polypropylene and polyacrylonitrile. UNIT-III Preparatory process prior to dyeing Sourcing: objectives of scouring-process of caustic scouring on open kier and closed kier machine with sine diagram, scouring with NaOH and Na₂CO₃- precautions to be taken before scouring. Desizing using						

	malt extract- merits and demerits of acid and enzyme desizing. Singeing- impurities present in grey cotton and cotton fabric- objects of singeing- process of singeing on gas- singeing machine- precautions to be taken during gas singeing. UNIT-IV Principles of bleaching Principles of wetting and mechanism of detergency- synthetic detergents- surface active agents-Bleaching processes- bleaching agents- H₂O₂, NaOCl, bleaching powder and bio-bleaching and their properties- bleaching of cotton, rayon, wool and synthetic fibres. UNIT-V Principle of dyeing Colour and chemical constitution- chromophore and auxochrome- natural and synthetic dyes- classification, synthesis of dye shift-congored, bismark brown and crystal violet, Theories of dyeing- effect of temperature and salt on dyeing- dyeing of wool, silk and polyesters- dyeing of cotton with reactive dyes- fastness properties- washing, light, rubbing and perspiration.
Extended Professional Component (is a part of internal component only, not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved. (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Shenai, V.A., <i>Textile fibres (Vol. 2)</i>, Mahajan Pubs, Ahmedabad. 2. Shenai, V.A., <i>Technology of bleaching</i>, Mahajan Pubs, Ahmedabad.

	3. Shenai, V.A., <i>Chemistry of Dyes and principles of dyeing (Vol.2)</i>, Mahajan Pubs, Ahmedabad. 4. Gopalakrishnan, R., <i>Textile fibres</i>, Mahajan Pubs, Ahmedabad.
Reference Books	Corbman B.P, <i>Fibre to fabric</i> , International Students Edition McGraw Hill Book Co., Singapore, 2000.
Website and e-learning source	1) http://eacharya.inflibnet.ac.in/data-server/eacharya-documents/53e0c6cbe413016f234436ed_INFIEP_8/10/ET/8_ENG-10-ET-V1-S1_lesson.pdf 2) https://www.textileschool.com/448/man-made-regenerated-cellulose-fibres
Course Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to CO1: classify the vegetable fibres and animal fibres CO2: summarise the manufacture, properties and uses of various polymeric fibres. CO3: explain the colour, chemical constituents of dyes and theories of dyeing. CO4: outline the process of pre-dyeing, bleaching and dyeing. CO5: analyse and explain the factors affecting dyeing	

CO-PO mapping (Course Articulation matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	M	M	M	L	S	L	S
CO 2	S	S	S	M	M	S	M	M	M	S
CO 3	S	S	S	M	S	S	M	S	M	S
CO 4	S	S	S	M	S	S	M	S	S	S
CO 5	S	S	S	M	S	S	S	S	S	S

S – Strong, M – Medium, L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	13	15	15
Weighted percentage of Course Contribution to PSO	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date : 16.04.2025

Title of the Course	ORGANIC CHEMISTRY - II						
Course No.	Core Course – XIII						
Category	Core	Year	III	Credits	3	Course Code	26UCHCC8
		Semester	VI				
Instructional hours per week	Lecture	Tutorial		Lab Practice		Total	
	4	1		-		5	
Prerequisites	Organic Chemistry – I						
Objectives of the course	This course aims at providing knowledge on • classification, isolation and discussing the properties of alkaloids and terpenes • preparation and properties of saccharides • different molecular rearrangements and special reagents • preparation and properties of organometallic compounds • principles and applications of greener synthesis						
Course Outline	UNIT-I Alkaloids Classification, isolation, general properties - Hofmann Exhaustive Methylation; Structure elucidation - Coniine, piperine, nicotine. Terpenes: Classification, Isoprene rule, isolation and structural elucidation of Citral, alpha terpineol, Menthol, Geraniol and Camphor.						
	UNIT-II Carbohydrates Definition and Classification of Carbohydrates with examples. Relative configuration of sugars. Determination of configuration (Fischer's Proof). Definition of enantiomers, diastereomers, epimers and anomers with suitable examples. Monosaccharides - configuration - D and L hexoses - aldohexoses and ketohexoses. Glucose, Fructose - Occurrence, preparation, properties, reactions, structural elucidation, uses. Interconversions of sugar series - ascending, descending, aldose to ketose and ketose to aldose. Disaccharides - sucrose, lactose, maltose - preparation, properties and uses (no structural elucidation). Polysaccharides - Source, constituents and biological importance of homo polysaccharides - starch and cellulose, hetero polysaccharides - hyaluronic acid, heparin.						

	UNIT-III Molecular rearrangements: Molecular Rearrangement: Type of rearrangements, Mechanism for Benzidine, Favorskii, Claisen, Fries, Hofmann, Curtius, Schmidt, Beckmann and Pinacol-pinacolone rearrangement. UNIT-IV Special reagents in organic synthesis AIBN, 9-BBN, BINAP/BINOL, BOC, DABCO, DCC, DIBAL, DMAP, NBS/NCS, NMP, PCC, TBHP, TEMPO. Organometallic compounds in Organic Synthesis Preparation, Properties and applications: Grignard Reagents, Organo Lithium Compounds, Ziegler -Natta, Wilkinson, Metal Carbonyl, Zeise's Salt. UNIT-V Green Chemistry: Principles, chemistry behind each principle and applications in chemical synthesis. Green reaction media - green solvents, green reagents and catalysts; tools used like microwave and ultra-sound in chemical synthesis.
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Extended Professional Component (is a part of internal component only, not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved. (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Jain M.K, Sharma S.C, <i>Modern Organic Chemistry</i>, Vishal Publishing Co., 2022. (for Unit I, II & III) 2. Mukherji, S.M. and Singh, S.P. <i>Reaction Mechanism in Organic Chemistry</i>, Macmillan India Ltd., 3rd Ed, 2009. (for Unit III) 3. Arun Bahl and Bahl B.S., <i>A Textbook of Organic Chemistry</i>, New Delhi, S. Chand & Company Pvt. Ltd., 22nd Ed, 2018. (for Unit I & II) 4. Soni P.L., and H. M. Chawla, <i>Text Book of Organic Chemistry</i>, Sultan Chand & Sons, New Delhi, 29th Ed, 2007. (for Unit II) 5. Bradford P. Mundy, Michael G. Eller, Frank G. Favaloro, Jr, A John Wiley & Sons, INC., Publication, 2005. (for Unit IV) 6. Bandyopadhyaya C; <i>An Insight into Green Chemistry</i>; Book and Allied Pvt. Ltd., 2020. (for Unit V)
Reference Books	1. Morrison R. T and Boyd R. N., <i>Organic Chemistry</i>, Pearson Education, Asia, 6th Ed, 2012. 2. Graham Solomons T. W., <i>Organic Chemistry</i>, John Wiley & Sons, 11th Ed, 2012. 3. Carey Francis A, <i>Organic Chemistry</i>, Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 7th Ed, 2009. 4. Finar I. L., <i>Organic Chemistry</i>, Vol. (1& 2), England, Wesley Longman Ltd, 6th Ed, 2006. 5. Joule J.A, and Smith G.F., <i>Heterocyclic Chemistry</i>, Wiley, 5th Ed, 2010.
Website and e-learning source	1. www.epgpathshala.nic.in 2. www.nptel.ac.in 3. http://swayam.gov.in 4. Virtual Textbook of Organic Chemistry 5. https://vlab.amrita.edu/

Course Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: explain classification, isolation and structural elucidation of alkaloids and terpenes.

CO2: discuss the classification, configuration, and chemical properties of carbohydrates.

CO3: describe the types and mechanisms of molecular rearrangements.

CO4: illustrate the applications of reagents and organometallic compounds in organic synthesis.

CO5: summarize the principles and applications of Green chemistry in organic synthesis.

CO-PO mapping (Course Articulation matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	M	M	S	S	S	S	S	S	S
CO 2	S	M	S	S	S	S	S	S	S	S
CO 3	S	S	S	S	S	S	S	S	S	S
CO 4	S	S	S	S	S	S	S	S	S	S
CO 5	S	M	S	S	S	S	S	S	S	S

S – Strong, M – Medium, L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to PSO	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date : 30.10.2025

Title of the Course	INORGANIC CHEMISTRY – II						
Course No.	Core Course – XIV						
Category	Core	Year	III	Credits	3	Course Code	26UCHCC9
		Semester	VI				
Instructional hours per week	Lecture	Tutorial		Lab Practice		Total	
	4	-		-		4	
Prerequisites	Inorganic Chemistry-I						
Objectives of the course	This course aims at providing knowledge on • essential and trace elements and their role in the biological system. • metal ion transport and storage • metalloenzymes and electron transport. • silicates and their applications • industrial applications of refractories, alloys, paints and pigments						
Course Outline	UNIT-I Bioinorganic Chemistry Essential and trace elements: Role of Na⁺, K⁺, Mg²⁺, Ca²⁺, Fe³⁺, Cu²⁺ and Zn²⁺ in biological systems. Effect of excess intake (Toxicity) of Metal ions – trace elements - As, Cd, Pb, Hg.						
	UNIT-II Metal ion transport and storage Iron - storage, transport - Transferrin and Ferritin; Iron-porphyrins - myoglobin, haemoglobin - oxygen transport - Bohr effect; Sodium/potassium pump, calcium pump; transport and storage - copper and zinc.						
	UNIT-III Metalloenzymes Isomerase and synthetases, structure of cyanocobalamin (Vitamin B12), Vitamin B-12 as transferase and isomerase, nature of Co-C bond; Metalloenzymes - zinc metalloenzyme-Carboxy peptidase -A and Carbonic anhydrase – functions, mechanism and uses, Zn-Cu enzyme - structure and function - Iron-sulphur proteins - 2Fe-2S - rubredoxin, 4Fe-2S - ferridoxin, Iron - sulphur cluster enzymes. Invivo and Invitro nitrogen fixation - biological functions of nitrogenase and molybdo enzymes.						

	UNIT-IV Silicates Introduction - general properties of silicates, structure – types of silicates - ortho silicates(zircon), pyrosilicates (thortveitite), chain silicates(pyroxenes), ring silicates(beryl), sheet silicates(talc, mica, asbestos), silicates having three dimensional structure (feldspars, zeolites, ultramarines)
	UNIT-V Industrial Applications of Inorganic Compounds Refractories, pyrochemical, explosives. Alloys, Paints and pigments - requirements of a good paint; classification, constituents of paints - pigments, vehicles, thinners, driers, extenders, anti-knocking agents, anti-skinning agents, plasticizers, binders-application; varnishes- oils, spirit; enamels. Nanocomposite Hydrogels: synthesis, characterization and uses. Industrial visits mandatory.
Extended Professional Component (is a part of internal component only, not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved. (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

Recommended Text	1. Asim K. Das, <i>Bioinorganic Chemistry</i> 2nd Ed. Books and allied (P) Ltd., 2020 (for Unit I, II & III) 2. Lippard S.J., Berg M.J., <i>Principles of Bioinorganic Chemistry</i>, 1st Ed., University Science Books 1994. (for Unit II & III) 3. Puri B. R., Sharma L. R., Kalia K. C <i>Principles of Inorganic Chemistry</i>, 31st Ed., Milestone Publishers & Distributors, Delhi. 2011. 4. Satya Prakash, Tuli G. D., Basu S. K., Madan R. D., <i>Advanced Inorganic Chemistry</i>, 18th Ed, S. Chand & Co., New Delhi 2009. 5. Lee J.D., <i>Concise Inorganic Chemistry</i>, 4th Ed., ELBS William Heinemann, London 1991. 6. Malik W. V. Tuli G. D., Madan R. D., <i>Selected Topics in Inorganic Chemistry</i>, S. Chand and Company Ltd. 2000 7. De A.K., <i>Text book of Inorganic Chemistry</i>, Wiley East Ltd, 7th Ed, 1992. 8. Sharma, B.K. Industrial Chemistry, 9th Ed.; Goel Publishing House: Meerut, 1998.(for Unit – V)
Reference Books	1. Madan R. D, Sathya Prakash, <i>Modern Inorganic Chemistry</i>, 2nd Ed., S.Chand and Company, New Delhi, 2011. (for Unit -IV) 2. Gopalan R, <i>Inorganic Chemistry for Undergraduates</i>, 1st Ed, University Press (India) Private Limited, Hyderabad 2009. 3. Sivasankar B, <i>Inorganic Chemistry</i>. 1st Ed, Pearson, Chennai (2013). 4. Alan G. Sharp <i>Inorganic Chemistry</i>, 3rd Ed, Addition- Wesley, England (1992). 5. Peter Atkins, Tina Overton, Jonathan Rourke and Mark Weller, <i>Inorganic Chemistry</i>, Oxford University Press, 6th Ed 2014.
Website and e-learning source	1. www.epgpathshala.nic.in 2. www.nptel.ac.in 3. http://swayam.gov.in
Course Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to CO1: express the importance of essential and trace elements on biological system CO2: analyse the metal ions transport and storage, Na, K, Ca pump. CO3: point out the function of Vitamin B12, Zn-Cu enzyme, and Fe-S clusters. CO4: Summarize the classification and structure of silicates. CO5: compile and assess the manufacture of refractories, explosives, paints and pigments.	

CO-PO mapping (Course Articulation matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	M	S	S	S	S	S	M	S	S
CO 2	S	S	S	S	S	S	S	M	S	S
CO 3	S	S	S	S	S	S	S	M	S	S
CO 4	S	S	S	S	S	S	S	M	S	S
CO 5	S	S	S	S	S	S	S	M	S	S

S – Strong, M – Medium, L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to PSO	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date : 30.10.2025

Title of the Course	PHYSICAL CHEMISTRY- II						
Course No.	Core Course – XV						
Category	Core	Year	III	Credits	3	Course	26UCHCC10
		Semester	VI			Code	
Instructional hours per week	Lecture	Tutorial		Lab Practice		Total	
	4	1		-		5	
Prerequisites	Physical Chemistry-I						
Objectives of the course	This course aims at providing an overall view of the • phase diagram of one and two component systems • chemical equilibrium, • separation techniques for binary liquid mixtures. • electrical conductance and transport number. • galvanic cells, EMF and significance of electrochemical series.						
Course Outline	UNIT-I Phase rule Definition of terms; derivation of phase rule ; application to one component systems - water and sulphur - super cooling, sublimation ; two component systems - solid liquid equilibria- simple eutectic (lead - silver), freezing mixtures (potassium iodide- water), compound formation with - congruent melting points (magnesium - zinc and ferric chloride - water system), peritectic change (sodium - potassium), copper sulphate - water system.						
	UNIT-II Chemical equilibrium Law of mass action - thermodynamic derivation - relationship between K_p and K_c - application to the homogeneous equilibria - dissociation of PCl_5 gas – equilibrium constant and degree of dissociation - formation of HI and NH_3 - heterogeneous equilibrium - decomposition of solid calcium carbonate - Lechatelier principle - van't Hoff reaction isotherm - temperature dependence of equilibrium constant - van't Hoff reaction isochore - Clayperon equation - Clausius Clayperon equation and its applications.						
	UNIT-III Binary liquid mixtures Ideal liquid mixtures - non ideal solutions - azeotropic mixtures - fractional distillation - partially miscible mixtures - phenol-water, triethylamine-water, nicotine-water - effect of impurities on critical solution temperature; immiscible liquids - steam distillation; Nernst distribution law - applications.						

	UNIT-IV Electrical Conductance and Transference Arrhenius theory of electrolytic dissociation - Ostwald's dilution law, limitations of Arrhenius theory; behavior of strong electrolytes – Debye Huckel theory - Onsager equation (no derivation), significance of Onsager equation, Debye Falkenhagen effect, Wien effect. Transport number - determination - Hittorf's method, moving boundary method - factors affecting transport number. Kohlrausch's law-applications; molar ionic conductance and viscosity (Walden's rule); applications of conductance measurements - determination of - degree of dissociation of weak electrolyte, dissociation constant of weak acid and weak base, ionic product of water, solubility and solubility product of sparingly soluble salts – conductometric titrations - acid base titrations.
	UNIT-V Galvanic Cells and Applications Galvanic cell, representation, reversible and irreversible cells, EMF and its measurement - standard cell; sign of EMF and spontaneity of a reaction, thermodynamics and EMF - calculation of ΔG, ΔH and ΔS from EMF data. Electrode potential, standard electrode potential, primary and secondary reference electrodes, Nernst equation for electrode potential and cell EMF; types of electrodes - metal/metal ion, metal amalgam/metal ion, metal, insoluble salt/anion, gas electrode, redox electrode; electrochemical series - applications of electrochemical series. Applications of EMF measurements applications of EMF measurements - determination of activity coefficient of electrolytes, transport number, valency of ions, solubility product, pH using hydrogen gas electrode and glass electrode, potentiometric titrations - acid base titrations, redox titrations, precipitation titrations, ionic product of water and degree of hydrolysis. Industrial component Galvanic cells- lead storage and Nickel-Cadmium batteries, Fuel cells – H_2-O_2 cell - efficiency of fuel cells.
Extended Professional Component (is a part of internal component only, not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved. (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

Recommended Text	1. Puri B. R and Sharma L.R., <i>Principles of Physical Chemistry</i>, ShobanLalNagin Chand and Co., 48th Ed, 2021. (for Unit I – V) 2. Bajpai D. N., <i>Advanced Physical Chemistry</i>, S.Chand&Co., 2001 (for Unit I) 3. ArunBahl, Bahl B.S, Tuli G. D., <i>Essentials of physical chemistry</i>, 28th Ed, S Chand & Co, 2019. (for Unit I – III)
Reference Books	1. Kapoor K. L., <i>A Textbook of Physical Chemistry</i>, Macmillan India Ltd, 3rd Ed, 2009. 2. Gilbert. W. Castellen, <i>Physical Chemistry</i>, Narosa Publishing House, 3rd Ed 1985. 3. Peter Atkins, and Julio de Paula, James Keeler, <i>Physical Chemistry</i>, Oxford University press, International 11th Ed, 2018. 4. Dogra S.K and Dogra S, <i>Physical Chemistry through Problems: New Age International</i>, 4th Ed. 1996.
Website and e-learning source	https://nptel.ac.in https://swayam.gov.in https://archive.nptel.ac.in/content/storage2/courses/112108150/pdf/PPTs/MTS_07_m.pdf https://www.youtube.com/watch?v=f0udxGcoztE Introduction to chemical equilibrium – MIT open course ware
Course Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to CO1: construct the phase diagram for one component and two component systems, explain the properties of freezing mixture, component with congruent melting points and Solid solutions. CO2: apply the concepts of chemical equilibrium and demonstrate important principles such as Le chatelier principle, van't Hoff reaction isotherm and Clausius-Clayperon equation. CO3: identify an appropriate distillation method for the separation of binary liquid mixtures, partially miscible mixtures and immiscible liquids. CO4: explain the significance of Arrhenius theory, Debye-Huckel theory, Onsager equation and Kohlrausch's law in conductance. CO5: construct electrochemical cell with the help of electrochemical series and calculate cell EMF and demonstrate the applications of EMF.	

CO-PO mapping (Course Articulation matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	S	S	S	S	S	M
CO 2	M	S	S	S	M	S	S	S	M	M
CO 3	S	S	S	M	S	S	S	S	S	S
CO 4	S	S	S	S	S	S	S	S	M	M
CO 5	S	M	S	S	S	S	S	S	M	S

S – Strong, M – Medium, L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to PSO	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date : 30.10.2025

Title of the Course	GRAVIMETRIC ESTIMATION - PRACTICAL						
Course No.	Core Course – XVI						
Category	Core	Year	III	Credits	3	Course	26UCHCCQ6
		Semester	VI			Code	
Instructional	Lecture	Tutorial		Lab Practice		Total	
hours per week	1	-		4		5	
Prerequisites	Theoretical knowledge on Analytical Chemistry						
Objectives of the course	This course aims at providing • basic principles of analytical chemistry experiments • hands on experience in carrying out the experiments						
Course Outline	1. Estimation of Barium as Barium sulphate 2. Estimation of Barium as Barium chromate 3. Estimation of Lead as Lead chromate 4. Estimation of Calcium as Calcium oxalate monohydrate 5. Estimation of Sulphate as Barium sulphate 6. Estimation of Chloride as Silver chloride 7. Estimation of Nickel as Nickel dimethyl glyoxime						
Extended Professional Component (is a part of internal component only, not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved. (To be discussed during the Tutorial hours)						
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.						

Reference Books	1. Venkateswaran, V.; Veeraswamy, R.; Kulandivelu, A.R. <i>Basic Principles of Practical Chemistry</i>, 2nd ed.; Sultan Chand & Sons: New Delhi, 1997. 2. Thomas, A.O., Mani, P.K., Text Book of Practical Chemistry for B.Sc. Main Students, Scientific Publications, Cannanoor. 3. Vogel's Text book of Inorganic Qualitative Analysis, 4th Ed., ELBS, London.
Website and e-learning source	https://www.vlab.co.in/broad-area-chemical-sciences
Course Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to CO1: Describe the principles and concepts for the practical work. CO2: Explain the procedure, data and methodology for the practical work CO3: Apply the principles for carrying out the practical work CO4: Demonstrate laboratory skills for safe handling of the equipment and chemicals	

CO-PO mapping (Course Articulation matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	S	S	S	S	S	S
CO 2	M	S	S	S	M	S	S	S	M	M
CO 3	S	S	S	M	S	S	S	S	S	S
CO 4	S	S	S	S	S	S	S	S	M	M
CO 5	S	M	S	S	S	S	S	S	M	S

S – Strong, M – Medium, L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to PSO	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date : 30.10.2025

Title of the Course	FUNDAMENTALS OF SPECTROSCOPY						
Course No.	ELECTIVE-III						
Category	Core	Year	III	Credits	3	Course Code	26UCHDSE C3A
		Semester	VI				
Instructional hours per week	Lecture	Tutorial		Lab Practice		Total	
	4	1		-		5	
Prerequisites	General Chemistry I, II, III and IV						
Objectives of the course	This course is designed to provide knowledge on • electrical and magnetic properties of organic and inorganic compounds • basic principles of microwave, UV-Visible, infrared, Raman, NMR and Mass spectrometry • instrumentation of microwave, UV-Visible, infrared, Raman, NMR and Mass spectrometry • applications of various spectral techniques in structural elucidation • solving combined spectral problems						
Course Outline	UNIT-I Electrical and Magnetic properties of molecules Dipole moment - polar and nonpolar molecules - polarisability of molecules.Magnetic permeability, volume susceptibility, mass susceptibility and molar susceptibility; diamagnetism, paramagnetism - determination of magnetic susceptibility using Guoy balance, ferromagnetism, anti ferromagnetism Microwave spectroscopy Rotation spectra - diatomic molecules (rigid rotator approximation) selection rules - determination of bond length, effect of isotopic substitution - instrumentation and applications.						
	UNIT-II Ultraviolet and Visible spectroscopy Electronic spectra of diatomic molecules (Born Oppenheimer approximation) - vibrational coarse structure - rotational fine structure of electronic vibration transitions - Frank Condon principle - dissociation in electronic transitions - Pre-dissociation energy - Types of electronic transistions: $\sigma - \sigma^*$, $\pi - \pi^*$, $n - \sigma^*$ and $n - \pi^*$ transitions - chromophore, auxochrome, bathochromic shift and hypsochromic shifts, applications						

	UNIT-III Infrared spectroscopy Vibrational spectra - principles - modes of vibrations - diatomic, triatomic linear (CO₂) and non- linear triatomic (H₂O) molecules - selection rules - stretching and bending vibrations - applications - determination of force constant, moment of inertia and inter nuclear distance - application of IR spectra to simple organic and inorganic molecules - (group frequencies). Raman Spectroscopy Rayleigh scattering and Raman scattering of light - Raman shift - Stokes and Antistokes lines - selection rules - mutual exclusion principle - instrumentation (block diagram) - applications - differences between IR and Raman spectroscopy.
	UNIT-IV Nuclear magnetic resonance spectroscopy: PMR - theory of PMR - instrumentation - number of signals - chemical shift - peak areas and proton counting - spin-spin coupling - coupling constant - shielding and deshielding of protons, chemical shifts of protons in hydrocarbons and in simple monofunctional organic compounds; spin-spin splitting of neighbouring protons in vinyl and allyl systems
	UNIT-V Mass spectrometry Principle - different kinds of ionisation - instrumentation - the mass spectrum - types of ions - molecular ion peak, base peak, meta stable peak, isotopic peak - fragmentation and their types - McLafferty rearrangement; Retro Diels Alder reaction - illustrations with simple organic molecules. Solving structure elucidation problems using multiple spectroscopic data (NMR, MS, IR and UV-Vis).
Extended Professional Component (is a part of internal component only, not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved. (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

Recommended Text	1. Gopalan, R.; Subramaniam, P. S.; Rengarajan, K. <i>Elements of Analytical Chemistry</i>; 3rd Ed, S Chand: New Delhi, 2003. (for Unit I to V) 2. Wahid U. Malik, G. D. Tuli, R. D. Madan, <i>Selected Topics in Inorganic Chemistry</i>, S. Chand and Company Limited, New Delhi, 8th Ed., 2014. (for Unit – I) 3. Banwell, C.N.; Mc Cash, E. M. <i>Fundamentals of Molecular Spectroscopy</i>, 4th ed.; Tata McGraw Hill, New Delhi, 2017. (for Unit I & II) 4. Sharma Y. R, <i>Elementary Organic Spectroscopy</i>, 4th Ed, S. Chand & Company Ltd, New Delhi 2009. (for Unit II to V) 5. Dash U. N, <i>Analytical Chemistry Theory and Practice</i>, Sultan Chand & Sons, 2nd Ed., 2005 (for Unit III to V)
Reference Books	1. Srivastava, A. K.; Jain, P. C. <i>Chemical Analysis an Instrumental Approach</i>, 3rd Ed.; S.Chand, New Delhi, 1997. 2. Robert D Braun. <i>Introduction to Instrumental Analysis</i>; Mc.Graw Hill: New York, 1987. 3. Skoog, D. A.; Crouch, S. R.; Holler, F.J.; West, D. M. <i>Fundamentals of Analytical Chemistry</i>, 9th Ed.; Harcourt college Publishers: USA, 2013. 4. Madan, R. L.; Tuli, G. D. <i>Physical Chemistry</i>, 2nd Ed.; S.Chand: New Delhi, 2005. 5. Puri, B. R.; Sharma, L. R.; Pathania, M.S. <i>Principles of Physical Chemistry</i>, 43rd ed.; Vishal Publishing: Delhi, 2008. 6. B.K.Sharma, <i>Spectroscopy</i>, 22nd ed., Goel Publishing House, 2011.
Website and e-learning source	1. http://vallance.chem.ox.ac.uk/pdfs/SymmetryLectureNotes2004.pdf 2. http://chemistry.rutgers.edu/undergrad/chem207/SymmetryGroupTheory.html 3. www.epgpathshala.nic.in 4. www.nptel.ac.in 5. http://swayam.gov.in
Course Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to CO1: summarize magnetic properties of materials and microwave spectroscopy CO2: apply selection rules to understand spectral transitions and calculate the wavelength maximum. CO3: discuss theory, instrumentation and applications of Infrared and Raman spectroscopy CO4: describe theory, instrumentation and applications of NMR spectroscopy CO5: explain theory, instrumentation and applications of Mass spectrometry	

CO-PO mapping (Course Articulation matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	S	S	S	S	S	S
CO 2	S	S	S	S	S	S	S	S	S	S
CO 3	S	S	S	M	S	S	S	M	S	S
CO 4	S	S	S	S	S	S	S	S	S	S
CO 5	S	M	S	S	S	S	S	M	S	S

S – Strong, M – Medium, L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to PSO	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date : 30.10.2025

Title of the Course	NANOSCIENCE						
Course No.	ELECTIVE-III						
Category	Core	Year	III	Credits	3	Course Code	26UCHDSE C3B
		Semester	VI				
Instructional hours per week	Lecture	Tutorial		Lab Practice		Total	
	4			-		4	
Prerequisites	Basics knowledge in Physics and Chemistry						
Objectives of the course	This course aims at providing knowledge on • introduction to nanoparticles/clusters and nanocomposites • properties of nanomaterials • characterization of nanomaterials by different methods • synthesis of carbon nanotubes, graphene, quantum dots, selfassembled nanomaterials • applications of nanomaterials as sensors						
Course Outline	UNIT-I Introduction to nanoscience Definition of terms - nanoscience, nanoparticles, clusters, quantum dots, nanostructures and nanocomposites. Electron behaviour in free space, bulk material and nanomaterials. Synthesis and stabilization of nanomaterials - Top down approach (physical methods), mechanical dispersion - ball milling, methods based on evaporation of a precursor-inert gas condensation. Bottom-up approach (chemical methods) - solvothermal synthesis, sol-gel method. Nanomaterials via chemical routes- solvents reducing agents, capping agents - stabilization of nanoparticles - electrostatic and steric stabilization, common stabilizers.						
	UNIT-II Properties of materials on a nanoscale Optical properties of metal and semiconductor nanomaterials- surface Plasmon resonance (SPR), surface enhanced Raman spectra (SERS), quantum confinement effect, tuning of optical spectrum. Magnetic properties - Fe₃O₄ particle, supra magnetic properties, electronic properties, Chemical properties- chemical process on the surface of nanoparticles, catalysis, mechanical properties.						

	UNIT-III Techniques employed for characterisation of nanomaterials Spectroscopy - UV-visible, Photoelectron spectroscopy - Electron microscopy - Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Scanning probe microscopy (SPM) - Atomic Force Microscopy (AFM), Scanning Tunneling Microscopy (STM), Optical microscopy - confocal microscopy, X-ray diffraction (XRD) [Principle and Block diagram only].
	UNIT-IV Special nanomaterials Carbon Nano Structures - Carbon nanotubes: Introduction - types - zigzag, armchair, helical, synthesis by CVD, Functionalization of Carbon Nanotubes, Reactivity of Carbon Nanotubes. Other Important Carbon based materials: Preparation, properties and applications of Fullerene and Graphene. Semiconductor nanoparticles: Quantum dots, synthesis - chemical synthesis using clusters, properties, porous silicon - electrochemical etching, aerogel - types - silica aerogel, resorcinol formaldehyde (RF) aerogels - applications. Selfassembled Nanomaterials: Self Assembled Monolayers (SAMS) - inorganic, organic molecules.
	UNIT-V Application of nanomaterials Biomedical Applications- drug, drug delivery, biolabelling, artificial implants, cancer treatment. Sensors - Natural nanoscale sensors, chemical sensors, biosensors, electronic noses. Optics & Electronics - Nanomaterials in the next generation computer technology, high definition TV, flat panel displays, quantum dot laser, single electron transistors [SET]. Nanotechnology in agriculture - Fertilizer and pesticides nanomaterials for water purification, nanomaterials in food and packaging materials, fabric industry. Impacts of Nanotechnology - human & environmental safety risks.
Extended Professional Component (is a part of internal component only, not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved. (To be discussed during the Tutorial hours)

Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Sulabha K. Kulkarni, <i>Nanotechnology: Principles and Practices</i>, Capital Publishing Co., New Delhi. (for Unit I) 2. Pradeep. T, <i>Nano: The Essentials, Understanding Nanoscience and Nanotechnology</i>; Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007. (for unit – III) 3. Shah. M.A.; Tokeer Ahmad, <i>Principles of Nanoscience and Nanotechnology</i>; Narosa Publishing House, New Delhi, 2010. (for unit – I & II) 4. Murthy. B.S; Shankar. P, Baldev Raj.; Rath. B.B. James Murday, <i>Textbook of Nanoscience and Nanotechnology</i>; Universities press, India Ltd ,Hyderabad. 2012. (for unit – IV & V)
Reference Books	1. Sharma. P.K., <i>Understanding Nanotechnology</i>; Vista International Publishing House, Delhi. 2008. 2. Charles P. Poole Jr.; Frank J. Owens. <i>Introduction to Nanotechnology</i>; A John Wiley & Sons, INC., Publication, 2003. 3. Viswanathan B., <i>Nano Materials</i>; Narosa Publishing House, New Delhi, 2009. 4. Edited by C.N.R. Rao; Müller.A; Cheetham. A.K. <i>Nanomaterials Chemistry Recent Developments and New Directions</i>, WILEY-VCH Verlag GMBH & Co., KGaA, Darmstad. 5. Jing Zhong Zhang, <i>Optical properties and spectroscopy of Nanomaterials</i>; World Scientific Publishing Pvt. Ltd., Singapore.
Website and e-learning source	1) http://www.nanotechnology.com/docs/wtd015798.pdf 2) http://nccr.iitm.ac.in/Nanomaterials.pdf
Course Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to CO1: explain the general concepts and physical phenomena of relevance within the field of nanoscience. CO2: describe the properties, synthesis, characteristics of nanomaterials, special nanomaterials and applications. CO3: examine the structure, properties, applicability and characterization of nanomaterials. CO4: analyze various synthesis procedures, characterizations and uses of carbon nanotubes, fullerene and graphene CO5: discuss applications of nanomaterials of sensors and in optics and electronics	

CO-PO mapping (Course Articulation matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	S	S	S	S	S	S
CO 2	S	S	S	S	S	S	S	S	S	S
CO 3	S	S	S	S	S	S	S	S	S	S
CO 4	S	S	S	S	S	S	S	S	M	M
CO 5	S	M	S	S	S	S	S	S	M	S

S – Strong, M – Medium, L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to PSO	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date : 30.10.2025

Title of the Course	PHARMACEUTICAL CHEMISTRY						
Course No.	ELECTIVE-IV						
Category	Core	Year	III	Credits	3	Course Code	26UCHDSE C4A
		Semester	VI				
Instructional hours per week	Lecture	Tutorial		Lab Practice		Total	
	4					4	
Prerequisites	Knowledge on active chemical compounds and Biochemistry						
Objectives of the course	The course aims at providing an overall view of • drugs design and drug metabolism • important Indian medicinal plants, common diseases and antibiotics • drugs for major diseases like cancer, diabetes and AIDS • analgesics and antipyretic agents • significance of clinical tests						
Course Outline	UNIT-I Introduction Important terminologies - drug, pharmacognosy, pharmacy, pharmacology, pharmacodynamics, pharmacokinetics, clinical pharmacology, pharmacotherapeutics, chemotherapy, toxicology, pharmacophore, antimetabolites, mutation, bacteria, virus, fungi, actinomycetes, vaccines, pharmacopeia, posology and therapeutic index. Sources of drugs - dosage forms - bio availability - routes of administration - absorption, distribution and elimination of drugs - drug metabolism - prescription terms. Structure and pharmacological activity Effect of - unsaturation, chain length, isomerism; groups - halogens amino, nitro, nitrite, cyano, acidic, aldehydic, keto, hydroxyl and alkyl groups.						

	UNIT-II Indian medicinal plants Some important Indian medicinal plants - tulsi, neem, kizhanelli, mango, semparuthi, adadodai, turmeric and thoothuvalai - uses. Common diseases and their treatment Causes, prevention and treatment of the following diseases: Insect borne diseases - malaria, filariasis, plague; Water borne diseases - cholera, typhoid, dysentery. Digestive system - jaundice; Respiratory system – asthma; Nervous system - epilepsy. Antibiotics Definition - classification - structure and therapeutic uses of chloramphenicol, penicillins, structure activity relationship of chloramphenicol; therapeutic uses of ampicillin, streptomycin, Erythromycin.
	UNIT-III Drugs for major diseases Cancer - common causes - chemotherapy - anti neoplastic agents - classification - adverse effects of cytotoxic agents; alkylating agents - chlorambucil; anti metabolites - methotrexate, fluorouracil; Vinca alkaloids - vincristine, vinblastine. Diabetes - types - management of diabetes - insulin; oral hypoglycemic agents - sulphonyl ureas - chlorpropamide; biguanides - metformin - thiazolidinediones. Cardiovascular drugs - cardio glycosides; antihypertensive drugs - Aldomet, pentolinium tartarate; AIDS - causes, symptoms and prevention - anti HIV drugs - AZT, DDC.
	UNIT-IV Analgesics and antipyretic agents Classification - action of analgesics - narcotic analgesics - morphine; synthetic analgesics - pethidine, methadone; antipyretic analgesics - salicylic acid derivatives, indolyl derivatives. Anaesthetics Definition, characteristics, classification - general anaesthetics - volatile anaesthetics - nitrous oxide, ethers, cyclopropane, chloroform, halothane, trichloro ethylene - storage, advantages and disadvantage; non volatile anaesthetics - thiopental sodium; local anaesthetics - requisites - advantages- esters - cocaine, benzocaine; amides. Blood and haematological agents Blood - composition, grouping - physiological functions of plasma proteins - mechanism of clotting; Coagulants - vitamin K, protamine sulphate, dry thrombin; Anti coagulants - coumarins, citric acid and heparin; antifibrinolytic agents, Anaemia - causes, types and control - anti anaemic drugs.

	UNIT-V Clinical Chemistry Blood tests - blood count - complete haemotogram - Hb, RBC, GTT, TC, DC, platelets, PCV, ESR; bleeding and clotting time - glucose tolerance test. Significance of Clinical Tests Serum electrolytes - blood Glucose - orthotoluidine method; Renal functions tests - blood urea, creatinine; liver function tests - serum proteins, albumin globulin ratio, serum bilirubin, enzymes SGOT, SGPT; lipid profile - cholesterol, triglycerides, HDL, LDL, coronary risk index. Urine examination - pH, tests for glucose, albumin and bile pigment.
Extended Professional Component (is a part of internal component only, not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved. (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Jayashree Ghosh, <i>A text book of pharmaceutical chemistry</i>, 2nd Ed., S.Chand& company, New Delhi. 1991 (for Unit I – V) 2. Lakshmi S, <i>Pharmaceutical chemistry</i>, 3rd ed., Sultanchand& sons, Delhi. 2004 (for Unit I & II) 3. Patrick G, <i>An introduction to Medicinal Chemistry</i>, Oxford university press, United Kingdom, 5th Ed 2013. (for Unit I & II) 4. Ashutosh Kar, <i>Medicinal chemistry</i>, 7th ed., New age international (P) Limited, Publishers, New Delhi. 2018 (for Unit II – IV)
Reference Books	1. Chatwal G R, <i>Pharmaceutical chemistry</i>, inorganic (vol-I) 6th Ed ., Himalaya publishing house, Bombay. 2013 2. Chatwal G R, <i>Pharmaceutical chemistry</i>, organic (vol-II), Himalaya publishing house, Bombay,1991. 3. Tripathi K D, <i>Essentials of medical pharmacology</i>, 8th Ed., Jaypee brothers medical publishers (P) Limited, New Delhi. 2018.

Website and e-learning source	http://www.pharmacy.umaryland.edu/faculty/amackere/courses/phar531_delete/lectures/qsar_1.pdf 2. http://www.indianmedicinalplants.info/ 3. https://www.wipo.int/about-ip/en/
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Course Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: define key pharmaceutical terminologies and describe the fundamental principles of pharmacological activity, clinical chemistry, haematology, therapeutic drugs and their applications in disease treatment.

CO2: discuss drug development, disease types, physicochemical properties of therapeutic agents, significance of medicinal plants and clinical tests.

CO3: apply principles of drug design, haematological agents and their functions, clinical parameter estimations and therapeutic application of drugs for major diseases.

CO4: explain the classification and significance of drugs such as analgesics, anaesthetics, antipyretics, antibiotics, cardiovascular agents and anti-HIV drugs.

CO5: explain the significance of clinical tests like blood urea, serum proteins and coronary risk index.

CO-PO mapping (Course Articulation matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	S	S	S	S	S	M
CO 2	M	S	S	S	M	S	S	S	M	M
CO 3	S	S	S	M	S	S	S	S	S	M
CO 4	S	S	S	S	S	S	S	S	M	M
CO 5	S	M	S	S	S	S	S	S	M	S

S – Strong, M – Medium, L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to PSO	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date : 30.10.2025

Title of the Course	POLYMER SCIENCE						
Course No.	ELECTIVE-IV						
Category	Core	Year	III	Credits	3	Course Code	26UCHDSE C4B
		Semester	VI				
Instructional hours per week	Lecture	Tutorial		Lab Practice		Total	
	4					4	
Prerequisites	Knowledge on functional groups and reaction mechanisms						
Objectives of the course	The course aims at providing an overall view of • classification of polymers, preparation of polymers • kinetics of polymerization and characterization of polymers • reactions of polymers • speciality polymers like PVC, PMMA						
Course Outline	UNIT-I Introduction Difference between polymer and macromolecule - classification - synthetic and natural, organic and inorganic, thermoplastic and thermosetting. Plastics, elastomers, fibres and liquid resins. Techniques of polymerization Bulk, solution, emulsion and suspension polymerization						
	UNIT-II Kinetics of polymerization Kinetics of condensation and addition polymerisation; ionic, free radical, copolymerisation and coordination polymerisation - reactivity ratios - block and graft copolymers. Characterisation of polymers Appearance, feel and hardness, density, effect of heat, solubility, combustion, tensile strength, shear, stress, impact strength, mechanical, thermomechanical and rheological properties of polymers in viscoelastic state.						

	UNIT-III Molecular Weight and Properties of Polymers Molecular Weight of Polymers-Number Average and Weight Average, Molecular Weight Distribution, Determination of Molecular Weight polydispersity index - membrane and vapour phase osmometry, light scattering - Zimm plot, ultracentrifuge - sedimentation velocity and sedimentation equilibrium - viscometry - gel permeation chromatography Thermal properties of polymers - Glass Transition Temperature-State of Aggregation and State of Phase Transitions, Factors Influencing Glass Transition Temperature and its importance.
	UNIT-IV Reactions of Polymers-Hydrolysis, Acidolysis, Aminolysis, Addition and Substitution Reactions (One Example Each) Cyclisation, Cross-Linking and Reactions of Specific Functional Groups in the Polymer. Polymer technology Processing of polymers - casting, thermoforming, moulding - extrusion, compression, blow moulding - foaming, lamination, reinforcing - processing of fibres - melt, wet and dry spinning.
	UNIT-V Speciality polymers Poelectrolytes, conducting polymers, polymeric supports for solid phase synthesis, biomedical polymers, liquid crystalline polymers, electroluminescent polymers - two examples of each of these polymers. Polyethylene, PVC, PMMA, polyester; rubber - synthetic and natural, vulcanisation of rubber. Polymer Degradation Types of Degradation - Thermal, Mechanical, Ultra Sound, Photo Radiation and Chemical Degradation Methods. Rubber-Natural and Synthetic-Structure, Mechanism of Vulcanisation Biodegradable and Non-Biodegradable Polymers.
Extended Professional Component (is a part of internal component only, not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved. (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

Recommended Text	1. Gowariker V.R, N.V. Viswanthan and Jayadev Sreedhar. <i>Polymer Science</i> . New Delhi: New Age International, 2015 (Unit I, II & V) 2. Misra G.S. <i>Introductory Polymer Chemistry</i> . New Delhi: Wiley Eastern, 2010. (for Unit II & III) 3. Bahadur P and Sastry N V. <i>Principles of Polymer Science</i> . New Delhi: Narosa Publishing House, 2005 (for Unit IV) 4. Ahluwalia, V.K. Anuradha Mishra, <i>Polymer Science A Text Book</i> , Ane Books India: New Delhi, 2008. (for Unit I)
Reference Books	1. Billmeyer, F.W. <i>Polymer Science</i> . India: Wiley-Interscience, 2007. 2. Seymour, R. B.; Carraher Jr.C.E. <i>Polymer Chemistry: An Introduction</i> , Marcel Dekker Inc : New York, 1981. 3. Sinha, R. <i>Outlines of Polymer Technology</i> , Prentice Hall of India: New Delhi, 2000. 4. Joel R. Fried, <i>Polymer Science and Technology</i> , 3rd Ed.; Prentice Hall of India: New Delhi, 2014.
Website and e-learning source	https://polymerdatabase.com 2. http://amrita.vlab.co.in/?sub=2&brch=190&sim=603&cnt=1 3. http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/polymers.htm 4. http://nsdl.niscair.res .

Course Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: explain classification of polymers, elastomers, fibres and liquid resins

CO2: explain addition and condensation polymerization, mechanical properties of polymers

CO3: determine the molecular weight of polymers, and explain the thermal properties of polymers.

CO4: explain reactions of polymers and polymer processing.

CO5: discuss speciality polymers like PVC, PMMA, rubbers, biodegradable polymers

CO-PO mapping (Course Articulation matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	S	S	S	M	S	M
CO 2	M	S	S	S	M	S	S	M	M	M
CO 3	S	S	S	M	S	S	S	M	S	M
CO 4	S	S	S	S	S	S	S	M	M	M
CO 5	S	M	S	S	S	S	S	M	M	S

S – Strong, M – Medium, L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to PSO	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date : 30.10.2025

Title of the Course	COMPUTER APPLICATIONS IN CHEMISTRY – PRACTICAL						
Course No.	Professional Competency Course						
Category		Year	III	Credits	2	Course Code	26UCHPCSQ
		Semester	VI				
Instructional hours per week	Lecture	Tutorial		Lab Practice		Total	
	-	-		2		2	
Prerequisites	Fundamental knowledge in computer						
Objectives of the course	This course aims at giving hands on skills in • internet • applications of Chemdraw and Chem 3D software • literature collection • spreadsheet for creating graph • structural search online resources • Cheminformatics • AI tools						
Course Outline	UNIT-I6 Hours Internet & E-mail Internet: Uniform Resource Locator (URL)-Web browsing- Search Engines (Yahoo, Google, Google Scholar etc.)- Utilizing popular websites in Chemistry; On-line literature survey- Accessing of e-journals. Electronic mail: Introduction-Working of E-Mail - Mailing Basics – Composing and sending of an E-Mail- Address book – Signature- File Attachments. UNIT-II6 Hours Cheminformatics Definition- Basic concepts- Representation of molecules in SMILES notation- Structure to SMILES and SMILES to Structure interconversion- Applications of Cheminformatics. UNIT III6 Hours Chemdraw and Chem 3D Software in Chemistry Introduction- Tool Pallets- Construction of the molecule using Chemdraw- Tools- Manipulating a molecule-Model display- Display type- Structure displays- Molecular Surface display- NMR simulation and interpretation- Naming IUPAC- Structure and Name interconversions -Converting structures from Chemdraw to Chem 3D. UNIT-IV6 Hours MS-Excel Spread sheet Introduction of spread sheet, formulas and functions, Applications - Creating basic graphs, Charting, Titration curves using Excel, Plotting Kinetics curves. UNIT-V6 hours Online Resources and AI tools Google forms, docs, slides, sheets; Structural search through Chemspace, Chems sketch, Chemspider, Pubchem sketch resources, Reaction flash app, Chemintelligence and SwissADME.						

Recommended Text	1. Joseph Billo. E., <i>Excel for Chemists A Comprehensive Guide</i> , 3 rd Ed., John Wiley & Sons, Inc., Hoboken, New Jersey, 2011.
Reference Books	1. Leach, Andrew R, and Valerie J Gillet. <i>An Introduction to Chemoinformatics</i> . Dordrecht ; Springer Dordrecht, 2007.
Website and e-learning source	1. https://edu.gcfglobal.org/en/email101/introduction-to-email/1/ 2. http://media.cambridgesoft.com/support/manuals/16/ChemDrawHelp.pdf 3. http://mason.gmu.edu/~sslayden/Chem350/manual/docs/chem3d-pro10.pdf 4. https://chem.hbcse.tifr.res.in/web-resources/ 5. https://chemintelligence.com/ai-for-chemistry 6. https://www.swissadme.ch/
Course Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to CO1: utilize search engine for accessing chemistry resources and effective email writing skills employing web resources CO2: Apply the concepts of cheminformatics in molecular representation CO3: Employ various tools of Chemdraw and simulate NMR spectra for compounds CO4: Utilize excel for basic operations relating to chemistry CO5: Acquire hands on experience in online chemistry resources and AI tools	

CO-PO mapping (Course Articulation matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	M	S	S	S	S	M	M	S	S	S
CO 2	M	S	S	S	S	M	M	S	M	S
CO 3	M	S	S	S	S	M	M	S	S	S
CO 4	M	S	S	S	S	M	M	S	M	S
CO 5	M	S	S	S	S	M	M	S	M	S

S – Strong, M – Medium, L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to PSO	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date : 30.10.2025