

**ARULMIGU PALANIANDAVAR ARTS COLLEGE FOR WOMEN
PALANI.**

(AUTONOMOUS)

Re- ACCREDITED WITH B⁺⁺ GRADE BY NAAC

(AFFILIATED TO MOTHER TERESA WOMEN'S UNIVERSITY, KODAIKANAL)

PG DEPARTMENT OF CHEMISTRY

SYLLABI

FOR

B.Sc CHEMISTRY

EXTRA CREDIT COURSES

&

VALUE ADDED COURSES

UNDER

CHOICE BASED CREDIT SYSTEM

2023- 2024 ONWARDS

SYLLABI PRESCRIBED BY,

TAMILNADU STATE COUNCIL FOR HIGHER EDUCATION

CHENNAI – 600 005

ARULMIGU PALANIANDAVAR ARTS COLLEGE FOR WOMEN, PALANI
PG DEPARTMENT OF CHEMISTRY
B.Sc., CHEMISTRY / TANSCHÉ PRESCRIBED SYLLABUS / 2023 – 2024 ONWARDS
CREDIT DISTRIBUTION

Sem I	C	H	Sem II	C	H	Sem III	C	H	Sem IV	C	H	Sem V	C	H	Sem VI	C	H
1.1. Part I Tamil	3	6	2.1. Part..II Tamil	3	6	3.1. Part..I Tamil	3	6	4.1. Part..I Tamil	3	6	5.1 Core CC IX Organic Chemistr y - I	4	5	6.1 Core CC XIII Organic Chemistry - II	3	5
1.2. Part. II English	3	6	2.2. Part. II English	3	6	3.2. Part. II English	3	6	4.2. Part. II English	3	6	5.2 Core CC X Inorganic Chemistr y - I	4	5	6.2 Core CC XIV Inorganic Chemistry - II	3	5
1.3 Core CC I General Chemist ry I	5	5	2. 3 Core CC III General Chemistr y II	5	5	3.3 Core CC V General Chemist ry III	4	4	4.3 Core CC VII General Chemist ry IV	5	5	5. 3. Core CC XI Physical Chemistr y – I	4	5	6.3 Core CC XV Physical Chemist ry - II	3	5
1.4 Core CC II Quantit ative Inorgani c Estimati on (Titrim etry) And Inorgani c Prepara tion (Practic al)	4	4	2.4 Core CC IV Qualitati ve Organic Analysis and Preparatio n of Organic Compound s (Practical)	4	4	3.4 Core CC VI Qualitat ive Inorgani c Analysis (Practic al)	4	4	4.4 Core CC VIII Physical Chemist ry (Practic al - I)	4	3	5. 4. Core CC XII (Project with viva- voce) 1. Project (Individu al)	4	5	6.4 Core Course XVI / CC XVI Physical Chemist ry Practical II	3	3
1.5 Elective I (Generic/ Disciplin e Specific) Allied – Maths / Zoology	4	5	2.5 Elective II (Generic/ Discipline Specific) Allied – Maths / Zoology	4	5	3.5 Elective III (Generic/ Disciplin e Specific) Allied – for Physics, Botany & Zoology.	4	5	4.5 Elective IV (Generic/ Disciplin e Specific) Allied – for Physics, Botany & Zoology.	4	5	5.5 Elective V (Generic/ Discipline Specific) Biochemis try or Water Treatment and Analysis	3	4	6.5 Elective VII (Generic/ Discipline Specific) Fundamen tals of Spectrosc opy or Polymer Science	3	5
1.6 Skill Enhance ment Course SEC-I (Non-	2	2	2.6 Skill Enhancem ent Course SEC-II (Non-	2	2	3.6 Skill Enhance ment Course SEC - IV (Entrepre	2	2	4.6 Skill Enhance ment Course SEC - VI Instrum	2	2	5.6 Elective VI (Generic/ Discipline Specific) Industrial	3	4	6.6. Elective VIII (Specific Elective) Pharmace utical	3	5

major Elective)			Dairy Chemistr y			neural Skill) Entrepreneurial Skills in Chemist ry			ental Methods of Chemical Analysis			y or Petro Chemistr y			Chemistr y or Nano Science		
Food Chemist ry																	
1.7 Skill Enhance ment - (Foundat ion Course) Role of Chemist ry in Daily Life	2	2	2.7 Skill Enhanceme nt Course SEC- III Cosmetics and Personal Care Products	2	2	3.7 Skill Enhance ment Course SEC – V Pesticide Chemist ry	2	2	4.7 Skill Enhance ment Course SEC – VII Forensic Science	2	2	5.7 Value Educatio n	2	2	6.8 (Profession al Competenc y Skill) Chemistry for Competitiv e Examinati ons	2	2
						3.8 Environ mental Science	-	1	4.8 Environ mental Science	2	1	5.8 Summer Internshi p /Industria l Training, Field Visit	2	-	6.67 Extension Activity	1	-
	23	30		23	30		22	30		25	30		26	30		21	30
Total – 140 Credits																	

B.Sc., CHEMISTRY / COURSE DESCRIPTION

SEMESTER – I							
Part	Course Type	Courses	Credits	Hrs	Exam Duration	Marks	
						CIA	Ext
Part I	Language – Tamil	Tamil	3	6	3	25	75
Part II	English	English	3	6	3	25	75
Part-III	Core Course - I CC - I	General Chemistry I	5	5	3	25	75
	Core Course – II CC - II	Quantitative Inorganic Estimation (Titrimetry) and Inorganic Preparation (Practical)	4	4	3	25	75
	Generic ‘ Elective I	Allied – Maths (or)	4	5	3	25	75
		Allied – Zoology Theory	2	3	3	25	75
		Allied - Zoology Practical	2	2	3	25	75
Part IV	Skill Enhancement Course SEC-I (NME)	Food Chemistry			3	25	75
			2	2			
	Skill Enhancement Foundation Course	Role of Chemistry in Daily Life	2	2	3	25	75
Total Hours and Credits			23	30			

SEMESTER – II							
Part	Course Type	Courses	Credits	Hrs	Exam Duration	CIA	Ext
Part I	Language – Tamil	Tamil	3	6	3	25	75
Part II	English	English	3	6	3	25	75
Part III	Core Course III CC III	General Chemistry II	5	5	3	25	75
	Core Course IV CC IV	Qualitative Organic Analysis and Preparation of Organic Compounds (Practical)	4	4	3	25	75
	Generic Elective II	Allied – Maths (or)	4	5	3	25	75
		Allied – Zoology Theory	2	3	3	25	75
		Allied - Zoology Practical	2	2	3	25	75
Part IV	Skill Enhancement Course SEC II (NME)	Dairy Chemistry	2	2	3	25	75
	Skill Enhancement Course SEC III	Cosmetics and Personal Care Products	2	2	3	25	75
Total Hours and Credits			23	30			

SEMESTER – III							
Part	Course Type	Courses	Credits	Hrs	Exam Duration	CIA	Ext
Part I	Language – Tamil	Tamil	3	6	3	25	75
Part II	English	English	3	6	3	25	75
Part III	Core Course V	General Chemistry III	4	4	3	25	75
	Core Course VI	Qualitative Inorganic Analysis (Practical)	4	4	3	25	75
	Generic Elective III	Allied Chemistry for Physics, Botany & Zoology. Theory Allied Practical	4	5	3	25	75
			2	3	3	25	75
			2	2			
Part IV	Skill Enhancement Course SEC IV	Entrepreneurial Skills in Chemistry	2	2	3	25	75
	Skill Enhancement Course SEC V	Pesticide Chemistry	2	2	3	25	75
	EVS	Environmental Science	-	1	-	-	-
Total Hours and Credits			22	30			
SEMESTER – IV							
Part	Course Type	Courses	Credits	Hrs			
Part I	Language – Tamil	Tamil	3	6	3	25	75
Part II	English	English	3	6	3	25	75
Part III	Core Course VII	General Chemistry IV	5	5	3	25	75
	CC VII						
	Core Course VIII	Physical Chemistry (Practical - I)	4	3	3	25	75
	CC VIII						
Part IV	Generic Elective IV	Allied Chemistry for Physics, Botany & Zoology. Theory Allied Practical	4	5			
			2	3	3	25	75
			2	2	3	25	75
	Skill Enhancement Course SEC VI	Instrumental Methods of Chemical Analysis	2	2	3	25	75
	Skill Enhancement Course SEC VII	Forensic Science	2	2	3	25	75
	EVS	Environmental Science	2	1	3	25	75
Total Hours and Credits			25	30			

SEMESTER – V							
Part	Course Type	Courses	Credits	Hrs	Exam Duration	CIA	Ext
Part III	Core Course IX CC IX	Organic Chemistry - I	4	5	3	25	75
	Core Course X CC X	Inorganic Chemistry - I	4	5	3	25	75
	Core Course XI CC XI	Physical Chemistry – I	4	5	3	25	75
	Core Course XII CC XII	Project with Viva Voce (Individual)	4	5	3	25	75
	Specific Elective V EC5	Biochemistry or Water Treatment and analysis	3	4	3	25	75
	Specific Elective VI EC6	Industrial Chemistry or Petro Chemistry	3	4	3	25	75
Part IV	Value Education	Value Education	2	2	3	25	75
	Summer Internship /Ind. Training/Field Visit		2	-	-	-	-
Total Hours and Credits			26	30			
SEMESTER – VI							
Part	Course Type	Courses	Credits	Hrs	Exam Duration	CIA	Ext
Part III	Core Course XIII / CC XIII	Organic Chemistry - II	3	5	3	25	75
	Core Course XIV / CC XIV	Inorganic Chemistry - II	3	5	3	25	75
	Core Course XV / CC XV	Physical Chemistry – II	3	5	3	25	75
	Core Course XVI / CC XVI	Physical Chemistry Practical II	3	3	3	25	75
	Specific Elective VII EC7	Fundamentals of Spectroscopy or Polymer Science	3	5	3	25	75
	Specific Elective VIII	Pharmaceutical Chemistry or Nano Science	3	5	3	25	75

	EC VIII						
Part IV	Skill Enhancement Course Professional Competency	Chemistry for Competitive Examinations	2	2	3	25	75
	Extension Activity	Extension Activity NCC/NSS/YRC/Physical Education	1	-			
Total Hours and Credits			21	30			
Grand Total			140	180			

INTRODUCTION

Chemistry is the study of composition and transformation of matter. A science that is central to energy production, healthcare, new material development for electronics and other applied fields and environmental protection. Bachelor's degree in Chemistry is the culmination of in-depth knowledge of Inorganic, Organic and Physical chemistry and specialized courses such as Pharmaceutical Chemistry, spectroscopy, Nanoscience, Forensic Science, Cosmetics & Personal Grooming, Food chemistry, Dairy Chemistry and soon. Thus, this programme helps learners in building a solid foundation for higher studies in Chemistry. The hands on experience the students gain in Practicals enable them 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 pressing problems that mankind is facing today. They can interpret data and present their findings to both scientific community and laymen and have ability to work as a team and evolve to become an entrepreneur.

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, Forensic Science etc... They have employability opportunities in public and private sector jobs in energy, pharmaceutical, Food, cosmetic industries etc...

LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK GUIDELINES BASED REGULATIONS FOR UNDER GRADUATE PROGRAMME

Programme:	B.Sc. Chemistry
Programme Code:	
Duration:	3 Years (UG)
Programme Outcomes:	<p>1: Disciplinary knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study</p> <p>2: Communication Skills: Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.</p> <p>3: Critical thinking: Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.</p> <p>4: Problem solving: Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.</p> <p>5: Analytical reasoning: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.</p> <p>6: Research-related skills: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation</p> <p>7: Cooperation/Team work: Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team</p> <p>PO8: Scientific reasoning: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.</p> <p>PO9: Reflective thinking: Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society.</p> <p>PO10 Information/digital literacy: Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.</p> <p>PO 11 Self-directed learning: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.</p> <p>PO 12 Multicultural competence: Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.</p>

	<p>PO 13: Moral and ethical awareness/reasoning: Ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstrating the ability to identify ethical issues related to one's work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.</p> <p>PO 14: Leadership readiness/qualities: Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way.</p> <p>PO 15: Lifelong learning: Ability to acquire knowledge and skills, including „learning how to learn“, that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.</p>
Programme Specific Outcomes:	<p>On successful completion of Bachelor of Physics with Computer Applications programme, the student should be able to:</p> <p>PSO1: Disciplinary Knowledge: Understand the fundamental principles, concepts, and theories related to physics and computer science. Also, exhibit proficiency in performing experiments in the laboratory.</p> <p>PSO2: Critical Thinking: Analyse complex problems, evaluate information, synthesize information, apply theoretical concepts to practical situations, identify assumptions and biases, make informed decisions and communicate effectively</p> <p>PSO3: Problem Solving: Employ theoretical concepts and critical reasoning ability with physical, mathematical and technical skills to solve problems, acquire data, analyze their physical significance and explore new design possibilities.</p> <p>PSO4: Analytical & Scientific Reasoning: Apply scientific methods, collect and analyse data, test hypotheses, evaluate evidence, apply statistical techniques and use computational models.</p> <p>PSO5: Research related skills: Formulate research questions, conduct literature reviews, design and execute research studies, communicate research findings and collaborate in research projects.</p> <p>PSO6: Self-directed & Lifelong Learning: Set learning goals, manage their own learning, reflect on their learning, adapt to new contexts, seek out new knowledge, collaborate with others and to continuously improve their skills and knowledge, through ongoing learning and professional development, and contribute to the growth and development of their field.</p>

Consolidated Semester wise and Component wise Credit distribution

Parts	SemI	SemII	SemIII	Sem IV	SemV	SemVI	Total Credits
PartI	3	3	3	3	-	-	12
PartII	3	3	3	3	-	-	12
PartIII	11	11	11	11	22	18	84
PartIV	6	6	5	8	4	2	31
PartV	-	-	-	-	-	1	1
Total	23	23	22	25	26	21	140

Methods of Evaluation		
Internal Evaluation	Continuous Internal Assessment Test	25 Marks
	Assignments	
	Seminars	
	Attendance and Class Participation	
External Evaluation	End Semester Examination	75 Marks
	Total	100 Marks
Methods of Assessment		
Recall(K1)	Simple definitions, MCQ, Recall steps, Concept definitions	
Understand/ Comprehend (K2)	MCQ, True/False, Short essays, Concept explanations, Short summary or Overview	
Application (K3)	Suggest idea/ concept with examples, Suggest formulae, Solve problems, Observe, Explain	
Analyze(K4)	Problem – solving questions, Finish a procedure in many steps, Differentiate	
	Between various ideas, Map knowledge	
Evaluate(K5)	Longer essay/Evaluation essay, Critique or justify with pros and cons	
Create(K6)	Check knowledge in specific core based situations, Discussion, Debating or Presentations	

	<p>UNIT-III: Structure and bonding-I</p> <p>Ionicbond</p> <p>Lewis dot structure of ionic compounds; properties of ionic compounds; Energy involved in ionic compounds; Born Haber cycle – lattice energies, Madelung constant; salvation energy; Ion polarisation – polarising power and polarizability; Fajans’ rules - effects of polarisation on properties of compounds.</p> <p>Covalentbond</p> <p>Shapes of orbitals, overlap of orbitals–σ and Π bonds; -hybridization; VSEPR theory - shapes of molecules of the type AB_2, AB_3, AB_4, AB_5, AB_6 and AB_7</p> <p>.</p>
	<p>UNIT-IV: Structure and bonding-II</p> <p>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</p> <p>orbitals, bond order; MO diagrams of H_2, C_2, O_2, N_2, NO, HF_2 and CO; comparison of VB and MO theories.</p> <p>Coordinate bond: Definition, Formation of BF_3, NH_3, NH_4^+, H_3O^+ properties</p> <p>Metallic bond-electron sea model, VB model; Band theory-mechanism of conduction in solids; conductors, insulator, semiconductor–types, applications of semiconductors</p> <p>Weak Chemical Forces - Vander Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interactions, Instantaneous dipole-induced dipole interactions. Hydrogen bonding – Types.</p>
	<p>UNIT-V:</p> <p>Basic concepts in Organic Chemistry and Electronic effects</p> <p>Types of bond cleavage – heterolytic and homolytic; reagents and substrates; types of reagents-electrophiles, nucleophiles, free radicals; reaction intermediates–carbanions, carbocations, carbenes.</p> <p>Inductive effect - reactivity of alkyl halides, acidity of halo acids, electromeric effects.</p> <p>Resonance–resonance energy, conditions for resonance-acidity of phenols, basicity of aromatic amines, stability of carbonium ions, carbanions and free</p>

	radicals, reactivity of vinyl chloride, Hyper conjugation-stability of alkenes, Types of organic reactions- addition, substitution, elimination and rearrangements
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 and 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	<ol style="list-style-type: none"> 1. Madan, R.D. and Sathya Prakash, <i>Modern Inorganic Chemistry</i>, 2nd ed., S. Chand and Company: New Delhi, 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>, 38th ed., Vishal Publishing Company: Jalandhar, 2002. 4. Bruce, P. Y. and Prasad K. J. R. <i>Essential Organic Chemistry</i>, Pearson Education: New Delhi, 2008. 5. Dash UN, Dharmarha OP, Soni P. L. <i>Textbook of Physical Chemistry</i>, Sultan Chand & Sons: New Delhi, 2016
Reference Books	<ol style="list-style-type: none"> 1. Maron, S. H. and Prutton C. P. <i>Principles of Physical Chemistry</i>, 4th ed., The Macmillan Company: New York, 1972. 2. Lee, J. D. <i>Concise Inorganic Chemistry</i>, 4th ed., ELBS William Heinemann: London, 1991. 3. Gurudeep Raj, <i>Advanced Inorganic Chemistry</i>, 26th ed., Goel Publishing House: Meerut, 2001. 4. Atkins, W. & Paula, J. <i>Physical Chemistry</i>, 10th ed., Oxford University Press: New York, 2014. 5. Huheey, J. E. <i>Inorganic Chemistry: Principles of Structure and Reactivity</i>, 4th ed., Addison, Wesley Publishing Company: India, 1993.
Website and e-learning source	<ol style="list-style-type: none"> 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 Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to	
CO1: explain the atomic structure, wave particle duality of matter, periodic properties bonding, and properties of compounds.	
CO2: classify the elements in the periodic table, types of bonds, reaction intermediates electronic effects in organic compounds, types of reagents.	
CO3: apply the theories of atomic structure, bonding, to calculate energy of a spectral transition, Δx , Δp electronegativity, percentage ionic character and bond order.	
CO4: evaluate the relationship existing between electronic configuration, bonding, geometry of molecules and reactions; structure reactivity and electronic effects	
CO5: construct MO diagrams, predict trends in periodic properties, assess the properties of elements, and explain hybridization in molecules, nature of H – bonding and organic reaction mechanisms.	

	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

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

Level of Correlation between PSO's and CO's

Title of the Course	Quantitative Inorganic Estimation (titrimetry) and Inorganic Preparations						
PaperNo.	CoreII						
Category	Core	Year	I	Credits	2	Course Code	
		Semester	I				
Instructional Hours per week	Lecture	Tutorial	LabPractice		Total		
	-	-	3		3		
Pre requisites	Higher secondary chemistry						
Objectives of the course	<p>This course aims at providing knowledge on</p> <ul style="list-style-type: none"> laboratory safety handling glasswares Quantitative estimation Preparation of inorganic compounds 						
Course Outline	<p>Unit I</p> <p>Chemical Laboratory Safety in Academic Institutions</p> <p>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 ofoperation; chemical waste and safe disposal.</p> <p>Common Apparatus Used in Quantitative Estimation (Volumetric)</p> <p>Description and use of burette, pipette, standard flask, measuring cylinder, conical flask, beaker, funnel, dropper, clamp, stand, wash bottle, watch glass,wiregauge and tripod stand.</p> <p>Principle of Quantitative Estimation (Volumetric)</p> <p>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.</p> <p>Unit II</p> <p>Quantitative Estimation (Volumetric)</p> <p>Preparation of standard solution, dilution from stock solution</p> <p>Permanganometry</p> <p>Estimation of sodium oxalate using standard ferrous ammonium sulphate</p>						

	<p>Dichrometry Estimation of ferric alum using standard dichromate (external indicator) Estimation of ferric alum using standard dichromate (internal indicator)</p> <p>Iodometry Estimation of copper in copper sulphate using standard dichromate</p> <p>Argentimetry Estimation of chloride in barium chloride using standard sodium chloride/ Estimation of chloride in sodium chloride (Volhard's method)</p>
	<p>Unit III Complexometry Estimation of hardness of water using EDTA</p> <p>Estimations Estimation of iron in iron tablets Estimation of ascorbic acid.</p> <p>Preparation of Inorganic compounds- Potash alum Tetraammine copper(II)sulphate Hexammine cobalt(III)chloride Mohr's Salt</p>
Skills acquired From this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Venkateswaran,V.; Veeraswamy,R.; Kulandivelu,A.R. <i>Basic Principles of Practical Chemistry</i>, 2nded.; Sultan Chand & Sons: New Delhi, 1997. 2. Nad,A.K.; Mahapatra,B.; Ghoshal,A.; <i>Anadvanced course in Practical Chemistry</i>, 3rded.; New Central Book Agency: Kolkata, 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	<p>Web References:</p> <ol style="list-style-type: none"> 1)http://www.federica.unina.it/agraria/analytical-chemistry/volumetric-analysis 2)https://chemdictionary.org/titration-indicator/
<p>Course Learning Outcomes (for Mapping with Pos and PSOs)</p> <p>On successful completion of the course the students should be able to</p> <p>CO1:explain the basic principles involved in titrimetric analysis and inorganic preparations.</p> <p>CO2:compare the methodologies of different titrimetric analysis.</p> <p>CO3:calculate the concentrations of unknown solutions in different ways and develop the skill to estimate the amount of a substance present in given solution.</p> <p>CO4:assess the yield of different in organic preparations and identify the end point of various titrations.</p>	

	Unit-II Food Poison Food poisons- natural poisons (alkaloids-nephrotoxin)-pesticides, (DDT, BHC, Malathion)- Chemical poisons- First aid for poison consumed victims.
	UNIT-III Food Additives 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 Beverages- soft drinks- soda-fruit juices-alcoholic beverages- examples. Carbonation-addiction to alcohol–diseases of liver and social problems.
	UNIT-V Edible Oils Fats and oils- Sources of oils- production of refined vegetable oils-preservation.Saturated and unsaturated fats - iodine value - role of MUFA and PUFA in preventing heart diseases- determination of iodine value, RM value, saponification values and their significance.
Recommended Text	1. Food chemistry, H.K.Chopra, P.S.Panesar, Narosa publishing house, 2010. 2. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S.Chand & Co. Publishers, second edition, 2006. 3. Food chemistry, H.K.Chopra, P.S.Panesar, Narosa publishing house, 2010. 4. Food Chemistry, Dr.L.Rakesh Sharma, Evincepub publishing, 2022. 5. Food processing and preservation, G.Subbulakshmi, Shobha A Udipi, Padmini S Ghugre, Newage international publishers, second edition, 2021.
Reference Books	1. H.D.Belitz, Werner Grosch, Food Chemistry Springer Science & Business Media, 4 th Edition, 2009. 2. M.Swaminathan, 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. Food Chemistry, H.-D.Belitz, W.Grosch, P.Schieberle, Springer, fourth revised and extended edition, 2009. 5. Principles of food chemistry, John M.deMan, John W.Finley, W.Jefferey Hurst, Chang Yong Lee, Springer, Fourth edition, 2018.
Website and	

E - learning source	
Course Learning Outcomes (for Mapping with Pos and PSOs) On completion of the course the students should be able to CO1: learn about Food adulteration- contamination of Wheat, Rice, Milk, Butter. CO2: get an awareness about food poisons likenatural poisons (alkaloids nephrotoxin) pesticides, DDT, BHC, Malathion CO3: get an exposure on food additives, artificial sweeteners, Saccharin, Cyclamate and Aspartate in the food industries. CO4: acquire knowledge on beverages, soft drinks, soda, fruit juices and alcoholic beverages examples. CO5: study about fats and oils- Sources of oils- production of refined vegetable oils-preservation. Saturated and unsaturated fats– MUFA and PUFA	

	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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

Title of the Course	ROLE OF CHEMISTRY IN DAILY LIFE						
Paper No.	SEC-I						
Category	NME	Year	I	Credits	2	Course Code	
		Semester	I				
Instructional Hours per week	Lecture	Tutorial	Lab Practice		Total		
	2	-	-		2		
Pre requisites	Higher secondary chemistry						
Objectives of the course	<p>This course aim providing an overall view of the</p> <ul style="list-style-type: none"> • Importance of Chemistry in everyday life • Chemistry of building materials and food • Chemistry of Drugs and pharmaceuticals 						
Course Outline	UNIT-I <p>General survey of chemicals used in everyday life. Air- components and their importance; photosynthetic reaction, air pollution, green - house effect. Water-Sources of water, qualities of potable water, soft and hard water, methods of removal of hardness.</p>						
	Unit-II <p>Building materials - cement, ceramics, and glass - definition, composition and application only. Plastics-polythene, PVC, bakelite, polyesters, - preparation and uses only.</p>						
	UNIT-III <p>Food and Nutrition - Carbohydrates, Proteins, - definition and their importance as food constituents – balanced diet – Calories minerals and vitamins (sources and their physiological importance). Cosmetics – toothpaste, soaps and detergents, shampoos, perfumes –general formulation and preparations.</p>						
	UNIT-IV <p>Chemicals in food production–fertilizers-need, natural sources; urea, and super phosphate. Fuel – classification - solid, liquid and gaseous; nuclear fuel examples and uses.</p>						
	UNIT-V <p>Pharmaceutical drugs – analgesics and antipyretics - paracetamol and aspirin. Colour chemicals - pigments and dyes - examples and applications.Explosives - classification and examples.</p>						

Recommended Text	1. Food chemistry, H. K. Chopra, P. S. Panesar, Narosa publishing house, 2010. 2. A Textbook of pharmaceutical chemistry by Jayashree Ghosh, S Chand publishing, 2012. 3. S. Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006. 4. B. K. Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014. Introduction to forensic chemistry, Kelly M. Elkins, CRC Press Taylor & Francis Group, 2019. 5. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S. Chand & Co. Publishers, Second edition, 2006.
Reference Books	1. Randolph. Norris Shreve, Chemical Process Industries, McGraw-Hill, Texas, fourth edition, 1977. 2. W. A. Poucher, Joseph A. Brink, Jr. Perfumes, Cosmetics and Soaps, Springer, 2000. 3. A. K. De, Environmental Chemistry, New Age International Public Co., 1990.
Website and e-learning source	
<p>Course Learning Outcomes (for Mapping with Pos and PSOs) On Completion of the course the students should be able to</p> <p>CO1 : learn about the chemicals used in everyday life as well as air pollution and water pollution.</p> <p>CO2: get knowledge on building materials cement, ceramics, glass and plastics, polythene, PVC Bakelite, polyesters,</p> <p>CO3: acquire information about Food and Nutrition .Carbohydrates, Proteins, Fats Also have an awareness about Cosmetics Toothpastes, face powder, soaps and detergents.</p> <p>CO4: discuss about the fertilizers like urea, NPK fertilizers and superphosphate. Fuel classification solid, liquid and gaseous; nuclear fuel-examples and uses</p> <p>CO5 : have idea about the pharmaceutical drugs analgesics and antipyretics like paracetamol and aspirin and also about pigments and dyes and its applications.</p>	

	<p>Lewis concept; Relative strengths of acids and bases dissociation constant; dissociation of poly basic acids, of water, pH scale, pH of solutions; Degree of dissociation, common ion effect, factors affecting degree of dissociation; acid base indicators, theory of acid base indicators – action of phenolphthalein and methyl orange -use of acid base indicators; Buffer solutions – types, Henderson - Hasselbalch 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;</p>
	<p>Unit-II</p> <p>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_2CO_3, alkaline earth metals. Anomalous behavior of Be.</p> <p>Chemistry of p-Block Elements (Group 13 & 14) Preparation and structure of diborane and borazine. Extraction of Al and its uses. Comparison of carbon with silicon – Preparation, properties, structure and uses Percarbonates, permono carbonates and perdicarbonates.</p>
	<p>UNIT-III</p> <p>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, and HN_3. Chemistry of PH_3, PCl_3, PCl_5, P_2O_5 and oxyacids of phosphorous (H_3PO_3 and H_3PO_4).</p> <p>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 – Oxyacids of sulphur (Caro's and Marshall's acids).</p> <p>Chemistry of Halogens: General characteristics of halogen with reference to electro-negativity, electronegativity, 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), pseudohalogens [$(\text{CN})_2$ and $(\text{SCN})_2$].</p> <p>Noble gases : Position in the periodic table. Preparation, properties and Structure of XeF_2, XeF_4, XeF_6 and XeOF_4; uses of noble gases.</p>

	<p>UNIT-IV</p> <p>Hydrocarbon Chemistry-I Petroproducts : Fractional distillation of petroleum; cracking ,isomerisation, alkylation, reforming and uses</p> <p>Alkenes-Nomenclature, general methods of preparation–Mechanism of β-elimination reactions – E_1 and E_2 mechanism – stereochemistry–orientation–Hofmann and Saytzeff rules.Reactions of alkenes – addition reactions – mechanisms – Markownikoff’s rule, oxidation reactions – hydroxylation, oxidative degradation, epoxidation and ozonolysis</p> <p>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 – polymerisation – poly butadiene, polyisoprene(naturalrubber),vulcanisation,polychloroprene.</p> <p>Alkynes Nomenclature; general methods of preparation, properties and reactions; acidic nature of terminal alkynes and acetylene, polymerization and isomerisation.</p> <p>Cycloalkanes: Nomenclature, Relative stability of cycloalkanes,Bayer’sstrain theory and its limitations .Conformational analysis of cyclohexane, mono and disubstituted cyclohexanes. Geometrical isomerism in cyclohexanes.</p>
	<p>UNIT-V</p> <p>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.Monosubstituted and disubstituted benzene—orientation and reactivity.</p> <p>Polynuclear Aromatic hydrocarbons: Naphthalene – nomenclature, Haworth synthesis; physical properties, reactions – electrophilic substitution reaction , nitration, sulphonation, halogenation, Friedel – Crafts acylation & alkylation,preferential substitution at -position–reduction,oxidation–uses. Anthracene – synthesis by Elbs reaction, Diels – Alder reaction and Haworth synthesis; physical properties;</p>
Extended Professional Component(is a Part of internal	<p>Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminations UPSC/JAM/TNPSCotherstobesolved (TobediscussedduringtheTutorialhours)</p>

Component only, Not to be included in the external examination Question paper)	
Skills acquired From this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	<ol style="list-style-type: none"> 1. Madan RD, Sathya Prakash, (2003), Modern Inorganic Chemistry, 2nd ed., S. Chand and Company, New Delhi. 2. Sathya Prakash, Tuli G D, Basu S K and Madan R D, (2003), Advanced Inorganic Chemistry, 17th ed., S. Chand and Company, New Delhi. 3. Bahl BS, Arul Bhal, (2003), Advanced Organic Chemistry, 3rd ed., S. Chand and Company, New Delhi. 4. Tewari KS, Mehrotra SN and Vishnoi NK, (1998), Textbook of Organic Chemistry, 2nd ed., Vikas Publishing House, New Delhi. 5. Puri BR, Sharma LR, (2002), Principles of Physical Chemistry, 38th ed., Vishal Publishing Company, Jalandhar.
Reference Books	<ol style="list-style-type: none"> 1. Maron SH and Prutton CP, (1972), Principles of Physical Chemistry, 4th ed., The Macmillan Company, New York. 2. Barrow GM, (1992), Physical Chemistry, 5th ed., Tata McGraw Hill, New Delhi. 3. Lee JD, (1991), Concise Inorganic Chemistry, 4th ed., ELBS William Heinemann, London. 4. Huheey JE, (1993), Inorganic Chemistry: Principles of Structure and Reactivity, 4th ed., Addison Wesley Publishing Company, India. 5. Gurudeep Raj, (2001), Advanced Inorganic Chemistry Vol-I, 26th ed., Goel Publishing House, Meerut. 6. Agarwal OP, (1995), Reactions and Reagents in Organic Chemistry, 8th ed., Goel Publishing House, Meerut.
Website and e-learning source	<p>https://onlinecourses.nptel.ac.in/http://cactus.dixie.edu/sblack/chem1010/lecture_notes/4B.htm http://www.auburn.edu/~deruija/pdareson.pdf https://swayam.gov.in/course/64 -atomic-structure-and-chemical-bonding</p> <p>MOOC components http://nptel.ac.in/courses/104101090/ Lecture 1: Classification of elements and periodic properties http://nptel.ac.in/courses/104101090/</p>

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

	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

CO-PO Mapping(Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

Title of the Course	QUALITATIVE ORGANIC ANALYSIS AND PREPARATION OF ORGANIC COMPOUNDS						
Paper No.	Core IV						
Category	Core	Year	I	Credits	2	Course Code	
		Semester	II				

Instructional Hours per week	Lecture	Tutorial	Lab Practice	Total
	-	-	3	3
Pre requisites	General Chemistry II			
Objectives of the course	<p>This course aims at providing knowledge on</p> <ul style="list-style-type: none"> • Laboratory safety • Handling glasswares • Analysis of organic compounds • Preparation of organic compounds 			
Course Outline	UNIT I Safety rules,symbols and first-aid in chemistry laboratory Basic ideas about Bunsen burner, its operation and parts of the flame. Chemistry laboratory glassware–basis information and uses			
	Unit II Qualitative Organic Analysis Preliminary examination, detection of elements-nitrogen, Aromatic and aliphatic nature, Test for saturation and unsaturation, identification of functional groups using solubility tests Confirmation of functional groups <ul style="list-style-type: none"> • Monocarboxylic acid • Monohydric phenol • aldehyde,ketone,ester • carbohydrate(reducing and non-reducing sugars) • primary amine • monoamide,diamide • Preparationofderivativesforfunctionalgroups 			
	UNIT III Preparation of Organic Compounds <ol style="list-style-type: none"> Nitration-picric acid from Phenol Halogenation-p-bromo acetanilide from acetanilide Oxidation-benzoic acid from Benzaldehyde Microwave assisted reactions in water: <ol style="list-style-type: none"> Methyl benzoate to Benzoic acid Salicylic acid from Methyl Salicylate Rearrangement-Benzil to Benzilic Acid Hydrolysis of benzamide to Benzoic Acid 			

	<p>Separation and Purification Techniques(Not for Examination)</p> <ol style="list-style-type: none"> 1. Purification of organic compounds by crystallization(from water/alcohol)and distillation 2. Determination of melting and boiling points of organic compounds. 3.Steam distillation-Extraction of essential oil from citrus fruits/eucalyptus leaves. 4. Chromatography(anyone)(Group experiment) <ol style="list-style-type: none"> (i) Separation of amino acids by Paper Chromatography (ii)Thin Layer Chromatography-mixture of sugars/plant pigments /permanganate dichromate. (iii) Column Chromatography-extraction of carotene,chlorophyll and xanthophylls from leaves/separation of anthracene-anthracene picrate. 5. Electrophoresis–Separation of amino acids and proteins. (Demonstration) 6. Isolation of casein from milk/ Determination of saponification value of oil or fat/ Estimation of acetic acid from commercial vinegar.(Anyone Group experiment)(4,5&6–not for ESE)
Reference Books	<ol style="list-style-type: none"> 1. Venkateswaran,V.; Veeraswamy, R.; Kulandaivelu,A.R.<i>Basic PrinciplesofPracticalChemistry</i>,2nded.;SultanChand:NewDelhi,2012. 2. Manna,A.K.<i>PracticalOrganicChemistry</i>,BooksandAllied:India,2018. 3. Gurtu,J.N;Kapoor,R.<i>AdvancedExperimentalChemistry(Organic)</i>,Sultan Chand:NewDelhi,1987. 4. Furniss,B.S.;Hannaford,A.J.;Smith,P.W.G.;Tatchell,A.R.<i>Vogel'sTextbookofPracticalOrganicChemistry</i>,5thed.;Pearson:India,1989.
Website and e-learning source	<p>https://www.vlab.co.in/broad-area-chemical-sciences</p>

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 carboxylic acids, primary amines, mono and di amides, mono hydric phenols, aldehyde and ketone, reducing and non-reducing sugars and explain here actions behind it.

CO4:exhibit a solid derivative with respect to the identified functional group.

	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

CO-PO Mapping(Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

Title of the Course	DAIRY CHEMISTRY						
Paper No.	SEC-II						
Category	NME	Year	I	Credits	2	Course Code	
		Semester	II				
Instructional Hours per week	Lecture	Tutorial	LabPractice		Total		
	2	-	-		2		
Pre requisites	Higher secondary chemistry						
Objectives of the course	<p>This course aims at providing an overall view of the</p> <ul style="list-style-type: none"> • Chemistry of milk and milk products • Processing of milk • Preservation and formation of milk products. 						
Course Outline	<p>UNIT I 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, specificgravity, 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.</p> <p>Unit II Processing of Milk Microbiology of milk - destruction of micro - organisms in milk, physico – chemical changes takingplace in milk due to processing- boiling, pasteurization– types of pasteurization- Bottle, Batchand HTST(HighTemperature Short Time) – Vacuum pasteurization – Ultra High Temperature Pasteurization.</p> <p>UNIT III Major Milk Products Cream- definition- composition- chemistry of creaming process-gravitational and centrifugal methods of separation of cream- estimation of fat in 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.</p> <p>UNIT IV: Special Milk Standardised milk- definition- merits- reconstituted milk- definition-flow diagram of manufacture- Homogenised milk- flavoured milk- vitaminised milk- toned milk- Incitation milk- Vegetable toned milk- humanized milk-</p>						

	<p>Condensed milk- definition, composition and nutritive value.</p> <p>UNIT V Fermented and other Milk Products Fermented milk products– fermentation of milk definition, conditions, cultured milk- definition of culture- example, conditions- cultured cream, buttermilk- Bulgarian milk- acidophilous milk– Yoheer Indigeneous products-khoa and chhena definition- Icecream- 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.</p>
Recommended Text	<ol style="list-style-type: none"> 1. K.Bagavathi Sundari, Applied Chemistry, MJP Publishers, first edition, 2006. 2. K.S.Rangappa and K.T.Acharya, Indian Dairy products, Asia Publishing House New Delhi, 1974. 3. Text book of dairy chemistry, M.P.Mathur, D.DattaRoy, P.Dinakar, Indian Council of Agricultural Research, 1st edition, 2008. 4. A Text book of dairy chemistry, Saurav Singh, Daya Publishing house, 1st edition, 2013. 5. Text book of dairy chemistry, P.L.Choudhary, Bio-Green book publishers, 2021.
Reference Books	<ol style="list-style-type: none"> 1. Robert Jenness and S.Patom, Principles of Dairy Chemistry, S.Wiley, NewYork, 2005. 2. F.P.Wond, Fundamentals of Dairy Chemistry, Springer, Singapore, 2006. 3. Sukumar De, Outlines of Dairy Technology, Oxford University Press, New Delhi, 1980. 4. P.F.Fox and P.L.H.Mcsweeney, Dairy Chemistry and Biochemistry, Springer, Second edition, 2016. 5. Dairy chemistry and biochemistry, P.F.Fox, T.Uniacke-Lowe, P.L.H. McSweeney, J.A.Omahony, Springer, Second edition, 2015.
Website and E –learning source	

Course Learning Outcomes (for Mapping with Pos and PSOs) On

completion of the course the students should be able to

CO1:understand about general composition of milk– constituents and its physical properties.

CO2:acquire knowledge about pasteurization of Milk and various types of pasteurization-Bottle, Batch and HTST Ultra High Temperature Pasteurization.

CO3:learn about Cream and Butter their composition and how to estimate fat in cream and Ghee

CO4:explain about Homogenized milk, flavoured milk, vitaminised milk and toned milk.

CO5:have an idea about how to make milk powder and its drying process- types of drying process

	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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

Title of the Course	COSMETICS AND PERSONAL GROOMING						
Paper No.	SEC-III(Discipline Specific)						
Category	SEC	Year	I	Credits	2	Course Code	
		Semester	I/ II				
Instructional	Lecture	Tutorial	Lab Practice		Total		

Hours per week	2	-	-	2
Pre requisites	Higher secondary Chemistry			
Objectives of the course	<p>This course aims at familiarizing the students with</p> <ul style="list-style-type: none"> • Formulations of various types of cosmetics and their significance • hair, skin and dental care • makeup preparations and personal grooming 			
Course Outline	<p>Unit I Skin care Nutrition of the skin, skin care and cleansing of the skin; face powder–ingredients; creams and lotions –cleansing, moisturizing all purpose, shaving and sun screen(formulation only);Gels–formulation and advantages; astringent and skin tonics–key ingredients, skin lightness, depilatories.</p> <p>Unit II Hair care Shampoos–types–powder,cream,liquid,gel–ingredients;conditioner–types–ingredients Dentalcare Tooth pastes–ingredients–mouthwash</p> <p>UnitIII Makeup Base–foundation–types–ingredients;lipstick,eyeliner,mascara,eyeshadow,concealers,rouge</p> <p>Unit IV Perfumes Classification-Natural– plant origin–parts of the plant used, chief constituents; animal origin – amber gries from whale, civetone from civet cat, musk from musk deer; synthetic–classification emphasizing characteristics–esters–alcohols– aldehydes– ketones</p> <p>Unit V Beautytreatments Facials–types–advantages–disadvantages;facemasks–types;bleach–types–advantages–disadvantages;shaping the brows; eye lash tinting; perming – types; hair colouring and dyeing; permanent waving–hair straightening; wax – types–waxing; pedicure, manicure–advantages–disadvantages</p>			
Recommended Text	1. Thankamma Jacob, (1997) Foods, drugs and cometics–Aconsumer guide, Macmill an publication, London.			
Reference Books	<p>1. Wilkinson JBE and Moore RJ, (1997) Harry’s cosmeticology,7th ed.,Chemical Publishers, London.</p> <p>2. George Howard,(1987) Principles and practice of perfumes and cosmetics, Stanley Therones, Chettenham</p>			
Website and e-learning source	<p>1. http://www.khake.com/page75.html</p> <p>2. Net. foxsm/list/284</p>			

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

- **CO1:** know about the composition of various cosmetic products
- **CO2:** understand chemical aspects and applications of hair care and dental care and skin care products.
- **CO3:** understand chemical aspects and applications of perfumes and skin care products.
- **CO4:** to understand the methods of beauty treatments their advantages and disadvantage
- **CO5:** understand the hazards of cosmetic products.

	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

CO-PO Mapping(Course Articulation Matrix)

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
WeightedpercentageofCourse ContributiontoPos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

Title of the Course	GENERAL CHEMISTRY-III						
Paper No.	Core V						
Category	Core	Year	II	Credits	5	Course Code	
		Semester	III				
Instructional Hours per week	Lecture	Tutorial	Lab Practice		Total		
	4	1	-		5		
Pre requisites	General Chemistry–I and II						
Objectives of the course	<p>This course aim provide a comprehensive knowledge on</p> <ul style="list-style-type: none"> • The physical properties of gases,liquids,solids and X-ray diffraction of solids. • Fundamentals of nuclear hemistry 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	<p>UNIT I Gaseous state</p> <p>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, law of equipartition of energy, degrees of freedom and molecular basis of heat capacities. Collision frequency; collision diameter; mean free path and viscosity of gases.</p> <p>Real gases: Deviations from ideal gas behavior ,(Andrew’s and Amagat’splots); compressibility factor, Z, and its variation with pressure for different gases.equations of states for real gases-vanderWaal’s equation; Boyle temperature; Numerical problems based on equations of states for realgases, isotherms of realgases–critical phenomena–isotherms of CO₂ —Vanderwaal’s equation and the critical state; law of corresponding states-liquefaction of gases.</p>						
	<p>Unit-II</p> <p>Liquid and Solid State Properties of Liquids - Surface tension, viscosity and their applications. Crystalline and amorphous–differences- geometry, isotropy and anisotropy, isomorphism, polymorphism. Crystals– size and shape;laws of crystallography; symmetry elements – plane,</p>						
	<p>Centre and axis Miller indices, unitcells and spacelattices; classification of crystal systems Bravais lattices;X–ray diffraction–Bragg’s equation</p>						

Packing in atomic solids—simple cubic, body centered cubic, face centered and hexagonal close packing; Co-ordination number in typical structures—NaCl, CsCl, ZnS, comparison of structure and properties of diamond and graphite; Defects in solids—stoichiometric and nonstoichiometric defects.

Liquid crystals—classification and applications.

UNIT-III

Nuclear Chemistry

Natural radioactivity — α , β and γ rays; half-life period; Fajan–Soddy group displacement law;; isotopes, isobars, isotones, ; nuclear isomerism; radioactive decay series; magic numbers;—Curie, Rutherford, Roentgen; nuclear stability—neutron-proton ratio; binding energy; packing fraction; mass defect. and B.E., decay constant and $t_{1/2}$ and radioactive series.

Isotopes—uses—determination of age of rocks by radio carbon dating.

Nuclear energy; nuclear fission and fusion—; disposal of radio active waste and safety measures.

UNIT-IV

Halogen derivatives

Aliphatic halogen derivatives

Nomenclature and classes of alkyl halides — isomerism, physical properties, Chemical reactions. Nucleophilic substitution reactions— S_N1 , S_N2 and S_Ni mechanisms with stereochemical aspects and effect of solvent.

Di, Tri & Tetra 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, use; conversions — ascent and descent of series; test for hydroxyl groups. Oxidation of diols by periodic acid and lead tetra acetate.

	<p>UNIT-V</p> <p>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-Teimen ,Kolbe, Schmidt, Libermann ,nitroreaction, phthalein reaction.</p> <p>Resorcinol,quinol,picric acid–preparation,properties and uses.</p> <p>Aromatic alcohols Nomenclature,benzyl alcohol–methods of preparation–hydrolysis,reduction of benzaldehyde, Cannizzaro reaction, Grignard synthesis, physical properties ,reactions–reaction with sodium,phosphorus pentachloride,thionylchloride,acetic anhydride,,oxidation –substitution on the benzene nucleus,uses. Thiols:Nomenclature,structure,preparation and properties.</p>
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/TNPSCOthers 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	<ol style="list-style-type: none"> 1. B.R.Puri,L.R.Sharma,M.S.Pathania;<i>PrinciplesofPhysicalChemistry</i>,46thedition,VishalPublishing,2020. 2. B.R.Puri,L.R.SharmaandK.C.Kalia,<i>PrinciplesofInorganicChemistry</i>,Milestone PublishersandDistributors,NewDelhi,thirtiethedition,2009. 3. 4.P.L.SoniandMohanKatyal,<i>TextbookofInorganicChemistry</i>,SultanChand& amp;Sons,twentiethedition,2006. 4. M.K.Jain,S.C.Sharma,<i>ModernOrganicChemistry</i>,VishalPublishing,fourthrepr int,2003. 5. S.M.Mukherji,andS.P.Singh,<i>ReactionMechanisminOrganicChemistry</i>,MacmillanIndiaLtd.,thirdedition,1994.
ReferenceBooks	<ol style="list-style-type: none"> 1. T.W.GrahamSolomons,<i>OrganicChemistry</i>,JohnWiley& amp;Sons,fifthedition, 1992. 2. A.CareyFrancis,<i>OrganicChemistry</i>,TataMcGraw-HillEducationPvt.,Ltd.,NewDelhi,seventhedition,2009. 3. I.L.Finar,<i>OrganicChemistry</i>,WesleyLongmanLtd,England,sixth edition,1996.

	<p>4. P.L.Soni, and H.M.Chawla-<i>Text Book of Organic Chemistry</i>, New Delhi, Sultana Chand & Sons, twenty ninth edition, 2007.</p> <p>5. J.D.Lee, <i>Concise Inorganic Chemistry</i>, Blackwell Science, fifth edition, 2005.</p>
Website and e-learning source	<p>MOOC components https://nptel.ac.in/courses/104104101 Solid state chemistry https://nptel.ac.in/courses/103106071 Nuclear industries and safety https://nptel.ac.in/courses/104106119 Introduction to organic chemistry</p>
<p>Course Learning Outcomes (for Mapping with Pos and PSOs) On completion of the course the students should be able to</p> <p>CO1: explain the kinetic properties of gases by using mathematical concepts.</p> <p>CO2: describe the physical properties of liquid and solids; identify various types of crystals with respect to its packing and apply the XRD method for crystal structure determinations.</p> <p>CO3: investigate the radioactivity, nuclear energy and its production, also the nuclear waste management.</p> <p>CO4: write the nomenclature, physical & chemical properties and basic mechanisms of haloorganic compounds and alcohols.</p> <p>CO5: investigate the named organic reactions related to phenol; explain the preparation and properties of aromatic alcohol including thiol.</p>	

	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

CO-PO Mapping (Course Articulation Matrix)

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

Course Learning Outcomes (for Mapping with Pos and PSOs)										
On successful completion of the course the students should be able to										
CO1: acquire knowledge on the systematic analysis of Mixture of salts										
CO2: identify the cations and anions in the unknown substance.										
CO3: identify the cations and anions in the soil and water and to test the quality of water.										
CO4: assess the role of common ion effect and solubility product										

	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

CO-PO Mapping(Course Articulation Matrix)

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

Level of Correlation between PSO' s and CO's

GENERIC ELECTIVE

Title of the Course	CHEMISTRY FOR PHYSICAL SCIENCES I (FOR MATHEMATICS & PHYSICS STUDENTS)						
PaperNo.	Generic Elective I						
Category	Generic Elective	Year	I	Credits	3	Course Code	
		Semester	I				
Instructional Hours per week	Lecture	Tutorial	Lab Practice		Total		
	4	-			4		
Pre requisites	Higher secondary chemistry						
Objectives of the course	<p>This course aims to provide knowledge on the</p> <ul style="list-style-type: none"> • basics of atomic orbitals, chemical bonds, hybridization • concepts of thermodynamics and its applications. • Concepts of nuclear chemistry • Importance of chemical industries • Qualitative and analytical methods. 						
Course Outline	<p>UNIT I Chemical Bonding and Nuclear Chemistry Chemical Bonding: Molecular Orbital Theory- bonding, antibonding and non-bonding orbitals. Molecular orbital diagrams for Hydrogen, Helium, Nitrogen; discussion of bond order and magnetic properties. Nuclear Chemistry: Fundamental particles - Isotopes, Isobars, Isotones and Isomers- Differences between chemical reactions and Nuclear reactions- group displacement law. Nuclear binding energy- Mass defect. Nuclear fission and nuclear fusion- differences. Applications of radioisotopes- Medicinal applications.</p>						
	<p>Unit II Industrial Chemistry Fuels: Fuel gases: Natural gas, water gas, semiwater gas, carbureted (Details not required). Silicones: Synthesis, properties and uses of silicones. Fertilizers: Urea, ammonium sulphate, potassium nitrate, NPK fertilizer, superphosphate, triple superphosphate.</p>						

	<p>UNIT III Fundamental Concepts in Organic Chemistry Hybridization: Orbital overlap, hybridization and geometry of CH₄, C₂H₄, C₂H₂ and C₆H₆. Electronic effects: Inductive effect, electromeric, mesomeric and hyperconjugation - examples.</p> <p>Reaction mechanisms: Types of reactions– aromaticity (Huckel's rule) aromatic electrophilic substitution; nitration, halogenation, Friedel-Craft's alkylation and acylation. Heterocyclic compounds Preparation, properties of pyrrole and pyridine.</p>
	<p>UNIT IV Thermodynamics and Phase Equilibria Thermodynamics: Types of systems, reversible and irreversible processes, isothermal and adiabatic processes and spontaneous processes. Statements of first law and second law of thermodynamics. Entropy and its significance. Free energy change and its importance (no derivation). Relationship between Gibbs free energy and entropy Phase Equilibria: Phase rule- definition of terms in it. Two component system- Reduced phase rule and its application to a simple eutectic system (Pb-Ag).</p>
	<p>UNIT V Analytical Chemistry Introduction to qualitative and quantitative analysis. Principles of volumetric analysis. Separation and purification techniques–extraction, distillation and crystallization. Chromatography: principle and application of column, paper and thin Layer chromatography.</p>
Extended Professional Component (is a Part of internal Component only, Not to be included in the external examination question paper)	<p>Questions related to the above topics, from various competitive examinations UPSC/JAM/TNPSC others to be solved (To be discussed during the Tutorial hours)</p>
Skills acquired from this course	<p>Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</p>

Recommended Text	<ol style="list-style-type: none"> 1. V.Veeraiyan, Text book of Ancillary Chemistry; Highmount publishing house, Chennai, first edition, 2009. 2. S.Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006. 3. S.ArunBahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, New Delhi, twenty third edition, 2012. 4. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.
Reference Books	<ol style="list-style-type: none"> 5. P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007. 6. B.R.Puri, L.R.Sharma, M.S.Pathania, Text book Physical Chemistry; Vishal Publishing Co., New Delhi, forty fourth seventh edition, 2018. 7. B.K,Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.
Course Learning Outcomes (for Mapping with Pos and PSOs) On completion of the course the students should be able to	
<p>CO1:gain in-depth knowledge about the theories of chemical bonding, nuclear reactions and its applications.</p> <p>CO2:evaluate the efficiencies and uses of various fuels and fertilizers</p> <p>CO3:explain the type of hybridization, electronic effect and mechanism involved in the organic reactions.</p> <p>CO4:apply various thermodynamic principles, systems and phase rule.</p> <p>CO5:explain various methods to identify an appropriate method for the separation of chemical components</p>	

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

Level of Correlation between PSO's and CO's

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

	<p>Unit II Industrial Chemistry Fuels: Fuel gases: Natural gas, water gas, semi water gas, carbureted water gas, producer gas, LPG and oil gas (manufacturing details not required). Silicones: Synthesis, properties and uses of silicones. Fertilizers: Urea, ammonium sulphate, potassium nitrate, NPK fertilizer, superphosphate, triple superphosphate.</p>
	<p>UNIT III Fundamental Concepts in Organic Chemistry Hybridization: Orbital overlap hybridization and geometry of CH₄, C₂H₄, C₂H₂ and C₆H₆. Polar effects: Inductive effect electromeric, mesomeric, hyperconjugation-examples. Reaction mechanisms: Types of reactions- aromaticity- aromatic Electrophilic substitution; nitration, halogenation, Friedel-Craft's Alkylation and acylation. Heterocyclic compounds: Preparation, properties of pyrrole and pyridine.</p> <p>UNIT IV Drugs and Speciality Chemicals Definition, structure and uses: Antibiotics viz., Penicillin, Chloramphenicol and Streptomycin; Anaesthetics viz., Chloroform and ether; Antipyretics viz., aspirin, paracetamol. Artificial Sweeteners viz., saccharin. Organic Halogen compounds viz., Freon, Teflon.</p> <p>UNIT V: Analytical Chemistry Introduction qualitative and quantitative analysis. Principles of volumetric analysis. Separation and purification techniques: extraction, distillation and crystallization. Chromatography: principle and application of column, paper and thin layer chromatography.</p>
Extended Professional Component (is a part of internal Component only,	<p>Questions related to the above topics, from various competitive Examinations UPSC/JAM/TNPSC others to be solved (To be discussed during the Tutorial hours)</p>

Not to be included in the external examination question paper)	
Skills acquired From this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	<ol style="list-style-type: none"> 1. V.Veeraiyan, Textbook of Ancillary Chemistry; Highmount publishing house, Chennai, first edition, 2009. 2. S.Vaithyanathan, Textbook of Ancillary Chemistry; Priya Publications, Karur, 2006. 3. ArunBahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, NewDelhi, twenty third edition, 2012. 4. P.L.Soni, H.M.Chawla, Text Book of Inorganic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.
Reference Books	<ol style="list-style-type: none"> 1. P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007. 2. B.K,Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014. 3. Jayashreegosh, Fundamental Concepts of Applied Chemistry; Sultan & Chand, Edition 2006.
Course Learning Outcomes (for Mapping with Pos and PSOs) On completion of the course the students should be able to CO1: state the theories of chemical bonding, nuclear reactions and its applications. CO2: evaluate the efficiencies and uses of various fuels and fertilizers. CO3: explain the type of hybridization, electronic effect and mechanism involved in the organic reactions. CO4: demonstrate the structure and uses of antibiotics, anaesthetics, antipyretics and artificial sugars. CO5: analyse various methods to identify an appropriate method for the separation of Chemical components.	

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
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Level of Correlation between PSO's and CO's

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

Level of Correlation between PO's and CO's

Title of the Course	CHEMISTRY PRACTICAL FOR PHYSICAL AND BIOLOGICAL SCIENCES (For Mathematics and Physics– I Year/ I Semester; for Botany and Zoology II Year / III Semester)						
Paper No.	Generic Elective V						
Category	Generic Elective	Year	I/II	Credits	1	Course Code	
		Semester	I/III				
Instructional hours per week	Lecture	Tutorial	LabPractice		Total		
	-	-	2		2		
Pre requisites							
Objectives of the Course	This course aims to provide knowledge on the <ul style="list-style-type: none">Basics of preparation of solutions.Principles and practical experience of volumetric analysis						
Course Outline	VOLUMETRIC ANALYSIS <ol style="list-style-type: none">Estimation of sodium hydroxide using standard sodium carbonate.Estimation of hydrochloric acid using standard oxalic acid.Estimation of ferrous sulphate using standard Mohr's salt.Estimation of oxalic acid using standard ferrous sulphate.Estimation of potassium permanganate using standard sodium hydroxide.						
ReferenceBooks	V.Venkateswaran, R.Veerasamy, A.R.Kulandaivelu, Basic Principles of Practical Chemistry; Sultan Chand & sons, Second edition, 1997.						
Course Learning Outcomes (for Mapping with Pos and PSOs) On completion of the course the students should be able to CO1:gain an understanding of the use of standard flask and volumetric pipettes, burette. CO2:design, carryout, record and interpret the results of volumetric titration. CO3:apply their skill in the analysis of water / hardness. CO4:analyze the chemical constituents in allied chemical products							
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 PSOs	3.0	3.0	3.0	3.0	3.0		

Level of Correlation between PSO's and CO's

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
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PO's and CO's

Title of the Course	ENTREPRENEURIAL SKILLS IN CHEMISTRY						
PaperNo.	SECIV						
Category	Skill Enhancement Course	Year Semester	II III	Credits	1	Course Code	
Instructional Hours per week	Lecture	Tutorial	LabPractice	Total			
	-	-	1	1			
Pre requisites	General Chemistry						
Objectives of the course	<p>The course aims at providing training to</p> <ul style="list-style-type: none"> • Develop entrepreneurskills in students • To provide hands on experience to prepare and develop products • Develop start ups 						
Course Outline	<p>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 (hazardouseffect),food colourants,Preservatives,leaveningagents,Baking powder and baking soda,yeast,MSG,vinegar. Dyes Classification–Natural,synthetic dyes and theirc haracteristics–basic methods and principles of dyeing</p> <hr/> <p>UNIT-II Hands on Experience - I(Students can choose any four) Detection of adulterants in food items like coffee, tea, pepper, chillipowder, turmeric powder,butter, ghee, milk, honey etc.,by simple techniques. Preparation of Jam, squash and Jelly, Gulkand, cottage cheese.</p> <p>UNIT-III Hands on Experience-II (Students can choose any four) Preparation of products like candles, soap, detergents, cleaning powder,shampoos, painbalm,toothpaste/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–ti eand dye,batik.</p>						

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 GP, A Handbook on Printing and Dyeing of Textiles.
Reference Books	Shyam Jha, Rapid detection of food adulterants and contaminants (Theory and Practice), Elsevier, eBook ISBN 9087128004289, 1 st Edition, 2015
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: identify adulterated food items by doing simple chemical tests. CO2: prepare cleaning products and become entrepreneurs CO3: educate others about adulteration and motivate them to become entrepreneurs.	

	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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	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

Title of the Course	PESTICIDE CHEMISTRY						
Paper No.	Skill Enhancement Course V (Discipline specific)						
Category	Skill Enhancement Course	Year	II	Credits	2	Course Code	
		Semester	III				
Instructional Hours per week	Lecture	Tutorial	Lab Practice		Total		
	2	-	-		2		
Pre requisites	Fundamentals in chemistry						
Objectives of the course	<p>This course aims to providing the students</p> <ul style="list-style-type: none"> • 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	<p>Unit I</p> <p>Introduction: History of pesticides. Chemistry of Pesticides: Brief introduction to classes of pesticides (Chemical class, targets), structures, chemical names, physical and chemical properties.</p> <p>Toxicity of pesticides: Acute and chronic toxicity in mammals, birds, aquatic species etc. Methods of analysis of pesticides.</p> <p>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.</p> <p>Organo phosphates and Phospho thionates: Acephate, Chlorpyrifos, Monocrotophos, and parathion- methyl. Organo chlorine-Endosulfan, heptachlor; Carbamate: Cartap hydro chloride, Methomyl, Propoxur.</p>						
	<p>Unit II</p> <p>Pesticides residues: Introduction-application of agro chemicals, dissemination path ways of pesticides, causes of pesticide residues, remedies. Pesticides residues in atmosphere-entry in to atmosphere, action of pesticides, effects on environments. Pesticides residues in water -entry in to water systems, action and effect in aquatic environment. Pesticides residues in soil. Entry in to soil, absorption, retention and transport in soil, effects on micro organism, soil condition and fertility, decomposition and degradation by climatic factors and micro organism.</p> <p>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.</p>						

	Unit III Biopesticides: Pheromones, attractants, repellents– Introduction, types and application (8-Dodecen-1-ol, 10-cis-12-hexa decadienoic, 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 obesolved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problemsolving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Handa SK. Principles of pesticide chemistry. Agrobios (India); 2012. 2. Matolcsy G, Nádasz M, Andriská V. Pesticide chemistry. Elsevier; 1989. 3. J. Miyamoto and P. C. Kearney Pesticide Chemistry Human Welfare and the Environment vol. IV Pesticide Residue and Formulation Chemistry, Pergamon press, 1985. 4. R.Cremlyn: Pesticides, JohnWiley.
Reference Books	1. Roy N.K., Chemistry of Pesticides. CBS Publisher & Distributors PLtd; 1 st Ed. (2010). 2. Nollet L.M., Rathore H.S., Handbook of pesticides: methods of pesticide residues analysis. CRC press; 2016. 3. Ellerbrock R.H., Pesticide Residues: Significance, Management and Analysis, 2005
Course Learning Outcomes (for Mapping with Pos and PSOs) On completion of the course the students should be able to CO1: teach a bout the pesticides and their toxicity with respect to structure and category. CO2: explain the preparation and property of pesticides CO3: investigate the pesticide residues, prevention and care CO4: demonstrate the extraction and analytical methods of pesticide residues CO5: make a wareness to the public on bio - pesticides	

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
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Level of Correlation between PSO's and CO's

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

Level of Correlation between PO's and CO's

Course Code	Environmental Science	Hrs	Credits	CIA	CE
Sem-III/Part- IV		1		-	

The Earth is an incredibly precious enigma. Environmental Activities for Students are necessary to encourage sustainability. Environmental Activity means any investigation, study, assessment, evaluation, sampling, testing, monitoring, containment, removal, disposal, closure, corrective action, remediation (regardless of whether active or passive), natural attenuation, restoration, bioremediation, response, repair, corrective measure, cleanup or abatement that is required or necessary under any applicable Environmental Law, including institutional or engineering controls or participation in a governmental voluntary cleanup program to conduct voluntary investigatory and remedial actions for the clean-up, removal or remediation of Hazardous Substances that exceed actionable levels established pursuant to Environmental Laws, or participation in a supplemental environmental project in partial or whole mitigation of a fine or penalty.

The students are to be engaged in Environmental activities such as:

Start a Garden Club

Plant

Anything

Go on a Nature Scavenger Hunt

Recycle Waste Materials

Start a Green Team

Do Mini Greenhouse Craft

Create Worm Farm

Take Plastic Pledge

Access the Wisdom of Local Community

Hold an Energy-free (or Energy-Light) Day etc.

Evaluation:

The participation and performance of the students in Environmental activities will be assessed and best performers will be rewarded.

Title of the Course	GENERAL CHEMISTRY-IV						
PaperNo.	CoreVII						
Category	Core	Year	II	Credits	4	Course Code	
		Semester	IV				
Instructional Hours per week	Lecture	Tutorial	LabPractice		Total		
	4	-	-		4		
Pre requisites	General Chemistry IV						
Objectives of the course	<p>This course aims to provide a comprehensive knowledge on</p> <ul style="list-style-type: none"> • 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 and ketones • The organic chemistry of carboxylic acids 						
Course Outline	<p>UNIT I Thermodynamics-I Terminology–Intensive,extensive,variables,state,path functions;isolated, closed and open systems; isothermal, adiabatic, isobaric, isochoric,cyclic, reversible and irreversible processes; First law of thermodynamics –Concept and significance ofheat(q),work(w),internal energy(E), enthalpy(H);calculations of q,w,E and H fo rreversible,irreversible</p>						
	<p>Expansion of ideal and real gases under isothermal and adiabatic conditions; relation between heat capacities(Cp&Cv);JouleThomson effect-inversion temperature.</p> <p>Thermochemistry-heats of reactions, standard states;types of heats of reactions and their applications;effect of temperature (Kirchhoff's equations) and pressure on enthalpy of reactions; Hess's law and its applications;determination of bondenergy;Measurement of heat of reaction – determination of calorific value of food and fuels</p> <p>Zeroth law of thermodynamics-Absolute Temperature scale.</p>						
	Unit-II						

	<p>Thermodynamics-II Second Law of thermodynamics - Limitations of first law, spontaneity and randomness;Carnot'scycle;Concept of entropy,entropy change for reversible and irreversible processes,entropy of mixing,calculation of entropy changes of an ideal gas and a van der Waals gas with changes in temperature,volume and pressure,entropy and disorder.</p> <p>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.</p> <p>Third law of thermodynamics-Nernst heat theorem; Applications of third law -evaluation of absolute entropies fromheat capacity measurements, exceptions to thirdlaw.</p> <p>UNIT III</p> <p>General Characteristics of d-block elements Transition Elements - Electronic configuration-General periodic trend variable valency,oxidation states,stability of oxidation states,colour,magnetic 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, and Iron.</p> <p>UNIT IV</p> <p>Ethers, Thioethers and Epoxides</p> <p>Nomenclature, isomerism, general methods of preparations,reactions involving cleavage of C-Olinkages,alkyl group,Zeisel's method of estimation of methoxy group.</p>
	<p>Reactions of epoxides with alcohols,and ammonia derivatives Thioethers-nomenclature, structure,preparation,properties and uses.</p> <p>Aldehydes and Ketones</p> <p>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'sreaction,Perkin reaction,Benzoin condensation, , Knoevenagel reaction.. Baeyer –Villiger oxidation of ketones.Reduction:Clemmensen reduction,Wolf-Kishner reduction,Meerwein –Ponndorf Verley reduction, reduction with LiAlH_4 and NaBH_4. Addition reactions of unsaturated carbonyl compounds:Michael addition.</p> <p>UNIT V</p>

	<p>Carboxylic Acids: Nomenclature, structure, preparation and reactions of aliphatic and aromatic mono carboxylic acids. Physical properties, acidic nature, effect of substituent on acidic strength. HVZ reaction, Bouveault Blanc reduction, decarboxylation, Hunsdiecker reaction. Formic acid-reducing property.</p> <p>Reactions of dicarboxylic acids, hydroxyacids and unsaturated acids.</p> <p>Carboxylic acid Derivatives: Preparations of aliphatic and aromatic acid chlorides, esters, and anhydrides. Nucleophilic substitution reaction anhydride, ester, amide. Schotten - Baumann reaction, Claisen condensation, Dieckmann and Reformatsky reactions, Hofmann bromamide degradation and Curtius rearrangement.</p> <p>Active methylene compounds: Keto-enol tautomerism. Preparation and synthetic applications of diethyl malonate and ethyl acetoacetate</p> <p>Halogens substituted acids—nomenclature; preparation by direct halogenation, iodination from unsaturated acids, alkylmalonic acids</p> <p>Hydroxy acids—nomenclature; preparation from halo, amino, aldehydic and ketonic acids, ethylene glycol, aldol acetaldehyde; reactions – action of heat on α, β and hydroxyacids.</p>
Extended Professional Component (is a Part of internal component only, Not to be Included in the external examination question paper)	<p>Questions related to the above topics, from various competitive examinations UPSC/JAM/TNPSC others to be solved (To be discussed during the Tutorial hours)</p>
Skills acquired From this course	<p>Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</p>
Recommended Text	<ol style="list-style-type: none"> 1. B.R. Puri and L.R. Sharma, <i>Principles of Physical Chemistry</i>, Shoban Lal Nagin Chand and Co., thirtythree edition, 1992. 2. K.L. Kapoor, <i>A Textbook of Physical chemistry</i>, (volume-2 and 3), Macmillan, India Ltd, third edition, 2009. 3. P.L. Soni and Mohan Katyal, <i>Textbook of Inorganic Chemistry</i>, Sultan Chand & Sons, twentieth edition, 2006. 4. M.K. Jain, S.C. Sharma, <i>Modern Organic Chemistry</i>, Vishal Publishing, fourth reprint, 2003. 5. S.M. Mukherji, and S.P. Singh, <i>Reaction Mechanism in Organic Chemistry</i>, Macmillan India Ltd., third edition, 1994.

Reference Books	<ol style="list-style-type: none"> 1. Maron, S.H. and Prutton C.P. <i>Principles of Physical Chemistry</i>, 4th ed.; The Macmillan Company: New York, 1972. 2. Lee, J.D. <i>Concise Inorganic Chemistry</i>, 4th ed.; ELBS William Heinemann: London, 1991. 3. Gurudeep Raj, <i>Advanced Inorganic Chemistry</i>, 26th ed.; Goel Publishing House: Meerut, 2001. 4. Atkins, P. W. & Paula, J. <i>Physical Chemistry</i>, 10th ed.; Oxford University Press: New York, 2014. 5. Huheey, J.E. <i>Inorganic Chemistry: Principles of Structure and Reactivity</i>, 4th ed.; Addison Wesley Publishing Company: India, 1993.
Website and e-learning source	MOOC components https://nptel.ac.in/courses/112102255 Thermodynamics https://nptel.ac.in/courses/104101136 Advanced transition metal chemistry
Course Learning Outcomes (for Mapping with Pos and PSOs) On completion of the course the students should be able to CO1: explain the terms and processes in thermodynamics; discuss the various laws of thermodynamics and thermochemical calculations. CO2: discuss the second law of thermodynamics and its application to heat engine; discuss third law and its application on heat capacity measurement. 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; discuss chemistry of active methylene compounds, halogen substituted acids and hydroxyl acids.	

	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

CO-PO Mapping (Course Articulation Matrix)

	9.Determination of concentration of copper sulphate solution
	UNIT III Colligative property 10.Determination of molecular weight of an organic compound by Rast method using naphthalene or diphenyl as solvent Adsorption 11.Construction of Freundlich isotherm for the adsorption of acetic acid on activated charcoal
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 Learning Outcomes (for Mapping with Pos and PSOs) 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 electro chemistry, kinetics for carrying out the practical work. CO4: demonstrate laboratory skills for safe handling of the equipment and chemicals	

	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

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
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Level of Correlation between PSO's and CO's

Title of the Course		CHEMISTRY FOR PHYSICAL SCIENCES II (FOR MATHEMATICS & PHYSICS STUDENTS)					
Paper No.	Generic Elective II						
Category	Generic Elective	Year	I	Credits	3	Course Code	
		Semester	II				
Instructional hours per week	Lecture	Tutorial	LabPractice		Total		
	4	-	-		4		
Prerequisites	Chemistry for physical sciences-I						
Objectives of the course	<p>This course aims at providing knowledge on the</p> <ul style="list-style-type: none"> • Co-ordination Chemistry and Water Technology • Carbohydrates and Amino acids • Basics and applications of electro chemistry • Basics and applications of kinetics and catalysis • Various photo chemical phenomenon 						
Course Outline	<p>UNIT I Co-ordination Chemistry and Water Technology Co-ordination Chemistry: Definition of terms- IUPAC Nomenclature- Werner's theory- EAN rule- Applications to $[\text{Ni}(\text{CO})_4]$, $[\text{Ni}(\text{CN})_4]^{2-}$, $[\text{Co}(\text{CN})_6]^{3-}$- Biological role of Haemoglobin and Chlorophyll (elementary idea). Water Technology: Hardness of water, determination of hardness of water using EDTA method, zeolite method- Purification techniques- BOD, COD.</p>						
	<p>Unit II Carbohydrates and Amino acids Carbohydrates: Classification, preparation and properties of glucose, fructose and sucrose. Discussion of open chain ring structures of glucose and fructose. Glucose –fructose interconversion. Properties of starch and cellulose. Amino acids: Classification- preparation and properties of alanine. RNA and DNA (elementary idea only).</p>						

	<p>UNIT III</p> <p>Electro chemistry</p> <p>Galvanic cells- Standard hydrogen electrode- calomel electrode- standard electrode potentials –electro chemical series. Strong and weak electrolytes - ionic product of water - pH determination by colorimetric method – buffer solutions and its biological applications- electro plating- Nickel and chrome plating–Types of cells- fuel cells- corrosion and its prevention.</p>
	<p>UNIT IV</p> <p>Kinetics and Catalysis</p> <p>Order and molecularity. Integrated rate expression for I and II (2A → Products) order reactions. Pseudo first order reaction, methods of determining order of a reaction– Half-life period– Catalysis- homogeneous and heterogeneous, catalyst used in Contact and Haber’s processes.</p>
	<p>UNIT V</p> <p>Photo Chemistry</p> <p>Grothus-Draper’s law and Stark-Einstein’s law of photo chemical equivalence, Quantum yield. Phosphorescence, fluorescence, chemi luminescence and Photosensitization and photosynthesis (definition with examples).</p>
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	<p>Questions related to the above topics, from various competitive examinations UPSC/JAM/TNPSC others to be solved (To be discussed during the Tutorial hours)</p>
Skills acquired from this course	<p>Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</p>

Recommended Text	<ol style="list-style-type: none"> 1. V.Veeraiyan, Text book of Ancillary Chemistry; Highmount publishing house, Chennai, first edition, 2009. 2. S.Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006. 3. ArunBahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, New Delhi, twenty third edition, 2012. 4. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.
Reference Books	<ol style="list-style-type: none"> 1. P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007. 2. R.Puri, L.R.Sharma, M.S.Pathania, Text book Physical Chemistry; Vishal Publishing Co., New Delhi, forty seventh edition, 2018.
	3.B.K,Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.
Website and e-learning source	
Course Learning Outcomes (for Mapping with Pos and PSOs) On completion of the course the students should be able to CO1: write the IUPAC name for complex, different theories to explain the bonding in coordination compounds and water technology CO2: explain the preparation and property of carbohydrate, amino acids and nucleic acids. CO3: apply/ demonstrate the electro chemistry principlesincorrosion,electro plating and fuel cells. CO4: identify the reaction rate, order for chemical reaction and explain the purpose of a catalyst. CO5: outline the various type of photo chemical process.	

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

Level of Correlation between PSO's and CO's

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

Level of Correlation between PO's and CO's

Title of the Course	CHEMISTRY FOR BIOLOGICAL SCIENCES II (FOR BOTANY AND ZOOLOGY STUDENTS)						
Paper No.	Generic Elective IV						
Category	Generic Elective	Year Semester	II IV	Credits	3	Course Code	
Instructional Hours per week	Lecture	Tutorial	Lab Practice		Total		
	4	-	-		4		
Prerequisites	Chemistry for Biological Sciences I						
Objectives of the course	This course aims to provide knowledge on <ul style="list-style-type: none"> • Nomenclature of coordination compounds and carbohydrates. • Amino Acids and Essential elements of biosystem • Understand the concepts of kinetics and catalysis • Provide fundamentals of electrochemistry and photochemistry 						
Course Outline	UNIT I Co-ordination Chemistry and Water Technology Co-ordination Chemistry: Definition of terms- IUPAC Nomenclature -Werner's theory- EAN rule – Applications to $[\text{Ni}(\text{CO})_4]$, $[\text{Ni}(\text{CN})_4]^{2-}$, $[\text{Co}(\text{CN})_6]^{3-}$ Chelation-Biological role of Hemoglobin and Chlorophyll (elementary idea)- Water Technology: Hardness of water, determination of hardness of water using EDTA method, zeolite method- Purification techniques – BOD and COD.						
	Unit II Carbohydrates Classification, preparation and properties of glucose and fructose. Discussion of open chain ring structures of glucose and fructose. Glucose- fructose interconversion. Preparation and properties Of sucrose, starch and cellulose.						
	UNIT III Amino Acids and Essential elements of biosystem Classification- preparation and properties of alanine, Proteins- classification – structure - Colour reactions – Biological functions – nucleosides -nucleotides – RNA and DNA– structure. Essentials of trace metals in biological system- Na, Cu, K, Zn, Fe, Mg.						

	UNIT IV Electrochemistry Galvanic cells – Standard hydrogen electrode- calomel electrode- standard electrode potentials –electro chemical series. Strong and weak electrolytes - ionic product of water - pH determination by colorimetric method – buffer solutions and its biological applications-electroplating – Nickel and chrome plating–Types of cells-fuel cells-corrosion and its prevention.
	UNIT V Photochemistry Grothus- Drapper's law and Stark - Einstein's law of photo chemical equivalence, Quantum yield- Phosphorescence, fluorescence, chemiluminescence and Photosensitization and photo synthesis (definition with examples).
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 UPS C/JAM/TNPSC other 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	<ol style="list-style-type: none"> 1. V.Veeraiyan, Textbook of Ancillary Chemistry; Highmount publishing house, Chennai, first edition, 2009. 2. S.Vaithyanathan, Textbook of Ancillary Chemistry; Priya Publications, Karur, 2006. 3. Arun Bahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, New Delhi, twenty third edition, 2012. 4. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.
Reference Books	<ol style="list-style-type: none"> 1. Arun Bahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, New Delhi, twenty third edition, 2012. 2. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007. 3. P.L.Soni, Mohan Katyal, Textbook of Inorganic chemistry;

	<p>Sultan Chand and Company, New Delhi, twentieth edition, 2007.</p> <p>4. B.R. Puri, L.R. Sharma, M.S. Pathania, Textbook Physical Chemistry; Vishal Publishing Co., New Delhi, forty seventh edition, 2018.</p> <p>5. B.K. Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.</p>
<p>Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to</p> <p>CO1: write the IUPAC name for complex, different theories to explain the bonding in coordination compounds and water technology.</p> <p>CO2: explain the preparation and property of carbohydrate.</p> <p>CO3: enlighten the biological role of transition metals, amino acids and nucleic acids.</p> <p>CO4: apply/demonstrate the electrochemistry principles in corrosion, electroplating and fuel cells.</p> <p>CO5: outline the various types of photochemical process.</p>	

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

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

Level of Correlation between PO's and CO's

Title of the Course	CHEMISTRY PRACTICAL FOR PHYSICAL AND BIOLOGICAL SCIENCES (For Mathematics and Physics–I year / II semester; For Botany and Zoology II year / IV semester)						
Paper No.	Generic Elective VI						
Category	Generic Elective	Year Semester	I/II II/IV	Credits	1	Course Code	
Instructional hours per week	Lecture	Tutorial	LabPractice		Total		
	-	-	2		2		
Prerequisites							
Objectives of the course	<p>This course aims to provide knowledge on</p> <ul style="list-style-type: none"> • Identification of organic functional groups • Different types of organic compounds with respect to their properties. • Determination of elements in organic compounds.. 						
	SYSTEMATIC ANALYSIS OF ORGANIC COMPOUNDS The analysis must be carried out as follows:						
	<p>(a) Functional group tests [phenol, acids (mono & di) aromatic primary amine, amides (mono & di), aldehyde and glucose].</p> <p>(b) Detection of elements (N, S, Halogens).</p> <p>(c) To distinguish between aliphatic and aromatic compounds.</p> <p>(d) To distinguish – Saturated and unsaturated compounds.</p>						
Reference Books	V.Venkateswaran, R.Veerasamy, A.R.Kulandaivelu, Basic Principles of Practical Chemistry; Sultan Chand & sons, Second edition, 1997.						
Course Learning Outcomes (for Mapping with Pos and PSOs) On completion of the course the students should be able to CO1:gain an understanding of the use of standard flask and volumetric pipettes, burette. CO2:design, carryout, record and interpret the results of volumetric titration. CO3:apply their skill in the analysis of water / hardness. CO4:analyze the chemical constituents in allied chemical products							

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 PSOs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

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
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PO's and CO's

Title of the Course		INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS						
Paper No.	SEC VI (Discipline Specific)							
Category	Skill Enhancement Course	Year	II	Credits	2	Course Code		
		Semester	IV					
Instructional Hours per week	Lecture	Tutorial	LabPractice		Total			
	2	-	-		2			
Prerequisites	General Chemistry							
Objectives of the course	<p>The course aims at providing an overall view of the</p> <ul style="list-style-type: none">• Operation and trouble shooting of chemical instruments• fundamentals of analytical techniques and its application in the characterization of compounds• theory of chromatographic separation and							
	<ul style="list-style-type: none">• theory of thermo/electro analytical techniques• stoichiometry and the related concentration terms							
Course Outline	UNIT-I Qualitative and Quantitative Aspects of Analysis S.I Units, Distinction between Mass and Weight. Molality, Molarity, Normality. Evaluation of analytical data, Errors–Types of Errors, Accuracy, Precision, Minimization of Errors. Significant Figures. Precision: Mean, Median, Average Deviation, Standard Deviation, Confidence Limits, Q-test.							
	UNIT-II Atomic Absorption Spectroscopy: Basic principles of instrumentation (choice of source, monochromator, detector, choice of flame and Burner designs. Techniques of atomization and sample introduction; Method of background correction, sources of chemical interferences and their method of removal. Techniques for the quantitative estimation of trace level of metal ions from water samples.							
	UNIT-III UV-Visible and IR Spectroscopy Origin of spectra, interaction of radiation with matter, fundamental laws of spectroscopy and selection rules, validity of Beer-Lambert’s law. UV-Visible Spectrometry: Basic principles, instrumentation (choice of source, monochromator and detector) for single and double beam instrument; Basic principles of quantitative analysis: estimation of metal ions from aqueous solution, geometrical isomers, keto-enol tautomers. Infrared Spectroscopy: Basic principles of instrumentation (choice of source, monochromator & detector) for single and double beam instrument; sampling techniques.							

	<p>UNIT-IV Thermal and Electro-analytical Methods of Analysis TGA -Principle, Instrumentation, methods of obtaining Thermograms, factors affecting TGA, Thermal analysis of silver nitrate, calcium oxalate and calcium acetate Electro analytical methods: polarography-principle, instrumentation and applications. Derivative polarography- Cyclic Voltammetry- principle.</p> <p>UNIT-V Separation and purification techniques</p>
	<p>Classification, principle, Factors affecting- Solvent Extraction– Liquid -Liquid Extraction, Chromatography: Column, TLC, Paper, Gas, HPLC and Electrophoresis, Principle, Classification, Choice of Adsorbents, Solvents, Preparation of Column, Elution Mechanism of separation: adsorption, partition & ion exchange. Development of chromatograms and R_f value.</p>
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	<p>Questions related to the above topics, from various competitive examinations UPSC/JAM/TNPSC others to be solved (To be discussed during the Tutorial hours)</p>
Skills acquired from this course	<p>Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</p>
Recommended Text	<ol style="list-style-type: none"> 1. Vogel, Arthur I: A Test book of Quantitative Inorganic Analysis (Rev. by G.H. Jeffery and others) 5th Ed., The English Language Book Society of Longman. 2. R. Gopalan, P. S.Subramanian and K. Rengarajan, Elements of Analytical Chemistry, Sultan Chand, New Delhi, 2007 3. Skoog, Holler and Crouch, Principles of Instrumental Analysis, Cengage Learning, 6th Indian Reprint (2017). 4. R.Speyer, Thermal Analysis of Materials, CRC Press, 1993. 5. R.A. Day and A.L. Underwood, Quantitative Analysis, 6th edn., Prentice Hall of India Private Ltd., New Delhi, 1993
Reference Books	<ol style="list-style-type: none"> 1. D.A.Skoog, D.M. West and F. J. Holler, Analytical Chemistry: An Introduction, 5th edn., Saunders college publishing, Philadelphia, 1998. 2. Dash UN, Analytical Chemistry; Theory and Practice, Sultan Chand and sons Educational Publishers, New Delhi, 2011. 3. Christian, Gary D; Analytical Chemistry, 6th Ed., John Wiley & Sons, New York, 2004. 4. Mikes,O.& Chalmes, R.A. Laboratory Handbook of Chromatographic & Allied Methods, Elles Harwood Ltd. London 5. G.H.Jeffery, J.Bassett, J.Mendham and R.C.Denney, Vogel's Text book of Quantitative Chemical Analysis, sixth edition 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 Learning Outcomes (for Mapping with Pos and PSOs) 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 electro chemical techniques CO4: explain the use of chromatographic techniques in the separathion and identification of mixtures CO5: explain preparation of solutions, stoichiometric calculations	

	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

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

Level of Correlation between PSO's and CO's

Title of the Course	FORENSIC SCIENCE						
PaperNo.	SEC-VII(Discipline Specific)						
Category	Skill Enhance ment Course	Year	II	Credits	2	Course Code	
		Semester	IV				
Instructional hours per week	Lecture	Tutorial	LabPractice		Total		
	2	-	-		2		
Pre requisites	General Chemistry						
Objectives of the course	<p>This course aims at giving an overall view of</p> <ul style="list-style-type: none"> • Crime detection through analytical instruments • Forgery and its detection • Medical aspects involved 						
CourseOutline	UNIT-I Poisons Poisons-types and classification-diagnosis of poisons in the living and the dead-clinical symptoms-post mortem appearances.Heavy metal contamination(Hg,Pb,Cd)of sea foods-use of neutron activation analysis in detecting arsenic in human hair. Treatment in cases of poisoning – use of antidotes for common poisons.						
	Unit-II CrimeDetection Accidental explosion during manufacture of matches and fireworks (as inSivakasi). Human bombs - possible explosives (gelatin sticks and RDX) –metal detector devices and other security measure sforVVIP-composition of bullets and detecting powder burns.						
	UNIT-III Forgery and Counterfeiting Documents-different types of forged signatures-simulated and tracedforgeries-inherent signs of forgery methods-writing deliberately modified -uses of ultraviolet rays-comparisonof type writtenletters–checking silverline watermarkin currency notes–alloy analysis usingAAS to detect counterfeit coins – detection of gold purity in 22 carat ornaments –detecting gold plated ewels-authenticity of diamond.						
	UNIT-IV Tracks and Traces Tracks and traces-small tracks and police dogs-footprints-costing of						

	<p>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-Cranial analysis (head and teeth) DNA Finger printing for tissue identification in dismembered bodies-detecting steroid consumption in athletes and race horses.</p> <p>UNIT-V</p> <p>Medical Aspects</p> <p>Aids - causes and prevention - misuse of scheduled drugs - burns and their treatment by plastic surgery. 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-small arms-laboratory examination of barrel washing and detection of powder residue by chemical tests.</p>
Recommended Text	<ol style="list-style-type: none"> 1. SAIqbal,MLiviu,Text book of forensicchemistry,Discovery publishing house private limited,2011. 2. KellyM.Elkins,Introduction to Forensic Chemistry,CRCPress,Taylor&FrancisGroup,2019. 3. JavedI.Khan,ThomasJ.Kennedy,DonnellR.Christian,Jr.,Basic principles of Forensic chemistry,HumanaPress,firstedition,2012. 4. BapulyAK,(2006)Forensic Science–Its application in crime investigation,Paras Medical Publisher,Hyderabad. 5. SharmaB.R.,(2006)Scientific Criminal Investigation,Universal Law PublishingCo.Pvt.Ltd,New Delhi.
Reference Books	<ol style="list-style-type: none"> 1. RichardSaferstinandCriminalistics-An Introduction to Forensic Science(CollegeVersion),Sopfestein,Printicehall,eighthedition,2003 2. SuzanneBell,Forensic Chemistry,Pearson,second international ledition,2014. 3. JaySiegel,Forensic chemistry:Fundamentals and applications,Wiley-Blackwell,first edition,2015. 4. MaxM.Houck&JayA.Segal,(2006)Fundamentals of Forensic Science,Elsevier Academicpress. 5. HenryC.Lee,Timothy Palmbach,MarilynT.Miller,(2006)HenryLee’sCrime Scene Book Elsevier Academicpress.
Website and e-learning source	<ol style="list-style-type: none"> 1. http://www.library.ucsb.edu/ist/03-spring/internet.html 2. http://www.wonderhowto.com/topic/forensic-science/

Course Learning Outcomes(for Mapping with Pos and PSOs)On

completion of the course the students should be able to

CO1:learn about the Poisons-types and classification of poisons in the living and the dead organisms and also get information about Postmortem.

CO2:get awareness on Human bombs,possible explosives(gelatin sticks and RDX)and metal detector devices and other security measures for VVIP-composition of bullets and detecting powder burns

CO3:detect the forgery documents,different types of forged signatures

CO4:have an idea about how to track and trace using police dogs,foot prints identification and gain the knowledge in analyzing biological substances-blood,semen,saliva,urine and hair-DNA Fingerprinting for tissue identification in dismembered bodies

CO5:get the awareness on Aids-causes and prevention and also have an exposure on handling fire explosives.

	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

CO-PO Mapping(Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

Semester – IV

Course Code	Environmental Science	Hrs	Credits	CIA	CE
Sem–IV / Part– IV	1	2	25	75	

Learning Objectives:

After completing the course, students will be able to:

Demonstrate an integrative approach to environmental issues with a focus on sustainability;

Use critical thinking, problem-solving, and the methodological approaches of the social sciences, natural sciences, and humanities in environmental problem solving;

Communicate complex environmental information to both technical and non-technical audiences

Understand and evaluate the global scale of environmental problems and

Reflect critically on their roles, responsibilities, and identities as citizens, consumers and environmental actors in a complex, interconnected world.

COURSE CONTENT

Unit – I: The Environment:

The Atmosphere, Hydrosphere, Lithosphere, Biosphere, Ecology, Ecosystem, Biogeochemical Cycle (Carbon Cycle, Nitrogen Cycle),

Unit – II: Environment Pollution:

Air Pollution, Water Pollution, Soil Pollution, Radiation Pollution.

Unit – III: Population Ecology:

Individuals, Species, Pollution, Community, Control Methods of Population, Urbanization and its effects on Society, Communicable Diseases and its Transmission, Non-Communicable Diseases.

Unit- IV: Environmental Movements in India:

Grassroot Environmental movements in India, Role of women, Environmental Movements in Tamil Nadu, State Pollution Control Board, Central Pollution Control Board.

Unit –V Natural Resources:

Conservation of Natural Resources, Management and Conservation of Wildlife, Soil Erosion and Conservation, Environmental Laws: Water Act, 1974, Air Act, 1981, The Wildlife (Protection) Act, 1972, Environment Protection, 1986, Natural Disasters and their Management.

References:

Dr Bharucha Erach, Text Book of Environmental Studies for UG Course, University Press (India) Pvt. Ltd.

Dr Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd, Ahmedabad – 380 013, India.

Katyal Timi & Satake M., Environmental Pollution, Anmol Publication Pvt. Ltd, New Delhi.

G. R. Chhatwal, M. C. Mehra, M. Satake, T. Katyal & Mohan V., Environmental Radiation and Thermal Pollution and their control, Anmol Publications, New Delhi.

R. C. Brunner, Hazardous Waste Incineration, Mc Graw Hill Inc.

K. C. Agarwal, Environmental Biology, Nidi Publishing Ltd, Bikaner.

R. N. Basu (Editor), Environment Calcutta University, Kolkata.

QUESTION PATTERN

Section – A: (10X1=10)

Ten questions are to be given, testing K1. All questions are to be answered. Each question carries one mark. Questions must be taken from all units.

Section – B: (5X7=35)

Five questions are to be given in the internal choice (Either-or) pattern, testing K2 and K3.

Questions must be taken from all units. Each question carries seven marks.

Q.No-11 (A and B) from Unit – I

Q. No -12 (A and B) from Unit – II

Q.No-13 (A and B) from Unit – III

Q.No-14 (A and B) from Unit – IV

Q.No-15 (A and B) from Unit – V

Section – C (3X10=30)

Five questions are to be given, testing K4 and K5. Three questions are to be answered.

Each question carries Ten Marks. Questions must be taken in this order.

Q.No. – 16 from Unit – I

Q.No. – 17 from Unit – II

Q.No. – 18 from Unit - III

Q.No. – 19 from Unit - IV

Q.No. - 20 from Unit – V

Title of the Course	ORGANIC CHEMISTRY-I						
Paper No.	Core IX						
Category	Core	Year	III	Credits	4	Course Code	
		Semester	V				
Instructional Hours per week	Lecture	Tutorial	Lab Practice		Total		
	4	1	-		5		
Pre requisites	General Chemistry I,II,III and IV						
Objectives of the course	<p>This course aims to provide an understanding of</p> <ul style="list-style-type: none"> • 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	<p>UNIT I</p> <p>Stereo Chemistry Fischer Projection, Newmann and Sawhorse Projection formulae for C₂H₆ and n-butane Geometrical isomerism: cis-trans, syn-anti isomerism, E/Z notations.</p> <p>Optical Isomerism: Optical activity, specific rotation, asymmetry, enantiomers, diastereoisomers, meso structures - molecules with one and two chiral centres, racemisation-methods of racemisation; resolution-methods of resolution. R and S notations for one and two chirality (stereogenic) centres.</p> <p>Molecules with no asymmetric carbon atoms—allenes and biphenyls. Conformational analysis of ethane and butane.</p>						
	<p>UNIT-II</p> <p>Chemistry of Nitrogen Compounds-I</p> <p>Nitro alkanes Nomenclature, isomerism, preparation from alkyl halides, haloacids, alkanes; physical properties; reactions—reduction, halogenations, Grignard reagent, Nitro-acid nitro tautomerism.</p> <p>Aromatic nitro compounds Nomenclature, preparation—nitration, from diazonium salts, physical properties; reactions—reduction of nitrobenzene in different medium, Electrophilic substitution reactions, TNT.</p>						

Amines:Aliphatic amines

Nomenclature, isomerism, preparation–Hofmanns’ degradation reaction, Gabriel’ sphthalimide synthesis.

Physical properties,reactions–alkylation,acylation,carbylamines 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,carbyl amine reaction, reaction with nitrous acid, aldehydes, oxidation, Electrophilic substitution reactions, diazotization and coupling reactions.

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 –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,PaalKnorr 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.

	<p>UNIT-V Six-membered heterocyclic compounds</p> <p>Pyridine – synthesis - from acetylene, Physical properties; reactions – basic character, oxidation, reduction, electrophilic substitution reactions; nucleophilic substitution - uses</p> <p>Quinoline– preparation-Skraup synthesis and Friedlander’s synthesis; reactions– basic nature, reduction, oxidation; electrophilic substitutions ;nucleophilic substitutions– Chichibabin reaction</p> <p>Isoquinoline–preparation by the Bischler–Napieralski reaction, reduction, oxidation; electrophilic substitution.</p>
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 etc. 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	<p>1. M.K. Jain, S.C. Sharma, Modern Organic Chemistry, Vishal Publishing, fourth reprint, 2009.</p> <p>2. S.M. Mukherji, and S.P. Singh, Reaction Mechanism in Organic Chemistry, Macmillan India Ltd., third edition, 2009.</p> <p>3. Arun Bahadur and B.S. Bahl, Advanced organic chemistry, New Delhi, S. Chand & Company Pvt. Ltd., Multicoloured edition, 2012.</p> <p>4. P.L. Soni and H.M. Chawla, Text Book of Organic Chemistry, Sultan Chand & Sons, New Delhi, twenty ninth edition, 2007.</p> <p>5. C.N. Pillai, Text Book of Organic Chemistry, Universities Press (India) Private Ltd., 2009.</p>
Reference Books	<p>1. R.T. Morrison and R.N. Boyd, Organic Chemistry, Pearson Education, Asia, sixth edition, 2012.</p> <p>2. T.W. Graham Solomons, Organic Chemistry, John Wiley & Sons, eleventh edition, 2012.</p>

	<p>3. A.CareyFrancis,OrganicChemistry,TataMcGraw-HillEducationPvt.Ltd.,NewDelhi,seventhedition,2009.</p> <p>4. I.L.Finar,OrganicChemistry,Vol.(1&2),England,WesleyLongmanLtd,sixth edition,2006.</p> <p>5. J.A.Joule,andG.F.Smith,HeterocyclicChemistry,Wiley,Fifth Edition,2010.</p>
Websiteand e-learning sources	<p>1. www.epgpathshala.nic.in</p> <p>2. www.nptel.ac.in</p> <p>3. http://swayam.gov.in</p> <p>4. VirtualTextbookofOrganicChemistry</p>
<p>Course Learning Outcomes(for Mapping with Pos and PSOs)</p> <p>On completion of the course the students should be able to</p> <p>CO1:assign RS notations to chirals and EZ notations to olefins and explain conformations of ethane and butane.</p> <p>CO2:explain preparation and properties of aromatic and aliphatic nitro compounds and amines</p> <p>CO3:explaincolour and constitution of dyes and food additives</p> <p>CO4:discuss preparation and properties of five membered heterocycles like pyrrole,furan and thiophene</p> <p>CO5:discuss preparation and properties of six membered heterocycles like pyridine,quinoline and isoquinoline</p>	

	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

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

Level of Correlation between PSO's and CO's

Title of the Course	INORGANIC CHEMISTRY-I						
Paper No.	Core X						
Category	Core	Year	III	Credits	4	Course Code	
		Semester	V				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	4	-	-		4		
Pre requisites	General Chemistry I, II, III and IV						
Objectives of the course	<p>The course aims to provide knowledge on</p> <ul style="list-style-type: none"> • 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 • Lanthanoids and actinoids • Preparation and properties of inorganic polymers 						
Course Outline	<p>UNIT I Co-ordination Chemistry-I</p> <p>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.</p> <p>Chelates–types of ligands forming chelates–stability of chelates, applications of chelates in qualitative and quantitative analysis–application of DMG Estimation of hardness of water using EDTA, metal ion indicators.</p> <p>Role of metal chelates in living systems – haemoglobin and chlorophyll</p>						
	<p>Unit II Co-ordination Chemistry-II</p> <p>Crystal field theory – Crystal field splitting of energy levels in octahedral and tetrahedral complexes, Crystal field stabilization energy(CFSE), crystal field effect on ionic radii, lattice energies, interpretation of magnetic properties, spectra of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ - Stability of complexes in aqueous solution, stability constants- factors affecting the stability of a complex ion, Comparison of VBT and CFT.</p>						

	<p>UNIT III Organo metallic compounds</p> <p>Metal Carbonyls Mono and poly nuclear carbonyls, General methods of preparation of carbonyls –general properties of binary carbonyls– bonding in carbonyls– structure and bonding in carbonyls of Ni, Fe, Cr, and Mn, EAN rule as applied to metal carbonyls.</p> <p>Ferrocene – Methods of preparation, physical and chemical properties</p>
	<p>UNIT IV Inner transition elements (Lanthanoids and Actinoids)</p> <p>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 ammonium sulphate, and thorium dioxide.</p>
	<p>UNIT V Inorganic polymers</p> <p>General properties – classification of inorganic polymers based on element in the backbone (Si, and P) - preparation and properties of silicones phosphorous based polymer (poly phosphazines and poly phonitrilic chloride), sulphur based polymer (poly sulfid e and polymeric sulphurnitride) , boron based polymers (borazine polymers)–industrial applications of inorganic polymers.</p>
Extended Professional Component (is apart 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	<ol style="list-style-type: none"> 1. PuriBR, SharmaLR, KaliaKC (2011), Principles of Inorganic Chemistry, 3rd Edition, Milestone Publishers & Distributors, Delhi. 2. SatyaPrakash, Tuli G.D., Basu S.K., Madan R.D. (2009),

	<p>Advanced Inorganic Chemistry, 18th Edition, S. Chand & Co., New Delhi</p> <p>3. Lee JD, (1991), Concise Inorganic Chemistry, 4th Edition, ELBS William Heinemann, London.</p> <p>4. W V Malik, G D Tuli, R D Madan, (2000), Selected Topics in Inorganic Chemistry, S. Chand and Company Ltd.</p> <p>5. A. K. De, Textbook of Inorganic Chemistry, Wiley East Ltd, seventh edition, 1992.</p>
Reference Books	<p>1. Madan RD, Sathya Prakash, (2003), Modern Inorganic Chemistry, 2nd ed., S. Chand and Company, New Delhi.</p> <p>2. Gopalan R, (2009) <u>Inorganic Chemistry for Undergraduates</u>, 1st Edition, University Press (India) Private Limited, Hyderabad</p> <p>3. Sivasankar B, (2013) <u>Inorganic Chemistry</u>, 1st Edition, Pearson, Chennai</p> <p>4. Alan G. Sharp (1992), <u>Inorganic Chemistry</u>, 3rd Edition, Addison-Wesley, England</p> <p>5. Peter Atkins, Tina Overton, Jonathan Rourke and Mark Weller, Inorganic Chemistry, Oxford University Press, sixth edition, 2014.</p>
Website and e-learning source	<p>1. www.epgpathshala.nic.in</p> <p>2. www.nptel.ac.in</p> <p>3. http://swayam.gov.in</p>
<p>Course Learning Outcomes (for Mapping with Pos and PSOs)</p> <p>On completion of the course the students should be able to</p> <p>CO1: explain isomerism, Werner's Theory and stability of chelate complexes</p> <p>CO2: discuss crystal field theory, magnetic properties and spectral properties of complexes.</p> <p>CO3: explain preparation and properties of metal carbonyls</p> <p>CO4: give a comparative account of the characteristics of lanthanoids and actinoids</p> <p>CO5: explain properties and uses of inorganic polymers of silicon, sulphur, boron and phosphorous</p>	

	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

	<p>UNIT-II Chemical Kinetics</p> <p>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 and complex reactions, Rate laws- Rate constants – derivation of rate constants and characteristics 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.</p> <p>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.</p> <p>Complex reactions – reversible and parallel reactions (no derivation and only examples) – Kinetics of consecutive reactions – steady state approximation.</p> <p>UNIT III 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, kinetics of enzyme catalysed reaction – Michaelis- Menten and Briggs- Haldane equation – Lineweaver- Burk plot – inhibition – reversible – competitive, non competitive and uncompetitive (no derivation of rate equations)</p> <p>Catalysis – general characteristics of catalytic reactions, auto catalysis, promoters, negative catalysis, poisoning of a catalyst – theories of homogeneous and heterogeneous catalysis – Kinetics of Acid – base and enzyme catalysis. Heterogeneous catalysis</p> <p>UNIT IV Colloids and Surface Chemistry</p> <p>Colloids: Types of Colloids, Characteristics 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,</p> <p>Coagulation or precipitation, Stability of sols, associated colloids, Emulsions, Gels- preparation of Gels, Applications of colloids</p>
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	<p>Macromolecules: Molecular weight of Macromolecules- Number average molecular weight- average molecular weight, Determination of Molecular weight of molecules.</p> <p>UNIT V Photo chemistry</p> <p>Laws of photochemistry–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 $\text{H}_2\text{-I}_2$ reactions, comparison between thermal and photochemical reactions.</p> <p>Fluorescence–applications including fluorimetry–sensitized fluorescence, phosphorescence – applications - chemiluminescence and photosensitisation– examples Chemistry of Vision–11 cisretinal–vitamin A as a precursor–colour perception of vision</p>
Extended Professional Component (is a part of internal component only, Not to be included in the external examination Question paper)	<p>Questions related to the above topics, from various competitive examinations UPSC/JAM/TNPSC others to be solved (To be discussed during the Tutorial hours)</p>
Skills acquired from this course	<p>Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</p>
Recommended Text	<ol style="list-style-type: none"> 1. B.R. Puri and L.R. Sharma, Principles of Physical Chemistry, Shoban Lal Nagin Chand and Co., forty eighth edition, 2021. 2. Peter Atkins, and Julio de Paula, James Keeler, Physical Chemistry, Oxford University press, International eleventh edition, 2018. 3. Arun Bahl, B.S. Bahl, G.D. Tuli Essentials of physical chemistry, 28th edition 2019, S, Chand & Co. 4. S.K. Dogra and S. Dogra, Physical Chemistry through Problems: New Age International, fourth edition, 1996. 5. J. Rajaram and J.C. Kuriacose, Thermodynamics, Shoban Lal Nagin Chand and CO., 1986.
Reference Books	<ol style="list-style-type: none"> 1. J. Rajaram and J.C. Kuriacose, Chemical Thermodynamics, Pearson, 1st edition, 2013. 2. Keith J. Laidler, Chemical kinetics, third edition, Pearson, 2003. 3. P.W. Atkins, and Julio de Paula, Physical Chemistry, Oxford University press, seventh edition, 2002. 4. K.L. Kapoor, A Textbook of Physical Chemistry, Macmillan

	India Ltd,third edition,2009. 5. B.R.Puri,L.R.SharmaandM.S.Pathania,Principles of Physical Chemistry,ShobanlalNagin ChandandCo.Jalendhar,forty first,edition,2001
Website and e-learning source	1. https://nptel.ac.in 2. https://swayam.gov.in 3. www.epgpathshala.nic.in
Course Learning Outcomes(for Mapping with Pos and PSOs) On completion of the course the students should be able to CO1: explain Gibbs and Helmholtz free energy functions,partial molar quantities and Ellinghams CO2: apply the concepts of chemical kinetics to predict the rate of the reaction and order of the reaction, demonstrate the effect of temperature on reaction rate, and the significance of free energy and entropy of activation. CO3: compare chemical and physical adsorption, Freundlich and Langmuir adsorption isotherms, and differentiate between homogenous and heterogeneous catalysis. CO4: demonstrate the types and characteristics of colloids, preparation of sols and emulsions,and determine the molecular weights of macromolecules. CO5: utilize the concepts of photochemistry in fluorescence, phosphorescence, chemiluminescence and color perception of vision.	

	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

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
Weightedpercentageof CourseContributiontoPos	3.0	3.0	3.0	3.0	3.0

LevelofCorrelationbetweenPSO'sandCO's

Course Code		Project with Viva Voce (Individual Project)	Hrs	Credits	CIA	CE
Sem-V / Part- III / Core - XII			5	4	25	75

Learning Objective:

Other than class room teaching through theory and practical lectures, internships, field visits, assignments and seminars, the learners are put in the practice of doing research at the Under-Graduation level itself.

Methodology:

Every individual learner has to carry out a minor research work

The area of focus can be related to the core subjects

Inter-disciplinary research works are encouraged.

The project work must retain its originality and avoidance of plagiarism is mandatory

Evaluation Pattern:

After completion of eighty percent of the working days in the concerned semester, the candidate has to submit the research/ project work to the Examination section of the institution for evaluation.

The final product of the research work must be duly signed by the candidate, the Research Supervisor and the Head of the Department

The Examination section of the institution will fix a date for Viva-voce examination. Each individual has to appear for the Viva-voce.

Allocation of Marks:

CIA – 25 marks

The research supervisor will award the marks assessing the performance of the researcher through out the process of research

Viva-voce – 75 marks

The student will appear for Viva-voce examination. The examiner will assess the quality of the research, subject knowledge and the presentation of the learner.

Title of the Course	BIO CHEMISTRY						
PaperNo.	ECV						
Category	Elective	Year	III	Credits	4	Course Code	
		Semester	V				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	4	1	-		5		
Pre requisites	Organic Chemistry-I						
Objectives of the course	<p>The course aims at providing knowledge on</p> <ul style="list-style-type: none"> relationship between biochemistry and medicine, composition of blood structure and properties of aminoacids, 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 Maintenance of pH of Blood–Bicarbonate Buffer, Acidosis, Alkalosis.						
	UNIT II Peptides and Proteins Amino acids – nomenclature, classification – essential and Non-essential; Synthesis-Gabriel Phthalimide, zwitter Ion and isoelectric point, electrophoresis and reactions. Peptides –peptide bond – nomenclature – synthesis of simple peptides–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, hydrolysis, oxidation, denaturation, colour tests for proteins; structure Of proteins – primary, secondary, tertiary and quaternary. Metabolism of Aminoacids–general aspects of metabolism (a brief outline); urea cycle.						
	UNIT III Enzymes and Vitamins Nomenclature and classification, characteristics, factors influencing Enzyme activity – mechanism of enzyme action – Koshland’s induced fit model. Pro enzymes, anti enzymes, coenzymes and isoenzymes;						

	<p>Vitamins as coenzymes – functions of TPP, lipoic acid, NAD, NADP, FMN, FAD, pyridoxal phosphate, CoA, folic acid, biotin, Cyano cobalamin.</p> <p>UNIT IV Amino acids Components of nucleic acids - nitrogenous bases and pentose sugars, Structure of nucleosides and nucleotides, DNA- structure & functions;</p>
	<p>RNA–types–structure - functions;biosynthesis of proteins</p> <p>Hormones Adrenalin and thyroxine — structure and functions (No structure elucidation).</p> <p>UNIT V Lipids Occurrence, biological significance of fats, classification of lipids. Simple lipids – Oils and fats, chemical composition, properties, Trans -esterification, saponification, rancidity; analysis of oils and fats– saponification number, iodine number, , R.M.value.Distinction between animal and vegetable fats. Compound lipids – Lipo proteins - VLDL, LDL, HDL, chylomicrons – biological significance. Cholesterol–occurrence, structure, test ,physiological activity. Metabolism of lipids :β – oxidation of fatty acids.</p>
Extended Professional Component (is a part of internal component only, Not to be included in the external examination Question paper)	<p>Questions related to the above topics, from various competitive examinations UPSC/JAM/TNPSC others to be solved (To be discussed during the Tutorial hours)</p>
Skills acquired From this course	<p>Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</p>
Recommended Text	<ol style="list-style-type: none"> 1. Bahl,B.S.;Bhal,A.<i>AdvancedOrganicChemistry</i>,3rded.;S.Chand: NewDelhi,2003. 2. Jain, M.K.; Sharma, S.C. <i>ModernOrganicChemistry</i>,VishalPublications:NewDelhi,2017. 3. Shanmugam,A.<i>FundamentalsofBiochemistryforMedicalStudents</i>,6thed.;Publishedbythe author,1999. 4. Veerakumari,L.<i>Biochemistry</i>,1sted.;MJPPublications:Chennai,2004. 5. Jain,J.L.;<i>FundamentalsofBiochemistry</i>,2nded.;S.Chand:New Delhi,1983.

Reference Books	1. Conn,E.E.;Stumpf,P.K. <i>OutlineofBiochemistry</i> ,5 th ed.;WileyEastern:NewDelhi,2002. 2. West,E.S.;Todd,W.R.;Mason,H.S.;VanBruggen,J.T. <i>TextBookofBiochemistry</i> ,4 th ed.;Macmillan:NewYork,1970. 3. Lehninger,A.L. <i>PrinciplesofBiochemistry</i> ,2 nd ed.;CBSPublisher:Delhi,1993. 4. Rastogi,S.C. <i>Biochemistry</i> ,2 nd ed.;TataMcGraw-Hill:NewDelhi,
	2003. 5.Chatterjea,M.N.;Shinde,R. <i>TextbookofMedicalBiochemistry</i> ,5 th ed.;JaypeeBrothers: NewDelhi,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 4) https://onlinecourses.nptel.ac.in/noc19_cy07/preview Experimental Biochemistry
Course Learning Outcomes (for Mapping with Pos and PSOs) On completion of the course the students should be able to CO1: explain molecular logic of living organisms, composition of blood and blood coagulation CO2: explain synthesis and properties of aminoacids, determination of structure of peptides and proteins CO3: explain factors influencing enzyme activity and vitamins as coenzymes CO4: explain RNA and DNA structure and functions CO5: explain biological significance of simple and compound lipids	

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

Level of Correlation between PSO's and CO's

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

Level of Correlation between PO's and CO's

Water Treatment and Analysis (Optional)

Objectives:

The objectives of the course is to give an in depth understanding of water quality parameters, ground water and surface water pollution and its control measures. In Addition, the students will also learn the water treatment methods, sewage and industrial effluent treatment methods and water resources management.

Unit – I Water Quality Parameters and their determination

Physical, chemical and biological standards significance of these contaminates over the quality and their determinations- Electrical Conductivity – turbidity – pH, total solids, TDS- alkalinity- hardness – chlorides- DO-BOD- COD.

Unit- II Ground water and surface water pollution and control measures

Surface water and ground water pollution- Harmful effects – Pollution of major rivers- protecting ground water from pollution – ground water pollution due to fluoride, Iron, Chromium and Arsenic – Sources, ill effects and treatment methods.

Unit- III Water treatment methods

Treatment for community supply- screening, Sedimentation , , coagulation, filtration- removal of micro organisms- Chlorination, adding bleaching Powder, UV irradiation and ozonation.

Unit- IV Sewage and industrial effluent treatment

Sewage- Characteristics – purpose of sewage treatment – methods of sewage treatment- primary – secondary and tertiary – Role of algae in Sewage treatment – Types of industrial Wastes- treatment of effluents with organic and inorganic impurities.

Unit- V Water Management

Water resources management – rain water harvesting methods – Percolation Ponds- Check dams – roof top collection methods – water management in industries.

References Book:

1. Chemical and biological methods for water pollution studies, R.K.Trivedy and P.K. Goel. Environmental Publications, 1986.
2. Engineering Chemistry, P.C. Jain and Monica Jain, Dhanpat Rai and Sons, 1993.
3. Environmental Chemistry, B. K.Sharma, Goel Publishing House.
4. Water Quality and Defluoridation Techniques, Rajiv Gandhi National Drinking water mission Publication 1994.

PSO C	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	Strong	Strong	Strong	High	High
CO2	High	Medium	Strong	Medium	Strong
CO3	Strong	Strong	Medium	Strong	Strong
CO4	Strong	High	High	High	Medium
CO5	High	Strong	Strong	Medium	High

CO Number	CO Statement	Knowledge Level
CO1	To Understand the quantitative information on the physical, chemical and biological characteristics of water via statistical sampling.	K2
CO2	To Explain the importance of ground water, surface water pollution & its harmful effects.	K1
CO3	Know the types of water treatment methods.	K2
CO4	To acquire knowledge about the different steps involved in primary, secondary and tertiary treatment of waste water.	K2
CO5	To Understand how water resources management are developed.	K2

	<p>Civetone and musk; Synthetic -gereniol; ketones- muskone, coumarin; aldehydes- vanilin.</p> <p>Soaps and Detergents</p> <p>Soaps- properties, manufacture of soap- batchprocess; types-transparent soap, toilet soap, powder soap and liquid soap– ingredients.</p> <p>Detergents- definition, properties- cleansing action; soapless detergents- anionic, cationic and non-ionic (general idea only); uses of detergents as surfactants. Bio degradability of soaps and detergents.</p> <p>UNIT III Sugar Industry</p> <p>Manufacture from sugarcane; recovery of sugar from molasses; testing and estimation of sugar.</p> <p>Food Preservation and processing</p> <p>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.</p> <p>UNIT IV Abrasives</p> <p>Definition, characteristics, types-natural and synthetic; natural abrasives – diamond, corundum, emery, garnet, quartz – uses; synthetic abrasives– carborundum, aluminiumcarbide, boroncarbide, boronnitride- uses.</p> <p>Leather Industry</p> <p>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.</p> <p>Paper Industry</p> <p>Manufacture of pulp - mechanical, chemical processes; sulphate pulp, rag pulp; manufacture of paper-beating, refining, filling, sizing, colouring, calendaring; cardboard.</p> <p>UNIT V Lubricants Definition, classification- liquid, semi-solid, solid and synthetic;properties-viscosity index, flashpoint.</p>
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	<p>Cement Industry</p> <p>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.</p>
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	<p>Questions related to the above topics, from various competitive examinations UPSC/JAM/TNPSC others to be solved (To be discussed during the Tutorial hours)</p>
Skills acquired from this course	<p>Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</p>
Recommended Text	<ol style="list-style-type: none"> 1. Sharma,B.K. <i>Industrial Chemistry</i>, 9thed.; Goel Publishing House: Meerut, 1998. 2. Wilkinson,J.B.E.Moore,R.J. <i>Harry's Cosmeticology</i>, 7thed.; Chemical Publishers: New York, 1982. 3. Alex V.Ramani, <i>Food Chemistry</i>, MJP publishers: Chennai, 2009. 4. Jayashree Ghosh, <i>Applied Chemsitry</i>, S.Chand: New Delhi, 2006. 5. Srilakshmi,B. <i>Food Science</i>, 4thed.; NewAge International Publication, 2005.
ReferenceBooks	<ol style="list-style-type: none"> 1. Jain, P.C.; Jain, M. <i>Engineering Chemistry</i>, 16thed.; DhanapetRai: Delhi, 1992 2. George Howard, <i>Principles and Practice of Perfumes and Cosmetics</i>, Stanley Therones, 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>, 3rded.; New Age Publication, 2008. 5. NeerajPandey, 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 Learning Outcomes (for Mapping with Pos and PSOs) 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 propellants CO2: evaluate cosmetic products, soaps, detergents. CO3: explain manufacture of sugar, food spoilages and food additives CO4: explain properties of abrasives, manufacture of leather and paper CO5: explain properties and manufacture of lubricants and cement, and intellectual property rights	

	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

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

Level of Correlation between PSO's and CO's

Petro Chemistry

Hours : 6 Per week

Credits : 4

Marks: 75(Ext); 25 (Int)

Course Objectives:

- 1. To Understand the occurrence, composition and uses of petro chemicals.**
- 2. To acquire knowledge on the classification of petroleum products.**
- 3. To understand the chemistry of petroleum products and purification process**

Unit – I

- Introduction, petrochemicals - definition, occurrence, composition, examples and uses. crude petroleum- collection of petroleum and gas at oil wells. Fractional distillation of petroleum, cracking, octane number, flash point and setane number.
- Synthetic petroleum- Definition, preparation from coal by Bergius method and Fischer - Tropsch process.

Unit – II

- Petroleum as a source of aromatics, natural gas, gasoline, extraction methods of light hydrocarbons (refrigerated absorption and low temperature distillation).
- Precursors for petrochemicals, classification of petroleum products, Liquified hydrocarbon gases and fuels, liquification by gases – fuel for carbureted engine, aviation motor.

Unit – III

Fuel oils or Boiler oils

Fuel oil – types, quality of fuel oil, fuels for jet and gas turbine engine. Lubriants- Classification, characteristics, kinds of mineral oils - aviation oil, Industrial oil, turbine oil, insulating oil, compressor oil.

Unit- IV

Paraffins, Ceresins, Medical, capacitor petroleum and miscellaneous, petroleum products, greases, bitumens, solvents kerosene, productivity, greases domestic kerosene, coke carbon black and their uses.& Inter – relationship of precursors from natural gas, petroleum cuts & Coal.

Unit – V

Purification of petroleum products

Introduction, - Types of purification process (absorptive and adsorptive sulphuric acid purification), alkaline purification, hydrofining Purification in a DC electric field, new methods of purification - Demercaptanisation and stabilization.

Reference Books:

1. A Text on Petrochemicals by B.K.Bhaskararao.
2. A Text on Petrochemicals – Petroleum Refining Technology by Dr.Ram Prasad.
3. Fundamentals of Petroleum and Petrochemical Engineering by Uttam Ray Chaudhuri.

CO Number	CO Statement	Knowledge Level
CO1	To understand the occurrence ,composition, uses of petrochemicals and also to know the preparation of synthetic petroleum	K1 – K5
CO2	To acquire knowledge on extraction of hydrocarbons and classification of petroleum products	K1 – K3
CO3	To sketch the fuel oils and classification of lubricants	K2, K3
CO4	To understand chemistry of petroleum products and Inter – relationship of precursors from natural gas, Petroleum cuts & Coal.	K2, K3
CO5	To outline the purification processes of petroleum products	K1 – K4

CO \ PSO	PSO				
	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	High	Strong	Medium	Strong	High
CO2	Strong	High	Strong	Medium	Strong
CO3	Strong	Strong	Strong	High	Strong
CO4	Medium	Strong	High	Strong	Medium
CO5	High	Medium	Strong	High	Strong

Course Code	Value Education	Hrs	Credits	CIA	CE
Sem-V / Part- IV		2	2	25	75

Learning Objectives:

This course aims to

LO1 – build physical and mental strength of the learners

LO2 – strengthen the emotional and spiritual aspects of the learners.

LO1 – make the learners responsible and cooperative citizens

LO3 – develop democratic way of thinking and inculcate spirit of national integration

LO4 – develop the practice of paying respect for dignity of individual and diversity in society

COURSE CONTENT

Unit I - Yoga and Physical Health

1.1 Physical Structure – Three bodies – Five limitations

1.2 Simplified Physical Exercises – Hand Exercises -Leg Exercises – Breathing

Exercises – Eye Exercises – Kapalapathi

1.3 Maharasanas 1-2 – Massages – Acu-puncture – Relaxation

1.4 Yogasanas – ~~Padmasana~~ [&] Padmasana – Vajrasanas – Chakrasanas

(Side) – Viruchasanas – Yoga muthra – Patchimothasanas – Ustrasanas –

Vakkarasanas – Salabasanas

Unit II - Art of Nurturing the life force and Mind

2.1 Maintaining the youthfulness – Postponing the ageing process

2.2 Sex and Spirituality - Significance of sexual vital fluid – Married life –

Chastity

2.3 Ten stages of Mind

2.4 Mental frequency – Methods for concentration

Unit III - Sublimation

3.1 Purpose and Philosophy of life

3.2 Introspection – Analysis of Thought

3.3 Moralization of Desires

3.4 Neutralization of Anger

Unit IV – Human Resources Development

4.1 Eradication of worries

4.2 Benefits of Blessings

4.3. Greatness of Friendship

4.4 Individual Peace and World Peace

Unit V – Law of Nature

5.1 Unified force – Cause and Effect system

5.2 Purity of Thought and Deed and Genetic Centre

5.3 Love and Compassion

5.4 Cultural Education – Five fold Culture

1) யோகமும் உடல்நலமும்

(16 hours)

- 1.1 உடலமைப்பு - 3 உடல்கள் - ஐந்தில் அளவுமுறை
- 1.2 எளியமுறை உடற்பயிற்சி - கைப்பயிற்சி - கால் பயிற்சி - முச்சுப்பயிற்சி - கண் பயிற்சி - கபாலபதி
- 1.3 மகராசனம் 1-2 - உடல் தேய்த்தல் - அக்குபிரஷா பயிற்சி - உடல் தளர்த்தல்
- 1.4 யோகாசனங்கள்: ஸூரியாஸனம் - பத்மாசனம் - வஜ்ராசனம் - சக்கராசனம் (பக்கவாட்டில்) - விருச்சாசனம் - யோக முத்ரா - பச்சி மோத்தாசனம் - உஸ்ட்ராசனம் - வக்கராசனம் - சலபாசனம்

2) உயிர்வளமும் - மனவளமும்

(16 hours)

- 2.1 இளமை காத்தல் - முதுமையைத் தள்ளிப்போடுதல்
- 2.2 பாலுணர்வும் ஆன்மீகமும் - வித்தின் மகிமை - இல்லற வாழ்வு - கற்புநெறி
- 2.3 மனதின் பத்து படிநிலைகள்
- 2.4 மன அலைச்சுழல் - மன ஓர்மைக்கான பயிற்சிகள்

3) குணநலப்பேறு

(16 hours)

- 3.1 வாழ்வின் நோக்கம் - வாழ்க்கைத் தத்துவம்
- 3.2 அகத்தாய்வு - எண்ணம் ஆராய்தல்
- 3.3 ஆசை சீரமைத்தல்
- 3.4 சினம் தவிர்த்தல்

4) மனிதவள மேம்பாடு

(16 hours)

- 4.1 கவலை ஒழித்தல்
- 4.2 வாழ்த்தும் பயனும்
- 4.3 நட்பு நலம்
- 4.4 தனிமனித அமைதி - உலக அமைதி

5) இயற்கை நியதி

(16 hours)

- 5.1 ஒருங்கிணைப்பு ஆற்றல் - செயல்விளைவுத் தத்துவம்
- 5.2 மனத்தாய்மை, வினைத்தாய்மை - கருமையம்
- 5.3 அன்பும் கருணையும்
- 5.4 பண்பாட்டுக் கல்வி - ஐந்தொழுக்கப் பண்பாடு

Reference Book:

Manavalakalai Yoga, Vethathri Publications, Tamil Nadu, 2008.

Evaluation Pattern:

Practical [Performing Yoga & Meditation] – 25 marks

Theory [End-Semester Examination] – 75 marks

Question Pattern:

Section – A:

Ten objective type questions with multiple answers are to be given. (10X1=10)

Section – B:

Five short essay type questions in ‘Either – or’ pattern are to be given. (5X7=35)

Section – C:

Five long essay type questions are to be given. Three questions are to be answered. (5X10=30)

Course Code		Summer Internship / Industrial Training	Hrs	Credits	CIA	CE
Sem–V / Part– IV			-	2	25	75

Learning Objectives:

LO1 – To offer a hands-on-learning experience, that allows the learners to maximize the outcome and benefits of their theoretical knowledge through practical implementation.

LO2 – By adding technical skills, soft skills and professional experience to the learners’ resume, they can enhance their chances of securing the job they desire

LO3 – To provide the learners an experience of the real corporate world and thus help them understand the expectations and requirements of the industry

LO4 – To enable the learners build their network and professional relationships, which turns them into confident future professionals.

Duration of the Training:

- * The learners of all the Under-Graduation Programmes are to undergo the Internship / Industrial Training during the summer vacation, after completion of the IV Semester examinations. The training period is 30 working days.
- * Evaluation:
- * After completion of the training, the evaluation of the performance of the learners will be done in the V semester.
- * Two credits will be awarded for the best performers.
- * Viva-voce examination will be conducted and the learners have to appear for the Viva-voce individually.
- * At the time of Viva-voce, the learners have to submit the given records to the examiner.
 - Work Diary, endorsed by the trainer
 - A complete report on the objectives, modules and outcomes.
 - A certificate, duly signed and issued by the trainer

Title of the Course	ORGANIC CHEMISTRY-II						
Paper No.	CoreXIII						
Category	Core	Year	III	Credits	3	Course Code	
		Semester	VI				
Instructional Hours Per Week	Lecture	Tutorial	LabPractice		Total		
	1	4	-		5		
Pre Requisites	Organic Chemistry–I						
Objectives of the Course	<p>This course aims at providing knowledge on</p> <ul style="list-style-type: none"> • classification, isolation and discussing the properties of alkaloids and terpenes • preparation and properties of saccharides • biomolecules • different molecular rearrangement • preparation and properties of organometallic compounds 						
Course Outline	<p>UNIT-I Alkaloids Classification, isolation, general properties- Structure elucidation–Coniine, piperine, nicotine.</p> <p>Terpenes: Classification, Isoprene rule, isolation and structural elucidation of Citral, Menthol. Geraniol.</p>						
	<p>UNIT-II Carbohydrates Definition and Classification of Carbohydrates with examples. Definition of enantiomers, diastereomers, epimers and anomers with suitable examples.</p> <p>Monoaccharides—configuration—Glucose, Fructose—Occurrence, preparation, properties, reactions, structural elucidation, uses. Interconversions of sugar series—ascending, descending, aldose to ketose and ketose to aldose.</p> <p>Disaccharides— sucrose, - preparation, properties and uses (no structural elucidation).</p> <p>Polysaccharides—Source, constituents and biological importance of homopolysaccharides-starch and cellulose.</p>						

	UNIT-III Molecular rearrangements: Molecular Rearrangement: Type of rearrangements , Mechanism for Benzidine, Claisen, Fries, Hofmann, Curtius, Schmidt and Beckmann, Pinacol-pinacolone rearrangement
	UNIT-IV Special reagents in organic synthesis SeO ₂ , OsO ₄ , N-bromo succinimide, lead tetra acetate and Raney Nickel. Organometallic compounds in Organic Synthesis Preparation, Properties and applications: Grignard Reagents, Organo Lithium Compounds, Ziegler–Natta, Wilkinson, Metal Carbonyl, Zeiss'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.
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	<ol style="list-style-type: none"> 1 M.K.Jain, S.C.Sharma, Modern Organic Chemistry, Vishal Publishing, 4th reprint, 2009. 2 S.M.Mukherji, and S.P.Singh, Reaction Mechanism in Organic Chemistry, Macmillan India Ltd., 3rd edition, 2009 3 Arun Bahadur and B.S.Bahl, Advanced organic chemistry, New Delhi, S.Chand & Company Pvt.Ltd., Multicoloured edition, 2012. 4 P.L.Soni and H.M.Chawla, Text Book of Organic Chemistry, Sultan Chand & Sons, New Delhi, 29th edition, 2007.

	5.CBandyopadhyay;An Insight into Green Chemistry ;Publishedon2020
ReferenceBooks	1. R.T.MorrisonandR.N.Boyd,Organic Chemistry,PearsonEducation,Asia,6 th edition,2012. 2. T.W.GrahamSolomons,Organic Chemistry,JohnWiley&Sons,11 th edition,2012. 3. A. Carey Francis, Organic Chemistry, Tata McGraw-HillEducationPvt.Ltd.,NewDelhi,7 th edition,2009. 4. I.L.Finar,Organic Chemistry,Vol.(1&2),England,WesleyLongmanLtd,6 th edition,2006. 5. J.A.Joule,andG.F.Smith,Heterocyclic Chemistry,Wiley,5 th Edition,2010.
Website and e-learning source	1.www.epgpathshala.nic.in2.www.nptel.ac.in3.http://swayam.gov.in 4.VirtualTextbookofOrganicChemistry 5.https://vlab.amrita.edu/
Course Learning Outcomes(for Mapping with POs and PSOs) On completion of the course the students should be able to CO1: explain isolation and properties of alkaloids and terpenes CO2: explain preparation and reactions of mono and disachharides CO3: classify biomolecules and natural products based on their structure,properties,reactions and uses. CO4: explain molecular rearrangements like benzidine,Hoffmannetc., CO5: preparation and properties of organolithiumcompounds	

	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

	<p>UNIT III Metallo enzymes</p> <p>Isomerase and synthetases, structure of cyanocobalamin (Vitamin B12), nature of Co - C bond; Metalloenzymes – functions of carboxy peptidase A, zinc metallo enzyme–mechanism and uses, Zn – Cu enzyme - structure and function, carbonic anhydrase, Vitamin B-12 as transferase and isomerase - Iron-sulphur proteins - 2Fe-2S – rubredoxin, 4Fe-2S –ferridoxin, Iron sulphur cluster enzymes.</p> <p>Invivo and Invitro nitrogen fixation – biological functions of nitrogenase and molybdo enzymes.</p>
	<p>UNIT IV Silicates</p> <p>Introduction – general properties of silicates, structure– types of silicates Ortho silicates (zircon), pyrosilicates (thortveitite), chainsilicates (pyroxenes), ring silicates (beryl), sheet silicates (talc,mica,asbestos), silicates having three dimensional structure (feldspars, zeolites, ultramarines)</p>
	<p>UNIT V Industrial Applications of Inorganic Compounds</p> <p>Refractories, pyrochemical, explosives. Alloys, Paints and pigments-requirements of a good paint; classification, constituents of paints–pigments,vehicles,thinners, driers, extenders, anti- knocking agents, plasticizers,binders-application;varnishes-oils,spirit;enamels.</p> <p>Nanocomposite Hydrogels: synthesis, characterization and uses.</p> <p>Industrial visits and internship mandatory.</p>
Extended Professional Component (is apart of internal component only, Not to be included in the external examination Question paper)	<p>Questions related to the above topics, from various competitive examinations UPSC/JAM/TNPSC others to be solved (To be discussed during the Tutorial hours)</p>
Skills acquired From this course	<p>Knowledge, Problem solving, Analytical ability, Professional Competency,Professional Communication and Transferable skills.</p>
Recommended Text	<p>1.PuriBR,SharmaLR,KaliaKC(2011),PrinciplesofInorganicChemistry,31thed.,MilestonePublishers&Distributors,Delhi.</p>

	<ol style="list-style-type: none"> 2. SatyaPrakash,TuliG.D.,BasuS.K.,MadanR.D.(2009),AdvancedInorganic Chemistry,18thEdition,S.Chand&Co.,NewDelhi 3. LeeJD,(1991),ConciseInorganicChemistry,4thed.,ELBSWilliamHeinemann,London. 4. WVMalik,GDTuli,RDMadan,(2000),SelectedTopicsinInorganicChemistry,SchandandCompanyLtd. 5. A.K.De,TextbookofInorganicChemistry,WileyEastLtd,seventh edition, 1992
Reference Books	<ol style="list-style-type: none"> 1. MadanRD,SathyaPrakash,(2003),ModernInorganicChemistry,2nded.,S. Chand andCompany,NewDelhi. 2. GopalanR,(2009)<u>InorganicChemistryforUndergraduates</u>,1stEdition,UniversityPress(India)PrivateLimited,Hyderabad 3. SivasankarB,(2013)<u>InorganicChemistry</u>,1stEdition,Pearson,Chennai 4. AlanG. Sharp(1992), <u>InorganicChemistry</u>,3rdEdition, Addition-Wesley,England 5. PeterAtkins,TinaOverton,JonathanRourkeandMarkWeller,Inorganic Chemistry,OxfordUniversityPress,sixth edition,2014.
Website and E - learning source	<ol style="list-style-type: none"> 1. www.epgpathshala.nic.in 2. www.nptel.ac.in 3. http://swayam.gov.in
<p>Course Learning Outcomes (for Mapping with Pos and PSOs) On Completion of the course the students should be able to CO1:ability to explain the importance of tracer elements on biological system. CO2:explain the metal ion transport, Bohr effect,Na,K,Ca pump. CO3:explain the function of Vitamin B₁₂,Zn- Cu enzyme, ferredoxin,cluster enzymes. CO4:classification and structure of silicates. CO5:explain the manufacture ofrefractories,explosives,paintsandpigments</p>	

	change(sodium–potassium), solidsolution(gold-silver); copper sulphate–watersystem.
	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, N_2O_4 gas – equilibrium constant and degree of dissociation – formation of HI , NH_3 , and SO_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 – interionic effects – Debye Huckel theory – Onsager equation (no derivation), significance of Onsager equation, Debye Falkenhagen effect, Wien effect. Ionic mobility – Discharge of ions on electrolysis (Hittorf's theoretical device), transport number – determination – Hittorf's method, moving boundary method – factors affecting transport number – determination of ionic mobility; 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; relationship between electrical energy and chemical energy; sign of EMF and spontaneity of a reaction, Thermodynamics and EMF – calculation of ΔG , ΔH , and ΔS from EMF data; reversible electrodes, 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. Chemical cells with and without transport, concentration cells with and without transport; Applications of EMF measurements applications of EMF measurements – determination of activity

	<p>coefficient of electrolytes, transport number, valency of ions, solubility product, pH using hydrogen gas electrode, quinhydrone electrode and glass electrode, potentiometric titrations—acid base titrations, redox titrations, precipitation titrations, ionic product of water and degree of hydrolysis; redox indicators—use of diphenyl amine indicator in the titration of ferrous iron against dichromate.</p> <p>Industrial component</p> <p>Galvanic cells—lead storage, Ni-Cd, Li and Zn-air, Al-air batteries</p> <p>Fuel cells—H₂-O₂ cell—efficiency of fuel cells.</p> <p>corrosion—mechanism, types and methods of prevention.</p>
Extended Professional Component (is a part of internal component only, Not to be included in the external examination Question paper)	<p>Questions related to the above topics, from various competitive examinations UPSC/JAM/TNPSC Others to be solved</p> <p>(To be discussed during the Tutorial hours)</p>
Skills acquired From this course	<p>Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</p>
Recommended Text	<ol style="list-style-type: none"> 1. B.R. Puri and L.R. Sharma, Principles of Physical Chemistry, Shoban Lal Nagin Chand and Co., forty eighth edition, 2021. 2. Peter Atkins, and Juliode Paula, James Keeler, Physical Chemistry, Oxford University press, International eleventh edition, 2018. 3. Arun Bahl, B.S. Bahl, G.D. Tuli Essentials of physical chemistry, 28th edition 2019, S, Chand & Co. 4. S.K. Dogra and S. Dogra, Physical Chemistry through Problems: New Age International, fourth edition, 1996. 5. J. Rajaram and J.C. Kuriacose, Thermodynamics, Shoban Lal Nagin Chand and CO., 1986.

Reference Books	<ol style="list-style-type: none"> 1. K.L.Kapoor,A Textbook of Physical Chemistry,MacmillanIndiaLtd,thirdedition,2009. 2. Gilbert.W.Castellen, Physical Chemistry,NarosaPublishingHouse,thirdedition,1985. 3. P.W.Atkins,and JuliodePaula, Physical Chemistry,OxfordUniversitypress,seventhedition,2002 . 4. B.R.Puri,L.R.SharmaandM.S.Pathania,Principles of Physical Chemistry,Shobanlal Nagin Chand and Co.Jalendhar,fortyfirst,edition,2001 5. D.N.Bajpai,Advanced Physical Chemistry,S.Chand&Co.,2001
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 Thermodynamics- NPTEL https://www.youtube.com/watch?v=f0udxGcoztE Intro ductiontochemical equilibrium–MITopencourseware
Course Learning Outcomes(for Mapping with POs and PSOs)On completion of the course the students should be able to	
<p>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.</p> <p>CO2:apply the concepts of chemical equilibrium in dissociation of PCl_5, N_2O_4 and formation of HI, NH_3, SO_3 and decomposition of calcium carbonate.Demonstrate important principles such as Lechatelier principle,van'tHoff reaction isotherm and Clausius-Clayperon equation.</p> <p>CO3:Identify an appropriate distillation method for the separation of binary liquid mixtures such as azeotropic mixtures,partially miscible mixtures and immiscible liquids.</p> <p>CO4:Explain the significance of Arrhenius theory,Debye-Huckel theory,Onsager equation and Kohlrausch's law in conductance.</p> <p>CO5: Construct electrochemical cell with the help of electrochemical series and calculate cell EMF.Demonstrate the applications of EMF and significance of potentiometric titrations.</p>	

	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

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
Weightedpercentageof CourseContributiontoPos	3.0	3.0	3.0	3.0	3.0

LevelofCorrelationbetweenPSO'sandCO's

Title of the Course	PHYSICAL CHEMISTRY PRACTICAL-II						
PaperNo.	CoreXVI						
Category	Core	Year	III	Credits	2	Course Code	
		Semester	VI				
Instructional Hours per week	Lecture	Tutorial	LabPractice	Total			
	-	-	3	3			
Pre requisites	Theoretical knowledge on physical chemistry						
Objectives of the course	This course aims at providing <ul style="list-style-type: none"> • Basic principles of physical chemistry experiments • Hands on experience in carrying out thee xperiments 						
Course Outline	UNIT-I Phase diagrams <ol style="list-style-type: none"> 1. Simple eutectic-determination of eutectic temperature and composition of naphthalene- 2. Diphenylamine or naphthalene-diphenyl system 3. Determination of transition temperature of a salt hydrate. 4. Determination of upper critical solution temperature of phenol–waters ystem 5. Effect of an electrolyte on miscibility temperature of phenol–waters ystem 6. Determination of concentration of sodium chloride using phenol-sodium chloride system 						
	UnitII Distributionlaw <ol style="list-style-type: none"> 6. Determination of the distribution coefficient of iodine between carbon tetrachloride 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 <ol style="list-style-type: none"> 9. Conductometric titration of hydrochloric acid against sodium hydroxide 10. Potentiometric titration of ferrous ion against potassium dichromate using quinhydrone electrode. 						
Extended Professional Component(is a Part of internal componentonly, Not to be included In th eexternal examination Question paper)	Questions related to the above topics,from various competitive examinationsUPSC/JAM/TNPSCothers to bes olved (To be discussed during the Tutorial hours)						

Skills acquired From this course	Knowledge, Problemsolving, Analyticalability, Professional Competency, Professional Communication and Transferable skills.
Reference Books	1. Sindhya, 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 Learning Outcomes (for Mapping with Pos and PSOs) 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/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 PSOs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

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
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PO's and CO's

Title of the Course	FUNDAMENTALS OF SPECTROSCOPY						
Paper No.	ECVII						
Category	Elective Course	Year	III	Credits	3	Course Code	
		Semester	VI				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	4	1	-		5		
Pre requisites	General Chemistry I, II, III and IV						
Objectives of the course	<p>This course is designed to provide knowledge on</p> <ul style="list-style-type: none"> 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	<p>UNIT-I</p> <p>Electrical and Magnetic properties of molecules</p> <p>Dipole moment–polar and nonpolar molecules– polarisability of molecules. Application of dipole moments in the study of organic and inorganic molecules.</p> <p>Magnetic permeability, molar susceptibility; diamagnetism, paramagnetism – determination of magnetic susceptibility using Guoy balance, ferro magnetism, anti ferromagnetism</p> <p>Microwave spectroscopy</p> <p>Rotation spectra of diatomic molecules, selection rules– instrumentation and applications</p> <hr/> <p>UNIT-II</p> <p>Ultraviolet and Visible spectroscopy</p> <p>Electronic spectra of diatomic molecules- rotational fine structure of electronic vibration transitions– Frank Condon principle– dissociation in electronic transitions– $\sigma \rightarrow \sigma^*$, $\pi \rightarrow \pi^*$, $n \rightarrow \sigma^*$, $n \rightarrow \pi^*$ transitions.</p> <p>Applications of UV-Woodward – Fieser rules as applied to conjugated dienes and α, β - unsaturated ketones. Colorimetry- principle and applications (estimation of Fe^{3+})</p> <hr/> <p>UNIT-III</p>						

	<p>Infrared spectroscopy Vibration spectra –diatomic molecules – harmonic oscillator and Anharmonic oscillator; Vibration– rotation spectra–diatomic molecule as rigid rotator and anharmonic oscillator -selection rules, vibrations of polyatomic molecules– stretching and bending vibrations – applications –</p> <p>isotopic shift–application of IR spectra to simple organic And inorganic molecules.</p> <p>Raman Spectroscopy Rayleigh scattering and Raman scattering of light– Raman shift– Classical theory of Raman effect– quantum theory of Raman effect– Vibrational Raman spectrum– selection rules– mutual exclusion principle– instrumentation (block diagram)– applications.</p> <p>UNIT-IV Nuclear magnetic resonance spectroscopy:</p> <p>PMR– theory of PMR– instrumentation- number of signals– chemical shift– peak areas and proton counting – spin-spin coupling – applications. chemical shifts of protons in hydrocarbons, and in simple Mono functional organic compounds; spin-spin splitting of neighbouring Protons in vinyl and allyl systems.</p> <p>UNIT-V Mass spectrometry Principle– different kinds of ionisation– instrumentation– the mass spectrum– types of ions– determination of molecular formula- Fragmentation and structural elucidation– McLafferty rearrangement; Retro Diels Alder reaction- illustrations with simple organic molecules.</p>
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	<ol style="list-style-type: none"> 1. Gopalan, R.; Subramaniam,P.S.; Rengarajan,K. <i>Elements of Analytical Chemistry</i>;SChand:NewDelhi,2003. 2. Usharani, S. <i>Analytical Chemistry</i>, 1st ed.; Macmillan: India, 2002. 3. Banwell, C.N.; McCash, E.M. <i>Fundamentals of Molecular Spectroscopy</i>, 4th ed.; Tata McGraw Hill, New Delhi, 2017. 4. U.N.Dash, <i>Analytical Chemistry Theory and Practice</i>, Sultan Chand&Sons, 2nd Ed., 2005 5. B.K.Sharma, <i>Spectroscopy</i>, 22nd ed., Goel Publishing House, 2011.
Reference Books	<ol style="list-style-type: none"> 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.GrawHill: 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.
Website and e-learning source	<ol style="list-style-type: none"> 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 Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to CO1: explain electrical and magnetic properties of materials and microwave spectroscopy CO2: explain theory, instrumentation and applications of Infrared and Raman spectroscopy CO3: apply selection rules to underst and spectral transitions, explain Woodward–Fieser’s rule for the calculation of wavelength maximum of conjugated dienes CO4: explain theory, instrumentation and applications of NMR spectroscopy CO5: explain theory, instrumentation and applications of Mass spectrometry	

	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

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

Level of Correlation between PSO's and CO's

Title of the Course	POLYMER SCIENCE						
Paper No.	ECVIII						
Category	Elective	Year	III	Credits	3	Course Code	
		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	<p>The course aims at providing an overall view of</p> <ul style="list-style-type: none"> • classification of polymers, preparation of polymers • kinetics of polymerization and characterization of polymers • analytical techniques used to characterize polymers • reactions of polymers • speciality polymers like PVC, PMMA 						
Course Outline	<p>UNIT I Introduction Difference between polymer and macromolecule – classification – synthetic and natural, organic and inorganic, thermoplastic and thermosetting. Plastics, elastomers, fibres and liquid resins.</p> <p>Techniques of polymerization Bulk, solution, emulsion and suspension polymerization</p> <p>Unit – II Kinetics of polymerization Kinetics of condensation and addition polymerisation; ionic, free radical, copolymerisation and coordination polymerisation – reactivity ratios – block and graft copolymers.</p> <p>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.</p> <p>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, Importance of</p>						

	<p>Glass Transition Temperature, Heat Distortion Temperature, TGA/DTA, Crystallinity of Polymers: Crystalline Behaviour, Degree of Crystallinity</p>
	<p>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</p> <p>Polymers technology Processing of polymers – casting, thermoforming, moulding – extrusion, compression, blow moulding – foaming, lamination, reinforcing – processing of fibres – melt, wet and dry spinning.</p>
	<p>UNIT V Speciality polymers Polyelectrolytes, 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.</p> <p>Polymer Degradation Types of Degradation – Thermal, Mechanical, Ultra Sound, Photo</p>
	<p>Radiation and Chemical Degradation Methods. Rubber – Natural and Synthetic – Structure, Mechanism of Vulcanisation Biodegradable and Non-Biodegradable Polymers.</p>
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	<p>Questions related to the above topics, from various competitive examinations UPSC/JAM/TNPSC etc. to be solved (To be discussed during the Tutorial hours)</p>
Skills acquired from this course	<p>Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</p>

Recommended Text	<ol style="list-style-type: none"> 1. Gowariker V.R., N.V. Viswanathan and Jayadev Sreedhar. Polymer Science . New Delhi: New Age International, 2015 3. Misra G.S. Introductory Polymer Chemistry. New Delhi: Wiley Eastern, 2010. 4. Bahadur Pand Sastry N.V. Principles of Polymer Science. New Delhi: Narosa Publishing House, 2005 5. Ahluwalia, V. K. Anuradha Mishra, <i>Polymer Science A Text Book</i>, Ane Books India: New Delhi, 2008. 6. Morrison, R. R.; Boyd, R. N.; Bhattacharjee, S. K. <i>Organic Chemistry</i>, 7th ed. ; Pearson: New Delhi, 2011.
Reference Books	<ol style="list-style-type: none"> 1. Billmeyer, F. W. Polymer Science. India: Wiley-Interscience, 2007. 2. Seymour, R. B.; Carraher Jr. C. E. <i>Polymer Chemistry: An Introduction</i>, Marcel Dckker 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	<ol style="list-style-type: none"> 1. https://polymerdatabase.com 2. http://amrita.vlab.co.in/?sub=2&brch=190&sim=603&cnt=13. http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/polymers.htm http://nsdl.niscair.res.in/bitstream/123456789/406/2/Molecular+weights+of+polymers.pdf
Course Learning 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/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
WeightedpercentageofCourse Contributionto PSOs	3.0	3.0	3.0	3.0	3.0

LevelofCorrelationbetweenPSO'sandCO's

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
Weightedpercentageof CourseContributiontoPOs	3.0	3.0	3.0	3.0	3.0

LevelofCorrelationbetweenPO'sandCO's

Title of the Course		PHARMACEUTICAL CHEMISTRY					
Paper No.	Elective Course VIII						
Category	Elective	Year	III	Credits	3	Course Code	
		Semester	VI				
Instructional Hours per week	Lecture	Tutorial	Lab Practice		Total		
	4		-		4		
Pre requisites	Knowledge on active chemical compounds and biochemistry						
Objectives of the course	<p>The course aims at providing an overall view of</p> <ul style="list-style-type: none"> • Drugs design and drug metabolism • Important Indian medicinal plants, common diseases and antibiotics 						
	<ul style="list-style-type: none"> • Drugs for major diseases like cancer, diabetes and AIDS • Analgesics and antipyretic agents • Significance of clinical tests 						
Course Outline	<p>UNIT-I</p> <p>Introduction</p> <p>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.</p> <p>Sources of drugs—dosage forms—bioavailability—routes of administration—absorption, distribution and elimination of drugs—drug metabolism—prescription terms.</p> <p>Structure and pharmacological activity</p> <p>Effect of—unsaturation, chain length, isomerism; groups—halogens amino, nitro, nitrite, cyano, acidic, aldehydic, keto, hydroxyl and alkyl groups.</p> <p>Development of Drugs</p> <p>Development of a drug—classic steps—lead compounds—comparison of traditional and modern methods of development of drugs—drug design By method of variation—disjunction and conjunction methods.</p> <p>Unit-II</p> <p>Indian medicinal plants</p> <p>Some important Indian medicinal plants—tulsi, neem, kizhanelli, mango, semparuthi, adadodai, turmeric and thoothuvalai—uses.</p>						

	<p>Common diseases and their treatment Causes, prevention and treatment of the following diseases: Insect borne diseases—malaria, filariasis, plague; Airborne diseases—diphtheria, whooping cough, influenza, measles, mumps, common cold, tuberculosis; Waterborne diseases—cholera, typhoid, dysentery. Digestive system—jaundice; Respiratory system—asthma; Nervous system—epilepsy.</p> <p>Antibiotics Definition—classification—structure and therapeutic uses of chloramphenicol, penicillins, structure activity relationship of chloramphenicol; therapeutic uses of ampicillin, streptomycin, Erythromycin tetracycline, rifamycin.</p>
	<p>UNIT-III Drugs for major diseases Cancer—common causes—chemotherapy—anti neoplastic agents - classification –adverse effects of cytotoxic agents ; alkylating agents—chlorambucil; antimetabolites—methotrexate, fluouracil; Vinca alkaloids – vincristine, vinblastine. Diabetes— types –</p>
	<p>Management of diabetes—insulin ;oral hypoglycemic agents-sulphonylureas—chlorpropamide; biguanides-metformin—thiazolidine diones. Cardio vascular drugs—cardioglycosides; antiarrhythmic agents—quinidine, propranolol hydrochloride; anti-hypertensive drugs—Aldomet, pentolinium tartarate; vasodilator-tolazoline hydrochloride, sodium nitroprusside. AIDS—causes, symptoms and prevention—antiHIV drugs-AZT, DDC.</p>
	<p>UNIT-IV Analgesics and antipyretic agents Classification— action of analgesics— narcotic analgesics – morphine; synthetic analgesics—pethidine, methadone; antipyretic analgesics—salicylic acid derivatives, indolyl derivatives, p-amino phenol derivatives.</p> <p>Anaesthetics Definition, characteristics, classification - general anaesthetics – volatile anaesthetics—nitrous oxide, ethers, cyclopropane, chloroform, halothane, trichloro ethylene— storage, advantages and disadvantages ; non volatile anaesthetics— thiopental sodium; local anaesthetics—requisites—advantages—esters—cocaine, benzocaine; amides—lignocaine, cinchocaine.</p> <p>Blood and haematological agents Blood—composition, grouping—physiological functions of plasma proteins – mechanism of clotting; Coagulants – vitamin K, protaminesulphate, drythrombin; Anticoagulants—coumarins, citric acid and heparin; antifibrinolytic agents—aminocaproic acid and tranexamic acid. Anaemia—causes, types and control—antianaemic drugs.</p>

	UNIT-V Clinical Chemistry Blood tests–blood count–complete haemogram–Hb,RBC,GTT, TC,DC, platelets, PCV,ESR;bleeding and clottingtime–glucose tolerance test. Significance of Clinical Tests Serum electrolytes-blood Glucose-ortho toluidin emethod;Renal Functions tests-blood urea,creatinine;liver function tests-serum proteins,albumin globulin ratio,serumbilirubin,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 examinationsUPSC/JAM/TNPSCOthers to be solved (To be discussed during theTutorial hours)
Skills acquired From this course	Knowledge,Problemsolving,Analyticalability,Professional Competency,Professional Communication andTransferableskills.
Recommended Text	1. Jayashree Ghosh,(1999),A textbook of pharmaceutical chemistry,2 nd ed.,S.Chand& company,NewDelhi. 2. LakshmiS,(2004),Pharmaceutical chemistry,3 rd ed.,Sultanchand&sons,Delhi. 3. TripathiKD,(2018),Essentials of medical pharmacology,8 th ed.,Jaype ebrothers medicalpublishers(P)Limited,NewDelhi. 4. AshutoshKar,(2018),Medicinal chemistry,7 th ed., Newage international(P)Limited, Publishers,New Delhi.
Reference Books	Reference Books: 1. Chatwal G R, (2013), Pharmaceutical chemistry, inorganic (vol-I)6 th ed.,Himalaya publishinghouse,Bombay. 2. Chatwal G R, (1991), Pharmaceutical chemistry, organic (vol-II),Himalayapublishing house,Bombay. 3. Patrick G, (2002), Instant Notes Medicinal Chemistry, Viva BooksPrivateLimited,NewDelhi. 4. IntellectualPropertyRights,NeerajPandey,Khushdeep Dharni.Publisher:PHILearningPvt.Ltd.,2014ISBN:812034989X,9788120349896.

Website and e-learning source	1. 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/
<p>Course Learning Outcomes(for Mapping with Pos and PSOs)On completion of the course th students should be able to</p> <p>CO1:Define the pharmaceutical terminologies;describe the principles in pharmacological activity,drug development,clinical chemistry,hematology,therapeutic drugs and treatment of diseases;list the types of IPR and trademarks.</p> <p>CO2:Discuss the development of drugs,structura lactivity,disease types,physio-Chemical properties of therapeutic agents,significance of medicinal plants,clinical tests and factors for patentability.</p> <p>CO3:Apply the rinciples involved in structural activity and drug designing,functions of haematological agents; estimation of clinical parameters and therapeutic application of drugs for major diseases.</p> <p>CO4:explain classification of analgesics and anesthetics,and physiological functions of plasma protiens</p> <p>CO5: explain the significance of clinical tests like blood urea, serum proteins and coronary risk index</p>	

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

Level of Correlation between PSO's and CO's

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

Level of Correlation between PO's and CO's

Title of the Course	NANO SCIENCE						
Paper No.	ECVIII						
Category	Elective	Year	III	Credits	3	Course Code	
		Semester	VI				
Instructional hours per week	Lecture	Tutorial	Lab Practice			Total	
	4		-			4	
Prerequisites	Basic knowledge in physics and chemistry						
Objectives of the course	<p>This course aims at providing knowledge on</p> <ul style="list-style-type: none"> • introduction to nanoparticles/clusters and nanocomposites • properties of nanomaterials • characterization of nanomaterials by different methods • synthesis of carbon nanotubes, graphene, quantum dots, self-assembled nanomaterials • applications of nanomaterials as sensors 						
Course Outline	<p>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, ion sputtering, spray pyrolysis, aerosol synthesis – nanolithography. Bottom-up approach (chemical methods) – solvothermal synthesis, photochemical method, gamma radiolysis, sonochemical synthesis, electrodeposition, sol-gel method, nanomaterials via chemical routes – solvents reducing agents, capping agents – stabilization of nanoparticles – electrostatic and steric</p>						

	<p>stabilization, common stabilizers, nanoparticle growth in solution, templated growth, Langmuir–Blodgett (L-B) method, reverse micelles-emulsion method.</p>
	<p>Unit II Properties of materials on 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 - Fe_3O_4 particle, supra magnetic properties, electronic properties, Chemical properties-chemical process on the surface of nanoparticles, catalysis, mechanical properties.</p>
	<p>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].</p>
	<p>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, Field emission, Fuel Cells, Display devices. Other Important Carbon based materials: Preparation and Characterization Fullerene, Graphene, properties, DLC and nanodiamonds and Applications Semiconductor nanoparticles: Quantum dots, synthesis – chemical synthesis using clusters, properties, porous silicon–electrochemical etching, aerogel–types–silica aerogel, resorcinol formaldehyde (RF) aerogels, zeolites–applications. Self Assembled Nanomaterials: Self Assembled Monolayers (SAMs)–inorganic, organic molecules.</p>
	<p>UNIT V Application of nanomaterials Biomedical Applications-drug, drug delivery, bio labelling, 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. Impact of Nanotechnology–human & environmental safety risks.</p>
Extended Professional Component (is a)	<p>Questions related to the above topics, from various competitive examinations UPS C/JAM/TNPSC other to be solved (To be discussed during the Tutorial hours)</p>

part of internal component only, Not to be included in the external examination question paper)	
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	<ol style="list-style-type: none"> 1. Sulabha K. Kulkarni, <i>Nanotechnology: Principles and Practices</i>, Capital Publishing Co., New Delhi. 2. Pradeep T., <i>Nano: The Essentials, Understanding Nanoscience and Nanotechnology</i>; Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007. 3. Shah M. A.; Tokeer Ahmad, <i>Principles of Nanoscience and Nanotechnology</i>; Narosa Publishing House, New Delhi, 2010. 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.
Reference Books	<ol style="list-style-type: none"> 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, Darmstadt. 5. Jing Zhong Zhang, <i>Optical properties and spectroscopy of Nanomaterials</i>; World Scientific Publishing Pvt. Ltd., Singapore.
Website and e-learning source	<ol style="list-style-type: none"> 1) http://www.nanotechnology.com/docs/wtd015798.pdf 2) http://nccr.iitm.ac.in/Nanomaterials.pdf
Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the student 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/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
Weightedpercentageof CourseContribution toPSOs	3.0	3.0	3.0	3.0	3.0

LevelofCorrelationbetweenPSO'sandCO's

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
Weightedpercentageof CourseContributiontoPOs	3.0	3.0	3.0	3.0	3.0

LevelofCorrelationbetweenPO'sandCO's

Professional Competency Skill
Chemistry for Competitative Examinations

Extension Activities

SEMESTER - I
Extra Credit Paper -1
FOOD CHEMISTRY

Hours: 2

Credit: 2

Max Marks (Internal: 100)

Objectives:

- 1. To get knowledge about food adulteration.**
- 2. To acquire knowledge about food additives and food poisons.**
- 3. To get thorough knowledge about beverages and edible oils.**

UNIT 1: FOOD ADULTERATION :

Sources of food, types, advantages and disadvantages, Food adulteration –contamination of Wheat, Rice, Alial, Milk, Butter etc. with clay stones, water and toxic chemicals –Common adulterants. Common adulterants Ghee adulterants and their detection. Detection of adulterated Foods by simple analytic techniques. (10hrs Theory + 5hrs Practical).

UNIT 2: FOOD POISON: Food poisons –natural poisons (alkaloids –nephrotoxing) – pesticides, (DDT, BHC, and Malathion) - Chemical poisons and First aid for poison consumed victims. (15hrs).

UNIT 3: FOOD ADDITIVES: Food additives –artificial sweetners-Saccharin-Cyclomater and aspartate. Food flavours –esters, aldehydes and heterocyclic compound. Food colors –restricted use –spurious colors –Emulsifying agents –preservatives learning agents. Baking powder yeast – taste makers –MSG vinegar. .

UNIT 4: BEVERAGES:

Beverages –Soft drinks –soda –fruit juices –alcoholic beverages examples. Carbonation – addiction to alcohol –cirrhosis of liver and social problems.

UNIT 5 EDIBLE OILS:

Fats, Oils –Sources of oils –Production of Refined vegetables oils –Preservation. Saturated and unsaturated fatty acids – I_2 value, saponification values and their significance. Estimation of I_2 and RM values in Edible oils.

Books for Reference:

1. Swaminathan M. Food Science and Experimental foods, Ganesh and Company.
2. Jayashree Ghosh, Fundamental concepts of Applied chemistry, S.Chand & Co., publishers.
3. Thanlamma Jacob, Text Books of applied chemistry for Home Science and allied Sciences, Macmillan.

CO Number	CO Statement	Knowledge Level
CO1.	To understand the chemistry of food adulteration and adulterants	K2
CO2.	To know the chemistry of food poisoning	K2
CO3.	To acquire knowledge about food additives	K2
CO4	To understand the chemistry of beverages and soft drinks and to know the methods of preparing the soft drinks by field visits.	K2
CO5.	To acquire knowledge about various edible oils and the processing techniques related to oils.	K2

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	High	Strong	High	Strong	High
CO2	Strong	Medium	High	Strong	High
CO3	High	High	Medium	High	Medium
CO4	Strong	Medium	High	Strong	Medium
CO5	Strong	High	Strong	Strong	Medium

Semester – III

Extra Credit Paper - 2

CHEMISTRY IN DAY TODAY LIFE

Hours : 2

Credits : 2

Max. Marks (Internal : 100)

Objectives:

- 1. To Visualise the importance of chemistry in Everyday life.**
- 2. To explain the terms soaps and detergents.**
- 3. To know about health hazards of corrosive chemicals used in manual cleaning of house hold vessels.**

UNIT – I :

TEXTILE CHEMISTRY – Brief introduction to types of fabrics-natural and synthetic fabrics (cotton, fur, jute, silk, polymeric metallic)-durability and maintenance of cloth, fading and introduction to natural and synthetic dyes for colouring textiles, starching process.

UNIT – II: Soaps and detergents –types of soaps, surfactants-types, importance, fabric whiteners, stiffeners, flavouring agents, ultramarines ,brighteners, selection of cost effective washing powders-pleasant odours, flavouring liquids for fabrics-collar and surf dirty remover liquids.

UNIT –III : Dishwashers-soft and hard utensil cleaning liquid soaps-brighteners. Efficient way of using and maintenance-significance in health hazards of corrosive chemicals used in manual cleaning of household vessels, awareness on healthy way of using cleaning chemicals in day today life.

UNIT –IV:

Floor cleaning agents used in vacuum cleaners (lizol, phenoyl - sanifresh) deodorants, room air freshners.LPG stove top made of SS, glass, GI, chromium alloys-cleaning liquids not affecting metals and glass. Anti mosquito repellent machines –evaporators-liquid, solids and gases.

UNIT-V:

Chemicals used in water purifiers-germicidal effect of uv radiation exposure-nutrient elements-sedimentation alum-types of water purifiers-water borne diseases-health care awareness on purified drinking water.

REFERENCE BOOKS:

1. Industrial Chemistry by B.K.Sharma, Goel publishing House 1995,websites manual of home appliances-healthcare printouts from the hospitals related to the syllabus mentioned above.

CO Number	CO Statement	Knowledge Level
CO1.	To learn the types of fabrics, fading, starching process.	K2
CO2.	To acquire knowledge about types of soaps whiteners, stiffeners, flavouring agents	K2
CO3.	To understand soft and hard utensil cleaning liquid soaps	K2
CO4	To acquire a comprehensive knowledge about Floor cleaning agents and Anti mosquito repellent machines	K2
CO5.	To understand the Chemicals used in water purifiers and germicidal effect of uv radiation	K2

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	Strong	Strong	High	Strong	High
CO2	Strong	Medium	High	Strong	High
CO3	High	High	Medium	Strong	Medium
CO4	Strong	Medium	High	Strong	Medium
CO5	Strong	High	Strong	Strong	Medium

Semester - V
Extra Credit Paper - 3
Forensic Science & Crime Investigation

Hours : 2

Credit :2

Max. Marks (Internal : 100)

Sub Code: UGEFCI

- 1.**
- 2. To get thorough knowledge about explosives and Arson.**
- 3. To acquire knowledge about types of poisons and diagnosis of poisoning.**

Unit 1:

Crimonology – Definition – Nature and Scope – types of Crime – penology – Indian Penal Code- Indian Evidence Act- Indian Criminal Procedure Code.

Unit- II

- a) Forensic Science – Definition , Principles and uses in Crime Investigation.
- b) Finger Prints- Patterns – Classification , Uses of finger prints in Crime investigation.
- c) Tracks and traces – Foot prints – casting of Foot prints – Residue Prints.
- d) Biological Substance – Blood, Semen, Saliva, Sweat, Urine and hair.

Unit – III

- A) Arson- Natural fires and arson – Nature of action of fire- Frigths and air supply burning characteristics and Chemistry of combustible material – nature of combustion.
- B) Explosives- Definition – classification – composition and mechanism of explosion bombs.
- C) Ballistic – Classification – Internal, External and Terminal ballistic and overall view.
- D) Small arms – classification and characteristic laboratory examination of the barrel washing and detection of power residues by chemical tests.

Unit – IV

Documents – chemistry of paper ink – writing paper- carbon paper – safety paper. Ink various writing inks – chalk – coloured chalk – Adhesives- sealing waxes. Different types of forged signature – Simulated and traced forgeries – Inherent signs of forgery models- writing deliberately- modified – Uses of ultraviolet Rays- comparison of type written letters – counterfeit currency and coins.

Unit – V

Poison – types and classification – diagnosis of poisoning in the living and in the dead clinical symptoms - Post Mortem appearances – treatment in cases of poisoning – uses of antidotes.

TEXT BOOKS:

1. Forensic Science Principles and applications by Dr.Nishant Singh, Ancient Publishing House, 01.01.2011.

REFERENCE BOOKS:

1. T.H. James, Forensic Sciences , Stanley Thornes Ltd.,
2. Richard, Criminalistics – An introduction to Forensic Science College Version), 8th Edition Sofestein, Printice Hall.,

CO Number	CO Statement	Knowledge Level
CO1.	To learn crime investigation through diagnosis of poisoning and postmortem	K2
CO2.	To acquire knowledge about explosions, the causes (gelatin sticks, TDX etc) and the security measures.	K2
CO3.	To understand the methods of detecting Forgery in bank and educational records.	K2
CO4	To acquire a comprehensive knowledge about tracks and traces.	K2
CO5.	To understand the chemical methods used in crime investigation (Medical aspects).	K2

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	Strong	Strong	High	Strong	High
CO2	Strong	Medium	High	Strong	High
CO3	High	High	Medium	Strong	Medium
CO4	Strong	Medium	High	Strong	Medium
CO5	Strong	High	Strong	Strong	Medium

Value Added Course - I

I Year B.Sc Chemistry Semester - II

Soil Chemistry

Contact Hours: 30 Hours

CIA : 100

Course Outcomes

S.No	Description	Blooms' Taxonomy Level
1.	Gaining Theoretical Knowledge in Soil Chemistry	Knowledge (Level 1)
2.	Gaining in depth knowledge of soil bio chemistry and anomalous soils	Knowledge (Level 1)
3.	Comprehending the values of soil chemistry in agriculture	Comprehension (Level 2)
4.	Analyzing different methods for soil enrichment	Analysis (Level 4)
5.	Creative new strategies to minimise soil pollution and detoxification.	Synthesis (Level 6)

Unit – I

Components of Soil

Physical and Chemical properties of soil

Unit – II

Soil Bio Chemistry

Anomalous soils

Unit – III

Detection of Elements in Soil

Importance of soil in agriculture

Unit – IV

Soil Pollution - Inorganic and Organic Pollutants

Enrichment of soil using fertilizers.

Unit – V

Detoxification of soil pollutants

Strategies to minimize soil pollution

Books of Reference:

Modern Inorganic Chemistry by R.D.Madhan

A Text Book of Soil chemistry by Saroj Kumar Sanyal

Fertilizers – A Text Book by Ranjan Kumar Basak

Principles of Soil Chemistry 4e Kim H Tan

Soil Fertility and Fertilizers an Introduction Nutrient Management, John L

Havelin, Werner L Nelson

Question Pattern

Section – A

Six Questions will be given. Four Questions are to be answered. (**4X20=80**)

Section – B

Practical Examination = (**20 Marks**)

Total Marks: 100

Value Added Course - II

II Year B.Sc Chemistry Semester - IV

Clinical Chemistry and Toxicology

Contact Hours: 30 Hours

CIA: 100

S.No	Description	Blooms' Taxonomy Level
1.	To Understand the Carbohydrate metabolism	Understand (Level 2)
2.	Gaining Knowledge on Renal function	Knowledge (Level 1)
3.	To Knowledge on Liver function	Knowledge (Level 1)
4.	Applying gained practical knowledge of blood analysis	Application (Level 3)
5.	Analysing the introduction of Toxicology	Analysis (Level 4)

Course Content

Unit : 1

Terminology of metabolism – anabolism- catabolism – Fundamentals of Carbohydrate Metabolism – Diabetes mellitus – Glucosuria.

Unit : 2

An introduction of Renal function test – composition of Urine – Urine formation

Unit – 3

An introduction of Liver function test- Function of Liver

Unit – 4 Blood Analysis

Blood Collection – serum – plasma separation , Blood grouping. Total cholesterol- Normal – abnormal values. Blood glucose – normal – abnormal values.

Unit – 5

An introduction to Toxicology . Dose – type of doses - dose unit

Books of Reference:

Fundamental of bio Chemistry – Ambika Shanmugam

Principles of Toxicology by - Paul Heroux -2013

Question Pattern**Section – A**

Six Questions will be given. Four Questions are to be answered. (**4X20=80**)

Section – B

Practical Examination = (**20 Marks**)

Total Marks: 100

Value Added Course - III

III Year B.Sc Chemistry Semester - VI

Pharmaceutical Quality control and quality Assurance

Contact Hours: 30 Hours

CIA: 100

S.No	Description	Blooms' Taxonomy Level
1.	To Understand the concept of quality Control and Quality Assurance	Knowledge (Level 1)
2.	To Comprehend the guidelines of pharmacology	Comprehension (Level 2)
3.	To know the organization and personal Responsibilities of Pharmaceutical Industries	Knowledge (Level 1)
4.	To analyse various material used in pharmaceutical industries	Analysis (Level 4)
5.	To acquire in depth knowledge in documentation	Analysis (Level 4)

Course Content

Unit – 1 Quality control and quality Assurance

Concept and evolution and scopes, Good laboratory Practise, GMP, Overview of ICH, Guidelines – QSEM, with special emphasis on Qseries qudielines – Scope of GLP, Definitions , quality Assurance unit , Protocol for conduct of non clinical testing, report Preparation and documentation, CPCSEA guidelines.

Unit – 2

cGMP guidelines according to schedule M, USFDA(inclusive of CDER and CBER) Pharmaceutical inspection convention (PIC), WHO and EMEA covering.

Unit – 3

Organizaition and personnel responsibilities, training, hygiene and personal records, drug industry location , design , construction and plant lay out, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination and Good Warehousing Practice.

Unit – 4

Analysis of raw material , finished products, packing materials, in process quality control (IPQC), Developing specification (ICH Q6 and Q3), purchase specifications and maintenance of stores for raw materials.

Unit – 5

Documentation in pharmaceutical industries

- (a) Three tier documentation, Policy, Procedures and work instructions and records (Formats), Basic Principles
- (b) Introduction, Scope and importance of intellectual property rights. Concept of trade mark, copyright and patents.

Books for Reference

1. Quality assurance guide by organization of pharmaceutical procedures of India 3rd revised edition, Volume 1 & II , Mumbai 1996.
2. Good laboratory practice Regulations, 2nd Edition, Sandy Weinberg Vol 69, Marcel Dekker Series , 1995.
3. Quality Assurance of Pharmaceuticals – A compendium of Guidelines and related materials Vol 1 & II , 2nd Edition , WHO Publications , 1999.
4. Good manufacturing practices for pharmaceuticals a plan for total quality control – Sidney H.Willig, Vol 52, 3rd edition Marcel Dekker series.
5. Pharmaceutical Quality Assurance by Mr.Manohar A.Potdar
6. Quality control by Dale H.Besterfield.

Question Pattern

Section – A

Six Questions will be given. Four Questions are to be answered. (4X20=80)

Section – B

Practical Examination = (20 Marks)

Total Marks: 100

DEPARTMENT OF CHEMISTRY
PROGRAMME SPECIFIC OUTCOMES

On successful completion of the programme the students will be able to

- PSO1:** acquire in –depth knowledge of the fundamental concepts in all disciplines of chemistry.
- PSO2:** disseminate the basics of chemistry and advanced topics and analytical skills inorganic, inorganic and physical chemistry.
- PSO3:** uphold ethical values in personallife, research and career.
- PSO4:** demonstrate laboratory skills, analytical acumen,creatively in academics and research.
- PSO5:** apply digital tools to collect, analyze and interpret data and present scientific findings.
- PSO6:** gain competence to pursue higher education and career opportunities in chemistry and allied fields.
- PSO7:** exhibit leadership qualities to work individually and within a team in organizing curricular, co-curricular and extra curricular activities.
- PSO8:** apply the concepts of chemistry to solve problems in the community ,entrepreneurial and research pursuits.
- PSO9:** exhibit competence in educational, industrial and research pursuits that contribute towards the holistic development of self and community.
- PSO10:** display proactive approach towards sustainable environment through green laboratory practices.

