

(Affiliated Colleges)

204 - B.Sc. Chemistry

Programme Structure and Scheme of Examination (under CBCS)

(Applicable to the candidates admitted from the academic year 2023 -2024 onwards)

D4		one to the candidates admitted from the acaden		Hours/			m Marks
Part	Course Code	Study Components & Course Title	Credit	week	CIA	ESE	Total
		SEMESTER – I					
Ι	23UTAML11/ 23UHINL11/ 23UFREL11	Language — I: பொதுதமிழ் – I: தமிழிலக்கிய வரலாறு -1/ Hindi – I/ French – I	பொதுதமிழ் – I: தமிழிலக்கிய வரலாறு -1/ Hindi – I/				100
II	23UENGL12	General English – I	3	6	25	75	100
	23UCHEC13	Core – I: General Chemistry-I	5	5	25	75	100
	23UCHEP14	Core –II : Practical - I Quantitative Inorganic Estimation (Titrimetry) and Inorganic Preparations	5	4	25	75	100
III	23UMATE15 23UBOTE15 23UZOOE15 23UBIOE15	Elective - I Mathematics-1 (or) Botany — I (or) Zoology — I (or) Biochemistry — I	3/2	5/3	25	75	100
	23UBOTEP1 23UZOOEP1 23UBIOEP1	Botany Practical – I (or) Zoology Practical – I (or) Biochemistry Practical–I	1	2	25	75	100
IV	23UTAMB16 23UTAMA16	Skill Enhancement Course – 1* NME-I/ Basic Tamil – I / Advanced Tamil - I	2	2	25	75	100
	23UCHEF17	Foundation Course : Introductory Chemistry	2	2	25	75	100
		Total	23	30			700/800
		SEMESTER – II					
I	23UTAML21/ 23UHINL21/ 23UFREL21	Language – II: பொது தமிழ் -II: தமிழிலக்கிய வரலாறு -2/ Hindi – II/ French –II	3	6	25	75	100
II	23UENGL22	General English – II	3	6	25	75	100
	23UCHEC23	Core – III: General Chemistry-II	5	5	25	75	100
	23UCHEP24	Core –IV: Practical– II Qualitative Organic Analysis and Preparation of Organic Compounds	5	4	25	75	100
III	23UMATE25	Elective - II Mathematics-II /	3	5	25	75	100
	23UBOTE25	Botany-II /	2	3	25	75	100
	23UZOOE25	Zoology-II /	2	3	25	75	100
	23UBIOE25	Biochemistry -II	2	3	25	75	100
III	23UBOTEP2	Botany Practical – II /	1	2	25	75	100
111	23UZOOEP2	Zoology Practical – II/	1	2	25	75	100

	23UBIOEP2	Biochemistry Practical –II	1	2	25	75	100
	230BIOLI 2	Skill Enhancement Course – 2*	-		23	7.5	100
		NME-II/					
	23UTAMB26	Basic Tamil – II /	2	2	25	75	100
	23UTAMA26	Advanced Tamil - II					
IV	230171111120	Skill Enhancement Course – 3:					
	23USECG27	Internet and its Applications	2	2	25	75	100
	230520027	(Common Paper)	_	_	23	7.5	100
•		Language Proficiency for employability:	_				
	23UNMSD01	Overview of English Communication**	2	-	25	75	100
		Total	25	30			700/800
•		SEMESTER – III					
		Language – III:					
	23UTAML31/	பாது தமிழ் -III: தமிழக வரலாறும், பண்பாடும்/	2		25	7.5	100
	23UHINL31/	Hindi-III/	3	6	25	75	100
	23UFREL31	French-III					
I	23UENGL32	English Course – III :	3	6	25	75	100
=	23UCHEC33	Core Course – V :General Chemistry-III	5	5	25	75	100
•	23UCHEP34	Core Course-VI-Core Practical – III-	5	4	25	75	100
		Inorganic Qualitative Analysis					
	23UPHYE35	Elective-III:	2	3	25	75	100
III		Physics-I					
	23UPHYEP3	Physics Practical-I	1	2	25	75	100
	23UCHES36.	Skill Enhancement Course SEC-4:	1	1	25	75	100
		Entrepreneurial Skills in Chemistry					
IV	23UCHES37	Skill Enhancement Course-SEC-5:	2	2	25	75	100
-		Pesticide Chemistry					
		Environmental Studies	-	1	-	-	-
		Total	22	30			800
		SEMESTER – IV					
		Language – IV:	3	6	25	75	100
	23UTAML41/	பொது தமிழ் -IV: தமிழும்					
T	23UHINL41/	அறிவியலும்/					
1	23UFREL41	Hindi-IV/					
		French-IV					
	23UENGL42	English Course – IV	3	6	25	75	100
	23UCHEC43	Core Course – VII : General Chemistry-IV	5	4	25	75	100
III		Core Course-VIII-Core Practical – IV:	5	4	25	75	100
	23UCHEP44	Physical Chemistry Practical					
		Elective-IV:	2	3	25	75	100
	23UPHYE45	Physics-II					
	23UPHYEP4	Physics Practical-II	1	2	25	75	100
IV		Skill Enhancement Course-SEC-6:	2	2	25	75	100
1 4	23UCHES46	Instrumental Methods of Chemical analysis					
		Skill Enhancement Course-SEC-7:	2	2	25	75	100
	23UCHES47	Forensic Science	2	1	2.5	7.	100
	23UEVSG48	Environmental Studies	2	1	25	75	100
		Total	25	30			900

		Grand total	142				4600/4800
		Total	21	30			700
V	23UCHEX67	Extension Activity	1	-	100		100
IV	23UCHEF66	Professional Competency Skill: Cheminformatics	2	2	25	75	100
		Elective Course VIII-Nano Science/ Polymer Science/ Pharmaceutical Chemistry	3	5	25	75	100
Ш	23UCHEE64-2/ 23UCHEE64-3	Elective Course VII – Fundamentals Of Spectroscopy/ Organic Synthesis / Health Chemistry	3	5	25	75	100
	23UCHEC63	Core Course – XV: Physical Chemistry-II	4	6	25	75	100
	23UCHEC62	Core Course – XIV Inorganic Chemistry-II	4	6	25	75	100
	23UCHEC61	Core Course –XIII: Organic Chemistry-II	4	6	25	75	100
		SEMESTER VI					
		Total	26	30			800
IV	23UCHEI58	Summer Internship ⁺⁺	2	-	25	75	100
	23UVALG57	Applied Chemistry Value Education	2	2	25	75	100
	23UCHEE56-2	Elective –VI: Industrial Chemistry/ C Language and Chemistry/	3	4	25	75	100
III		Bio Chemistry/ Green Chemistry/ Agriculture Chemistry			25	7.5	100
***	22110110155 1	Elective-V:	3	4	25	75	100
	23UCHED54	Core course-XII-Project with viva voce	4	5	25	75	100
	23UCHEC53	Core Course – XI: Physical Chemistry-I	4	5	25	75	100
	23UCHEC52	Core Course – X :Inorganic Chemistry-I	4	5	25	75	100
	23UCHEC51	SEMESTER – V Core Course – IX: organic Chemistry-I	4	5	25	75	100

Non-major (NME) Electives offered to other Departments

IV	23UCHEN16	Role of Chemistry in Daily Life	2	2	25	75	100
1 V	23UCHEN26	Dairy Chemistry	2	2	25	75	100

^{*} PART-IV: NME / Basic Tamil / Advanced Tamil (Any one)

Students who have not studied Tamil upto12th Standard and have taken any Language other than Tamil in Part-I, must choose Basic Tamil-I in First Semester & Basic Tamil-II in Second Semester. Students who have studied Tamil upto10th & 12th Standard and have taken any Language other than Tamil in Part-I, must choose Advanced Tamil-I in First Semester and Advanced Tamil-II in Second Semester.

^{**} The course "23UNMSD01: Overview of English Communication" is to be taught by the experts from Naan Mudhalvan Scheme team. However, the faculty members of Department of English should coordinate with the Naan Mudhalvan Scheme team for smooth conduct of this course.

⁺⁺Students should complete two weeks of internship before the commencement of V semester.

Choice Based Credit System (CBCS), Learning Outcomes Based Curriculum Framework (LOCF) Guideline Based Credit and Hours Distribution System for all UG courses including Lab Hours

First Year - Semester-I

Part	List of Courses	Cro	edit	No. of
				Hours
Part I	Language – Tamil	3	3	6
Part II	English	3	3	6
Part III	Core Theory, Practical & Elective Courses	1	13	14
	Skill Enhancement Course SEC-1 (NME-I)	2	2	2
Part IV	Foundation Course	2	2	2
		2	23	30

Semester-II

Part	List of Courses	Credit	No. of
			Hours
Part I	Language – Tamil	3	6
Part II	English	3	6
Part III	Core Theory, Practical & Elective Courses	13	14
Part IV	Skill Enhancement Course -SEC-2 (NME-II)	2	2
	Skill Enhancement Course -SEC-3 (Discipline / Subject Specific)	2	2
		23	30

Second Year - Semester-III

Part	List of Courses	Credit	No. of
			Hours
Part I	Language - Tamil	3	6
Part II	English	3	6
Part III	Core Theory, Practical & Elective Courses	13	14
Part IV	Skill Enhancement Course -SEC-4 (Entrepreneurial Based)	1	1
	Skill Enhancement Course -SEC-5 (Discipline / Subject Specific)	2	2
	E.V.S	-	1
		22	30

Semester-IV

Part	List of Courses	Credit	No. of
			Hours
Part I	Language - Tamil	3	6
Part II	English	3	6
Part III	Core Theory, Practical & Elective Courses	13	13
Part IV	Skill Enhancement Course -SEC-6 (Discipline / Subject Specific)	2	2
	Skill Enhancement Course -SEC-7 (Discipline / Subject Specific)	2	2
	E.V.S	2	1
		25	30

Third Year Semester-V

Part	List of Courses	Credit	No. of
			Hours
Part III	Core Theory, Practical, Project & Elective Courses	22	28
Part IV	Value Education	2	2
	Internship / Industrial Visit / Field Visit	2	-
		26	30

Semester-VI

Part	List of Courses	Credit	No. of
			Hours
Part III	Core Theory, Practical & Elective Courses	18	28
Part IV	Professional Competency Skill	2	2
Part V	Extension Activity	1	-
		21	30

Consolidated Semester wise and Component wise Credit distribution

Parts	Sem I	Sem II	Sem III	Sem IV	Sem V	Sem VI	Total
							Credits
Part I	3	3	3	3	-	-	12
Part II	3	3	3	3	-	-	12
Part III	13	13	13	13	22	18	92
Part IV	4	4	3	6	4	2	23
Part V	-	-	-	-	-	1	1
Total	23	23	22	25	26	21	140

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

CREDIT DISTRIBUTION FOR U.G. PROGRAMME

Part	Course Details	No. of	Credit	Total
		Courses	per	Credits
			course	
Part I	Tamil	4	3	12
Part II	English	4	3	12
Part	Core Courses	15	4/5	68
III	Elective Courses: Generic / Discipline Specific	8	3	24
	(3 or 2+1 Credits)			
	Part I, II and III Credits		•	116
	Skill Enhancement Courses / NME / Language	7	1/2	15
	Courses			
	Professional Competency Skill Course	1	2	2
Part IV	Environmental Science (EVS)	1	2	2
	Value Education	1	2	2
	Internship	1	2	2
	Part IV Credits		•	23
Part V	Extension Activity (NSS / NCC / Physical Education)	1	1	1
	Total Credits for the UG Programme			140

Methods of					
	Evaluation				
	Continuous Internal Assessment Test				
Internal Evaluation	Assignments	25 Marks			
	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	MCQ, True/False, Short essays, Concept expla	anations, Short			
(K2)	summary or overview				
Application (K3)	Suggest idea/concept with examples, Suggest for	ormulae, Solve			
	problems, Observe, Explain				
Analyze(K4)	Problem-solving questions, Finish a procedure is	n 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 or off beat situation	ns, Discussion,			
	Debating or Presentations				

Programme Outcomes:

PO1: Disciplinary knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study

PO2: 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.

PO3: 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.

PO4: 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.

PO5: 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.

PO6: 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

PO7: 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

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.

PO9: Reflective thinking: Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society.

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.

PO 11 Self-directed learning: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.

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.

PO 13: Moral and ethical awareness/reasoning: Ability toembrace 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 demonstratingthe 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.

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.

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.

Programme Specific Outcomes:

On successful completion of Bachelor of Physics with Computer Applications programme, the student should be able to:

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.

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

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.

PSO4: Analytical & Scientific Reasoning: Apply scientific methods, collect and analyse data, test hypotheses, evaluate evidence, apply statistical techniques and use computational models.

PSO5: Research related skills: Formulate research questions, conduct literature reviews, design and execute research studies, communicate research findings and collaborate in research projects.

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.

PO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
PO1	✓					
PO2		✓				
PO3			✓			
PO4				✓		
PO5					✓	
PO6						√

SEMESTER: I PART: III Core – I	23UCHEC13 GENERAL CHEMISTRY-I	Credit: 5 H/W: 5
--------------------------------------	----------------------------------	---------------------

Objectives of The course aims at giving an overall view of the the course • various atomic models and atomic structure • wave particle duality of matter • periodic table, periodicity in properties and its application in explaining the chemical behaviour nature of chemical bonding, and fundamental concepts of organic chemistry Course Outline UNIT I Atomic structure and Periodic trends History of atom (J.J.Thomson, Rutherford); Moseley's Experiment and Atomic number, Atomic Spectra; Black-Body Radiation and Planck's quantum theory Bohr's model of atom; The Franck-Hertz Experiment; Interpretation of Hspectrum; Photoelectric effect, Compton effect; Dual nature of Matter- DeBroglie wavelength-Davisson and Germer experiment Heisenberg's Uncertainty Principle; Electronic Configuration of Atoms and ions- Hund's rule, Pauli'exclusion principle and Aufbau principle; Numerical problems involving the core concepts.

Unit II

Introduction to Quantum mechanics

Classical mechanics, Wave mechanical model of atom, distinction between a Bohr orbit and orbital; Postulates of quantum mechanics; probability interpretation of wavefunctions, Formulation of Schrodinger wave equation - Probability and electron density-visualizing the orbitals -Probability density and significance of Ψ and Ψ^2 .

Modern Periodic Table

Cause of periodicity; Features of the periodic table; classification of elements Periodic trends for atomic size- Atomic radii, Ionic, crystal and Covalent radii; ionization energy, electron affinity, electronegativity- electronegativity scales, applications of electronegativity.

Problems involving the core concepts

UNIT-III: Structure and bonding - I

Ionic bond

Lewis dot structure of ionic compounds; properties of ionic compounds; Energy involved in ionic compounds; Born Haber cycle – lattice energies, Madelung constant; relative effect of lattice energy and solvation energy; Ion polarisation – polarising power and polarizability; Fajans' rules - effects of polarisation on properties of compounds; problems involving the core concepts.

Covalent bond

Shapes of orbitals, overlap of orbitals – σ and Π bonds; directed valency hybridization; VSEPR theory - shapes of molecules of the type AB_2 , AB_3 , AB_4 , AB_5 , AB_6 and AB_7

Partial ionic character of covalent bond-dipole moment, application to molecules of the type A₂, AB, AB₂, AB₃, AB₄; percentage ionic character-numerical problems based on calculation of percentage ionic character.

UNIT-IV: Structure and bonding - II

VB theory – application to hydrogen molecule; concept of resonance - resonance structures of some inorganic species – CO₂, NO₂, CO₃^{2-,} NO₃⁻; limitations of VBT; MO theory - bonding, antibonding and nonbonding orbitals, bond order; MO diagrams of H₂, C₂, O₂, O₂⁺, O²⁻, O₂²⁻N₂, NO, HF, CO; magnetic characteristics, comparison of VB and MO theories.

Coordinate bond: Definition, Formation of BF₃, NH₃, NH₄⁺, H₃O⁺ properties

Metallic bond-electron sea model, VB model; Band theory-mechanism of conduction in solids; conductors, insulator, semiconductor – types, applications of semiconductors

Weak Chemical Forces - Vander Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interactions, Instantaneous dipole-induced dipole interactions. Repulsive forces; Hydrogen bonding – Types, special properties of water, ice, stability of DNA; Effects of chemical force, melting and boiling points.

UNIT-V:

Basic concepts in Organic Chemistry and Electronic effects

Types of bond cleavage – heterolytic and homolytic; arrow pushing in organic reactions; reagents and substrates; types of reagents - electrophiles, nucleophiles, free radicals; reaction intermediates – carbanions, carbocations, carbenes, arynes and nitrynes.

Inductive effect - reactivity of alkyl halides, acidity of halo acids, basicity of amines; inductomeric and electromeric effects.

Resonance – resonance energy, conditions for resonance - acidity of phenols, basicity of aromatic amines, stability of carbonium ions, carbanions and free

radicals, reactivity of vinyl chloride, dipole moment of vinyl chloride and nitrobenzene, bond lengths; steric inhibition to resonance.

Hyperconjugation - stability of alkenes, bond length, orienting effect of methyl group, dipole moment of aldehydes and nitromethane

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	 Madan, R. D. and Sathya Prakash, Modern Inorganic Chemistry, 2nded.; S. Chand and Company: New Delhi, 2003. Rao, C.N. R. University General Chemistry, Macmillan Publication: New Delhi, 2000. Puri, B. R. and Sharma, L. R. Principles of Physical Chemistry, 38thed.;Vishal Publishing Company: Jalandhar, 2002. Bruce, P. Y. and PrasadK. J. R. Essential Organic Chemistry, Pearson Education: New Delhi, 2008. Dash UN, Dharmarha OP, Soni P.L. Textbook of Physical Chemistry, Sultan Chand & Sons: New Delhi, 2016
Reference Books	 Maron, S. H. and Prutton C. P. Principles of Physical Chemistry,4thed.; The Macmillan Company: Newyork,1972. Lee, J. D. Concise Inorganic Chemistry, 4th ed.; ELBS William Heinemann: London,1991. Gurudeep Raj, Advanced Inorganic Chemistry, 26thed.; Goel Publishing House: Meerut, 2001. Atkins, P.W. & Paula, J. Physical Chemistry, 10th ed.; Oxford University Press:New York, 2014. Huheey, J. E. Inorganic Chemistry: Principles of Structure and Reactivity, 4th ed.; Addison, Wesley Publishing Company: India,1993.
Website and e- learning source	1) https://onlinecourses.nptel.ac.in 2) http://www.mikeblaber.org/oldwine/chm1045/notes_m.htm 3) http://www.ias.ac.in/initiat/sci_ed/resources/chemistry/Inorganic.html 4) https://swayam.gov.in/course/64-atomic-structure-and-chemical-bonding 5) https://www.chemtube3d.com/

Course 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'

SEMESTER: I PART: III Core – II	23UCHEP14 Quantitative Inorganic Estimation (titrimetry) and Inorganic Preparations	Credit: 5 H/W: 4
---------------------------------------	---	---------------------

Objectives of This course aims at providing knowledge on the course · laboratory safety handling glasswares • Quantitative estimation preparation of inorganic compounds To develop the skill in finding out the end points of various types of indicators Course Outline Unit I Chemical Laboratory Safety in Academic Institutions Introduction - importance of safety education for students, common laboratory hazards, assessment and minimization of the risk of the hazards, prepare for emergencies from uncontrolled hazards; concept of MSDS; importance and care of PPE; proper use and operation of chemical hoods and ventilation system; fire extinguishers-types and uses of fire extinguishers, demonstration of operation; chemical waste and safe disposal. Common Apparatus Used in Quantitative Estimation (Volumetric) Description and use of burette, pipette, standard flask, measuring cylinder, conical flask, beaker, funnel, dropper, clamp, stand, wash bottle, watch glass, wire gauge and tripod stand. Principle of Quantitative Estimation (Volumetric) Equivalent weight of an acid, base, salt, reducing agent, oxidizing agent; concept of mole, molality, molarity, normality; primary and secondary standards, preparation of standard solutions; theories of acid-base, redox, complexometric, iodimetric and iodometric titrations; indicators - types, theory of acid-base, redox, metal ion and adsorption indicators, choice of indicators. Dichrometry Estimation of ferric alum using standard dichromate (external indicator) Estimation of ferric alum using standard dichromate (internal indicator)

	Iodometry Estimation of copper in copper sulphate using standard dichromate
	Argentimetry Estimation of chloride in barium chloride using standard sodium chloride/ Estimation of chloride in sodium chloride (Volhard's method) Complexometry Estimation of hardness of water using EDTA
	Estimation of iron in iron tablets Estimation of ascorbic acid
	Preparation of Inorganic compounds- Potash alum Tetraammine copper (II) sulphate Hexamminecobalt (III) chloride Mohr's Salt
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	Reference Books: 1. Venkateswaran, V.; Veeraswamy, R.; Kulandivelu, A.R. Basic Principles of Practical Chemistry, 2 nd ed.; Sultan Chand & Sons: New Delhi, 1997. 2. Nad, A. K.; Mahapatra, B.; Ghoshal, A.; An advanced course in Practical Chemistry, 3 rd ed.; New Central Book Agency: Kolkata, 2007.
Reference Books	1. Mendham, J.; Denney, R. C.; Barnes, J. D.; Thomas, M.; Sivasankar, B.; Vogel's Textbook of Quantitative Chemical Analysis, 6 th ed.; Pearson Education Ltd: New Delhi, 2000.
Website and e- learning source	Web References: 1) http://www.federica.unina.it/agraria/analytical-chemistry/volumetricanalysis 2)https://chemdictionary.org/titration-indicator/

Course Learning Outcomes (for Mapping with POs and PSOs)

On successful completion of the course the students should be able to

CO1: explain the basic principles involved in titrimetric analysis and inorganic preparations.

CO2: compare the methodologies of different titrimetric analysis.

CO3: calculate the concentrations of unknown solutions in different ways and develop the skill to estimate the amount of a substance present in a given solution.

CO4. Indetify the end point of various titrations

CO5 acquire knowledge on the systematic analysis of Mixture of salts., identify the cations and anions in the unknown substance.

CO5: handle the common apparatus used in volumetric estimation.

	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
СОЗ	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	S	S	M	S	S	S	M	S	M

CO-PO Mapping (Course Articulation Matrix)

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

Note: Scheme for Practical Evaluation

Inorganic Preparation:15 marks

Record:10 marks
Procedure-10 marks

Volumetric Estimation – 40 marks

Results

< 2% - 40 marks

2-3% - 30 marks

3-4% - 20 marks

> 4% - 10 marks

SEMESTER: I 23UMATE15 Credit: 3 H/W: 5
--

UNIT-I: SOLUTIONS OF TRANSCENDENTAL AND ALGEBRAIC EQUATIONS

Iteration method, Bisection method, Newton's method - Regula Falsi method, (without proof) (Simple problems only)

Unit-II: SOLUTIONS OF SIMULTANEOUS EQUATIONS

Gauss Elimination method- Gauss Jordan method-Gauss Seidel Iterative method-Gauss Jacobi method (Restricted to three variables only) (Simple problems only)

UNIT-III: MATRICES

Characteristic equation of a square matrix—Eigen values and eigen vectors—Cayley—Hamilton theorem [without proof]—Verification and computation of inverse matrix.

UNIT-IV: DIFFERENTIAL CALCULUS

n-th derivatives – Leibnitz theorem [without proof] and applications – Jacobians–Curvature and radius of curvature in Cartesian co-ordinates

UNIT-V: APPLICATION OF INTEGRATION

Evaluation of double – Simple applications to area,

TEXT BOOKS:

1. A.Singaravelu "Numerical Methods" Meenakshi Publications

Unit-I: Chapter 2 Unit-II: Chapter 2

2. P. Duraipandian and Dr. S. Udayabaskaran. 1997, "Allied Mathematics", Vol I & II. Chennai: Muhil Publishers.

Unit-III: Sec(4.5, 4.5.1 to 4.5.3)Vol I

Unit-IV: Sec(1.1.1, 1.1.2, 1.2, 1.4.3)vol II

Unit-V: Chap:3(3.2, 3.4, 3.4.1) vol II

REFERENCE BOOKS:

- 1. P. Balasubramanian and K. G. Subramanian. 1997, "Ancillary Mathematics", Vol I & II. New Delhi: Tata McGraw Hill.
- 2. S.P.Rajagopalan and R.Sattanathan(2005), "Allied Mathematics", Vol I & II. New Delhi: Vikas Publications.
- 3. P. R. Vittal (2003), "Allied Mathematics", Chennai: Marghan Publications.

Course Outcomes:

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

CO1: Attain knowledge on finding Approximate root for polynomial equations using Numerical methods.

CO2: Develop the skills of finding solutions of Simultaneous Linear equations.

CO3: Adopt techniques in solving problems involving Matrices

CO4: Provide skills on finding curvature and radius of curvature in Cartesian and polar co-ordinates.

CO5:Understand the applications of double and Triple integration in real life situation.

Outcome Mapping:

	· I ·				
CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

SEMESTER: I	23UBOTE15	Credit: 2
PART: III	BOTANY- I	H/W: 3

Learning Objective (LO):

LO1	To study morphological and anatomical adaptations of plants of various
LOI	habitats.
LO2	To demonstrate techniques of plant tissue culture.
LP3	To familiarize with the structure of DNA, RNA.
LO4	To carryout experiments related with plant physiology.
LO5	To perform biochemistry experiments.

Unit – 1: Algae:

General characters of algae - Structure, reproduction and life cycle of the following genera - *Anabaena* and *Sargassum* and economic importance of algae.

Unit − **2** : Fungi, Bacteria and Virus:

General characters of fungi, structure, reproduction and life cycle of the following genera - *Penicillium* and *Agaricus* and economic importance of fungi.

Bacteria - general characters, structure and reproduction of *Escherichia coli* and economic importance of bacteria. Virus - general characters, structure of TMV, structure of bacteriophage.

Unit − **3** : Bryophytes, Pteridophytes and Gymnosperms:

General characters of Bryophytes, Structure and life cycle of Funaria.

General characters of Pteridophytes, Structure and life cycle of *Lycopodium*.

General characters of Gymnosperms, Structure and life cycle of Cycas.

Unit – 4: Cell Biology:

Prokaryotic and Eukaryotic cell- structure /organization. Cell organelles - ultra structure and function of chloroplast, mitochondria and nucleus. Cell division - mitosis and meiosis.

Unit – 5: Genetics and Plant Biotechnology:

Mendelism - Law of dominance, Law of segregation, Incomplete dominance. Law of independent assortment. Monohybrid and dihybrid cross - Test cross - Back cross. Plant tissue culture - *In vitro* culture methods. Plant tissue culture and its application in biotechnology.

Course Outcomes (CO)

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

CO1	Increase the awareness and appreciation of human friendly						
COI	algae and their economic importance.						
CO2	Develop an understanding of microbes and fungi and						
appreciate their adaptive strategies.							
CO3	Develop critical understanding on morphology, anatomy and						
COS	reproduction of Bryophytes, Pteridophytes and Gymnosperms.						
CO4	Compare the structure and function of cells and explain the						
CO4	development of cells.						
CO5 Understand the core concepts and fundamentals of plant							
003	biotechnology and genetic engineering.						

Recommended Texts

- 1. Singh, V., Pande, P.C and Jain, D.K. 2021. A Text Book of Botany. Rastogi Publications, Meerut.
- 2. Bhatnagar, S.P and Alok Moitra. 2020. Gymnosperms, New Age International (P) Ltd., Publishers, Bengaluru.
- 3. Sharma, O.P. 2017. Bryophyta, MacMillan India Ltd. Delhi.
- 4. Lee, R.E. 2008. Phycology, IV Edition, Cambridge University Press, New Delhi.
- 5. Rao, K., Krishnamurthy, K.V and Rao, G.S. 1979. Ancillary Botany, S. Viswanathan Pvt. Ltd., Madras.

Reference books:

- 1. Parihar, N.S. 2012. An introduction to Embryophyta –Pteridophytes Surject Publications, Delhi.
- 2. Alexopoulos, C.J. 2013. Introduction to Mycology. Willey Eastern Pvt. Ltd.
- 3. Vashishta, P.C. 2014. Botany for Degree Students Gymnosperms. Chand & Company Ltd, Delhi.
- 4. Coulter, M. Jhon, 2014. Morphology of Gymnosperms. Surject Publications, Delhi.
- 5. Vashishta, P.C. 2014. Botany for Degree Students Algae. 2014. Chand & Company Ltd, Delhi.
- 6. Parihar, N.S. 2013. An introduction to Embryophyta –Bryophytes -, Surject Publications, Delhi.
- 7. Pandey B.P. 1986, Text Book of Botany (College Botany) Vol I &II, S.Chand and Co. New Delhi.

Course Objectives

The main objectives of this course are:

1	To acquire a basic knowledge of diversity and organization of Protozoa, Coelenterata, Helminthes and Annelida
2	To acquire a basic knowledge of diversity and organization of Arthropoda, Mollusca and Echinodermata
3	To comprehend the taxonomic position and diversity among Protochordata, Pisces and Amphibia
4	To comprehend the taxonomic position and diversity among Reptilia, Aves and Mammalia
5	To acquire detailed knowledge of selected invertebrate and chordate forms

Unit - I: Diversity of Invertebrates-I

Principles of taxonomy. Criteria for classification—Symmetry and Coelom—Binomial nomenclature. Classification of Protozoa, Coelenterata, Helminthes and Annelida upto classes with two examples.

Unit – II: Diversity of Invertebrates–II

Classification of Arthropoda, Mollusca and Echinodermata upto class level with examples.

Unit - III: Diversity of Chordates-I

Classification of Prochordata, Pisces and Amphibia upto orders giving two examples.

Unit - IV: Diversity of Chordates-II

Classification of Reptilia, Aves and Mammalia upto orders giving two examples.

Unit -V: Animal organization

Structure and organization of (i) Earthworm, (ii) Rabbit/Rat, (iii) Prawn/Fish

Expected Course Outcomes

On completion of this course, students will:

1	Recall the characteristic features invertebrates and chordates.					
2	Classify invertebrates up to class level and chordates up to order level					
3	Explain and discuss the structural and functional organisation of some invertebrates and chordates					
4	Relate the adaptations and habits of animals to their habitat					
5	Analyse the taxonomic position of animals.					

Text Books (Latest Editions)

1. Ekambaranatha Iyer, - Outlines of Zoology, Viswanathan Publication.

References Books

(Latest editions, and the style as given below must be strictly adhered to)

- 1. Ekambaranatha Iyar and T.N.Ananthakrishnian A Manual of Zoology Invertebrata–Vol. I: Viswanathan Publishers.
- 2. Ekambaranatha Iyar and T.N. Ananthakrishnan, A Manual of Zoology -Invertebrata–Vol. II: Viswanathan Publishers.
- 3. Ekambaranatha Iyar and T.N.Ananthakrishnan, A Manual of Zoology: Chordata Viswanathan Publishers.
- Jordan E.L. and P.S. Verma-Invertebrate Zoology, S. Chand & Co.

Web Resources

- 1. www.sanctuaryasia.com
- 2. www.iaszoology.com

Outcome Maping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S							
CO 2	M	S						
CO 3				S		S		
CO 4				S	S	M		
CO 5			S					S

S-Strong

M-Medium

L-Low

SEMESTER: I	23UBIOE15	Credit: 2
PART: III	Biochemistry- I	H/W: 3

Learning objectives

The objectives of this course are to

- Introduce the structure and classification of carbohydrates
- Comprehend the metabolism of carbohydrates
- Study the classification and properties of amino acids
- Elucidate the various levels of organization of Proteins
- Study functions and deficiency diseases of vitamins

Module I:Definition and classification of carbohydrates, linear and cyclic forms (Haworth projection) for glucose, fructose and mannose and disaccharides (maltose, lactose, sucrose). General properties of monosaccharides and disaccharides. Occurrence and significance of polysaccharides. 12Hrs

Module II:Metabolism- Catabolism and Anabolism.Carbohydrate metabolism-Glycolysis, TCA cycle, HMP shunt and glycogen metabolism and energetics 12Hrs

Module III: Amino acids -Classifications, physical properties -amphoteric nature, isoelectric point and chemicalreactions of carboxyl ,amino and both groups. Amino acid metabolism- transamination, deamination and decarboxylation.12Hrs

Module IV: Proteins- classification - biological functions ,physical properties- ampholytes, iso electric point, salting in and salting out, denaturation, nature of peptide bond. Secondary structure, α -helix and β -pleated sheet, tertiary structure, various forces involved- quaternary structure. 12Hrs

Module V: Vitamins- Fat(A,D,E and K) and water soluble vitamins(B complex and C)-sources, RDA, biological functions and deficiency diseases12 Hrs

Course Outcome

СО	On completion of this course, students will be able to	Programme Outcome
CO1	Classify the structure of carbohydrates and its properties	PO1

CO2	Explain the metabolism of carbohydrates and its significance	PO1
CO3	Classify amino acids and its properties	PO1
CO4	Explain the classification and elucidate the different levels of structural organization of proteins	PO1
CO5	Identify the disease caused by the deficiency of vitamins	PO1

Text Books

1 Satyanarayan,U (2014) Biochemistry (4th ed), Arunabha Sen Books & Allied (P) Ltd, Kolkata.

2.Jain J.L.(2007) Fundamentals of Biochemistry, S. Chand publishers 311

Reference books

- 1. David L.Nelson and Michael M.Cox (2012) Lehninger Principles of Biochemistry (6th ed) W.H. Freeman.
- 2. Voet.D&Voet. J.G (2010) Biochemistry, (4th ed), John Wiley & Sons, Inc.
- 3. Lubert Stryer (2010) Biochemistry, (7th ed), W.H.Freeman
- **4.** Satyanarayan,U (2014) Biochemistry (4th ed), Arunabha Sen Books & Allied (P) Ltd, Kolkata.
- 5.Jain J.L.(2007) Fundamentals of Biochemistry, S.Chand publishers 31

Web sources

1.onlinecourses.swayam2.ac.in/cec20_bt12

2 onlinecourses.swayam2.ac.in/cec20_bt19

Mapping with Program Outcome

	PO 1	PO 3	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	3				3			3
CO 2	3				3			3
CO 3	3				3			3
CO 4	3				3			3
CO5	3				3	3		3

S - Strong (3) M - Medium (2) L -Low(1)

SEMESTER -I	Elective	CREDITS: 1
PART – III	23UBOTEP1: Botany Practical I	H/W: 2

Course Objectives

- 1. To enhance information on the identification of each taxonomical group by developing the skill-based detection of the morphology and microstructure of microorganisms, algae, and fungi
- **2.** To comprehend the fundamental concepts and methods used to identify Bryophytes, Pteridophytes and Gymnosperms through morphological changes and evolution, anatomy and reproduction.
- **3.** To be familiar with the basic concepts and principles of cell biology.
- **4.** Understanding of laws of inheritance, genetic basis of loci and alleles.
- 5. To learn about the principles and applications of Biotechnology

EXPERIMENTS

- 1. Make suitable micro preparation of the types prescribed in Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms.
- 2. Micro photographs of the cell organelles ultra structure.
- 3. Simple genetic problems.
- 4. Spotters Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms Cell biology and Biotechnology.

Bonafide record of practical work done should be submitted for the practical examination

Course outcomes:

On completion of this course, the students will be able to:

- 1. To study the internal organization of algae.
- 2. To study the structure and organization of fungi, bacteria and viruses
- 3. Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms.
- 4. To study the cell structure and function.
- 5. Understand the fundamental concepts of genetics and Biotechnology

Recommended texts

- 1. Sharma, O.P. 2017. Bryophyta, MacMillan India Ltd, New Delhi.
- 2. Sharma, O.P. 2012. Pteridophyta, Tata McGraw-Hills Ltd, New Delhi.
- 3. Subramaniam, N.S. 1996. Laboratory Manual of Plant Taxonomy. Vikas Publishing House Pvt. Ltd., New Delhi.
- 4. Benjamin, A. Pierce. 2012. Genetics- A conceptual Approach. W.H. Freeman and Company, New York, England.
- 5.Noggle G.R and G.J. Fritz. 2002. Introductory Plant Physiology. Prentice Hall of India, New Delhi.

Reference books

- 1. Strickberger, M.W. 2005. Genetics (III Ed). Prentice Hall, New Delhi, India.
- 2. Nancy Serediak and M. Huynh. 2011. Algae identification lab Guide. Accompanying manual to algae identification field guide, Ottawa Agriculture and Agri food Canada publisher.
- 3. Mohammed Gufran Khan, Shite Gatew and Bedilu Bekele. 2012. Practical manual for Bryophytes and Pteridophytes. Lambert Academic Publishing.
- 4. Aler Gingauz. 2001. Medicinal Chemistry. Oxford University Press & Wiley Publications.
- 5. Steward, F.C. 2012. Plant Physiology Academic Press, US

Web Resources

- 1. https://www.amazon.in/Practical-Manual-Pteridophyta-Rajan-Sundara/dp/8126106883
- 2. https://www.google.co.in/books/edition/Gymnosperms/3YrT5E3Erm8C?hl=en&g bpv=1&dq=gy mnosperms&printsec=frontcover
- 3. https://www.amazon.in/Manual-Practical-Bryophyta-Suresh-Kumar/dp/B0072GNFX4

OUTCOME MAPPING

	PO1	PO2	PO3	PO4	PO5
CO1	2	3	1	3	2
CO2	2	3	2	2	3
CO3	2	1	3	2	3
CO4	1	3	3	2	2
CO5	2	2	3	1	3

BOTANY PRACTICAL I

Time : 3 Hours Max. Marks : 75

PRACTICAL QUESTION PAPER

1. Make suitable micro preparations of the given specimens A, B and C. Submit the slides for valuation. Identify the specimens, draw diagrams and give reasons.

(Identification – 1, diagram – 2, Reasons – 2, Slide -2) (7 X 3) (21)

2. Make suitable micro preparations of the given specimens D. Submit the slides for valuation. Identify the specimens, draw diagrams and give reasons.

(Identification – 1, diagram – 2, Reasons – 2, Slide -2) (08)

- 3. Identify the given electron micrograph –E, describe and draw diagrams (Identification 2, Diagram 3, description 3) (08)
- 4. Spotters F, G, H, I, J, K and L. (Identification 1, diagram 1, Reasons 2) (7 X 4) (28)

Total = 65
Record = 10

Grand Total = 75

BOTANY PRACTICAL I KEY & SCHEME OF VALUATION

- 1. A Algae / Fungi : Sargassum/Agaricus
 - B Bryophytes: Funaria
 - C Pteridophytes : *Lycopodium*

(Identification – 1, diagram – 2, Reasons – 2, Slide -2) (7 X 3) (21)

- 2. Gymnopserms D : *Cycas* rachis and leaflet (Identification 1, diagram 2, Reasons 2, Slide -3) (08)
- 3. Cell biology E Electron Micrograph of organelles- Chloroplast, Mitochondria, Nucleus, Mitosis, Giant Chromosomes
- (Identification 2, Diagram 3, description 3) (08)
- 4. Spotters F, G, H, I, J and L(any seven of the following)

(Algae, Fungi, Bacteria, Virus, Bryophytes, Pteridophytes and Gymnosperms –permanent slides, book diagrams or wet preserved jar specimens, mentioned in the syllabus)

Cytology – photographs of cell organelles

Genetics – simple genetics problems

Plant biotechnology – tissue culture techniques: explants, callus, hardening

(Identification – 1, diagram – 1, Reasons – 2) (7 X 4) (28)

Total = 65 Record = 10 Grand Total = 75

SEMESTER: I	23UZOOEP1	Credit: 1
PART: III	Zoology Practical– I	H/W: 2

Course Objectives

1	To identify the different groups of invertebrate animals by observing their
	external characteristics.
2	To understand the organs, organ system and their functions in lower animals.
3	To get knowledge about the different modes of life and their adaptation based on
	the environment.
4	Able to dissect and display the internal organs and mount the mouthparts and
	scales of invertebrates.

UNIT - I: Major Dissection:

Cockroach: Circulatory system, Nervous system, Reproductive system. Leech: Nervous System, Reproductive system. Earthworm: Nervous System, Reproductive system. *Pila globosa*: Nervous system. Prawn: Nervous system (including Appendages).

UNIT – II: Minor Dissection:

Cockroach: Digestive system. Earthworm: Viscera, Lateral hearts.

Pila globosa: Digestive system (Including radula). Freshwater Mussel: Digestive system.

UNIT – III: Mounting:

Earthworm: Body setae; Pineal setae. *Pila globosa*: Radula. Freshwater muscle: Pedal ganglia.

UNIT - IV: Mounting:

Cockroach: Salivary apparatus, Mouth parts - Honey Bee, House fly and Mosquito mouth parts.

UNIT - V: Spotters :(i).

Protozoa: Amoeba, Paramoecium, Paramoecium Binary fission and Conjugation, Vorticella, Entamoeba histolytica, Plasmodium vivax (ii). **Porifera:** Sycon, Spongilla, Euspongia, Sycon - T.S & L.S, Spicules, Gemmule (iii). **Coelenterata:** Obelia – Colony & Medusa, Aurelia, Physalia, Velella, Corallium, Gorgonia, Pennatula (iv). **Platyhelminthes:** Planaria, Fasciola hepatica, Fasciola larval forms – Miracidium, Redia,

Cercaria, Echinococcus granulosus, Taenia solium, Schistosoma haematobium (v). Nemathelminthes: Ascaris(Male & Female), Drancunculus, Ancylostoma, Wuchereria (vi). Annelida: Nereis, Aphrodite, Chaetopteurs, Hirudinaria, Trochophore larva (vii). Arthropoda: Cancer, Palaemon, Scorpion, Scolopendra, Sacculina, Limulus, Peripatus, Larvae - Nauplius, Mysis, Zoea, Mouth parts of male & female Anopheles and Culex, Mouthparts of Housefly and Butterfly. (viii). Mollusca: Chiton, Pila, Unio, Pteredo, Murex, Sepia, Loligo, Octopus, Nautilus, Glochidium larva (ix). Echinodermata: Asterias, Ophiothrix, Echinus, Clypeaster, Cucumaria, Antedon, Bipinnaria larva

Expected Course Outcomes

On completion of this course, students will;

1	Identify and label the external features of different groups of invertebrate
1	animals.
_	Illustrate and examine the circulatory system, nervous system and
2	reproductive system of invertebrate animals.
2	Differentiate and compare the structure, function and mode of life of
3	various groups of animals.
4	To compare and distinguish the dissected internal organs of lower animals.
_	Prepare and develop the mounting procedure of economically important
5	invertebrates.

Text Books

(Latest Editions)

- 1. Ekambaranatha Iyyar and T. N. Ananthakrishnan, 1995 A manual of Zoology Vol.I (Part 1, 2) S. Viswanathan, Chennai.
- 2. Ganguly, Sinha and A dhikari, 2 0 11. Biology of Animals: Volume I, New Central Book Agency; 3rd revised edition. 1008 pp.
- 3. Sinha, Chatterjee and Chattopadhyay, 2 0 1 4. Advanced Practical Zoology, Books & Allied Ltd; 3rd Revised edition, 1 07 0 pp.
- **4.** Lal ,S. S, 2016. Practical Zoology Invertebrate, Rastogi Publications.
- **5.** Verma, P. S. 2010. A Manual of Practical Zoology: Invertebates, S Chand, 4 97pp.

References Books

1. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). *The Invertebrates: A New Synthesis*, III Edition, Blackwell Science.

- 2. Barnes, R.D. (1982). *Invertebrate Zoology*, V Edition. Holt Saunders International Edition.
- 3. Barrington, E.J.W. (1979). *Invertebrate Structure and Functions*. II Edition, E.L.B.S. and Nelson
- **4.** Boradale, L.A. and Potts, E.A. (1961). *Invertebrates: A Manual for the use of Students*. Asia Publishing Home.
- 5. Lal, S.S. 2005. A text Book of Practical Zoology: Invertebrate, Rastogi, Meerut

Web Resources

- 1. https://nbb.gov.in/
- 2. http://www.agshoney.com/training.htm
- 3. https://icar.org.in/
- 4. http://www.csrtimys.res.in/
- 5. http://csb.gov.in/
- 6. https://iinrg.icar.gov.in/
- 7. https://www.nationalgeographic.com/animals/invertebrates/

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S			S	S	S	M	
CO 2	M	S			M		L	
CO 3			M	S		S		
CO 4	S			S	S	M	S	
CO 5			S			S		S

S-Strong(3) M-Medium (2) L-Low (1)

SEMESTER: I PART: III 23UBIOEP1 Credit: 1 H/W: 2	
--	--

Learning objectives

- Identify carbohydrates by qualitative test
- Estimate biomolecules volumetrically
- Estimate protein quantitatively

I Qualitative analysis of carbohydrates- 25Hrs

- a) Monosaccharides-Glucose, Fructose
- b) Disaccharides- Lactose, Maltose, Sucrose
- c) Polysaccharides-Starch

II Volumetric analysis 15 Hrs

- a) Estimation of ascorbic acid using 2,6dichlorophenolindophenol as link solution
- b) Estimation of Glucose by Benedicts method
- c)Estimation of Glycine by Sorenson Formal titration

III Quantitative analysis(Demonstration Expt)5 hrs

a)Colorimetric estimation of protein by Biuret method

Course Outcome

CO	On completion of this course, students will be able	Program	
	to	Outcomes	
CO 1	Qualitatively analyze and report the type of	PO1,PO2.PO3	
CO1	carbohydrate based on specific tests		
CO2	Quantitatively estimate the carbohydrates, amino	PO1,PO2,PO3	
	acids and ascorbic acid		
CO3	Estimate protein by colorimetric method	PO1,PO2,PO3	

Text books

1.Laboratory manual in Biochemistry, J. Jayaraman, 2nd edition, New Age International Publishers, 2011,

- 2. An Introduction to Practical Biochemistry, David T. Plummer, 3 rd edition, Tata McGraw- Hill Publishing Company Limited, 2001.
- 3. Biochemical Methods, Sadasivam S and Manickam A, 4h edition, New Age International Publishers, 2016

Mapping with Program Outcomes

	PO	PO	PO	PO	PO	PO	PSO1	PSO2	PSO3	PSO4
	1	2	3	4	5	6				
СО	2	3	3				3	3	3	3
1										
CO	2	3	3				3	3	3	3
2										
CO	2	3	3				3	3	3	3
3	_									

S - Strong (3) M - Medi) L -Low(1)

SEMESTER: I PART: IV	23UCHEF17 INTRODUCTORY CHEMISTRY	Credit: 2 H/W: 2					
Objectives of the Course	To give insights into chemistry experiments for a beginn	ner in					
	1. Lab safety and Nature of chemicals.						
	2. Types of titrations and Concentration terms.						
	3. Semi micro analysis and precipitation technique	es.					
	4. Organic analysis5. Gravimetric Principles						
	3. Gravimente i inicipies						
Course Outline	UNIT-I: LAB SAFETY, CHEMICALS AND GLA	SSWARE					
	1.1 laboratory hygiene and safety – first–aid techniq culture inside the chemistry lab.	ues – general work					
	1.2 Nature of chemicals – toxic, corrosive, explosive, inflammable, carcinogenic, other hazardous chemicals – safe storing and handling of chemicals – disposal of chemical wastes.						
	1.3. Handling of glass wares- Calibration of pipette, standard measuring flask and burette.						
	UNIT-II: TITRIMETRIC METHODS OF ANALYSIS						
	 2.1 Definitions of Molarity and Normality. Primary and secondary standards, Criteria for primary standards-Preparation of standard solutions. 2.2 Concepts of Acids & Bases - pH of strong and weak acid solutions. Indicators-Theory and their choice. 						
	2.3 Types of titrations- Acid-base Titrations, Redox Titrations, Precipitation Titrations and Complexometric Titrations- Principles and theory.						
	UNIT-III: SEMIMICRO METHODS						
	3.1. Identification of interfering & non-interfering acid interfering radicals (any one test for each).3.2 Separation of cations into groups-Reagents involved3.3 Spot test analysis for ammonium, Pb, Cu, Mg, Mn a	and their principle					
	UNIT-IV: BASICS OF ORGANIC ANALYSIS						
	4.1 Preliminary and solubility tests for identifying orga for Aliphatic/Aromatic – Saturated/ Unsaturated compo- 4.2 Detection of Nitrogen, Sulphur and halogens	unds yde, ketone, ester					

UNIT V: GRAVIMETRIC METHODS

	 5.1 Gravimetric analysis- principle, theory and calculation. 5.2 Steps of a gravimetric analysis: precipitation, digestion, filtration, washing, drying and weighing. 5.2 Conditions for precipitation-choice of precipitants-advantages and disadvantages of using organic precipitants.
Professional	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	 U.N. Dash, 2005, Analytical Chemistry: Theory and Practice, Sultan Chand and sons. Educational Publishers, 2nd Edition, New Delhi, J.Bassett, R.C.Denney, G.H.Jerrey and J.Mendham, 1994,Vogel's Text Book Of Inorganic Quantitative Analysis, ELBS, 5th Edition, London. Gopalan R., Rangarajan K., Subramanian P.S. Elements of Analytical Chemistry, Sultan Chand & Sons, 2003 Svehla, 2012, Vogel's Qualitative Analysis, Pearson Education, 7thEdition,New Delhi. Venkateswaran V, Veeraswamy R, Kulandaivelu A R,1997,Basic Principles Of Practical Chemistry, Sultan Chand and Sons, 2nd Edition, New Delhi. D.A. Skoog, D.M. West and F. J.Holler, 1990, Analytical chemistry,Saunders college publishing, 5th Edition, Philadelphia.
Reference Books	 Svehla, 2012, Vogel's Qualitative Analysis, Pearson Education, 7thEdition,New Delhi. Venkateswaran V, Veeraswamy R, Kulandaivelu A R,1997,Basic Principles Of Practical Chemistry, Sultan Chand and Sons, 2nd Edition, New Delhi

		edge, Problem solving, Analytical ability, Professional Competency, ional Communication and Transferable skills.
Website and	1.	https://www.tees.ac.uk/parttime_courses/engineering_&_construction/
e-learning source		certificate of credit foundation process chemistry (by flexible ope
		<u>n_learning</u>).cfm
	2.	https://le.ac.uk/courses/chemistry-with-foundation-year-bsc/2023
	3.	https://www.researchgate.net/publication/345381808 Foundations for
		Teaching Chemistry Chemical Knowledge for Teaching
	4.	https://yuli-elearning.com/mod/resource/view.php?id=738
	5.	https://pubs.acs.org/doi/10.1021/acs.jchemed.1c00666

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

CO1: to understand laboratory safety and hygiene.

CO2: to understand principle of titrations. CO3: to understand semi micro analysis.

CO4: to understand basics of organic compound analysis. CO5: to understand about gravimetric analysis

	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	2	2	2	2	2
CO2	2	2	2	2	2
CO3	2	2	2	2	2
CO4	2	2	2	2	2
CO5	2	2	2	2	2
Weightage	10	10	10	10	10
Weighted percentage of Course Contribution to Pos	2.0	2.0	2.0	2.0	2.0

Level of Correlation between PSO's and CO's

SEMESTER: II PART: III Core III	23UCHEC23 GENERAL CHEMISTRY-II	Credit: 5 H/W: 5
---------------------------------------	-----------------------------------	---------------------

Objectives of the This course aims at providing an overall view of the course chemistry of acids, bases and ionic equilibrium properties of s and p-block elements chemistry of hydrocarbons applications of acids and bases compounds of main block elements and hydrocarbons **UNIT-I** Course Outline Acids, bases and Ionic equilibria Concepts of Acids and Bases - Arrhenius concept, Bronsted-Lowry concept, Lewis concept; Relative strengths of acids, bases and dissociation constant; dissociation of poly basic acids, ionic product 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, titration curves - use of acid base indicators; Buffer solutions – types, mechanism of buffer action in acid and basic buffer, 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; numerical problems involving the core concepts. Unit-II 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, Na₂CO₃, KBr, KClO₃ alkaline earth metals. Anomalous behaviour of Be. Chemistry of p- Block Elements (Group 13 & 14) preparation and structure of diborane and borazine. Chemistry of borax. Extraction of Al and its uses. Alloys of Al. comparison of carbon with silicon. Carbon-di-sulphide – Preparation, properties, structure and uses. Percarbonates, per monocarbonates and per dicarbonates. UNIT-III Chemistry of p- Block Elements (Group 15-18) General characteristics of elements of Group 15; chemistry of H₂N-NH₂,

NH₂OH, HN₃ and HNO₃. Chemistry of PH₃, PCl₃, PCl₅, POCl₃, P₂O₅ and oxy acids of phosphorous (H₃PO₃ and H₃PO₄).

General properties of elements of group16 - Structure and allotropy of elements - chemistry of ozone - Classification and properties of oxides - oxides of sulphur and selenium - Oxy acids of sulphur (Caro's and Marshall's acids).

Chemistry of Halogens: General characteristics of halogen with reference to electro-negativity, electron affinity, oxidation states and oxidizing power. Peculiarities of fluorine. Halogen acids (HF, HCl, HBr and HI), oxides and oxy acids (HClO₄). Inter-halogen compounds (ICl, ClF₃, BrF₅ and IF₇), pseudo halogens [(CN)₂ and (SCN)₂] and basic nature of Iodine.

Noble gases: Position in the periodic table. Preparation, properties and structure of XeF₂, XeF₄, XeF₆ and XeOF₄; uses of noble gases - clathrate compounds.

UNIT-IV

Hydrocarbon Chemistry-I

Petroproducts: Fractional distillation of petroleum; cracking, isomerisation, alkylation, reforming and uses

Alkenes-Nomenclature, general methods of preparation – Mechanism of \square elimination reactions – E_1 and E_2 mechanism - factors influencing – stereochemistry – orientation – Hofmann and Saytzeff rules. Reactions of alkenes – addition reactions – mechanisms – Markownikoff's rule, Kharasch effect, oxidation reactions – hydroxylation, oxidative degradation, epoxidation, ozonolysis; polymerization.

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 – polybutadiene, polyisoprene (natural rubber), vulcanisation, polychloroprene.

Alkynes

Nomenclature; general methods of preparation, properties and reactions; acidic nature of terminal alkynes and acetylene, polymerisation and isomerisation.

Cycloalkanes: Nomenclature, Relative stability of cycloalkanes, Bayer's strain theory and its limitations. Conformational analysis of cyclohexane, mono and di substituted cyclohexanes. Geometrical isomerism in cyclohexanes.

UNIT-V 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. Mono substituted and disubstituted benzene - Effect of substituent – orientation and reactivity. Polynuclear Aromatic hydrocarbons: Naphthalene – nomenclature, Haworth synthesis; physical properties, reactions – electrophilic substitution reaction, nitration, sulphonation, halogenation, Friedel – Crafts acylation & alkylation, preferential substitution at \square - position – reduction, oxidation – uses. Anthracene – synthesis by Elbs reaction, Diels – Alder reaction and Haworth synthesis; physical properties; reactions - Diels-Alder reaction, preferential substitution at C-9 and C-10; uses. Extended Questions related to the above topics, from various competitive examinations Professional UPSC/JAM /TNPSC others to be solved Component (is a part (To be discussed during the Tutorial hours) of internal component only, Not to be included in the external examination question paper) Skills acquired Knowledge, Problem solving, Analytical ability, Professional Competency, from this course Professional Communication and Transferable skills. 1. Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry, 2nded, Recommended Text 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 B S, Arul Bhal, (2003), Advanced Organic Chemistry, 3rd ed., S.Chand and Company, New Delhi. 4. Tewari K S, Mehrothra S N and Vishnoi N K, (1998), Text book of Organic Chemistry, 2nd ed., Vikas Publishing House, New Delhi. 5. Puri B R, Sharma L R, (2002), Principles of Physical Chemistry, 38th ed., Vishal Publishing Company, Jalandhar. Reference 1. Maron S H and Prutton C P, (1972), Principles of Physical Chemistry, 4th **Books** ed., The Macmillan Company, Newyork. 2. Barrow G M, (1992), Physical Chemistry, 5th ed., Tata McGraw Hill, New Delhi. 3. Lee J D, (1991), Concise Inorganic Chemistry, 4thed., ELBS William Heinemann, London. 4. Huheey J E, (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 O P, (1995), Reactions and Reagents in Organic Chemistry, 8 th ed., Goel Publishing House, Meerut.
Website and e- learning source	https://onlinecourses.nptel.ac.inhttp://cactus.dixie.edu/smblack/chem1010/lecture_notes/4B.html http://www.auburn.edu/~deruija/pdareson.pdfhttps://swayam.gov.in/course/64-atomic-structure-and-chemical-bonding
	MOOC components http://nptel.ac.in/courses/104101090/ Lecture 1: Classification of elements and periodic properties http://nptel.ac.in/courses/104101090/

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: explain the concept of acids, bases and ionic equilibria; periodic properties of s and p-block elements, preparation and properties of aliphatic and aromatic hydrocarbons CO2: discuss the periodic properties of sand p- block elements, reactions of aliphatic and

CO2: discuss the periodic properties of sand 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
СОЗ	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&CO

SEMESTER: II PART: II Core IV	23UCHEP24 QUALITATIVE ORGANIC ANALYSIS AND PREPARATION OF ORGANIC COMPOUNDS	Credit: 5 H/W: 4
-------------------------------------	---	---------------------

Objectives of the course	This course aims at providing knowledge on laboratory safety handling glass wares analysis of organic compounds preparation of organic compounds
Course Outline	UNIT I 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 special elements - nitrogen, sulphur and halogens

Aromatic and aliphatic nature, Test for saturation and unsaturation, identification of functional groups using solubility tests

Confirmation of functional groups

- monocarboxylic acid, dicarboxylic acid
- monohydric phenol, polyhydric phenol
- aldehyde, ketone, ester
- carbohydrate (reducing and non-reducing sugars)
- primary, secondary, tertiary amine
- monoamide, diamide, thioamide
- anilide, nitro compound
- Preparation of derivatives for functional groups

UNIT III

Preparation of Organic Compounds

- i. Nitration picric acid from Phenol
- ii. Halogenation p-bromo acetanilide from acetanilide
- iii. Oxidation benzoic acid from Benzaldehyde
- iv. Microwave assisted reactions in water:
- v. Methyl benzoate to Benzoic acid
- vi. Salicylic acid from Methyl Salicylate
- vii. Rearrangement Benzil to Benzilic Acid
- viii. Hydrolysis of benzamide to Benzoic Acid

Unit-IV

Separation and Purification Techniques (Not for Examination)

- 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 (any one) (Group experiment)
 - (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 xanthophyll 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. (Any one Group experiment) (4,5& 6–not for ESE)				
Reference Books	1. Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. Basic Principles of Practical Chemistry, 2 nd ed.; Sultan Chand: New Delhi, 2012.				
	 Manna, A.K. Practical Organic Chemistry, Books and Allied: India, 2018. 				
	3. Gurtu, J. N; Kapoor, R. Advanced Experimental Chemistry				
	(Organic), Sultan Chand: New Delhi, 1987.				
	4. Furniss, B. S.; Hannaford, A. J.; Smith, P. W. G.; Tatchell, A.R.				
	Vogel's Textbook of Practical Organic Chemistry, 5 th ed.;				
	Pearson: India,1989.				
Website and e-learning					
source	https://www.viele.co.in/hussed.ones.ch.omics.l.coioness				
	https://www.vlab.co.in/broad-area-chemical-sciences				
Scheme of Valuation	Max. marks(75)				
Record	:10 Marks				
Preparation	:15 Marks				
Recrystallization	:05 Marks				
Organic Qualitative Analys	is :45 Marks				
Preliminary Test	:05 Marks				
Detection of Elements	:05 Marks				
Detection of Functional Gro					
Identification of the compo					
Confirmatory Test	:15 Marks				
Derivatives preparation and	l its m.pt determination :10 Marks				

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: observe the physical state, odour, colour and solubility of the given organic compound.

CO2: identify the presence of special elements and functional group in an unknown organic compound performing a systematic analysis.

CO3: compare mono and dicarboxylic acids, primary, secondary and tertiary amines, mono and diamides, mono and polyhydric phenols, aldehyde and ketone, reducing and non-reducing sugars and explain the reactions behind it.

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

	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

SEMESTER: II PART: II Core IV

23UMATE25 MATHEMATICS – II

Credit: 3 H/W: 5

UNIT-I:TRIGONOMETRY

Expansions of $\sin^n \theta$, $\cos^n \theta$, $\sin \theta$, $\cos \theta$, $\tan \theta$ – Expansions of $\sin \theta$, $\cos \theta$, $\tan \theta$ in terms of θ

Unit-I: Chap: 6 (6.1,6.1.1 to 6.1.3)

UNIT-II: PARTIAL DIFFERENTIAL EQUATIONS

Formation of partial differential equations, elimentary partial differential equations-Lagranges equations.

Unit-II: Chap:6 (6.1,6.1.1, 6.4).

UNIT-III: VECTOR DIFFRENTIATION

Vector functions- Scalar and vector point functions- Directional derivatives —Unit vector normal to a surface — angle between the surfaces-divergence, Gradient of a scalar point function- Divergence and curl of a vector point function.

Unit-III Section 8.1,8.2,8.3, 8.4).

UNIT-IV: VECTOR INTEGRATION

Green's theorem in the plane-Gauss divergence theorem- [without proofs] ,Stoke's theorem

(Statement only)

Unit-IV:Section(8.6.1, to 8.6.3).

UNIT-V: FINITE DIFFERENCES

Operator E, Relation between $^{\Delta,\nabla}$ and E – Interpolation – Newton – Gregory forward & backward formulae for interpolation-Lagrange's interpolation formula for unequal intervals(without proof) .

Unit-V:Sec(5.1,5.2).

TEXT BOOK:

1.P. Duraipandian and S. Udayabaskaran(1997), "Allied Mathematics", Vol I & II. Chennai:

Muhil Publishers.

Unit-I: Chap: 6 (6.1,6.1,1 to 6.1.3), Vol I,

Unit-II: Chap:6 (6.1,6.1.1,6.4), Vol II, Unit-IIISec(8.1,8.2,8.3,8.4), Vol I, Unit-IV:Sec(8.6.1, - 8.6.3), Vol I, Unit-V:Sec(5.1,5.2), Vol II.

REFERENCE BOOKS:

- 1. P. Balasubramanian and K. G. Subramanian. 1997, "Ancillary Mathematics", Vol I & II. New Delhi: Tata McGraw Hill.
- 2. S.P.Rajagopalan and R.Sattanathan(2005), "Allied Mathematics", Vol I & II. New Delhi: Vikas Publications.
- 3. P. R. Vittal (2003), "Allied Mathematics", Chennai: Marghan Publications.
- 4. P.Kandhasamy, K. Thilagavathy (2003), "Allied Mathematics" Vol I & II, New Delhi: Tata McGraw Hill.

Course Outcomes:

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

- **CO1**: Attain knowledge on finding the expansions of trigonometric functions and concept of hyperbolic and inverse hyperbolic functions.
- **CO2**: Provide a basic knowledge of Partial Differential equations and develops knowledge on handle practical problems.
- CO3: Adopt techniques in solving problems involving vector and scalar functions
- **CO4**: Provide skills on finding derivatives and gradients on vector differentiation and Integration.
- **CO5**: Understand the applications of differentiation and integration in real life situation.

Outcome Mapping:

		11 (
CO	PO1	PO2	PO3	PO4	PO5
/ PO					
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

SEMESTER: II PART: III	23UBOTE25 BOTANY-II (Elective)	Credit: 2 H/W: 3
---------------------------	--------------------------------------	---------------------

Learning Objective (LO):

LO1	To be familiar with the basic concepts and principles of plant systematics.
LO2	Learn the importance of plant anatomy in plant production systems.
LO3	Understand the mechanism underling the shift from vegetative to reproductive phase.
LO4	To learn about the physiological processes that underlie plant metabolism.
LO5	To know the energy production and its utilization in plants.

Unit – 1: MORPHOLOGY OF FLOWERING PLANTS

Plant and its parts. Structure and function of root and stem. Leaf and its parts. Leaf types-simple and compound. Phyllotaxy and types. Inflorescence - Racemose, Cymose and Special types. Terminology with reference to flower description.

Unit - 2: TAXONOMY

Study of the range of characters and plants of economic importance in the following families: Rutaceae, Caesalpiniaceae, Asclepiadaceae, Euphorbiaceae and Cannaceae

Unit – 3: ANATOMY

Tissue and tissue systems: Simple and complex tissues. Anatomy of monocot and dicot roots - anatomy of monocot and dicot stems - anatomy of dicot and monocot leaves.

Unit – 4: EMBRYOLOGY

Structure of mature anther and ovule - Types of ovules, structure of embryo sac, pollination - double fertilization, structure of dicotyledonous and monocotyledonous seeds.

Unit – 5: PLANT PHYSIOLOGY

Absorption of water, photosynthesis - light reaction - Calvin cycle; respiration - Glycolysis - Krebs cycle - electron transport system. Growth hormones - auxins and cytokinins and their applications.

Course Outcomes (CO)

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

CO1	Understand the fundamental concepts of plant anatomy and embryology.
CO2	Analyze and recognize the different organs of plants and secondary growth.
CO3	Understand water relation of plants with respect to various physiological processes
CO4	Classify aerobic and anaerobic respiration.
CO5	Classify plant systematics and recognize the importance of herbarium and virtual herbarium.

Recommended Texts

- 1. Sharma, O.P. 2017. Plant Taxonomy. (II Edition). The McGraw Hill Companies.
- 2. Bhojwani, S.S. Bhatnagar, S.P and Dantu, P.K. 2015. The Embryology of Angiosperms (6th revised and enlarged edition). Vikas Publishing House, New Delhi.
- 3. Maheshwari, P. 1963. Recent Advances in Embryology of Angiosperms. Intl. Soc. Plant Morphologists, New Delhi.
- 4. Salisbury, F. B.C.W. Ross.1991. Plant Physiology. Wassworth Pub. Co. Belmont.
- **5.** Ting, I.P. 1982. Plant Physiology. Addison Wesley Pb. Philippines.

Reference books

- 1. Lawrence.G.H.M. 1985. An Introduction to Plant Taxonomy, Central Book Depot, Allahabad.
- 2. Bhojwani, S.S and Bhatnagar, S.P. 2000. The Embryology of Angiosperms (4th revised and enlarged edition). Vikas Publishing House, New Delhi.
- 3. Pandey, B.P. 2012. Plant Anatomy. S Chand Publishing.
- 4. Jain, VK. 2006. Fundamentals of Plant Physiology, S. Chand and Company Ltd.
- 5. Rajni Gupta. 2012. Plant Taxonomy: Past, Present and Future. <u>Vedams (P) Ltd. New</u> Delhi.
- **6.** Jain, V.K. 2006. Fundamentals of Plant Physiology, S.Chand and Company Ltd., New Delhi.
- 7. Verma, S.K. 2006. A Textbook of Plant Physiology, S.K.Chand & Co., New Delhi.

Web Resources

- 1. https://books.google.co.in/books/about/Plant_Taxonomy.html?id=0bYs8F0Mb9gC&redir esc=v
- 2. https://books.google.co.in/books/about/PLANT_TAXONOMY_2E.html?id=Roi0lwSXFnUC&redir_esc=y
- 3. https://archive.org/EXPERIMENTS/plantanatomy031773mbp
- 4. https://www.amazon.in/Embryology-Angiosperms-6th-S-P-Bhatnagar-ebook/dp/800UN5KPOG
- 5. https://www.crcpress.com/Plant-Physiology/Stewart-Globig/p/book/9781926692692

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	S	S	S	S	S	S	S	S	S	S
CO 2	S	S	S	S	S	S	S	S	S	S
CO 3	M	S	S	S	S	L	S	S	S	S
CO 4	S	S	M	S	S	S	S	M	S	M
CO 5	S	M	M	M	M	M	M	L	M	M

S-Strong; M-Medium; L-Low

SEMESTER: II	23UZOOE25	Credit: 2
PART: III	Zoology – II	H/W: 3

1	To enable students to learn basic concepts relating to aspects of respiratory, circulatory, excretory, nervous and sensory physiology.
2	To enable students to comprehend the processes involved during development
3	To enable students to learn basic concepts of immunity and the working of immune organs and familiarize them with the recommended vaccination schedule
4	To enable students to comprehend the basic concepts of human genetics and patterns of inheritance
5	To enable students to learn about aspects of animal behaviour such as foraging, courtship, nest construction, parental care and learning

Unit – I: Respiration- Respiratory pigments and transport of gases. Mechanism of blood clotting. Types of excretory products – Ornithine cycle. Structure of neuron –Conduction of nerve impulse, Mechanism of vision and hearing.

Unit – II: Fertilization, Cleavage, Gastrulation and Organogenesis of Frog; Placentation in mammals

Unit – III: Innate and Acquired - Active and Passive; Antigens and Antibodies; Immunological organs—responses in humans; Vaccination schedule

Unit – IV: Human Genetics: Human Chromosomes – Sex Determination in Humans; Patterns of Inheritance: Autosomal Dominant, Autosomal Recessive, X-linked, Y-linked, Mitochondrial, Multiple Allelic and Polygenic; Genetic Counseling

Unit - V: Animal Behaviour: Foraging, Courtship Behaviour, Shelter and Nest Construction, Parental Care, Learning Behaviour

Expected Course Outcomes

On completion of this course, students will be able to:

1	Recall the parts and working of body organs and developmental stages, name the patterns of inheritance and list different types of animal behaviour
2	Analyse the different developmental stages
3	Analyse the working of body and immune systems
4	Analyse the different patterns of inheritance
5	Relate the behaviour of animals to physiology. Analyse the different types of behaviour

Text Books (Latest Editions)

1. Verma P.S. & Agarwal - Developmental Biology, Chordata embryology S. Chand & Co.

References Books

(Latest editions, and the style as given below must be strictly adhered to)

- 1. Owen, J. A., Punt, J. & Stranford, S. A. Kuby Immunology. New York: W.H. Freeman & Company.
- 2. Klug, W. S., Cummings, M. R. & Spencer, C Concepts of Genetics. (12th ed.). New Jersey: Pearson Education.
- 3. Mathur, R. Animal Behaviour. Meerut: Rastogi.
- 4. Verma P.S. & Agarwal Developmental Biology, Chordata embryology. S.Chand & Co.

Outcome Maping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S		S		M		S	S
CO 2	M	S						
CO 3		S	M	S		S	M	
CO 4	S			S	S	M		
CO 5			S					S

S-Strong

M-Medium

L-Low

SEMESTER: II	23UBIOE25	Credit: 2
PART: III	Biochemistry- II	H/W: 3

Learning objectives

The objectives of this course are to

- Impart knowledge on the classification, properties and characterization of lipids.
- Comprehend the metabolism of Lipids
- Acquaint with the structure, properties and functions of nucleic acids
- Learn about the enzyme kinetics and inhibition
- Study the importance of Hormones

Module I:Lipids–Bloor's classification of lipids- simple lipids, fatty acids (saturated and unsaturated), compound lipids, derived lipids. Properties of lipids- reduction, oxidation, halogenation, saponification and rancidity. Classification and functions of phospholipids, Cholesterol – structure and biological importance. 12 Hrs

Module II:Lipid metabolism- Oxidation of fatty acids(Palmitic acid) – Beta oxidation-Role of carnitine, energetics, alpha oxidation and omega oxidation. Biosynthesis of saturated fatty acids. 12 Hrs

Module III: Purine and pyrimidine bases, nucleosides, nucleotides, polynucleotides, DNA structure, various types, properties- absorbance, effect of temperature. Different types of RNA, structure and function, Genetic code. 12 Hrs

Module III :Enzymes - Nomenclature, IUB system of enzyme classification, active site, specificity, isoenzymes, units of enzyme activity factors affecting enzyme activity-substrate concentration, pH, temperature. Enzyme Kinetics - Michaelis and Menten equation. Lineweaver - Burk plot. Enzyme inhibition, competitive, uncompetitive and and non competitive inhibition 12Hrs

Module V: Hormones -classification,Biological functions of Insulin, Thyroid and Reproductive hormones . 12Hr

Course Outcome

CO	On completion of this course, students will be able to	Program Outcomes
CO1	Elaborate on classification, structure, properties, functions and characterization of lipids	PO1
CO2	Discuss the metabolism of lipids and its importance	PO1
CO3	Explain about structure, properties and functions of nucleic acids	PO1
CO4	Derive Michaelis Menten equation and concepts of enzyme inhibition	PO1,PO3
CO5	Classify the Hormones and its biological functions	PO1,PO4

Text books

- 1.Satyanarayan,U (2014) Biochemistry (4th ed), Arunabha Sen Books & Allied (P) Ltd, Kolkata.
- 2.Jain J.L.(2007) Fundamentals of Biochemistry, S. Chand publishers

Reference books

- **1.** David L.Nelson and Michael M.Cox (2012) Lehninger Principles of Biochemistry (6th ed) W.H. Freeman.
- 2. Voet.D & Voet. J.G (2010) Biochemistry, (4th ed), John Wiley & Sons, Inc.
- 3. Lubert Stryer (2010) Biochemistry, (7th ed), W.H.Freeman

Web sources

1.onlinecourses.swayam2.ac.in/cec20_bt12

2 onlinecourses.swayam2.ac.in/cec20_bt19

Mapping with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	3						3			3
CO 2	3						3			3
CO 3	3		3				3			3
CO 4	3			3			3			3
CO5	3						3	3		3

S - Strong (3) M - Medium (2) L -Low(1)

SEMESTER -II	Elective	CREDIT: 1
PART – III	23UBOTEP2: Botany Practical II	H/W: : 2

Course Objectives

- 1. To enhance information on the identification of taxonomical plant
- 2. To be familiar with the basic concepts and principles of plant systematics.
- **3.** Understanding of reproduction and development of angiosperms
- **4.** To understand the internal organization of Angiopserms
- 5. To learn about the physiological processes that underlie plant metabolism.

EXPERIMENTS

- 1. To identify Angiosperm root, stem, leaf, flowers and fruits based on morphology
- 2. To describe in technical terms, plants belonging to any of the family prescribes and to identify the family.
- 3. To dissect a flower, construct floral diagram and write floral formula.
- 4. Demonstration experiments
 - a. Ganong's Light screen
 - b. Ganong's respiroscope
- 5. To make suitable micro preparations of anatomy materials prescribed in the syllabus.
- 6. Spotters Angiosperm morphology, anatomy, Embryology and Physiology

Bonafide record of practical work done should be submitted for the practical examination

Course outcomes:

On completion of this course, the students will be able to:

- 1. Understand external structure of angiosperms
- 2. To study the classical taxonomy with reference to different parameters.
- 3. Understand the fundamental concepts of plant anatomy and embryology
- 4. To study the effect of various physical factors on photosynthesis.
- 5. Understand simple experiments in plant Physiology

Recommended texts

- 1. Sharma, O.P. 2017. Bryophyta, MacMillan India Ltd, New Delhi.
- 2. Sharma, O.P. 2012. Pteridophyta, Tata McGraw-Hills Ltd, New Delhi.
- 3. Subramaniam, N.S. 1996. Laboratory Manual of Plant Taxonomy. Vikas Publishing House Pvt. Ltd., New Delhi.
- 4. Benjamin, A. Pierce. 2012. Genetics- A conceptual Approach. W.H. Freeman and Company, New York, England.
- 5.Noggle G.R and G.J. Fritz. 2002. Introductory Plant Physiology. Prentice Hall of India, New Delhi.

Reference books

1. Strickberger, M.W. 2005. Genetics (III Ed). Prentice Hall, New Delhi, India.

- 2. Nancy Serediak and M. Huynh. 2011. Algae identification lab Guide. Accompanying manual to algae identification field guide, Ottawa Agriculture and Agri food Canada publisher.
- 3. Mohammed Gufran Khan, Shite Gatew and Bedilu Bekele. 2012. Practical manual for Bryophytes and Pteridophytes. Lambert Academic Publishing.
- 4. Aler Gingauz. 2001. Medicinal Chemistry. Oxford University Press & Wiley Publications.
- 5. Steward, F.C. 2012. Plant Physiology Academic Press, US

Web Resources

- 4. https://www.amazon.in/Practical-Manual-Pteridophyta-Rajan-Sundara/dp/8126106883
- 5. https://www.google.co.in/books/edition/Gymnosperms/3YrT5E3Erm8C?hl=en&g bpv=1&dq=gy mnosperms&printsec=frontcover
- 6. https://www.amazon.in/Manual-Practical-Bryophyta-Suresh-Kumar/dp/B0072GNFX4

OUTCOME MAPPING

	PO1	PO2	PO3	PO4	PO5
CO1	2	3	1	3	2
CO2	2	3	2	2	3
CO3	2	1	3	2	3
CO4	1	3	3	2	2
CO5	2	2	3	1	3

BOTANY PRACTICAL II

Time: 3 Hours Max. Marks: 75

PRACTICAL QUESTION PAPER

1. Identify the given specimens –A to its respective family, draw MLS of the flower and describe it in technical terms.

(Identification of family – 2, MLS diagram – 3, technical description – 4) (09)

2. Identify the given specimen –B, to its respective family, construct the floral diagram and write the floral formula.

(Identification of family – 2, floral diagram – 3, floral formula – 2) (07)

- 3. Make suitable micro preparations of the given specimens C. Submit the slides for valuation. Identify the specimens, draw diagrams and give reasons. (Identification 1, diagram 2, Reasons 2, Slide -2) (07)
- 4. Comment on the Physiology setup D Write the aim, materials required , Procedure, Results and Inference

(Aim-1, Materials required -1, Procedure -2, Results and Inference -3) (07)

4. Spotters – E, F, G, H, I, J, K and L. (Identification – 1, diagram – 2, Reasons – 2) (7 X 5)

(35)

Total = 65 Record = 10

Grand Total = 75

BOTANY PRACTICAL II KEY & SCHEME OF VALUATION

- 1. Taxonomy A MLS of the flower (from any one family mentioned in the syllabus) (Identification of family 2, MLS diagram 3, technical description 4) (09)
- 2. Taxonomy B Floral diagram and floral formula (from any one family mentioned in the syllabus) (Identification of family -2, floral diagram -3, floral formula -2) (07)
- 3.. Anatomy C : Dicot and monocot stem, root and leaf. (Identification – 1, diagram – 2, Reasons – 2, Slide -2) (07)
- 4. Physiology Set up D Osmosis thistle funnel experiment, Photosynthesis Beaker and Funnel experiment, Ganong's light screen and Ganong's respire scope (Aim-1, Materials required -1, Procedure -2, Results and Inference -3) (07)
- 5. Spotters –E, F, G, H, I, J, and K (any seven of the following) (08)

Morphology – vegetative and reproductive morphological parts Anatomy – simple and complex tissues, dicot, monocot root and leaf Embryology – ovules, anther T.S.

Physiology - Osmosis - thistle funnel experiment, Photosynthesis - Beaker and Funnel experiment, Ganong's light screen and Ganong's respire scope experimental setup. (Identification - 1, diagram - 2, Reasons - 2) (7 X 5) (35)

Total =	65
Record =	10
Grand Total =	75

SEMESTER: II	23UBIOEP2	Credit: 1
PART: III	Biochemistry Practical - II	H/W: 2

Learning objectives

The objectives of this course are to

- Identify amino acids by qualitative test
- Prepare biomolecules from its sources
- Estimate phosphorus quantitatively

I. Qualitative analysis of amino acids

a) Arginine b)Cysteine c) Tryptophan d)Tyrosine e) Histidine

II. Biochemical preparations

- a) Preparation of casein from milk.
- b)Preparation of starch from potato.
- c)Preparation of albumin from egg.

IIIGroup Experiment

Determination of Iodine/ Saponification number of an edible oil(Demonstration) .

Course Outcome

CO	On completion of this course, students will be able to	Programme Outcome
CO1	Qualitatively analyze the amino acids and report the type of amino acids based on specific tests	PO1,PO2,PO3
CO2	Prepare the macronutrients from the rich sources.	PO1,PO2,PO3
CO3	Check the quality of edible oil	PO1,PO2,PO3

Text books

- 1.Laboratory manual in Biochemistry, J. Jayaraman, 2nd edition, NewAge International Publishers, 2011,
- 2. An Introduction to Practical Biochemistry, David T. Plummer, 3 rd edition, Tata McGraw-Hill Publishing Company Limited, 2001.

Reference books

- 1. Biochemical Methods, Sadasivam S and Manickam A, 4h edition, NewAge International Publishers, 2016
- 2. Essentials of Food and Nutrition, Vol. I & Samp; II, M.S. Swaminathan.

Mapping with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	2	3	3				3	3	3	3
CO 2	2	3	3				3	3	3	3
CO 3	2	3	3				3	3	3	3

S - Strong (3) M - Medium (2) L -Low

SEMESTER: II	23UZOOEP2	Credit: 1
PART: III	Zoology Practical – II	H/W: 2

Course Objectives:

1	To learn basic concepts relating to various physiological aspects of animals.
2	To comprehend the processes involved during development
3	To learn basic concepts of immunity and familiarize on immune organs.
4	To know the basic concepts of human genetics and patterns of inheritance
5	To learn about aspects of animal behaviour.

Practicals:

- 1. Qualitative detection of excretory products (Ammonia, Urea, Uric acid).
- 2. Frog Egg, Blastula and Gastrula.
- 3. Demonstration of lymphoid organs.
- 4. Identification of ABO blood groups
- 5. Identification of human syndroms from karyotyping
- 5. Vital staining of chick blastoderm
- 7. Study of behavioural adaptations of animals

Expected Course Outcomes

On completion of this course, students will be able to:

1	Recall the parts and working of body organs
2	Analyse the different developmental stages
3	Analyse the functioning of body and immune systems
4	Analyse the different patterns of inheritance
5	Understand the different types of behaviour

Text Book(s)

- 1 Arumugam N. (2013). Developmental Zoology, Saras Publication, Nagercoil, Tamilnadu, India.
- 2 Das S. (2020). Microbiology Practical Manual, CBS Publication, Delhi.
- 3 Jayasurya, Arumugam N, Dulsy Fatima. (2013). Practical Zoology Vol 3, Saras Publication, Nagercoil, Tamilnadu, India.
- 4 Singh HR and Neerajkumar. (2014). Animal Physiology and Biochemistry, Vishal Publishing Co. Jalandhar, Delhi.

Outcome Maping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S	M		M	M	S		S
CO 2	M	S	M		S		M	
CO 3	S	M		S		S		M
CO 4	S	S		S	S	M		
CO 5	S	S	S				S	S

S-Strong M-Medium L-Low

Non-major (NME) Electives offered to other Department

SEMESTER: I PART: III 23UCHEN16 Credit: 2 H/W: 2	
--	--

Objectives of the This course aims at providing an overall view of the course importance of Chemistry in everyday life chemistry of building materials and food chemistry of Drugs and pharmaceuticals **UNIT-I** Course Outline General survey of chemicals used in everyday life. Air - components and their importance; photosynthetic reaction, air pollution, green - house effect and the impact on our life style. Water - Sources of water, qualities of potable water, soft and hard water, methods of removal of hardness-water pollution Unit-II Building materials - cement, ceramics, glass and refractories - definition, composition and application only. Plastics - polythene, PVC, bakelite, polyesters, melamine-formaldehyde resins -preparation and uses only. **UNIT-III** Food and Nutrition - Carbohydrates, Proteins, Fats - definition and their importance as food constituents - balanced diet - Calories minerals and vitamins (sources and their physiological importance). Cosmetics – tooth paste, face powder, soaps and detergents, shampoos, nail polish, perfumes general formulation and preparations - possible hazards of cosmetic use. **UNIT-IV** Chemicals in food production – fertilizers - need, natural sources; urea, NPK fertilizers and super phosphate. Fuel – classification - solid, liquid and gaseous; nuclear fuel examples and uses.

	UNIT-V
	Pharmaceutical drugs - analgesics and antipyretics - paracetamol and aspirin. Colour chemicals - pigments and dyes - examples and applications. Explosives - classification and examples.
Recommende d 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	Randolph. Norris Shreve, Chemical Process Industries, McGraw-
Books	Hill, Texas, fourthedition, 1977.
	2. W.A.Poucher, Joseph A.Brink, Jr. Perfumes, Cosmetics and
	Soaps,Springer, 2000.
	3. A.K.De,EnvironmentalChemistry,NewAge
	InternationalPublicCo.,1990.
Website and e-	1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7044178/
learning source	2. https://byjus.com/question-answer/name-the-element-which-is-
	important-component-of-ceramics-glass-and-cement-csialca-1/
	3. https://kids.britannica.com/students/article/food-and-
	nutrition/274373
	4. https://study.com/academy/lesson/pharmaceutical-drugs-
	definition-types.html

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: learn about the chemicals used in everyday life as well as air pollution and water pollution.

CO2: get knowledge on building materials cement, ceramics, glass and plastics, polythene, PVC bakelite, polyesters,

CO3: acquire information about Food and Nutrition. Carbohydrates, Proteins, Fats Also have an awareness about Cosmetics Tooth pastes, face powder, soaps and detergents.

CO4: discuss about the fertilizers like urea, NPK fertilizers and super phosphate. Fuel classification solid, liquid and gaseous; nuclear fuel - examples and uses

CO5: have an idea about the pharmaceutical drugs analgesics and antipyretics like paracetamol and aspirin and also about pigments and dyes and its applications.

	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: II	23UCHEN26	Credit: 2
PART: III	DAIRY CHEMISTRY	H/W: 2

Objectives of the This course aims at providing an overall view of the course chemistry of milk and milk products processing of milk preservation and formation of milk products. Course Outline **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, specific gravity, viscosity and conductivity -Factors affecting the composition of milk - adulterants, preservatives with neutralizerexamples and their detection- estimation of fat, acidity and total solids in milk. Unit II Processing of Milk Microbiology of milk - destruction of micro - organisms in milk, physico chemical changes taking place in milk due to processing - boiling, pasteurization - types of pasteurization -Bottle, Batch and HTST (High Temperature Short Time) – Vacuum pasteurization – Ultra High Temperature Pasteurization. **UNIT III** 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.

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 - condensed milk - definition, composition and nutritive value.

UNIT V

Fermented and other Milk Products

Fermented milk products – fermentation of milk - definition, conditions, cultured milk - definition of culture - example, conditions - cultured cream, butter milk - Bulgarious milk -acidophilous milk – YoheerIndigeneous products- khoa and chhena definition - Ice cream -definition-percentage composition-types-ingredients-manufacture of ice-cream, stabilizers emulsifiersandtheirrole-milkpowder-definition-

needformakingmilkpowderdryingprocess-types of drying.

SEMESTER: III PART: III Core – V

23UCHEC33 GENERAL CHEMISTRY-III

Credit: 5 H/W: 5

Prerequisites	General Chemistry – I and II			
Objectives of the	This course aims to provide a comprehensive knowledge on			
course	• the physical properties of gases, liquids, solids and X-ray diffraction of solids.			
	• fundamentals of nuclear chemistry and nuclear waste management.			
	applications of nuclear energy			
	• basic chemistry of halo-organic compounds, phenol and other aromatic alcohols.			
	• preparation and properties of phenols and alcohols.			
Course Outline	UNIT I			
	Gaseous state			
	Kinetic molecular model of a gas: postulates and derivation from the kinetic gas equation; The Maxwell –Boltzmann distribution of speed of molecules- average, root mean square and most probable velocity and average kinetic energy, law of equipartition of energy, degrees of freedom and molecular basis of heat capacities. Collision frequency; collision diameter; mean free path and viscosity of gases.			
	Real gases: Deviations from ideal gas behaviour, (Andrew's and Amagat's plots); compressibility factor, Z, and its variation with pressure for different gases. equations of states for real gases-van der Waal's equation; Virial equation; Boyle temperature; Numerical problems based on equations of statesfor real gases, isotherms of real gases – critical phenomena – isotherms of CO ₂ – continuity of state–Van der waal's equation and the critical state; law of corresponding states-liquefaction of gases; numerical problems involving thecore concepts.			
	Unit-II			
	Liquid and Solid State			
	Properties of Liquids- Surface tension, viscosity and their applications. Crystalline and amorphous – differences - geometry, isotropy and anisotropy, melting point; isomorphism, polymorphism.			
	Crystals –size and shape; laws of crystallography; symmetry elements – plane,			

centre and axis; Miller indices, unit cells and space lattices; classification of crystal systems; Bravais lattices; X – ray diffraction – Bragg's equation

Packing in atomic solids – simple cubic, body centered cubic, face centered and hexagonal close packing; Co-ordination number in typical structures - NaCl, CsCl, ZnS, TiO₂; comparison of structure and properties of diamond and graphite; numerical problems involving core concepts

Defects in solids - stoichiometric and nonstoichiometric defects.

Liquid crystals – classification and applications.

UNIT-III

Nuclear Chemistry

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

Isotopes – uses – tracers – determination of age of rocks by radiocarbon dating. (Problems to be worked out)

Nuclear energy; nuclear fission and fusion – major nuclear reactors in India; radiation hazards, disposal of radioactive waste and safety measures.

UNIT-IV

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 – 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 tetraacetate.

UNIT-V

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, Gatermann synthesis, Libermann, nitro reaction, phthalein reaction.

Resorcinol, quinol, picric acid – preparation, properties and uses.

Aromatic alcohols

Nomenclature, benzyl alcohol – methods of preparation – hydrolysis, reduction of benzaldehyde, Cannizzaro reaction, Grignard synthesis, physical properties, reactions – reaction with sodium, phosphorus pentachloride, thionyl chloride, acetic anhydride, hydrogen iodide, oxidation – substitution on the benzene nucleus, uses.

Thiols: Nomenclature, structure, preparation and properties.

Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)

Questions related to the above topics, from various competitive examinations UPSC/JAM /TNPSC others to be solved

(To be discussed during the Tutorial hours)

Skills acquired from this course

Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

Recommended Text

- 1. B.R. Puri, L.R. Sharma, M.S. Pathania; *Principles of Physical Chemistry*, 46th edition, Vishal Publishing, 2020.
- 2. B.R. Puri, L.R. Sharma and K.C. Kalia, *Principles of Inorganic Chemistry*, Milestone Publishers and Distributors, New Delhi, thirtieth edition, 2009.
- 3. 4. P.L. Soni and Mohan Katyal, *Textbook of Inorganic Chemistry*, Sultan Chand & amp; Sons, twentieth edition, 2006.
- 4. M. K. Jain, S. C. Sharma, *Modern Organic Chemistry*, Vishal Publishing, fourth reprint, 2003.
- 5. S.M. Mukherji, and S.P. Singh, *Reaction Mechanism in Organic Chemistry*, Macmillan India Ltd., third edition, 1994.

ReferenceBooks

- 1. T. W. Graham Solomons, *Organic Chemistry*, John Wiley & Sons, fifth edition, 1992.
- 2. A. Carey Francis, *Organic Chemistry*, Tata McGraw-Hill Education Pvt., Ltd.,New Delhi, seventh edition, 2009.
- 3. I. L. Finar, *Organic Chemistry*, Wesley Longman Ltd, England, sixth edition, 1996.

	 4. P. L. Soni, and H. M.Chawla - <i>Text Book of Organic Chemistry</i>, New Delhi, Sultan Chand & Sons, twenty ninth edition, 2007. 5. J.D. Lee, <i>Concise Inorganic Chemistry</i>, Blackwell Science, fifth edition, 2005.
Website and	MOOC components
e-learning	https://nptel.ac.in/courses/104104101 Solid
source	state chemistry
	https://nptel.ac.in/courses/103106071
	Nuclear industries and safety
	https://nptel.ac.in/courses/104106119s
	Introduction to organic chemistry

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

completion of the course the students should be able to

CO1: explain the kinetic properties of gases by using mathematical concepts.

CO2: describe the physical properties of liquid and solids; identify various types of crystals with respect to its packing and apply the XRD method for crystal structure determinations.

CO3: investigate the radioactivity, nuclear energy and it's production, also the nuclear waste management.

CO4: write the nomenclature, physical & chemical properties and basic mechanisms of halo organic compounds and alcohols.

CO5: investigate the named organic reactions related to phenol; explain the preparation and properties of aromatic alcohol including thiol.

	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: III PART: III Core – VI

23UCHEP34 INORGANIC QUALITATIVE ANALYSIS

Credit: 5 H/W: 4

Prerequisites	General chemistry					
Objectives of the course	To develop the skill on systematic analysis of simple inorganic salts and mixture of salts.					
Course	Semi - Micro Qualitative Analysis					
Outline	1. Analysis of simple acid radicals: Carbonate, sulphide, sulphate, thiosulphite, chloride, bromide, iodide, nitrate					
	2. Analysis of interfering acid radicals: Fluoride, oxalate, borate, phosphate, arsenate, arsenite.					
	3. Elimination of interfering acid radicals and Identifying the group of basic radicals					
	4. Analysis of basic radicals (group wise): Lead, copper, bismuth, cadmium, tin, antimony, iron, aluminium, arsenic, zinc,manganese, nickel, cobalt, calcium, strontium, barium, magnesium, ammonium					
	5. Analysis of a mixture - I to VIII containing two cations and two anions (of which one is interfering type)					
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.					
Recommended Text	Reference Books: V. Venkateswaran, R. Veeraswamy and A. R. Kulandivelu, Basic Principles of Practical Chemistry, Sultan Chand & Sons, New Delhi, second edition, 1997.					
Website and e-learning source	https://www.vlab.co.in/broad-area-chemical-sciences					
Course Learnin	g Outcomes (for Mapping with POs and PSOs)					

On successful completion of the course the students should be able to

CO 1: acquire knowledge on the systematic analysis of Mixture of salts.

CO 2: identify the cations and anions in the unknown substance.

CO 3: identify the cations and anions in the soil and water and to test the quality of water.

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

COURSE	ELECTIVE: III
COURSETITLE	PHYSICS – I
COURSE CODE	23UPHYE35
CREDITS	2
HOURS	3
COURSE	To impart basic principles of Physics that which would be helpful
OBJECTIVES	for students who have taken programmes other than Physics.

UNITS	COURSE DETAILS
	WAVES, OSCILLATIONS AND ULTRASONICS: simple
	harmonic motion (SHM) – composition of two SHMs at right angles
	(periods in the ratio 1:1) - Lissajous figures - uses - laws of
	transverse vibrations of strings – determination of AC frequency
UNIT-I	using sonometer (steel and brass wires) – ultrasound – production –
	piezoelectric method – application of ultrasonics: medical field –
	lithotripsy, ultrasonography – ultrasono imaging- ultrasonics in
	dentistry – physiotheraphy, 77phthalmology – advantages of
	noninvasive surgery – ultrasonics in green chemistry.
	PROPERTIES OF MATTER: <i>Elasticity</i> : elastic constants – bending
	of beam – theory of non- uniform bending – determination of Young's
	modulus by non-uniform bending – energy stored in a stretched wire –
	torsion of a wire – determination of rigidity modulus by torsional
	pendulum
UNIT-II	Viscosity: streamline and turbulent motion – critical velocity –
	coefficient of viscosity - Poiseuille's formula - comparison of
	viscosities – burette method,
	Surface tension: definition – molecular theory – droplets formation–
	shape, size and lifetime – COVID transmission through droplets, saliva
	- drop weight method – interfacial surface tension.
	HEAT AND THERMODYNAMICS: Joule-Kelvin effect – Joule-
	Thomson porous plug experiment – theory – temperature of inversion
	- liquefaction of Oxygen- Linde's process of liquefaction of air- liquid
UNIT-III	Oxygen for medical purpose- importance of cryocoolers -
	thermodynamic system – thermodynamic equilibrium – laws of
	thermodynamics – heat engine – Carnot's cycle – efficiency – entropy
	change of entropy in reversible and irreversible process.
	ELECTRICITY AND MAGNETISM: potentiometer – principle –
	measurement of thermo emf using potentiometer –magnetic field due
	to a current carrying conductor – Biot-Savart's law – field along the
UNIT-IV	axis of the coil carrying current – peak, average and RMS values of ac
	current and voltage – power factor and current values in an AC circuit
	- types of switches in household and factories- Smart Wi-Fi switches-
	fuses and circuit breakers in houses

	DIGITAL ELECTRONICS AND DIGITAL INDIA: logic gates,						
	OR, AND, NOT, NAND, NOR, EXOR logic gates – universal						
TINITE V	building blocks - Boolean algebra - De Morgan's theorem -						
UNIT-V	verification – overview of Government initiatives: software						
	technological parks under MeitY, NIELIT- semiconductor laboratories						
	under Dept. of Space – an introduction to Digital India						
	1. R. Murugesan (2001), Allied Physics, S. Chand & Co, New						
	Delhi.						
	2. Brijlal and N. Subramanyam (1994), Waves and Oscillations,						
	Vikas Publishing House, New Delhi.						
	3. Brijlal and N. Subramaniam (1994), Properties of Matter, S.						
	Chand & Co., New Delhi.						
TEXT BOOKS							
	4. J. B. Rajam and C. L. Arora (1976). Heat and Thermodynamics						
	(8 th edition), S. Chand & Co., New Delhi.						
	5. R. Murugesan(2005), Optics and Spectroscopy, S.Chand & Co,						
	NewDelhi.						
	6. A. Subramaniyam, Applied Electronics 2 nd Edn., National						
	Publishing Co., Chennai.						
	1. Resnick Halliday and Walker(2018). Fundamentals of Physics						
	(11 th edition), John Willey and Sons, Asia Pvt .Ltd., Singapore.						
	2. V. R. Khanna and R. S. Bedi (1998), Textbook of Sound 1stEdn.						
	Kedharnaath Publish & Co, Meerut.						
REFERENCE	3. N. S. Khare and S. S. Srivastava (1983), Electricity and						
BOOKS	Magnetism 10 th Edn., Atma Ram & Sons, New Delhi.						
	4. D. R. Khanna and H.R. Gulati (1979). Optics, S. Chand &Co.						
	Ltd., New Delhi.						
	5. V. K. Metha (2004). Principles of electronics 6 th Edn. S. Chand						
	and company.						
	1. https://youtu.be/M_5KYncYNyc						
	2. https://youtu.be/ljJLJgIvaHY						
	3. https://youtu.be/7mGqd9HQ_AU						
	4. https://youtu.be/h5jOAw57OXM						
	5. https://learningtechnologyofficial.com/category/fluid-mechanics-lab/						
WEBLINKS	6. http://hyperphysics.phy-						
	astr.gsu.edu/hbase/permot2.htmlhttps://www.youtube.com/watch?v=g						
	T8Nth9NWPMhttps://www.youtube.com/watch?v=9mXOMzUruMQ						
	&t=1shttps://www.youtube.com/watch?v=m4u-						
	SuaSu1s&t=3shttps://www.biolinscientific.com/blog/what-are-						
	surfactants-and-how-do-they-work						

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
25	75	100	

COURSE OUTCOMES:

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

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

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes (CO) for each course with program outcomes (PO) in the 3-point scale of STRONG (S), MEDIUM (M) and LOW (L).

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

COURSETITLE	PHYSICS PRACTICALS – I
CREDITS	1
COURSE CODE	23UPHYEP3
HOURS	2
COURSE OBJECTIVES	Apply various physics concepts to understand Properties of Matter and waves, set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results

ANY Seven only

- 1. Young's modulus by non-uniform bending using pin and microscope
- 2. Young's modulus by non-uniform bending using optic lever, scale and telescope
- 3. Rigidity modulus by static torsion method.
- 4. Rigidity modulus by torsional oscillations without mass
- 2. Surface tension and interfacial Surface tension drop weight method
- 3. Comparison of viscosities of two liquids burette method
- 4. Specific heat capacity of a liquid half time correction
- 5. Verification of laws of transverse vibrations using sonometer
- 6. Calibration of low range voltmeter using potentiometer
- 7. Determination of thermo emf using potentiometer
- 8. Verification of truth tables of basic logic gates using ICs
- 9. Verification of De Morgan's theorems using logic gate ICs.
- 10. Use of NAND as universal building block.

Note: Use of digital balance permitted

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
25	75	100	

Title of the	ENTREPRENEURIAL SKILLS IN											
Course	CHEMISTRY											
Paper No.	SEC IV											
Category	Skill Year II Credits 1 Cours 23UCH											
	Enhanc	Semester	III			eCode						
	ement											
	Course											
Instructional		Tutorial	Lab	Practice		Total						
	1	-				1						
hours per week												
Prerequisites		Chemistry										
Objectives of						and food add	ditive					
thecourse		o detect the										
		_	_		-	•	simple food					
			_			ne appliance						
						of pulses and						
	• T	o acquire k	nowl	edge abou	t foo	d preservati	on					
~ ~ · · ·												
Course Outline	UNIT -	I										
	Food Ch	nemistry										
	Food ad	ulteration-c	ontan	nination o	f foo	od items wi	th clay stones,					
	waterand	ltoxicchemi	icals -	Common	adul	terants.						
			_									
		Food additives, Natural and synthetic anti-oxidants, glazing agents (hazardous effect), food colourants, Preservatives, leavening agents, Baking powder and baking soda, yeast, MSG, vinegar.										
	,											
	Baking p	owder and	oakın	g soda, ye	east,I	viSG,vinega	ır.					

UNIT II

Detection of adulterants in food items like coffee, tea, pepper, chillipowder, turmeric powder, butter, ghee, milk, honey etc., by simple techniques.

UNIT III

Preparation of Jam, squash and Jelly, Gulkand, cottage cheese.

Preparation of products like candles, soap, detergents, cleaning powder, shampoos, pain balm, tooth paste/powde rand disinfectants in small scale.

UNIT IV

Cereals-Definition-Classification-Composition and Nutritive value-Pulses-Classification-composition-nutritive value-Medicinal value of pulses and cereals

UNIT V

Food Preservation-Definition—Classification-Preservatives-Sodium Benzoate- Benzoic Acid-Sodium Chloride-Methods Of preservation -By heating, Canning and Pasteurisation

Skills acquired	Entrepreneurial skills.
from this course	
Recommended	1. Negi J.(2016)Food safety and Hygiene.ABD Publishers,India.
Text	2. Food Science (2005) ,B.Srilakshmi,III Edition,New Age International
	Publishers.
	3. Hand Book Of Food And Nutrition- M.Swaminathan- Bangalore Printing
	and Publishing Co.ltd; Bangalore
Reference Books	Shyam Jha, Rapid detection of food adulterants and
Reference Dooks	
	contaminants(Theory and Practice), Elsevier, e Book ISBN
	9087128004289, 1 st
	Edition,2015
Website and	https://www.vlab.co.in/broad-area-chemical-sciences
e-learning source	

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO 1: identify adulterated food items by doing simple chemical tests.

CO 2: prepare cleaning products and become entrepreneurs

CO 3: educate others about adulteration and motivate them to become entrepreneurs.

CO4:explain food preservation

CO5: gain knowledge about cereals and pulses

CO /PSO	PSO	PSO	PSO PSO		
	1	2	3	PSO 4	PSO 5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3

SEMESTER: III PART: III SEC V

23UCHES37 PESTICIDE CHEMISTRY

Credit:2 H/W: 2

Title of the										
Course										
Paper No.		Enhancement Course V (Discipline specific)								
Category	Skill					Course				
	Enhanc	Semester	III			Code				
	ement									
	Course									
Instructional	Lecture	Tutorial	Lab	Practice		Total				
hours per week	2	-	<u>-</u>			2				
Prerequisites		tals in chem								
Objectives of the		rse aims to	•	•						
course	• k	nowledge at	out th	e various t	ypes	of pesticides	and their toxicity.			
	• to	understand	the a	ecumulatio	n of	pesticides in i	n the form of			
	re	esidues and i	ts anal	lysis.						
	• k	nowledge or	n choic	ce of altern	ate a	and eco-friend	ly pesticides.			
Course Outline	Unit I									
course outline		ion: Histor	v of	pesticides	s. C	hemistry of	Pesticides: Brief			
			•			•	argets), structures,			
		names, physi	•				,			
							mammals, birds,			
	aquatic sp	ecies etc. Me	ethods	of analysis	s of p	esticides.				
							cides with respect			
	to structu	re, chemica	al nar	ne, physic	al p	roperties, ch	emical properties,			
	-	degradation	n, met	abolism, f	ormu	lations, Mod	e of action, uses,			
	toxicity.									
	Organopho	•		Phosphothic			e, Chlorpyriphos,			
		•	•		•	•	ne – Endosulfan,			
	heptachlor	; Carbamate	: Cart	ap hydroch	llorid	le, Methomyl,	Propoxur.			
	Unit II									
	Pesticides	residues	: Int	roduction-	ar	oplication of	f agrochemicals,			
	disseminat					•	residues, remedies.			
			_			_	sphere, action of			
	pesticides,	effects on	enviro	nments. Pe	esticio	des residues i	n water			
			•			•	natic environment.			
							ntion and transport			
			_				ity, decomposition			
	and degrae	dation by cli	matic	factors and	d mic	croorganism.				
1	1									

Pesticide Residues effect and analysis: Effects of pesticides residue on human life, birds and animals- routes for exposure to pesticides, action of pesticides on living system. Analysis of pesticides residues- sample preparation, extraction of pesticides residues (soil, water and vegetables/fruits) simple methods and schemes of analysis, multi-residue analysis.

Unit III
Biopesticides: Pheromones, attractants, repellents – Introduction, types and
application (8- Dodecen-1-ol, 10-cis-12-hexadecadienoic, Trimedlure,
Cue-lure, methyl eugenol, N,N- Diethyl-m-toluamide, Dimethyl phthalate,
Icaridin). Baits- Metaldehyde, Iron (II) phosphate,
Indoxacarb, Zinc Phosphide, Bromadiolone.
Questions related to the above topics, from various competitive
examinations UPSC/ JAM /TNPSC others to be solved
(To be discussed during the Tutorial hours)
Knowledge, Problem solving, Analytical ability, Professional
Competency, Professional Communication and Transferable skills.
1. Handa SK. Principles of pesticide chemistry. Agrobios (India); 2012.
2. Matolcsy G, Nádasy M, Andriska 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, John Wiley.
1. Roy N. K., Chemistry of Pesticides. CBS Publisher & Distributors P
Ltd; 1st 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

- **CO 1:** teach about the pesticides and their toxicity with respect to structure and category.
- **CO 2:** explain the preparation and property of pesticides
- **CO 3:** investigate the pesticide residues, prevention and care
- CO 4: demonstrate the extraction and analytical methods of pesticide residues
- CO 5: make awareness to the public on bio-pesticides

CO /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 ofCourse					
Contribution to	3.0	3.0	3.0	3.0	3.0
PSOs					

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

SEMESTER: IV PART: III Core – VII

23UCHEC43 GENERAL CHEMISTRY-IV

Credit: 5 H/W: 4

Prerequisites	General Chemistry III									
Objectives of the	This course aims to provide a comprehensive knowledge on									
course	 thermodynamic concepts on chemical processes and applied aspects. 									
	thermo chemical 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	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 of heat (q), work (w), internal energy (E), enthalpy (H); calculations of q, w, E and H for reversible, irreversible									

expansion of ideal and real gases under isothermal and adiabatic conditions; relation between heat capacities (Cp & Cv); Joule Thomson effect-inversion temperature.

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 bond energy; Measurement of heat of reaction – determination of calorific value of food and fuels Zeroth law of thermodynamics-Absolute Temperature scale.

.

Unit II

Thermodynamics II

Second Law of thermodynamics - Limitations of first law, spontaneity and randomness; Carnot's cycle; Concept of entropy, entropy change for reversible and irreversible processes, entropy of mixing, calculation of entropy changes of an ideal gas and a van der Waals gas with changes in temperature, volume and pressure, entropy and disorder.

Free energy and work functions - Need for free energy functions, Gibbs free energy, Helmholtz free energy - their variation with temperature, pressure and volume, criteria for spontaneity; Gibbs-Helmholtz equation – derivations and applications; Maxwell relationships, thermodynamic equations of state; Thermodynamics of mixing of ideal gases, Ellingham Diagram-application.

Third law of thermodynamics - Nernst heat theorem; Applications of third law - evaluation of absolute entropies from heat capacity measurements, exceptions to third law.

UNIT III

General Characteristics of d-block elements

Transition Elements- Electronic configuration - General periodic trend variable valency, oxidation states, stability of oxidation states, colour, magnetic properties, catalytic properties and tendency to form complexes. Comparative study of transition elements and non transition elements — comparison of II and III transition series with I transition series. Group study of Titanium, Vanadium, Chromium, Manganese, Iron, Cobalt, Nickel and Zinc groups

UNIT IV

Ethers, Thio ethers and Epoxides

Nomenclature, isomerism, general methods of preparations, reactions involving cleavage of C-O linkages, alkyl group and ethereal oxygen. Zeisel's method of estimation of methoxy group.

Reactions of epoxides with alcohols, ammonia derivatives and LiAH₄ Thioethers - nomenclature, structure, preparation, properties and uses.

Aldehydes and Ketones

Nomenclatue, structure and reactivity of aliphatic and aromatic aldehydes and ketones; general methods of preparation and physical properties. Nucleophilic addition reactions, base catalysed reactions with mechanism-Aldol, Cannizzaro's reaction, Perkin reaction, Benzoin condensation, Haloform reaction, Knoevenagel reaction. Oxidation of aldehydes. Baeyer - Villiger oxidation of ketones. Reduction: Clemmensen reduction, Wolf - Kishner reduction, Meerwein – Pondorf Verley reduction, reduction with LiAlH₄ and NaBH₄.

Addition reactions of unsaturated carbonyl compounds: Michael addition.

UNIT V

Carboxylic Acids: Nomenclature, structure, preparation and reactions of aliphatic and aromatic monocarboxylic acids. Physical properties, acidic nature, effect of substituent on acidic strength. HVZ reaction, Claisen ester condensation, Bouveault Blanc reduction, decarboxylation, Hunsdieckerreaction.Formic acid-reducing property.

Reactions of dicarboxylic acids, hydroxy acids and unsaturated acids.

Carboxylic acid Derivatives: Preparations of aliphatic and aromatic acid chlorides, esters, amides and anhydrides. Nucleophilic substitution reaction at the acyl carbon of acyl halide, anhydride, ester, amide. Schottan-Baumann reaction. Claisen condensation, Dieckmann and Reformatsky reactions, Hofmann bromamide degradation and Curtius rearrangement.

Active methylene compounds: Keto – enol tautomerism. Preparation and synthetic applications of diethyl malonate and ethyl acetoacetate

Halogen substituted acids – nomenclature; preparation by direct halogenation, iodination from unsaturated acids, alkyl malonic acids

Hydroxy acids – nomenclature; preparation from halo, amino, aldehydic and ketonic acids, ethylene glycol, aldol acetaldehyde; reactions – action of heat on α , β and γ hydroxy acids.

Extended
Professional
Component (is a part of internal component only, Not to be included in the external examination question paper)

Questions related to the above topics, from various competitive examinations UPSC/JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)

Knowledge, Problem solving, Analytical ability, Professional Competency,									
Professional Communication and Transferable skills.									
1. B.R. Puri and L.R. Sharma, Principles of Physical Chemistry, Shoban									
Lal Nagin Chand and Co., thirty three edition, 1992.									
2. K. L. Kapoor, A Textbook of Physical chemistry, (volume-2 and 3),									
Macmillan, India Ltd, third									
edition, 2009.									
. P.L. Soni and Mohan Katyal, Textbook of Inorganic Chemistry, Sult									
Chand & Sons, twentieth edition, 2006.									
4. M. K. Jain, S. C. Sharma, Modern Organic Chemistry, Vishal									
Publishing, fourth reprint, 2003.									
5. S.M. Mukherji, and S.P. Singh, Reaction Mechanism in Organic									
Chemistry, Macmillan India Ltd., third edition, 1994.									
1. Maron, S. H. and Prutton C. P. <i>Principles of Physical Chemistry</i> , 4 th ed.;									
The Macmillan Company: Newyork,1972.									
2. Lee, J. D. Concise Inorganic Chemistry, 4th ed.; ELBS William									
Heinemann: London,1991.									
3. Gurudeep Raj, Advanced Inorganic Chemistry, 26thed.; Goel									
Publishing House: Meerut, 2001.									
4. Atkins, P.W. & Paula, J. Physical Chemistry, 10th ed.; Oxford									
University Press:New York, 2014.									
5. Huheey, J. E. Inorganic Chemistry: Principles of Structure and									
Reactivity, 4th ed; Addison Wesley Publishing Company: India,1993.									
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 thermo chemical 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)

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 PART: III Core – VIII

23UCHEP44 PHYSICAL CHEMISTRY PRACTICAL

Credit: 5 H/W: 4

Prerequisites	General Chemistry
Objectives of the	The course aims at providing an understanding of
course	• The laboratory experiments in order to understand the
	conceptsof physical changes in chemistry
	 The rates of chemical reactions
	Colligative properties and adsorption isotherm
Course Outline	UNIT-I
	Chemical kinetics
	1. Determination of rate constant of acid catalysed hydrolysis of an ester (methyl acetate).
	2. Determination of order of reaction between iodide and persulphate (initial rate method).
	3. Polarimetry: Determination of rate constant of acid catalysedinversion of cane sugar
	UNIT II
	Phase diagrams
	1. Simple eutectic - determination of eutectic temperature and
	composition of naphthalene-
	diphenyl amine or naphthalene-diphenyl system 2. Determination of transition temperature of a salt hydrate.
	2. Determination of transition temperature of a sait hydrate.
	3.Determination of concentration of sodium chloride using phenol-sodium chloride system
	UNIT III
	Electrochemistry – Conductance measurements
	6. Determination of cell constant
	7. Determination of molar conductance of strong electrolyte
	8. Determination of dissociation constant of acetic acid
	Colorimetry 9. Determination of concentration of copper sulphate solution

	UNIT IV 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 aceticacid on activated charcoal				
Skills acquired	Knowledge, Problem solving, Analytical ability, Professional				
from this course	Competency, Professional Communication and Transferable skills.				
Reference Books	 Sindhu, P.S. Practicals in Physical Chemistry, Macmillan India: New Delhi, 2005. Khosla, B. D.Garg, V. C.; Gulati, A.; Senior Practical Physical Chemistry, R.Chand: New Delhi, 2011. Gupta, Paper, Practical Physical Chemistry, 1st Ed.: New Against Action 1985. 				
	3. Gupta, Renu, <i>Practical Physical Chemistry</i> , 1 st Ed.; New Age International: New Delhi, 2017.				

Website and	https://www.vlab.co.in/broad-area-chemical-sciences
e-learning source	

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 electrochemistry, 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

Level of Correlation between PSO's and CO's

COURSE	ELECTIVE: IV
COURSE TITLE	PHYSICS –II
COURSE CODE	23UPHYE45
CREDITS	2
HOURS	3
COURSE OBJECTIVES	To understand the basic concepts of optics, modern Physics, concepts of relativity and quantum physics, semiconductor physics, and electronics.

UNITS	COURSE DETAILS
UNIT-I	OPTICS: interference – interference in thin films –colors of thin films – air wedge – determination of diameter of a thin wire by air wedge – diffraction – diffraction of light vs sound – normal incidence – experimental determination of wavelength using diffraction grating (no theory) – polarization – polarization by double reflection – Brewster's law – optical activity – application in sugar industries
UNIT-II	ATOMIC PHYSICS: atom models – Bohr atom model – mass number – atomic number – nucleons – vector atom model – various quantum numbers – Pauli's exclusion principle – electronic configuration – periodic classification of elements – Bohr magneton – Stark effect –Zeeman effect (elementary ideas only) – photo electric effect – Einstein's photoelectric equation – applications of photoelectric effect: solar cells, solar panels, optoelectric devices
UNIT-III	NUCLEAR PHYSICS: nuclear models — liquid drop model — magic numbers — shell model — nuclear energy — mass defect — binding energy — radioactivity — uses — half life — mean life - radio isotopes and uses —controlled and uncontrolled chain reaction — nuclear fission — energy released in fission — chain reaction — critical reaction — critical size— atom bomb — nuclear reactor — breeder reactor — importance of commissioning PFBR in our country — heavy water disposal, safety of reactors: seismic and floods — introduction to DAE, IAEA — nuclear fusion — thermonuclear reactions — differences between fission and fusion.
UNIT-IV	INTRODUCTION TO RELATIVITY AND GRAVITATIONAL WAVES: frame of reference – postulates of special theory of relativity – Galilean transformation equations – Lorentz transformation equations – derivation – length contraction – time dilation – twin paradox – mass-energy equivalence –introduction on gravitational waves, LIGO, ICTs opportunities at International Centre for Theoretical Sciences

UNIT-V	SEMICONDUCTOR PHYSICS: p-n junction diode – forward and reverse biasing – characteristic of diode – Zener diode – characteristic of Zener diode – voltage regulator – full wave bridge rectifier – construction and working – advantages (no mathematical
	treatment) – USB cell phone charger –introduction to e-vehicles and EV charging stations

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

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
25	75	100	

COURSE OUTCOMES:

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

	CO1	Explain the concepts of interference diffraction using principles of superposition of waves and rephrase the concept of polarization based on wave patterns				
	CO2	Outline the basic foundation of different atom models and various experiments establishing quantum concepts. Relate the importance of interpreting improving theoretical models based on observation. Appreciate interdisciplinary nature of science and in solar energy related applications.				
COURSEO UTCOMES CO		Summarize the properties of nuclei, nuclear forces structure of atomic nucleus and nuclear models. Solve problems on delay rate half-life and mean-life. Interpret nuclear processes like fission and fusion. Understand the importance of nuclear energy, safety measures carried and get our Govt. agencies like DAE guiding the country in the nuclear field.				
	CO4	To describe the basic concepts of relativity like equivalence principle, inertial frames and Lorentz transformation. Extend their knowledge on concepts of relativity and vice-versa. Relate this with current research in this field and get an overview of research projects of National and International importance, like LIGO, ICTS, and opportunities available.				
	CO5	Summarize the working of semiconductor devices like junction diode, Zener diode, transistors and practical devices we daily use like USB chargers and EV charging stations.				

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes (CO) for each course with program outcomes (PO) in the 3-point scale of STRONG (S), MEDIUM (M) and LOW (L).

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

COURSE TITLE	PHYSICS PRACTICALS – IV
COURSE CODE	23UPHYEP4
CREDITS	1
HOURS	2
COURSE OBJECTIVES	Apply various Physics concepts to understand concepts of Light, electricity and magnetism and waves, set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results

Any Seven only

- 1. Radius of curvature of lens by forming Newton's rings
- 2. Thickness of a wire using air wedge
- 3. Wavelength of mercury lines using spectrometer and grating
- 4. Refractive index of material of the lens by minimum deviation
- 5. Refractive index of liquid using liquid prism
- 6. Determination of AC frequency using sonometer
- 7. Specific resistance of a wire using PO box
- 8. Thermal conductivity of poor conductor using Lee's disc
- 9. Determination of figure of merit table galvanometer
- 10. Determination of Earth's magnetic field using field along the axis of a coil
- 11. Characteristics of Zener diode
- 12. Construction of Zener / IC regulated power supply
- 13. Construction of AND, OR, NOT gates using diodes and transistor
- 14. NOR gate as a universal building block

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
25	75	100	

SEMESTER: IV PART: IV SEC – VI

23UCHES46 INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS

Credit: 2 H/W: 2

Prerequisites	General Chemistry
Objectives of the	The course aims at providing an overall view of the
course	operation and troubleshooting of chemical instruments
	 fundamentals of analytical techniques and its
	application in the characterization of compounds
	theory of chromatographic separation and theory of thermo /
	electro analytical techniques
	stoichiometry and the related concentration terms
Course Outline	UNIT-I
Course Outme	Qualitative and Quantitative Aspects of Analysis S.I Units, Distinction between Mass and Weight. Moles, Millimoles, Milli equivalence, Molality, Molarity, Normality, Percentage by Weight and Volume, ppm, ppb. Density and Specific Gravity of Liquids. Stoichiometry Calculations Sampling, evaluation of analytical data, Errors – Types of Errors, Accuracy, Precision, Minimization of Errors. Significant Figures. Methods of Expressing Precision: Mean, Median, Average Deviation, Standard Deviation, Coefficient of Variation, Confidence Limits, Q- test, F-test, T-test. The Least Square Method for Deriving Calibration plots. 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 lawsof spetroscopy 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.

	UNIT IV
	Thermal and Electro-analytical Methods of Analysis
	TGA and DTA- Principle, Instrumentation, methods of obtaining
	Thermograms, factors affecting TGA/DTA, Thermal analysis of silver
	nitrate, calcium oxalate and calcium acetate
	DSC- Principle, Instrumentation and applications.
	Electroanalytical methods: polarography - principle, instrumentation and
	applications. Derivative polarography- Cyclic Voltammetry - principle.
	UNIT V
	Separation and purification techniques
	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 Rf value.
Extended	Questions related to the above topics, from various competitive
Professional	examinations UPSC/ JAM /TNPSC others to be solved
Component (is a	(To be discussed during the Tutorial hours)
part of internal	(10 be discussed during the 1 dtorial flours)
.	
component only,	
Not to be included	
in the external	
examination	
question paper)	
Skills acquired	Knowledge, Problem solving, Analytical ability, Professional
from this course	Competency, Professional Communication and Transferable skills.
·	•

Recommended Text	 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. R. Gopalan, P. S. Subramanian and K. Rengarajan, Elements of Analytical Chemistry, Sultan Chand, New Delhi, 2007 Skoog, Holler and Crouch, Principles of Instrumental Analysis, Cengage Learning, 6th Indian Reprint (2017). R. Speyer, Thermal Analysis of Materials, CRC Press, 1993. R.A. Day and A.L. Underwood, Quantitative Analysis, 6thedn., Prentice Hall of India Private Ltd., New Delhi, 1993
Reference Books	 D. A. Skoog, D. M. West and F. J. Holler, Analytical Chemistry: An Introduction, 5thedn., Saunders college publishing, Philadelphia, 1998. Dash U N, Analytical Chemistry; Theory and Practice, Sultan Chand and sons Educational Publishers, New Delhi, 2011. Christian, Gary D; Analytical Chemistry, 6th Ed., John Wiley & Sons, New York, 2004. Mikes, O. &Chalmes, R.A. Laboratory Handbook of Chromatographic & Allied Methods, Elles Harwood Ltd. London G.H. Jeffery, J. Bassett, J. Mendham and R.C. Denney, Vogel's Textbook of Quantitative Chemical Analysis, sixth edition Pearson Education, 2000
Website and e-learning sources	 http://www.epa.gov/rpdweb00/docs/marlap/402-b-04-001b-14-final.pdf http://eric.ed.gov/?id=EJ386287 http://www.sjsu.edu/faculty/watkins/diamag.htm http://www.britannica.com/EBchecked/topic/108875/separation-and-purification 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 electrochemical techniques

CO4: explain the use of chromatographic techniques in the separation 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	3.0	3.0	3.0	3.0	3.0
Course Contribution to Pos	5.0] 5.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

SEMESTER: IV PART: IV SEC – VII	23UCHES47 FORENSIC SCIENCE	Credit: 2 H/W: 2					
Prerequisites	General Chemistry						
	This course aims at giving an overall view of						
course	crime detection through analytical instruments						
	forgery and its detection						
	medical aspects involved						
	medical aspects involved						
Course Outline	UNIT I						
	Poisons						
	Poisons - types and classification - diagnosis of poisons	in the living and					
	the dead -clinical symptoms - postmortem appearance	~					
	contamination (Hg, Pb, Cd) of seafoods - use of neutron a	ctivation analysis					
	in detecting arsenic in human hair. Treatment in cases of p	oisoning – use of					
	antidotes for common poisons.						
	Unit-II						
	Crime Detection Accidental explosion during manufacture of matches and fireworks (as in Sivakasi). Human bombs - possible explosives (gelatin sticks and RDX) - metal detector devices andother security measures for VVIP-composition of bullets and detecting powder burns.						
	UNIT-III						
	Forgery and Counterfeiting Documents - different types of forged signatures - simulation forgeries -inherent signs of forgery methods - writing delibination - uses of ultraviolet rays -comparison of type written lessilver line water mark in currency notes — alloy analysis detect counterfeit coins — detection of gold purity in 22 of detecting gold plated jewels -authenticity of diamond.	perately modified tters – checking susing AAS to					
	UNIT-IV						
	Tracks and Traces						
	Tracks and traces - small tracks and police dogs - foot p	rints - costing of					

foot prints -residue prints, walking pattern or tyre marks – miscellaneous traces and tracks - glass fracture - tool marks - paints - fibres - Analysis of biological substances - blood, semen, saliva, urine and hair - Cranial analysis (head and teeth) DNA Finger printing for tissue identification in dismembered bodies - detecting steroid consumption in athletes and racehorses. **UNIT-V Medical Aspects** 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. Recommended SA Iqbal, M Liviu, Textbook of forensic chemistry, Discovery Text publishing house private limited, 2011. 2. Kelly M. Elkins, Introduction to Forensic Chemistry, CRC Press, Taylor & Francis Group, 2019. 3. Javed I. Khan, Thomas J. Kennedy, Donnell R. Christian, Jr., Basic principles of Forensic chemistry, Humana Press, first edition, 2012. Bapuly AK, (2006) Forensic Science – Its application in crime investigation, Paras Medical Publisher, Hyderabad. Sharma B.R., (2006) Scientific Criminal Investigation, Universal Law Publishing Co. Pvt. Ltd, New Delhi. ReferenceBooks 1. Richard Saferst in and Criminalistics-An Introduction to Forensic Science (College Version), Sopfestein, Printice hall, eighth edition,2003 2. Suzanne Bell, Forensic Chemistry, Pearson, second international edition, 2014. 3. Jay Siegel, Forensic chemistry: Fundamentals and applications, Wiley-Blackwell, first edition, 2015. 4. Max M. Houck & Jay A. Segal, (2006) Fundamentals of Forensic Science, Elsevier Academic press. 5. Henry C. Lee, Timothy Palmbach, Marilyn T. Miller, (2006) Henry Lee's Crime Scene Book Elsevier Academic press. Website and 1. http://www.library.ucsb.edu/ist/03-spring/internet.html e-learning source 2. http://www.wonder howto.com/topic/forensic-science/

Course Learning Outcomes (for Mapping with POs and

PSOs)On completion of the course the students should be

able to

- **CO 1:** learn about the Poisons types and classification of poisons in the living and the dead organisms and also get information about Postmortem.
- **CO 2:** get awareness on Human bombs, possible explosives (gelatin sticks and RDX) and metal defector devices and other security measures for VVIP composition of bullets and detecting powder burns
- CO 3: detect the forgery documents, different types of forged signatures
- **CO4:** have an idea about how to tracks and trace using police dogs, foot prints identification and gain the knowledge in analyzing biological substances blood, semen, saliva, urine and hair DNA Finger printing for tissue identification in dismembered bodies
- CO 5: get the awareness on Aids causes and prevention and also have an exposure on

	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: V PART: III Core IX

23UCHEC51 ORGANIC CHEMISTRY – I

Credit: 4 H/W: 5

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

Amines: Aliphatic amines

Nomenclature, isomerism, preparation – Hofmanns' degradation reaction, Gabriel's phthalimide synthesis, Curtius Schmidt rearrangement.

Physical properties, reactions – alkylation, acylation, carbylaminereaction, Mannich reaction, oxidation, basicity of amines.

UNIT III

Chemistry of Nitrogen Compounds – II

Aromatic amines – Nomenclature, preparation – from nitro compounds, Hofmann's method; Schmidt reaction, properties - basic nature, ortho effect; reactions – alkylation, acylation, carbylamine reaction, reaction with nitrous acid, aldehydes, oxidation, Electrophilic substitution reactions, diazotization and coupling reactions; sulphanilic acid - zwitter ion formation.

Distinction between primary, secondary and tertiary amines - aliphaticand aromatic

Diazonium compounds

Diazomethane, Benzene diazonium chloride - preparations and synthetic applications.

Dyes

Theory of colour and constitution; classification based on structure and application; preparation – Martius yellow, aniline yellow, methyl orange, alizarin, indigo, malachite green.

Industry oriented content

Dyes Industry, Food colour and additives

UNIT IV

Heterocyclic compounds

Nomenclature and classification. General characteristics - aromaticcharacter and reactivity.

Five-membered heterocyclic compounds

Pyrrole – preparation - from succinimide, Paal Knorr synthesis; reactions – reduction, basic character, acidic character, electrophilic substitution reactions, ring opening.

Furan – preparation from mucic acid and pentosan; reactions – hydrogenation, reaction with oxygen, Diels Alder reactions, formation of thiophene and pyrrole; Electrophilic substitution reaction.

Thiophene synthesis - from acetylene; reactions –reduction; oxidation;

	Transfer range a						
	electrophilic substitution reactions. UNIT V						
	Six-membered heterocyclic compounds						
	on membered necesocyclic compounds						
	Pyridine – synthesis - from acetylene, Physical properties; reactions - basic character, oxidation, reduction, electrophilic substitution reactions; nucleophilic substitution- uses Condensed ring systems Quinoline – preparation - Skraup synthesis and Friedlander's synthesis; reactions – basic nature, reduction, oxidation; electrophilic substitutions; nucleophilic substitutions – Chichibabin reaction						
	Isoquinoline – preparation by the Bischler – Napieralski reaction, reduction, oxidation; electrophilic substitution.						
Extended	Questions related to the above topics, from various competitive						
Professional	examinations UPSC/ JAM /TNPSC others to be solved						
Component (is a	(To be discussed during the Tutorial hours)						
part of internal							
component only,							
Not to be included							
in the external							
examination							
question paper)	W 1 1 D 11 1 1 A 1 2 1 1 1 1						
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.						
Recommended	1.M.K. Jain, S.C.Sharma, Modern Organic Chemistry, Vishal						
Text							
	Publishing, fourth reprint, 2009.						
	2.S.M. Mukherji, and S.P. Singh, Reaction Mechanism in Organic						
	Chemistry, Macmillan India Ltd., third edition, 2009.						
	3. ArunBahl and B.S. Bahl, Advanced organic chemistry, New Delhi,						
	S.Chand& Company Pvt. Ltd., Multicolour edition, 2012.						
	4.P. L.Soni and H. M. Chawla, Text Book of Organic Chemistry,						
	Sultan Chand & Sons, New Delhi, twenty ninth edition, 2007.						
	5.C.N.Pillai, Text Book of Organic Chemistry, Universities Press						
	(India) Private Ltd., 2009.						
Reference Books	1.R. T. Morrison and R. N. Boyd, Organic Chemistry, Pearson						
	Education, Asia, sixth edition, 2012.						
	2. T.W.Graham Solomons, Organic Chemistry, John Wiley & Sons, eleventh edition, 2012.						

	3. A. Carey Francis, Organic Chemistry, Tata McGraw-Hill Education				
	Pvt. Ltd., New Delhi, seventh edition,2009.				
	4. I. L. Finar, Organic Chemistry, Vol. (1& 2), England, Wesley				
	Longman Ltd, sixth edition, 2006.				
	5. J. A. Joule, and G. F. Smith, Heterocyclic Chemistry, Wiley, Fifth Edition, 2010.				
Website and e-learning sources	1.www.epgpathshala.nic.in 2. www.nptel.ac.in				
sources	3. http://swayam.gov.in4. Virtual Textbook of Organic Chemistry				

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: assign RS notations to chirals and EZ notations to olefins and explain conformations of ethane and butane.

CO2: explain preparation and properties of aromatic and aliphatic nitro compounds and amines

CO3: explain colour and constitution of dyes and food additives

CO4: discuss preparation and properties of five membered heterocycles like pyrrole, furan and thiophene

CO5: discuss preparation and properties of six membered heterocycles like pyridine, quinoline and isoquinoline

	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	3.0	3.0	3.0	3.0	3.0
Course Contribution to Pos					

Level of Correlation between PSO's and CO's

SEMESTER:	V
PART: III	
Core X	

23UCHEC52 INORGANIC CHEMISTRY -I

Credit: 4 H/W: 5

Core A						
Prerequisites	General Chemistry I, II, III and IV					
Objectives of the	The course aims to provide knowledge on					
course	• 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	UNIT I					
	Co-ordination Chemistry - I					
	IUPAC Nomenclature of coordination compounds, Isomerism in coordination compounds.					
	Werner's coordination theory – effective atomic number –interpretation of					
	geometry and magnetic properties by Pauling's theory – geometry of co-					
	ordination compounds with co-ordination number					
	4 &6.					
	Chelates – types of ligands forming chelates – stability of chelates, applications of chelates in qualitative and quantitative analysis–application of DMG and oxine in gravimetric analysis –estimation of hardness of water using EDTA, metal ion indicators.					
	Role of metal chelates in living systems – haemoglobin and chlorophyll					
	Unit II					
	Co-ordination Chemistry - II					
	Crystal field theory –Crystal field splitting of energy levels in octahedral					
	and tetrahedral complexes, Crystal field stabilization energy (CFSE),					
	spectrochemical series - calculation of CFSE in octahedral and tetrahedral					
	complexes - factors influencing the magnitude of crystal field splitting, crystal field effect on ionic radii, lattice energies, heats of ligation with					
	water as a ligand (heat of hydration), interpretation of magnetic properties,					
	spectra of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ - Jahn – Teller effect. Stability of complexes in					
	aqueous solution, stability constants- factors affecting the stability of a					
	complex ion, thermodynamic and kinetic					
	stability (elementary idea). Comparison of VBT and CFT.					

UNIT III

Organometallic compounds

Metal Carbonyls

Mono and polynuclear carbonyls, General methods of preparation of carbonyls – general properties of binary carbonyls – bonding in carbonyls – structure and bonding in carbonyls of Ni, Fe, Cr, Co, Mn, Ru and Os. EAN rule as applied to metal carbonyls.

Ferrocene-Methods of preparation, physical and chemical properties

UNIT IV

Inner transition elements (Lanthanoids and Actinoids)

General characteristics of f-block elements - Comparative account of lanthanoids and actinoids - Occurrence, Oxidation states, Magnetic properties, Colour and spectra - Lanthanoids and Actinoids, Separation by ion-Exchange and Solvent extraction methods - Lanthanoids contraction-Chemistry of thorium and Uranium-Occurrence, Ores, Extraction, properties and uses - Preparation, Properties and uses of ceric ammonium sulphate, thorium dioxide and uranyl acetate.

UNIT V

Inorganic polymers

General properties – classification of inorganic polymers based on element in the backbone (Si, S, B and P) - preparation and properties of silicones (polydimethylsiloxane and polymethylhydrosiloxane) phosphorous based polymer (polyphosphazines and polyphophonitrilic chloride), sulphur based polymer (polysulfide and polymeric sulphur nitride), boron based polymers (borazine polymers) – industrial applications of inorganic polymers.

Extended
Professional
Component (is a
part of internal
component only,
Not to be included
in the external
examination
question paper)
Chille acquired

Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)

Skills acquired from this course

Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

Recommended Text

- 1. Puri B R, Sharma L R, Kalia K C (2011), Principles of Inorganic Chemistry, 31thEdition, Milestone Publishers & Distributors, Delhi.
- 2. Satya Prakash, Tuli G. D., Basu S. K., Madan R. D. (2009),

	 Advanced Inorganic Chemistry, 18th Edition, S. Chand & Co., New Delhi 3. Lee J D, (1991), Concise Inorganic Chemistry, 4th Edition, ELBS William Heinemann, London. 4. W V Malik, G D Tuli, R D Madan, (2000), Selected Topics in Inorganic Chemistry, S. Chand and Company Ltd. 5. A. K. De, Text book of Inorganic Chemistry, Wiley East Ltd, seventh edition, 1992.
Reference Books	 Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry, 2nd ed., S.Chand and Company, New Delhi. Gopalan R, (2009) <u>Inorganic Chemistry for Undergraduates</u>, Ist Edition, University Press (India) Private Limited, Hyderabad Sivasankar B, (2013) <u>Inorganic Chemistry</u>. Ist Edition, Pearson, Chennai Alan G. Sharp (1992), <u>Inorganic Chemistry</u>, 3rd Edition, Addition-Wesley, England Peter Atkins, Tina Overton, Jonathan Rourke and Mark Weller, Inorganic Chemistry, Oxford University Press, sixth edition, 2014.
Website and	1.www.epgpathshala.nic.in
e-learning source	2. www.nptel.ac.in
	3. 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 isomerism, Werner's Theory and stability of chelate complexes

CO2: discuss crystal field theory, magnetic properties and spectral properties of complexes.

CO3: explain preparation and properties of metal carbonyls

CO4: give a comparative account of the characteristics of lanthanoids and actinoids

CO5:explain properties and uses of inorganic polymers of silicon, sulphur, boron and phosphorous

	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

SEMESTER: V PART: III Core XI

23UCHEC53 PHYSICAL CHEMISTRY -I

Credit: 4 H/W: 5

Prerequisites	General Chemistry I,II,III and IV					
<u>-</u>						
Objectives of the	The course aims at providing an overall view of					
course	 Gibbs free energy, Helmholtz free energy, Ellingham's diagram and partial molar properties chemical kinetics and different types of chemical reactions adsorption, homogeneous and heterogeneous catalysis colloids and macromolecules photochemistry, fluorescence and phosphorescence 					
Course Outline	UNIT I					
	Thermodynamics - III					
	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.					
	Partial molar properties – chemical potential, Gibbs Duhem equation, variation of chemical potential with temperature and pressure, chemical potential of a system of ideal gases, Gibbs- Duhem-Margules equation.					

UNIT II

Chemical Kinetics

Rate of reaction - Average and instantaneous rates, factors influencing rate of reaction - molecularity of a reaction - rate equation - order of reaction. order and molecularity of simple 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.

Effect of temperature on reaction rate – temperature coefficient - concept of activation energy - Arrhenius equation. Theories of reaction rates – Collision theory – derivation of rate constant of bimolecular gaseous reaction – Failure of collision theory. Lindemann's theory of unimolecular reaction. Theory of absolute reaction rates – Derivation of rate constant for a bimolecular reaction – significance of entropy and free energy of activation. Comparison of collision theory and ARRT.

Complex reactions – reversible and parallel reactions (no derivation and only examples)

- kinetics of consecutive reactions - steady state approximation.

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- Haldene equation – Lineweaver- Burk plot – inhibition – reversible – competitive, noncompetitive and uncompetitive (no derivation of rate equations)

Catalysis – general characteristics of catalytic reactions, auto catalysis, promoters, negative catalysis, poisoning of a catalyst – theories of homogenous and heterogeneous catalysis – Kinetics of Acid – base and enzyme catalysis. Heterogenous catalysis

UNIT IV

Colloids and Surface Chemistry

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,

Coagulation or precipitation, Stability of sols, associated colloids, Emulsions, Gels-preparation of Gels, Applications of colloids

	Macromolecules: Molecular weight of Macromolecules-Number average molecular weight- average molecular weight, Determination of Molecular weight of molecules
	UNIT V Photochemistry Laws of photo chemistry – Lambert – Beer, Grotthus – Draper and Stark – Einstein. Quantum efficiency. Photochemical reactions – rate law – Kinetics of H ₂ -Cl ₂ , H ₂ -Br ₂ and H ₂ -I ₂ reactions, comparison between thermal and photochemical reactions. Fluorescence – applications including fluorimetry – sensitised fluorescence, phosphorescence – applications - chemiluminescence and photosensitisation – examples Chemistry of Vision – 11 cis retinal – vitamin A as a precursor - colour perception of vision
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired	Knowledge, Problem solving, Analytical ability, Professional
from this course	Competency, Professional Communication and Transferable skills.
Recommended Text	 B.R. Puri and L.R. Sharma, Principles of Physical Chemistry, Shoban Lal Nagin Chand and Co., forty eighth edition, 2021. Peter Atkins, and Julio de Paula, James Keeler, Physical Chemistry, Oxford University press, International eleventh edition, 2018. ArunBahl, B.S. Bahl, G. D. Tuli Essentials of physical chemistry, 28th edition 2019, S, Chand & Co. S. K. Dogra and S. Dogra, Physical Chemistry through Problems: New Age International, fourth edition, 1996.
	5. J. Rajaram and J.C. Kuriacose, Thermodynamics, ShobanLalNagin Chand and CO., 1986.
Reference Books	 J. Rajaram and J.C. Kuriacose, Chemical Thermodynamics, Pearson, 1st edition, 2013. Keith J. Laidler, Chemical kinetics, third edition, Pearson, 2003. P. W. Atkins, and Julio de Paula, Physical Chemistry, Oxford University press, seventh edition, 2002. K. L. Kapoor, A Textbook of Physical Chemistry, Macmillan

	5.	India Ltd, third edition, 2009. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Shobanlal Nagin Chand and Co. Jalendhar, forty first, edition, 2001
Website and	1.	https://nptel.ac.in
e-learning source	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
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: V	23UCHED54	Credit: 4
PART: III	PROJECT WITH VIVA VOCE	H/W: 5
Core XII		

(Refer to the Regulations)

SEMESTER: V PART: III EC V

23UCHEE55-1 BIO CHEMISTRY

Credit: 3 H/W: 4

Prerequisites	Organic Chemistry – I					
Objectives of the	The course aims at providing knowledge on					
course	 relationship between biochemistry and medicine, composition of 					
	blood					
	 structure and properties of amino acids, peptides, enzyme, 					
	vitamins and proteins					
	 biological functions of proteins, enzymes, vitamins and hormones 					
	 biochemistry of nucleic acids and lipids 					
	metabolism of lipids					
Course Outline	UNIT I					
	Logic of Living Organisms					
	Relationship of Biochemistry and Medicine					
	Blood - Composition of Blood, Blood Coagulation – Mechanism.					
	Hemophilia and Sickle Cell Anaemia					
	 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, Strecker; properties – zwitter ion and isoelectric point, electrophoresis and reactions.					
	Peptides – peptide bond – nomenclature – synthesis of simple peptides – solution and solid phase. Determination of structure of peptides, N-terminal analysis – Sanger's & Edmann method; C terminal analysis –					
	Enzymic method. Proteins – classification based on composition, functions and structure;					
	properties and reactions — colloidal nature, coagulation, hydrolysis, oxidation, denaturation, renaturation; colour tests for proteins; structure of proteins — primary, secondary, tertiary and quaternary. Metabolism of Amino acids — general aspects of metabolism (a brief outline); urea cycle.					
1						

UNIT III

Enzymes and Vitamins

Nomenclature and classification, characteristics, factors influencing enzyme activity – mechanism of enzyme action – Lock and key hypothesis, Koshland's induced fit model.

Proenzymes, antienzymes, coenzymes and isoenzymes; allosteric enzyme regulation.

Vitamins as coenzymes – functions of TPP, lipoic acid, NAD, NADP, FMN, FAD, pyridoxal phosphate, CoA, folic acid, biotin, cyanocobalamin.

UNIT IV

Amino acids

Components of nucleic acids - nitrogenous bases and pentose sugars, structure of nucleosides and nucleotides, DNA- structure & functions; RNA -types- structure - functions; biosynthesis of proteins

Hormones

Adrenalin and thyroxine — chemistry, structure and functions (No structure elucidation).

UNIT V

Lipids

Occurrence, biological significance of fats, classification of lipids.

Simple lipids – Oils and fats, chemical composition, properties, reactions – hydrolysis, hydrogenation, trans-esterification, saponification, rancidity; analysis of oils and fats – saponification number, iodine number, acid value, R.M. value. Distinction between animal and vegetable fats.

Compound lipids – Lipoproteins - VLDL, LDL, HDL, chylomicrons – biological significance.

Cholesterol – occurrence, structure, test, physiological activity. Metabolism of lipids: β-oxidation of fatty acids.

Extended	Questions related to the above topics, from various competitive
Professional	examinations UPSC/ JAM /TNPSC others to be solved
Component (is a	(To be discussed during the Tutorial hours)
part of internal	
component only,	
Not to be included	
in the external	
examination	
question paper)	
Skills acquired	Knowledge, Problem solving, Analytical ability, Professional
from this course	Competency, Professional Communication and Transferable skills.
Recommended	1. Bahl, B. S.; Bhal, A. Advanced Organic Chemistry, 3rd ed.; S. Chand:
Text	New Delhi, 2003.
	2. Jain, M.K.; Sharma, S.C. Modern Organic Chemistry, Vishal
	Publications: New Delhi, 2017.
	3. Shanmugam, A. Fundamentals of Biochemistry for Medical Students,
	6 th ed.; Published by the author, 1999.
	· ·
	4. Veerakumari, L. <i>Biochemistry</i> , 1 st ed.; MJP Publications: Chennai, 2004.
	5. Jain, J. L.; Fundamentals of Biochemistry, 2 nd ed.; S.Chand: New
	Delhi, 1983.
Reference Books	1. Conn, E. E.; Stumpf, P. K. Outline of Biochemistry, 5th ed.; Wiley
	Eastern: New Delhi, 2002.
	2. West, E. S.; Todd, W. R.; Mason, H. S.; Van Bruggen, J. T. Text Book
	of Biochemistry, 4th ed.; Macmillan: New York, 1970.
	3. Lehninger, A. L. <i>Principles of Biochemistry</i> , 2 nd ed.; CBS Publisher:
	Delhi, 1993.
	4. Rastogi, S. C. <i>Biochemistry</i> , 2 nd ed.; Tata McGraw-Hill: New Delhi,
	2003
	5. Chatterjea, M. N.; Shinde, R. <i>Textbook of Medical Biochemistry</i> , 5 th ed.; Jaypee Brothers: New Delhi, 2002.
	supple Brothers. New Delli, 2002.

Website and	1) http://library.med.utah.edu/NetBiochem/nucacids.html			
e-learning source	2) http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/E/EnzymeKine			
	tics.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 amino acids, 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 ofCourse					
Contribution to	3.0	3.0	3.0	3.0	3.0
PSOs					

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

SEMESTER: V PART: III EC V 23UCHEE55-2 GREEN CHEMISTRY	Credit: 3 H/W: 4
---	---------------------

EC V			
Prerequisites	Organic Chemistry-I		
Objectives of the	The course aims at providing knowledge on		
 To know the basics of Green Chemistry and its dev To know the principles of green chemistry. To know the goals of Green Chemistry. To understand Limitations of green chemistry. To study the obstacles in the pursuit of the goals of Chemistry. 			
Course Outline	UNIT-I: GREEN CHEMISTRY – INTRODUCTION HOURS: 9		
	Need for green chemistry – principles of green chemistry – atom economy – definition with example (ibuprofen synthesis) – green oxidant – hydrogen peroxide. Microwave assisted organic synthesis – apparatus required – examples of MAOS (synthesis of fused anthroquinones, Leukart reductive amination of ketones) – advantages and disadvantages of MAOS. Organic reactions by sonication method – apparatus required – examples of sonochemical reactions (Heck, Hundsdiecker and Wittig reactions). UNIT-II: PRINCIPLES OF GREEN CHEMISTRY HOURS: 9 Twelve principles of Green Chemistry with their explanations and special emphasis on the following with examples: Designing a Green Synthesis using these principles; Prevention of Waste/byproducts, maximum incorporation of the materials used in the process into the final products, Atom Economy, calculation of atom economy of the rearrangement, addition, substitution and elimination reactions. UNIT-III: GREEN REACTIONS HOURS: 9 Acetylation of primary amine, base catalyzed aldol condensation (synthesis of dibenzalpropanone), halogen addition to C=C bond (bromination of trans-stilbene), [4+2] cycloaddition reaction (Diels-Alder reaction between furan and maleic acid).		

Electrophilic aromatic substitution reactions (nitration of phenol, bromination of acetanilide) – green oxidation reactions (synthesis of adipic acid, preparation of manganese (III) acetylacetonate) – zeolite
catalyzed Friedel-Crafts acylation.
UNIT-IV: GREEN SOLVENTS
HOURS: 9 Ionic liquids: simple preparation – types – properties and application – ionic liquids in organic reactions (Heck reaction, Suzuki reactions, epoxidation), industrial (battery) and analytical chemistry (matrices for MALDI-TOF MS, gas chromatography stationary phases – advantages and disadvantages. Super critical CO ₂ – preparation, properties, applications and environmental impact.
UNIT-V: FUTURE TRENDS IN GREEN CHEMISTRY
HOURS: 9 Oxidation reagents and catalysts; Biomimetic, multifunctional reagents; Combinatorial green chemistry; Proliferation of solventless reactions; co crystal controlled solid state synthesis (C ² S ³); Green chemistry in sustainable development.
Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminationsUPS C/JAM/TNPSCotherstobesolved (To be discussed during the Tutorial hours)
Knowledge, Problem solving, Analyticalability, Professional
Competency, Professional Communication and Transferable skills. P. Sanghi and M.M. Sriniyastaya, Graen Chemistry, Environmental
 R. Sanghi and M.M.Srinivastava, Green Chemistry: Environmental alternatives, Narosa Publishing House, New Delhi. 2. V.K. Ahluwalia, M.Kidwai, 2007, New Trends in Green Chemistry, Anamaya Publishers, 2nd Edition, New Delhi.

Reference Books	1.	P. Tundo, A. Perosa, F. Zechini, 2007, Methods and Reagents
		for Green Chemistry, John Wiley & Sons Inc., New Jersey.
	2.	Ahluwalia, Kidwai, 2005, New Trends in Green Chemistry,
		Anamalaya Publishers, Puducherry.
	3.	Anastas P.T. Warner J.K. 1998, Green Chemistry - Theory and
		Practical, University
	4.	Press, London.
	5.	Cann M.C., Connely M.E., 2000, World Cases in Green
		Chemistry, AmericanChemical Society, Washington.
Website and	1.	https://www.epa.gov/greenchemistry/basics-green-chemistry
e-learning source	2.	https://www.sciencedoze.com/2021/01/green-solvents-
		definition-examples-types-of-green-solvents.html
	3.	https://www.organic-chemistry.org/topics/green-
		<u>chemistry.shtm</u>

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

CO1: Able to understand the need of green chemistry.

CO2: Able to explain the principles of green chemistry.

CO3: Able to explain green synthesis and reactions.

CO4: Able to understand about green solvents.

CO5: Able to explain the future trends in green chemistry.

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

SEMESTER: V
PART: III
EC V

23UCHEE55-3 AGRICULTURAL CHEMISTRY

Credit:	3
H/W: 4	ļ

EC V	
Prerequisites	General Chemistry
Objectives of the	The course aims at providing knowledge on
Course	 importance of agricultural chemistry
	 role of fertilizers
	 effect of fertilizers and manures
	 pesticides
	 fungicides and herbicides
Course Outline	UNIT I:
	Soil science
	Soil-Definition of soil, Properties of soil – Physical Property Components – Soil Structure and texture. Soil water, Soil air and Soil temperature. Chemical properties – Soil mineral matter – Soil colloid, ion- Exchange reactions – Soi fertility and its evaluations, Soil organic matter and their transformation into soil. Soil reactions – Soil pH – soil acidity and buffer action
	UNIT II:
	Fertilizers
	Fertilizers-Primary nutrients -Nitrogen fertilizers: Effect of Nitrogen or plant growth and development. deficiency of nitrogeneous fertilizers classification – of nitrogeneous fertilizers – Nitrates, urea and cynamide Commercial method of preparing urea. Phosphate fertilizers: Effect of phosphorus on plant growth and development
	 kinds of phosphate fertilizers – Super phosphate – Bone meal – basic slag - rock phosphate – dicalcium phosphate – tricalcium phosphate and other phosphates – Manufacture of super phosphate.
	UNITIII
	Fertilizers And Manures
	Potassium fertilizers: function of potassium on plant growth and development — classification into chloride and nonchloride forms manufacturing processes and properties of potassium fertilizers. Complex fertilizers and mixed fertilizers: their manufacture and composition Secondary nutrients — micronutrients — their function in plants — materials containing micronutrients.
	Manures: bulky organic manures – Farm yard manure handling and storage – method of composting green manuring, concentrated organic manures and
	their chemical composition – oil cakes Blood meal – fish manures.
	UNITIV
	Pesticides And Insecticides
	Pesticides: Classification of Pesticides – mode of action – general methods of application and toxicity, safety measures when using pesticides.
	Insecticides: plant products – Nicotine, pyrethrum, rotenone, and petroleun

oils, Inorganic pesticides – arsenical fluorides, borates. Organic pesticides – organochlorine compounds – D.D.T. B.H.C., methoxychlor, chlordane, and

endosulfon

	UNITV Fungicides And Herbicides: Fungicides Inorganic – Sulphur compounds – Copper compounds – Mercuric compounds Organic – dithiocarbamates – Dithane, Bordeaux mixture. Herbicides: Inorganic herbicides – Arsenical compounds Boron compounds – Cyanamide – Cyanides and thiocyanates chlorates and sulphamates. Organic herbicides and Nitro – compounds – chlorinated compounds – 2 ,4D compounds –Propionic and acid derivatives – urea herbicides.
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	 Nelson S.L., Beaton, W.L. Tisdale J. D, 1990, Soil Fertility and Fertilizers, Macmillian Publishing Company, New York. Buchel K.H., 2008, Chemistry of Pesticides, John Wiley & Sons, New York.
Reference Books	 N.C. Brady, 1984, The Nature and properties of soils, Eurasia publishing House (P) Ltd., 9th Edition U.S. Jones, 1987, Fertilizers and soil Fertility Prentice, Hall of India, 2nd Edition, New Delhi. A.K. De, Environmental Chemistry, New Age International Pvt Ltd., 2nd Edition, New Delhi.
Website and e-learning source	https://en.wikipedia.org/wiki/Soil_science https://www.britannica.com/topic/fertilizer https://opjsrgh.in/Content/Worksheet/PRACTICE-WS/2021-2022/day32/12-AGRICULTURE.pdf https://byjus.com/chemistry/pesticides/ https://extension.psu.edu/fungicides-herbicides-and-insecticides https://extension.psu.edu/fungicides-herbicides-and-insecticides https://extension.psu.edu/fungicides-herbicides-and-insecticides

Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to \$(1) + (

CO1:Understand the basics of soil.

CO2:Classify and explain plant nutrients and fertilizers

CO3:Differentiate fertilizers and manures.

CO4:Explain the classification of pesticides CO5:Describe the Fungicides and herbicides

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 PSOs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

SEMESTER: V PART: III EC VI

23UCHEE56-1 INDUSTRIAL CHEMISTRY

Credit: 3 H/W: 4

Prerequisites	General Chemistry I,II, III and IV				
Objectives of the	This course is designed to provide knowledge on				
course	 classifications and characteristics of fuels preparation of cosmetics manufacture of sugar, paper, cement and leather and food processing applications of abrasives, lubricants and other industrial products intellectual property rights 				
Course Outline	UNIT I Survey of Indian Industries and mineral resources in India				
	Fuels: Classification, characteristics of fuels. Solid fuels: coal - classification; analysis of coal- proximate analysis and ultimate analysis; calorific value-determination, carbonisation of coal.				
	Liquid fuels: Petroleum - characteristics; Gasoline aviation petrol-knocking in internal combustion engines, antiknock agents; unleaded petrol-octane number, cetane number.				
	Gaseous fuel: advantages over solid and liquid fuels; water gas, producer gas, carburetted water gas - preparations - uses.				
	Natural gas: LPG-composition, advantages, application; gobar gas-production, composition, advantages, application. Propellants — rocket fuels (basic idea)				
	UNIT II Cosmetics				
	Skin care: powders, ingredients; creams and lotion-cleansing, moisturising, all purpose shaving cream, sunscreen; make up preparations.				
	Dental care: tooth pastes – ingredients.				
	Hair care: shampoos-types, ingredients; conditioners-types, ingredients. Perfumes: natural-plant origin-parts of the plant used, chief constituents;				

animal origin-amber gries, civetone and musk; synthetic-classificationesters-amylsalicylate alcohols-citronellol; terpeneols-gereniol and nerol; ketones-muskone, coumarin; aldehydes-vanilin.

Soaps and Detergents

Soaps-properties, manufacture of soap-batch process; types-transparent soap, toilet soap, powder soap and liquid soap – ingredients.

Detergents-definition, properties-cleansing action; soapless detergents-anionic, cationic and non-ionic (general idea only); uses of detergents as surfactants. Biodegradability of soaps and detergents.

UNIT III

Sugar Industry

Manufacture from sugar cane; recovery of sugar from molasses; testing and estimation of sugar.

Food Preservation and processing

Food spoilage – causes; Food preservation - methods – high temperature, low temperature, drying, radiation; Food additives – preservatives, flavours, colours, anti-oxidants, sweetening agents; hazards of using food additives; Food standards – Agmark and Codex alimentarius.

UNIT IV Abrasives

Definition, characteristics, types-natural and synthetic; natural abrasives – diamond, corundum, emery, garnet, quartz – composition, uses; synthetic abrasives – carborundum, aluminium carbide, boron carbide, boron nitride, synthetic graphite – composition and uses.

Leather Industry

Structure and composition of skin, hide; Manufacture of leather – pretanning process – curing, liming, beating, pickling; methods of tanning-vegetable, chrome – one bath, two bath process; finishing.

Paper Industry

Manufacture of pulp - mechanical, chemical processes; sulphate pulp, rag pulp; manufacture of paper- beating, refining, filling, sizing, colouring, calendaring; cardboard.

UNIT V

Lubricants Definition, classification-liquid, semi-solid, solid and synthetic; properties-viscosity index, flash point, cloud point, pour point, aniline point and drop point; greases-properties, types; cutting fluids,

	selection of lubricants.
	Cement Industry
	Cement – types, raw materials; manufacture-wet process, constituent of cement, setting of cement; properties of cement-quality, setting time, soundness, strength; mortar, concrete, RCC; curing and decay of concrete.
	Intellectual Property Rights Introduction to Intellectual Property Rights — Patents - Factors for patentability - Novelty, Non obviousness, Industrial applications - Patent offices in India: Trademark - Types of trademarks- Certification marks, logos, brand names, signatures, symbols and service marks
Extended	Questions related to the above topics, from various competitive
Professional	examinations UPSC/ JAM /TNPSC others to be solved
Component (is a part of internal component only,	(To be discussed during the Tutorial hours)
Not to be included	
in the external	
examination	
question paper)	
Skills acquired	Knowledge, Problem solving, Analytical ability, Professional
from this course	Competency, Professional Communication and Transferable skills.
Recommended Text	1. Sharma, B.K. <i>Industrial Chemistry</i> , 9 th ed.; Goel Publishing House:
Text	Meerut, 1998. 2. Wilkinson, J.B.E. Moore, R.J. <i>Harry's Cosmeticology</i> , 7 th ed.; Chemical Publishers: New York, 1982.
	 Alex V. Ramani, Food Chemistry, MJP publishers: Chennai, 2009. Jayashree Ghosh, Applied Chemsitry, S. Chand: New Delhi, 2006. Srilakshmi, B. Food Science, 4th ed.; New Age International Publication, 2005.
Reference Books	1. Jain, P.C.; Jain, M. <i>Engineering Chemistry</i> , 16 th ed.; Dhanapet Rai: Delhi, 1992
	2. George Howard, <i>Principles and Practice of Perfumes and Cosmetics</i> , Stanley Therones, Cheltenham: UK, 1987.
	3. Thankamma Jacob, Foods, Drugs and Cosmetics - A Consumer Guide, Macmillan: London, 1997.
	4. ShankuntalaManay, N.; Shadaksharaswamy, M. Food Facts and Principles, 3 rd ed.; New Age Publication, 2008.
	 Neeraj Pandey, KhushdeepDharni, <i>Intellectual Property Rights</i>, PHI Learning, 2014.

Website and	1. http://www.sciencecases.org/irradiation/irradiation_notes.asp					
e-learning source	2. http://discovery.kcpc.usyd.edu.au//9.5.5/					
o o	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 propellents

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	3.0	3.0	3.0	3.0	3.0
Course Contribution to Pos					

Level of Correlation between PSO's and CO's

SEMESTER: V PART: III EC VI

23UCHEE56-2 "C " LANGUAGE AND CHEMISTRY

Credit: 3 H/W: 4

EC VI						
Prerequisites	Computer Literacy Programme&Basic Knowledge In Computers					
Objectives of the	The course aims at providing knowledge on					
Course	 To acquire knowledge about the basic components of a computer and the operating system. To understand Hardware and Software. To understand Algorithm and Flowchart. To familiarize the students in C language. To understand the applications of computer software in Chemistry. 					
Course Outline	UNIT - I: BASIC COMPUTER ORGANISATION					
	HOURS: 9					
	1.1 BasicComputerOrganisation-Types Of Data-Simple					
	model Of A Computer-Data Processing Using A					
	Computer, Desktop Computer.					
	1.2 Input Unit,OutputUnit,DataStorage:Random Access Memory, Read Only memory,Secondary Storage, Central Processing Unit.					
	1.3 Computer Software-programming Languages-					
	Classification Of Programming languages based on					
	Applications-Planning The Computer Program-algorithm and Flowcharts.					
	UNIT – II: INTRODUCTION TO C PROGRAMMING HOURS:9					
	2. 1Introduction to C Language —Introduction-CCompiler-					
	PreprocessorDirectives.					
	2.3 Variables, Constants, Operators, Input and Output Functions.					
	UNIT – III: CONTROL STRUCTURES					
	HOURS: 9					
	3.1 Control Structures –Conditional, Looping, Goto, Break, Switchand					
	Continue Statements,					
	3.2 Functions, Arrays and Pointers.					

	UNIT – IV: APPLICATIONS IN CHEMISTRY-I						
	 4.1 CalculationoftheRadiusofthefirstBohrorbitforan Electron. 4.2 CalculationofHalf-lifeTimeforanintegralorderreaction-CalculationofMolarity, Molality and Normality of a solution. 4.3 CalculationofPressureofIdealGasesandVanderWaal'sgases-CalculationofElectronegativity of an Element using Pauling's relation. 						
	UNIT – V: APPLICATIONS IN CHEMISTRY-II						
	 5.1 ApplicationsinChemistry- CalculationofEmpiricalFormulaeofHydrocarbons-Calculation of Reduced Mass of a few Diatomic Molecules. 5.2 Determination of the Wave Numbers of Spectral lines of 						
	Hydrogen atom - Calculation of Work of Expansion in Adiabatic						
	Process.						
	5.3 CalculationofpH,SolubilityProductandBondEnergyusingBorn-						
	Landeequation-Calculation of Standard Deviation and						
	Correlation Coefficient.						
Extended Professional Component (is a part of internal component only, Not to be included in the external examination Question paper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminationsUPS C/JAM/TNPSCotherstobesolved (TobediscussedduringtheTutorialhours)						
Skills acquired	Knowledge, Problemsolving, Analytical ability, Professional						
From this course	Competency, Professional Communication and Transferables kills.						
Recommended Text	 K.V.Raman, 2005, Computers In Chemistry, TataMcGrawHillPublishers, 8th edition, New Delhi. VenugopalandPrasad, 1971, Programmimng with C, TataMcGrawHillPublishers 11thEdition, New Delhi. E.Balaguruswamy, 2017, Programming in C, TataMcGrawHillPublishers, 2ndEdition, New Delhi. 						

Reference Books	 YashavanKanetkar, Authentic guide to C programming, BPB Publications, 18th Edition, New Delhi. Byron Gottfried, Programming with C, McGraw Hill Education, 4th Edition, New Delhi.
Website and e-learning source	 https://unacademy.com/content/question-answer/gk/what-are-the-basic-organization-of-a-computer-system/ https://www.geeksforgeeks.org/c-language-introduction/ https://study.com/academy/lesson/molality-definition-formula.html

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

CO1: The students will be able to understand the basic computer architecture.

CO2:The students will be able to understand about the operating system.

CO3:The students will be able to understand the algorithm and programme.

CO4: The students will be able to describe the basic terminologies used in C language and explain the basic concepts of programming.

CO5:The students will be able to understand the applications of computer software in various areas in Chemistry.

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

	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

SEMESTER: V PART: III EC VI		23UCHEE56-3 Credit: 3 APPLIED CHEMISTRY H/W: 4					
Prerequisites	Gener	ral Chemistry					
Objectives of the Course	The c	 To impart Knowledge about Petrochemicals. To learn about the process involved in paper and pulp technology. To instill an interest about the process of sugar industry. To enhance the knowledge about explosives. To create an interest in leather chemistry. 					
CourseOutline	Introd Engle Theri Comp	UNIT – I: PETROLEUM HOURS:6 Introduction – Petroleum-Origin-Composition of Petroleum-Inorganic, Engler and Modern Theories-Classification-Refining-Cracking- Thermal and Catalytic-Knocking-Octane Rating-Antiknock Compounds - Cetane Rating-Synthetic Petrol-LPG - Gobargas- Production-Feasibility and Importance of Biogas. 1.1 Petrochemicals-Definition-Chemicals from Natural Gas, Petroleum-Light Naphtha and Kerosene-Origin-Composition- Synthetic Gasoline.					
	UNIT – II: PULP AND PAPER TECHNOLOGY						
	and F 2.2 essentionan	Pulp and Paper technology-Introduction- nanical Process-Chemical Process - Sulphar Rag Pulp. Various Processes-Beating, Refining, Fil Colouring - Manufacture of Paper- Caler tial;Synthesis-GabrielPhthalimide,Strecker;pro disoelectricpoint,electrophoresisandreactions. T - III: SUGARHOURS:6	te Pulp, Sulphite Pulp ling, Sizing and ndering - Uses				
	of Cr 3.2	Sugar-Introduction-Manufacture of Cand-Purification of Juice-Concentration – Crystystals-Refining of crystals. Recovery of Sugar Molasses – Bagasse - Molasses.	stallization - Separation				

	UNIT	- IV: EXPLOSIVESHOURS:6							
	4.1	Explosives-Introduction-Classification-Detonating or High							
	Explos	sives-Deflagrating or Low Explosives-Characteristics of							
	Explos	sives-Nitrocellulose, TNB,TNT, Picric acid, Cordite,							
	Nitrog	Nitroglycerine and Gun Powder, Lead Azide-Precautions during							
	storage of Explosives.								
	UNIT	– V: LEATHER CHEMISTRY							
		HOURS:6							
	5.1	Leather Chemistry-Main Process Used in leather Manufacture-							
		Structure of Hide and Skin, Leather Processing-Process before							
		tannage							
	5.2	5.2 Tanning Process-Vegetable tanning and Chrome tanning-							
		Tannery Effluent and by product-treatment.							
ExtendedProfession alComponent(isapar tofinternalcompone ntonly,Nottobeinclu dedintheexternalexa mination Questionpaper)	C/JAM	onsrelatedtotheabovetopics,fromvariouscompetitiveexaminationsUPS I/TNPSCotherstobesolved liscussedduringtheTutorialhours)							
Skillsacquired		edge,Problemsolving,Analyticalability,Professional							
Fromthiscourse RecommendedTex		tency,ProfessionalCommunicationandTransferableskills. B.K. Sharma, 2008, Industrial Chemistry including Chemical							
t		engineering, Goel Publishing house, 13 th Edition, Meerut.							
	2.	Jain and Jain, 2019 Chemistry of Engineering Materials,							
		DhanpatRai Publishing Company (P) LTD, (K.K.Group), 17 th							
		Edition, New Delhi.							
ReferenceBooks	1.	Jayashree Ghosh, 2006, Fundamentals Concepts of Applied Chemistry, Sultan Chand and Sons, 1 st Edition, New Delhi.							

Websiteand	2.	https://en.wikipedia.org/wiki/Petroleum
e-learningsource	3.	https://www.pulpandpaper-technology.com/articles/pulp-and-paper-
		manufacturing-process-in-the-paper-industry
	4.	https://www.haberwater.com/post/sugar-manufacturing-process
	5.	https://en.wikipedia.org/wiki/Explosive
	6.	https://www.chemistryislife.com/t-13

CourseLearningOutcomes(forMappingwithPosandPSOs)Oncomple tionofthecoursethestudentsshouldbeableto

CO1: Able to understand the concept of Petrochemicals.

CO2: Prepare alcohol from Molasses.

CO3: Understand the processes involved in paper technology.

CO4: Extensive Knowledge about the Explosives and Leather Chemistry.

CO5: Able to understand the concepts involved in tanning 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
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

SEMESTER: V	23UCHEI58	Credit: 2
PART: IV	SUMMER INTERNSHIP	H/W: -

(Refer to the Regulations)

SEMESTER: VI
PART: III
Core XIII

23UCHEC61 ORGANIC CHEMISTRY – II

Credit:	4
H/W: 6	(

Prerequisites	Organic Chemistry – I						
Objectives of the	This course aims at providing knowledge on						
course	 classification, isolation and discussing the properties of 						
	alkaloids and terpenes						
	 preparation and properties of saccharides 						
	biomolecules different molecular rearrangement						
	different molecular rearrangement						
	 preparation and properties of organometallic compounds 						
Course Outline	• preparation and properties of organometallic compounds UNIT I Alkaloids Classification, isolation, general properties- Hofmann Exhaustive Methylation; Structure elucidation – Coniine, piperine, nicotine. Terpenes: Classification, Isoprene rule, isolation and structural elucidation of Citral, alpha terpineol, Menthol, Geraniol and Camphor. UNIT II Carbohydrates Definition and Classification of Carbohydrates with examples.Relative configuration of sugars. Determination of configuration (Fischer's Proof). Definition of enantiomers, diastereomers, epimers and anomers with suitable examples. Monosaccharides— configuration— D and L hexoses— aldohexoses and ketohexoses. Glucose, Fructose— Occurrence, preparation, properties, reactions, structural elucidation, uses.						
	Interconversions of sugar series – ascending, descending, aldose to						
	ketose and ketose to aldose.						
	Disaccharides – sucrose, lactose, maltose - preparation, properties and uses (no structural elucidation).						
	Polysaccharides – Source, constituents and biological importance of						
	homopolysaccharides- starch and cellulose, heteropolysaccharides -						
	hyaluronic acid, heparin.						

	UNIT III Molecular rearrangements: Molecular Rearrangement: Type of rearrangements, Mechanism for Benzidine, Favorskii, Clasien, Fries, Hofmann, Curtius, Schmidt and Beckmann, Pinacol-pinacolone rearrangement UNIT IV Special reagents in organic synthesis AIBN, 9BBN, BINAP/BINOL, BOC, DABCO, DCC, DIBAL, DMAP, NBS/NCS, NMP, PCC,						
	TBHP, TEMPO						
	Organometallic compounds in Organic Synthesis						
	Preparation, Properties and applications:						
	Grignard Reagents, Organo Lithium Compounds, Ziegler – Natta, Wilkinson, Metal Carbonyl, 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	Knowledge, Problem solving, Analytical ability, Professional						
from this course	Competency, Professional Communication and Transferable skills.						
Recommended Text	 M.K.Jain, S. C.Sharma, Modern Organic Chemistry, Vishal Publishing, 4th reprint,2009. S.M. Mukherji, and S.P. Singh, Reaction Mechanism in Organic Chemistry, Macmillan IndiaLtd., 3rd edition,2009 Arun Bahl and B.S. Bahl, Advanced organic chemistry, New Delhi, S.Chand& Company Pvt. Ltd., Multicolour edition,2012. P. L.Soni and H. M. Chawla, Text Book of Organic Chemistry, Sultan Chand & Sons, New Delhi, 29th edition, 2007. 						

	5. C Bandyopadhya; An Insight into Green Chemistry; Published on						
	2020						
Reference Books	1. R. T. Morrison and R. N. Boyd, Organic Chemistry, Pearson						
	Education, Asia,6 th edition, 2012.						
	2. T.W.Graham Solomons, Organic Chemistry, John Wiley &						
	Sons,11 th edition, 2012.						
	3. A. Carey Francis, Organic Chemistry, Tata McGraw-Hill						
	Education Pvt. Ltd., New Delhi,7 th edition,2009.						
	4. I. L. Finar, Organic Chemistry, Vol. (1& 2), England, Wesley						
	Longman Ltd, 6 th edition, 2006.						
	5. J. A. Joule, and G. F. Smith, Heterocyclic Chemistry, Wiley, 5th						
	Edition, 2010.						
Website and	1.www.epgpathshala.nic.in						
e-learning source	2.www.nptel.ac.in						
	3.http:/swayam.gov.in						
	4. Virtual Textbook of Organic Chemistry						
	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, Hoffmann etc.,

CO5: preparation and properties of organolithium compounds

	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

SEMESTER: VI PART: III Core XIV

23UCHEC62 INORGANIC CHEMISTRY –II

Credit: 4 H/W: 6

Prerequisites	Inorganic Chemistry – I					
Objectives of the course	The course aims to provide knowledge on					
course	• tracer elements and their role in the biological system.					
	iron transport and storage					
	metallo enzymes, oxygen transport.					
	silicates and their applications					
	• industrial applications of refractories, alloys, paints and pigments					
Course Outline	UNIT I					
	Bioinorganic Chemistry					
	Essential and trace elements: Role of Na ⁺ , K ⁺ , Mg ²⁺ , Ca ²⁺ , Fe ³⁺ , Cu ²⁺ and Zn ²⁺ in biological systems. Effect of excess intake (Toxicity) of Metal ions – trace elements - As, Cd, Pb, Hg.					
	UNIT II					
	Metal ion transport and storage					
	Iron – storage, transport - Transferrin and Ferretin; Iron-porphyrins – myoglobin, haemoglobin – oxygen transport - Bohr effect; Sodium/potassium pump, calcium pump; transport and storage - copper and zinc.					

UNIT III

Metallo enzymes

Isomerase and synthetases, structure of cyanocobalamin (Vitamin B12), nature of Co-C bond; Metalloenzymes - functions of carboxy peptidase A, zinc metalloenzyme – 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.

Invivo and Invitro nitrogen fixation – biological functions of nitrogenase and molybdo enzymes.

UNIT IV

Silicates

Introduction – general properties of silicates, structure – types of silicates – ortho silicates(zircon), pyrosilicates (thortveitite), chain silicates(pyroxenes), ring silicates(beryl), sheet silicates(talc, mica, asbestos), silicates having three dimensional structure (feldspars, zeolites, ultramarines)

UNIT V

Industrial Applications of Inorganic Compounds

Refractories, pyrochemical, explosives. Alloys, Paints and pigments - requirements of a good paint; classification, constituents of paints – pigments, vehicles, thinners, driers, extenders, anti-knocking agents, anti-skinning agents, plasticizers, binders-application; varnishes- oils, spirit; enamels.

Nanocomposite Hydrogels: synthesis, characterization and uses.

Industrial visits and internship mandatory.

Extended
Professional
Component (is a part of internal component only,
Not to be included in the external examination question paper)

Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)

Skills acquired from this course

Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

Recommended Text 1. Puri B R, Sharma L R, Kalia K C (2011), Principles of Inorganic Chemistry, 31th ed., Milestone Publishers & Distributors, Delhi.

	 Satya Prakash, Tuli G. D., Basu S. K., Madan R. D. (2009), Advancd Inorganic Chemistry, 18th Edition, S. Chand & Co., New Delhi Lee J D, (1991), Concise Inorganic Chemistry, 4th ed., ELBS William Heinemann, London. W V Malik, G D Tuli, R D Madan, (2000), Selected Topics in Inorganic Chemistry, Schand and Company Ltd. A. K. De, Text book of Inorganic Chemistry, Wiley East Ltd, seventh edition, 1992
Reference Books	Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry, 2 nd ed., S.Chand and Company, New Delhi.
	2. Gopalan R, (2009) <u>Inorganic Chemistry for Undergraduates</u> , Ist Edition, University Press (India) Private Limited, Hyderabad
	3. Sivasankar B, (2013) <u>Inorganic Chemistry.</u> Ist Edition, Pearson, Chennai
	4. Alan G. Sharp (1992), <u>Inorganic Chemistry</u> , 3 rd Edition, Addition-Wesley, England
	5. Peter Atkins, Tina Overton, Jonathan Rourke and Mark Weller, Inorganic Chemistry, Oxford University Press, sixth edition, 2014.
Website and	1.www.epgpathshala.nic.in
e-learning source	2. www.nptel.ac.in
	3. http://swayam.gov.in
<u> </u>	

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 B_{12} , Zn-Cu enzyme, ferredoxin, cluster enzymes.

CO4: classification and structure of silicates.

CO5: explain the manufacture of refractories, explosives, paints and pigments

	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

SEMESTER: VI PART: III Core XV

23UCHEC63 PHYSICAL CHEMISTRY-II

Credit: 4 H/W: 6

Prerequisites	Physical Chemistry – I
Objectives of the	The course aims at providing an overall view of the
course	 phase diagram of one and two component systems
	chemical equilibrium,
	 separation techniques for binary liquid mixtures.
	 electrical conductance and transport number.
	galvanic cells, EMF and significance of electrochemical
	series.
Course Outline	UNIT-I
	Phase rule
	Definition of terms; derivation of phase rule; application to one
	component systems – water and sulphur - super cooling, sublimation; two
	component systems – solid liquid equilibria- simple eutectic (lead - silver
	and bismuth - cadmium), freezing mixtures (potassium iodide- water), compound formation with- congruent melting points
	(magnesium – zinc and ferric chloride – water system), peritectic
	change (sodium – potassium), solid solution (gold-silver); copper
	sulphate – water system.
	UNIT II
	Chemical equilibrium
	Law of mass action – thermodynamic derivation – relationship between
	K _p and K _c application to the homogeneous equilibria – dissociation of PCl ₅
	gas,N ₂ O 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
	temperature dependence of equinorium
	constant – van't Hoff reaction isochore – Clayperon equation –
	ClausiusClayperon 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.
	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 (noderivation),
	significance of Onsager equation, Debye Falkenhageneffect, Wien effect. Ionic mobility – Discharge of ions on electrolysis (Hittorf's
	nome mounty – Discharge of folis on electrorysis (fittoff 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 - degreeof dissociation of weak electrolyte, dissociation constant of weak acidand weak base, ionic product of water, solubility and solubility productof 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
	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 diphenylamine indicator in the titration of ferrous
	iron against dichromate.
	Industrial component
	Galvanic cells- lead storage, Ni-Cd, Li and Zn-air, Al-air batteries
	Fuel cells – H ₂ -O ₂ cell – efficiency of fuel cells.
	corrosion –mechanism, types and methods of prevention.
Extended	Questions related to the above topics, from various competitive
Professional	examinations UPSC/ JAM /TNPSC others to be solved
Component (is a	(To be discussed during the Tutorial hours)
part of internal	
component only,	
Not to be included	
in the external	
examination	
question paper)	
Skills acquired	Knowledge, Problem solving, Analytical ability, Professional
from this course	Competency, Professional Communication and Transferable skills.
<u> </u>	

Recommended Text	 B.R. Puri and L.R. Sharma, Principles of Physical Chemistry, ShobanLalNagin Chand and Co., forty eighth edition, 2021. Peter Atkins, and Julio de Paula, James Keeler, Physical Chemistry, Oxford University press, International eleventh edition, 2018. ArunBahl, B.S. Bahl, G. D. Tuli Essentials of physical chemistry, 28th edition 2019, S, Chand & Co. S. K. Dogra and S. Dogra, Physical Chemistry through Problems: New Age International, fourth edition, 1996. J. Rajaram and J.C. Kuriacose, Thermodynamics, ShobanLalNagin Chand and CO., 1986. 					
Reference Books	 K. L. Kapoor, A Textbook of Physical Chemistry, Macmillan India Ltd, third edition,2009. Gilbert. W. Castellen, Physical Chemistry, Narosa Publishing House, third edition, 1985. P. W. Atkins, and Julio de Paula, Physical Chemistry, Oxford University press, seventh edition, 2002. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Shobanlal Nagin Chand and Co. Jalendhar, forty first, edition, 2001 D.N.Bajpai, Advanced Physical Chemistry, S.Chand&Co., 2001 					

Website and	https://nptel.ac.in https://swayam.gov.in
e-learning source	https://archive.nptel.ac.in/content/storage2/courses/112108150/pdf/PPT
	s/MTS_07_m.pdf
	Thermodynamics - NPTEL
	https://www.youtube.com/watch?v=f0udxGcoztE Introduction
	to chemical equilibrium – MIT opencourse ware

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

completion of the course the students should be able to

- **CO1:** construct the phase diagram for one component and two component systems, explain the properties of freezing mixture, component with congruent melting points and solid solutions.
- CO2: apply the concepts of chemical equilibrium in dissociation of PCl₅, N₂O₄ and formation of HI, NH₃, SO₃ and decomposition of calcium carbonate. Demonstrate important principles such as Le chatelier principle, van't Hoff reaction isotherm and Clausius-Clayperon equation.
- **CO3:** Identify an appropriate distillation method for the separation of binary liquid mixtures such as azeotropic mixtures, partially miscible mixtures and immiscible liquids.
- **CO4:** Explain the significance of Arrhenius theory, Debye-Huckel theory, Onsager equation and Kohlrausch's law in conductance.
- **CO5:** Construct electrochemical cell with the help of electrochemical series and calculate cell EMF. Demonstrate the applications of EMF and significance of potentiometric titrations.

	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

SEMESTER: VI PART: III EC VII

23UCHEE64-1 FUNDAMENTALS OF SPECTROSCOPY

Credit: 3

H/W: 5

EC VII								
Prerequisites	General Chemistry I,II,III and IV							
Objectives of the	This course is designed to provide knowledge on							
course	 electrical and magnetic properties of organic and inorganic compounds 							
	 basic principles of microwave, UV-Visible, infrared, Raman, NMR and Mass spectrometry 							
	• instrumentation of microwave, UV-Visible, infrared, Raman, NMR and Mass spectrometry							
	• applications of various spectral techniques in structural elucidation							
	 solving combined spectral problems 							
Course Outline	UNIT I							
	Electrical and Magnetic properties of molecules							
	Dipole moment – polar and nonpolar molecules – polarisability of							
	molecules. Application of dipole moments in the study of organic and inorganic molecules.							
	Magnetic permeability, volume susceptibility, mass susceptibility and							
	molar susceptibility; diamagnetism, paramagnetism – determination of magnetic susceptibility using Guoy balance, ferromagnetism, anti							
	ferromagnetism							
	Microwave spectroscopy							
	Rotation spectra - diatomic molecules (rigid rotator approximation) selection rules – determination of bond length, effect of isotopic substitution – instrumentation and applications							
	UNIT II							
	Ultraviolet and Visible spectroscopy							
	Electronic spectra of diatomic molecules (Born Oppenheimer							
	approximation) - vibrational coarse structure – rotational fine structure							
	of electronic vibration transitions – Frank Condon principle – dissociation							
	in electronic transitions - BirgeSponer method of evaluation of							
	dissociation energy – pre-dissociation transition - σ - σ *, π - π *, n - σ *, n - π *							
	transitions.							
	Applications of UV-Woodward – Fieser rules as applied to conjugated							
	dienes and α , β - unsaturated ketones. Elementary Problems.							
	Colorimetry - principle and applications (estimation of Fe ³⁺)							
	UNIT III							

Infrared spectroscopy

Vibration spectra —diatomic molecules — harmonic oscillator and anharmonic oscillator; Vibration — rotation spectra — diatomic molecule as rigid rotator and anharmonic oscillator (Born-Oppenheimer approximation oscillator) — selection rules, vibrations of polyatomic molecules — stretching and bending vibrations — applications — determination of force constant, moment of inertia and internuclear distance — isotopic shift — application of IR spectra to simple organic and inorganic molecules — (group frequencies)

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.

UNIT IV

Nuclear magnetic resonance spectroscopy:

PMR – theory of PMR – instrumentation - number of signals – chemical shift – peak areas and proton counting – spin-spin coupling – applications. Problems related to shielding and deshielding of protons, chemical shifts of protons in hydrocarbons, and in simple monofunctional organic compounds; spin-spin splitting of neighbouring protons in vinyl and allyl systems.

UNIT V

Mass spectrometry

Principle – different kinds of ionisation – instrumentation – the mass spectrum – types of ions – determination of molecular formula-fragmentation and structural elucidation – McLafferty rearrangement; Retro Diels Alder reaction - illustrations with simple organic molecules.

Solving structure elucidation problems using multiple spectroscopic data (NMR, MS, IR and UV-Vis).

Extended
Professional
Component (is a part of internal component only,
Not to be included in the external examination question paper)

Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)

Skills acquired Know from this course Com

Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

Recommended 1. Gopalan, R.; Subramaniam, P. S.; Rengarajan, K. Elements of Text Analytical Chemistry; S Chand: New Delhi, 2003. 2. Usharani, S. *Analytical Chemistry*, 1sted.; Macmillan: India, 2002. 3. Banwell, C.N.; Mc Cash, E. M. Fundamentals of Molecular Spectroscopy, 4th ed.; Tata McGraw Hill, New Delhi, 2017. 4. U.N.Dash, Analytical Chemistry Theory and Practice, Sultan Chand &Sons,2nd Ed., 2005 5. B.K.Sharma, Spectroscopy,22nd ed., Goel Publishing House, 2011. 1. Srivastava, A. K.; Jain, P. C. Chemical Analysis an Instrumental Reference Books Approach, 3rded.; S.Chand, New Delhi, 1997. 2. Robert D Braun. Introduction to Instrumental Analysis; Mc.Graw Hill: New York, 1987. 3. Skoog, D. A.; Crouch, S. R.; Holler, F.J.; West, D. M. Fundamentals of Analytical Chemistry, 9thed.; Harcourt college Publishers: USA, 2013. 4. Madan, R. L.; Tuli, G. D. *Physical Chemistry*, 2nded.; S.Chand: New Delhi, 2005. 5. Puri, B. R.; Sharma, L. R.; Pathania, M.S. Principles of Physical Chemistry, 43rd ed.; Vishal Publishing: Delhi, 2008. 1. http://vallance.chem.ox.ac.uk/pdfs/SymmetryLectureNotes2004.pdf Website and 2.http://chemistry.rutgers.edu/undergrad/chem207/SymmetryGroupThe e-learning source ory.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 understand 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	3.0	3.0	3.0	3.0	3.0
Course Contribution to Pos					

Level of Correlation between PSO's and CO's

SEMESTER: VI PART: III EC VII

23UCHEE64-2 ORGANIC SYNTHESIS

Credit: 3 H/W: 5

EC VII	
Prerequisites	General Chemistry I,II,III and IV
Objectives of the	The course aims to provide knowledge on
course	 To introduce the basics of disconnection approach. To learn about protecting groups. To introduce one group C-C disconnections. To introduce two group C-C disconnections. To learn about ring synthesis.
Course Outline	UNIT I DISCONNECTION APPROACH
	An introduction to synthons and synthetic equivalent Disconnection approach, functional group interconversion, The importance of the order of events in organic synthesis, one group C-X and two group C-X disconnections. Chemo selectivity, reversal of polarity.
	UNIT II PROTECTING GROUPS
	Principle of protection of alcohol group and amine group. Principle of protection of carbonyl group and carboxyl group. Activation of functional group.
	UNIT III ONE GROUP C-C DISCONNECTIONS
	Alcohols and carbonyl compounds. Regioselectivity and Alkene synthesis. Use of acetylenes and aliphatic nitrocompounds in organic synthesis.
	UNIT IV TWO GROUP C-C DISCONNECTIONS
	Diels-Alder reaction, 1, 3 - difunctionalised compounds. α,β unsaturated carbonyl compounds, Control in carbonyl condensations. 1, 5 - difunctionalised compounds, Michael addition and Robinson annulation.
	UNIT V RING SYNTHESIS
	Saturated heterocycles. Synthesis of 3-,4-,5- and 6- membered rings, aromatic heterocycles. in organic synthesis. Application of the above in the synthesis of camphor, longifolene, cortisone & reserpine.

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)
	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	 Herbert O House, 1965, Modern synthetic reactions, W.A. Benjamin, 1st Edition, New York. Warren Stuart, 2008, Organic Synthesis: The Disconnection Approach, Wiley, 2nd Edition, New Jersey, USA. W. Carruthers, 1987, Some modern methods of Organic synthesis, Cambridge University Press, 3rd Edition, UK.
Reference Books	 Michael B. Smith, 1994, Organic Synthesis, McGraw-Hill Inc., 1st Edition, US C.K. Charles, 2012, Organic Synthesis, Alpha Science International Ltd, 1st Edition, Oxford, UK. F.A.Carey and R.J. Sundberg, 1977, Advanced Organic Chemistry, Part-B, Plenium Press, 1st Edition, New York.
Website and	1. https://www.lkouniv.ac.in/site/writereaddata/siteContent/202004
e-learning source	101314199439sangeeta sriv chem Disconnection Approach.pd
Bource	 1 2. https://profiles.uonbi.ac.ke/andakala/files/sch_504_protecting_groups_in_organic_synthesis.pdf
	3. http://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S0000_05CH/P000669/M026476/ET/1515666017CHE_P14_M3_etext.p_df
	4. http://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S0000 http://epgp.inflibnet.ac.in/epgp.
Course Learning O	5. https://en.wikipedia.org/wiki/Ring_forming_reaction https://en.wiki/Ring_forming_reaction https://en.wiki/Ring_forming_reaction https://en.wiki/Ring_forming_reaction https://en.wiki/Ring_forming_reaction https://en.wiki/Ring_forming_reaction https://en.wiki/Ring_forming_reaction https://en.wiki/Ring_forming_reaction<!--</td-->

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

CO1: To describe methods for organic synthesis.

CO2:To understand transformation of the most common functional groups.

CO3:To understand the principles of disconnection approach.

CO4:To learn strategic approaches for organic Synthesis.

CO5:To provide theoretical understanding of heterocyclic chemistry which includes various methods for ring synthesis.

	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	3.0	3.0	3.0	3.0	3.0
Contribution to Pos					

Level of Correlation between PSO's and CO's

SEMESTER: VI PART: III EC VII

23UCHEE64-3 HEALTH CHEMISTRY

Credit: 3 H/W: 5

EC VII	
Prerequisites	General Chemistry I,II,III and IV
Objectives of the course	The course aims to provide knowledge on
Course	 To recognize the causes of common diseases, their control and treatment To understand the first aid for accidents To study the organic pharmaceutical aids To know about organic diagnostic agents To have an idea about diabetes and cancer.
Course Outline	UNIT I
Course Outline	CAUSES, CONTROL AND TREATMENT OF COMMON DISEASES
	Insect borne diseases- Malaria, Filariasis, Plague. Air-borne diseases-Diphtheria, whooping cough, influenza, measles, mumps, tuberculosis (TB), and common cold, Water borne diseases-cholera, typhoid, dysentery. Some other common diseases-Jaundice, Asthma, Epilepsy, Piles, Leprosy.
	UNIT II FIRST AID FOR ACCIDENTS
	Important rules of First Aid – Cuts and Wounds, Abrasions, Bruises, Bleeding, Fractures, Burns, Fainting Poisonous bites. First Aid Box. Detection of Hallucinogens and poisons-Antidotes for Poisoning-Some common Poisons-Symptoms and their antidotes-Acid poisoning, Alkali poisoning, Disinfectant poisoning, Alcohol poisoning, Mercury poisoning and Salicylate poisoning.
	UNIT III ORGANIC PHARMACEUTICAL AIDS
	Preservatives, Antioxidants, Emulsifying agent, Sequestrants, Colouring, Flavouring and Sweetening agent, Ointment bases, Solvents, Stabilizing and Suspending agents.
	UNIT IV ORGANIC DIAGNOSTIC AGENTS
	Drug used as X-rays contrast media, Drugs used to test organ functions, Drugs used to determine blood volume, Hemopoietic

	functions, Drugs used for miscellaneous diagnostic tests.
	UNIT V DIABETES AND CANCER
	Diabetes and hypoglycemic drugs: Blood sugar level –Diabetes –causes, symptoms and control- Preliminary ideas about the structure and sources of insulin- oral hypoglycemic drugs-sulphonylureas and biguanides (synthesis not expected) Antineoplastic drugs: Causes of cancer- treatment methods-alkylating or cytotoxic agent- antimetabolite drugs.
Extended Professional	
Component (is a part of internal	Questions related to the above topics, from various competitive
component only, Not to be included	examinations UPSC/ JAM /TNPSC others to be solved (To be
in the external examination question paper)	discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Jayashree Ghosh, 2003, A Text Book of Pharmaceutical Chemistry, S.Chand& Company Ltd, 3 rd revised Edition, New Delhi.
	2. Lakshmi S, 1995, Pharmaceutical Chemistry, S.Chand& Company Ltd, 1st edition, New Delhi.
	3. A. L. Leninger, 1998, Biochemistry, Kalyani Publishers, 2 nd Edition, Ludhiana
Reference Books	1. Chatwal G.R, 1991, Pharmaceutical Chemistry-Organic-Volume II, Himalaya Publishing House, New Delhi.
	2. Ashutoshkar and Mehta S.C, 2018, Essentials of Pharmacology, New Age International Publishers, New Delhi.
	3. Gurdeep Chatwal, 2012 ,Medicinal Chemistry, Himalaya Publishing house private Ltd., Mumbai.

Website and	https://my.clevelandclinic.org/health/diseases/17724-infectious-
e-learning	diseases
source	https://www.cartercenter.org/resources/pdfs/health/ephti/library/lect
	ure_notes/health_extension_trainees/ln_hew_first_aid_mgmt_final.
	pdf
	https://noteskarts.com/wp-
	content/uploads/2022/01/Pharmaceutics_Chapter_3_Pharmaceutical
	_aids_Organoleptic_Colouring.pdf
	https://webstor.srmist.edu.in/web_assets/srm_mainsite/files/downlo
	ads/DIAGNOSTIC_AGENTS.pdf
	https://www.diabetes.org.uk/diabetes-the-basics/related-
	conditions/diabetes-and-cancer

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

CO1: Describe the causes, control and treatment of common diseases.

CO2: Understand the concepts of first aid for accidents.

CO3: Classify different organic pharmaceutical aids.

CO4: Explain organic diagnostic agents.

CO5: Describe diabetes, cancer and their control and treatment.

	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

	SEMESTER: V PART: III EC VIII	VI 23UCHEE65-1 NANO SCIENCE	Credit: 3 H/W: 5
ere	equisites	Basics knowledge in physics and chemistry	
ie	ctives of the	This course aims at providing knowledge on	

EC VIII	<u> </u>
Prerequisites	Basics knowledge in physics and chemistry
Objectives of the	This course aims at providing knowledge on
course	 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	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 nanomaterialsTop 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, electro deposition, sol-gel method, nanomaterials via
	chemical routes- solvents reducing agents, capping agents-stabilization of nanoparticles -electrostatic and steric stabilization, common stabilizers, nanoparticle growth in solution, templated growth, Langmuir — Blodgett (L-B) method, reverse micellesemulsion method.
	Unit II
	Properties of materials on a nanoscale Optical properties of metal and semiconductor nanomaterials- surface Plasmon resonance (SPR), surface enhanced Raman spectra (SERS), quantum confinement effect, tuning of optical spectrum. Magnetic properties - Fe ₃ O ₄ particle, supra magnetic properties, electronic properties, Chemical properties- chemical process on the surface of nanoparticles, catalysis, mechanical properties.
	UNIT III Techniques employed for characterisation of nanomaterials Spectrocopy – UV-visible, Photoelectron spectroscopy – Electron microscopy – Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Scanning probe microscopy (SPM) – Atomic Force Microscopy (AFM), Scanning Tunneling Microscopy (STM), Optical microscopy – confocal microscopy, X-ray diffraction (XRD) [Principle and Block diagram only].

	UNIT IV
	Special nanomaterials
	Carbon Nano Structures Carbon nanotubes: Introduction - types - zigzag,
	armchair, helical, synthesis by CVD, Functionalization of Carbon
	Nanotubes, Reactivity of Carbon Nanotubes, 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.
	UNIT V
	Application of nanomaterials
	Biomedical Applications- drug, drug delivery, biolabelling, artificial
	implants, cancer treatment. Sensors – Natural nanoscale sensors,
	chemical sensors, biosensors, electronic noses.
	Optics & Electronics – Nanomaterials in the next generation computer
	technology, high definition TV, flat panel displays, quantum dot laser,
	single electron transistors [SET]. Nanotechnology in agriculture – Fertilizer and pesticides nanomaterials
	for water purification, nanomaterials in food and packaging materials,
	fabric industry.
	Impacts of Nanotechnology – human & environmental safety risks.
Extended Professional	Questions related to the above topics, from various competitive examinations
	UPSC/ JAM /TNPSC others to be solved
Component (is a part	
of internal component	(To be discussed during the Tutorial hours)
only, Not to be	
includedin the	
external examination	
question paper)	
Skills acquired	Knowledge, Problem solving, Analytical ability, Professional
from this course	Competency, Professional Communication and Transferable skills.
RecommendedText	1. Sulabha K. Kulkarni, Nanotechnology: Principles and Practices,
	Capital Publishing Co., New Delhi.
	2. Pradeep. T, Nano: The Essentials, Understanding Nanoscience and
	Nanotechnology; Tata McGraw-Hill Publishing Company Limited,
	NewDelhi, 2007.
	3. Shah. M.A.; Tokeer Ahmad, <i>Principles of Nanoscince and</i>
	Nanotechnology; Narosa Publishing House, New Delhi, 2010.
	4. Murthy. B.S; Shankar. P, Baldev Raj.; Rath. B.B. JamesMurday, <i>Textbook</i>
	of Nanoscience and Nanotechnology; Universities press, India Ltd
D 6 B 7	,Hyderabad. 2012.
Reference Books	1. Sharma. P.K., <i>Understanding Nanotechnology</i> ; Vista International
	Publishing House, Delhi. 2008.
	2. Charles P. Poole Jr.; Frank J. Owens. <i>Introduction to Nanotechnology</i> ;
	A John Wiley & Sons, INC., Publication, 2003.
	3. Viswanathan B., <i>Nano Materials</i> ; Narosa Publishing House, New
	Delhi, 2009.
	4. Edited by C.N.R. Rao; Mu'ller.A; Cheetham. A.K.Nanomaterials
	7. Luneu by C.N.K. Nao, will liet.A, Cheethani. A.K.ivanomateriais

	Chemistry Recent Developments and New Directions, WILEY-VCH
	Verlag GMBH & Co.,KGaA, Darmstad.
	5. Jing Zhong Zhang, Optical properties and spectroscopy of
	Nanomaterials; World Scientific Publishing Pvt. Ltd., Singapore.
Website and	1) http://www.nanotechnology.com/docs/wtd015798.pdf
e-learning source	2) http://nccr.iitm.ac.in/Nanomaterials.pdf

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

CO1: explain the general concepts and physical phenomena of relevance within the field of nanoscience.

CO2: describe the properties, synthesis, characteristics of nanomaterials, specialnanomaterials 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
Weighted percentage of Course Contribution toPSOs	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

SEMESTER: VI PART: III EC VIII

23UCHEE65-2 POLYMER SCIENCE

Credit: 3 H/W: 5

Prerequisites	Knowledge on functional groups and reaction mechanisms
Objectives	The course aims at providing an overall view of
of thecourse	 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	UNIT I
Outline	Introduction
	Difference between polymer and macromolecule – classification – synthetic and natural, organic and inorganic, thermoplastic and thermosetting. Plastics, elastomers, fibres and liquid resins.
	Techniques of polymerization
	Bulk, solution, emulsion and suspension polymerization
	Unit – II
	Kinetics of polymerization
	Kinetics of condensation and addition polymerisation; ionic, freeradical,
	copolymerisation and coordination polymerisation – reactivity
	ratios – block and graft copolymers.
	Characterisation of polymers
	Appearance, feel and hardness, density, effect of heat, solubility, combustion, tensile
	strength, shear, stress, impact strength, mechanical,
	thermomechanical and rheological properties of polymers in
	viscoelastic state. UNIT III
	Molecular Weight and Properties of Polymers
	Molecular Weight of Polymers-Number Average and Weight Average, Molecular
	Weight Distribution, Determination of Molecular Weight polydispersity index –
	membrane and vapour phase osmometry, light scattering - Zimm plot,
	ultracentrifuge – sedimentation velocity and sedimentation equilibrium – viscometry
	gel permeation chromatography
	Thermal properties of polymers – Glass Transition Temperature-State of
	Aggregation and State of Phase Transitions, Factors Influencing Glass Transition
	Temperature, Importance of
	Glass Transition Temperature, Heat Distortion Temperature, TGA /
	DTA, Crystallinity of Polymers: Crystalline Behaviour, Degree of Crystallinity.

	Chemistry, 7th ed.; Pearson: New Delhi, 2011.
	Ane Books India: New Delhi, 2008. 6. Morrison, R. R.; Boyd, R. N.; Bhattacharjee, S. K. <i>Organic</i>
	5. Ahluwalia, V.K. Anuradha Mishra, Polymer Science A Text Book,
	Delhi: Narosa Publishing House, 2005
	4. Bahadur P and Sastry N V. Principles of Polymer Science. New
	Eastern, 2010.
	3. Misra G.S. Introductory Polymer Chemistry. New Delhi: Wiley
	2. New Delhi: New Age International, 2015
	Science.
RecommendedText	1. Gowariker V.R, N.V. Viswanthan and Jayadev Sreedhar. Polymer
from this course	Competency, Professional Communication and Transferable skills.
Skills acquired	Knowledge, Problem solving, Analytical ability, Professional
examination question paper)	
in the external	
Not to be included	
component only,	
part of internal	<u> </u>
Component (is a	(To be discussed during the Tutorial hours)
Professional	examinations UPSC/ JAM /TNPSC others to be solved
Extended	Questions related to the above topics, from various competitive
	vulcanisation of rubber. Polymer Degradation Types of Degradation - Thermal, Mechanical, Ultra Sound, Photo Radiation and Chemical Degradation Methods. Rubber-Natural and Synthetic-Structure, Mechanism of Vulcanisation Biodegradable and Non-Biodegradable Polymers.
	electroluminescent polymers – two examples of each of these polymers. Polyethylene, PVC, PMMA, polyester; rubber – synthetic and natural,
	Polyelectrolytes, conducting polymers, polymeric supports for solid phase synthesis, biomedical polymers, liquid crystalline polymers,
	UNIT V Speciality polymers
	spinning.
	extrusion, compression, blow moulding – foaming, lamination, reinforcing – processing of fibres – melt, wet and dry
	Polymer technology Processing of polymers – casting, thermoforming, moulding –
	Reactions of Polymers-Hydrolysis, Acidolysis, Aminolysis, Additionand Substitution Reactions (One Example Each) Cyclisation, Cross-Linking and Reactions of Specific FunctionalGroups in the Polymer
	UNIT IV Descriptions of Delymous Hydrolysis Acidelysis Aminelysis Additionand

Reference Books	1. Billmeyer, F.W. Polymer Science. India: Wiley-Interscience, 2007.						
	2. Seymour, R. B.; CarraherJr.C.E. Polymer Chemistry: An						
	Introduction, Marcel Dckker						
	Inc: New York, 1981.						
	3. Sinha, R. Outlines of Polymer Technology, Prentice Hall of India:						
	New Delhi, 2000.						
	4. Joel R. Fried, <i>Polymer Science and Technology</i> , 3 rd ed.; Prentice						
	Hall of India: New Delhi, 2014.						
Website and	1. https://polymerdatabase.com						
e-learning source	http://amrita.vlab.co.in/?sub=2&brch=190∼=603&cnt=1						
	3.http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/polymers. htm						
	4.http://nsdl.niscair.res.in/bitstream/123456789/406/2/Molecular+weigh						
	ts+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
Weighted percentage of Course					
Contribution to	3.0	3.0	3.0	3.0	3.0
PSOs					

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

SEMESTER: VI PART: III EC VIII

23UCHEE65-3 PHARMACEUTICAL CHEMISTRY

Credit: 3 H/W: 5

Prerequisites	Knowledge on active chemical compounds and biochemistry
Objectives of the	The course aims at providing an overall view of
course	 drugs design and drug metabolism
	 important Indian medicinal plants, common diseases andantibiotics
	drugs for major diseases like cancer, diabetes and AIDS
	analgesics and antipyretic agents
G	• significance of clinical tests
Course Outline	UNIT I
	Introduction
	Important terminologies – drug, pharmacognosy, pharmacy, pharmacology, pharmacodynamics, pharmacokinetics, clinical pharmacology, pharmacotherapeutics, chemotherapy, toxicology, pharmacophore, antimetabolites, mutation, bacteria, virus, fungi, actinomycetes, vaccines, pharmacopeia, posology and therapeutic index.
	Sources of drugs – dosage forms – bio availability – routes of administration – absorption, distribution and elimination of drugs – drug metabolism – prescription terms.
	Structure and pharmacological activity Effect of – unsaturation, chain length, isomerism; groups - halogens amino, nitro, nitrite, cyano, acidic, aldehydic, keto, hydroxyl and alkyl groups.
	Development of Drugs 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.
	Unit II
	Indian medicinal plants Some important Indian medicinal plants – tulsi, neem, kizhanelli,mango, semparuthi, adadodai, turmeric and thoothuvalai – uses.
	Common diseases and their treatment Causes, prevention and treatment of the following diseases: Insect borne diseases— malaria, filariasis, plague; Air borne diseases— diphtheria, whooping cough, influenza, measles, mumps, common cold, tuberculosis; Water borne diseases— cholera, typhoid, dysentery. Digestive system— jaundice; Respiratory system— asthma; Nervous system— epilepsy.
	Antibiotics Definition – classification – structure and therapeutic uses of chloramphenicol, penicillins , structure activity relationship of chloramphenicol; therapeutic uses of ampicillin, streptomycin, erythromycin, tetracycline, rifamycin.

UNIT III

Drugs for major diseases

Cancer – common causes – chemotherapy – anti neoplastic agents classification –adverse effects of cytotoxic agents; alkylating agents – chlorambucil; anti metabolites – methotrexate, fluouracil; alkaloids vincristine, vinblastine.Diabetesmanagement of diabetes – insulin ; oral hypoglycemic agents sulphonyl ureas – chlorpropamide ; biguanides - metformin – thiazolidinediones .Cardiovascular drugs- cardio glycosides ; anti arrhythmic agents - quinidine, propranolol hydrochloride : antihypertensive drugs - Aldomet, pentoliniumtartarate; vasodilator-tolazoline hydrochloride, sodium nitroprusside. AIDS – causes,

symptoms and prevention – anti HIV drugs - AZT, DDC.

UNIT IV

Analgesics and antipyretic agents

Classification – action of analgesics – narcotic analgesics –morphine; synthetic analgesics – pethidine, methadone; antipyretic analgesics – salicylic acid derivatives, indolyl derivatives, p-aminophenol derivatives.

Anaesthetics

Definition, characteristics, classification - general anaesthetics – volatile anaesthetics – nitrous oxide, ethers, cyclopropane, chloroform, halothane, trichloro ethylene- storage, advantages and disadvantages ; non volatileanaesthetics – thiopental sodium; local anaesthetics – requisites – advantages- esters - cocaine, benzocaine; amides - lignocaine, cinchocaine.

Blood and haemotological agents

Blood—composition, grouping—physiological functions of plasma proteins – mechanism of clotting; Coagulants – vitamin K, protamine sulphate, dry thrombin; Anti coagulants – coumarins, citric acid and heparin; antifibrinolytic agents – aminocaproic acid and tranexamic acid.

Anaemia— causes, types and control – anti anaemic drugs.

UNIT V

Clinical Chemistry

Blood tests – blood count – complete haemotogram – Hb, RBC, GTT, TC, DC, platelets, PCV, ESR; bleeding and clotting time — glucose tolerance test.

Significance of Clinical Tests

Serum electrolytes - blood Glucose - orthotoluidine method; Renal functions tests - blood urea, creatinine; liver function tests - serum proteins, albumin globulin ratio, serum bilirubin, enzymes SGOT, SGPT; lipid profile – cholesterol, triglycerides, HDL, LDL, coronaryrisk 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	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
in the external examination	
question paper)	
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
RecommendedText	1. Jayashree Ghosh, (1999), A text book of pharmaceutical chemistry, 2 nd ed., S.Chand& company, New Delhi.
	2. Lakshmi S, (2004), Pharmaceutical chemistry, 3 rd ed., Sultan chand& sons, Delhi.
	3. Tripathi K D, (2018), Essentials of medical pharmacology, 8 th ed., Jaypee brothers medical publishers (P) Limited, New Delhi.
	4. Ashutosh Kar, (2018), Medicinal chemistry, 7 th ed., New age international (P) Limited,
	Publishers, New Delhi.
Reference Books	Reference Books:
Reference Books	1. Chatwal G R, (2013), Pharmaceutical chemistry, inorganic (vol-I) 6 th ed., Himalaya
	publishing house, Bombay.2. Chatwal G R, (1991), Pharmaceutical chemistry, organic (vol-II).,
	Himalaya publishing house, Bombay.
	3. Patrick G, (2002), Instant Notes Medicinal Chemistry, Viva Books
	Private Limited, New Delhi.
	Intellectual Property Rights, NeerajPandey, Khushdeep Dharni. Publisher:
	PHI Learning Pvt. Ltd., 2014 ISBN: 812034989X, 9788120349896.
Website and	1.http://www.pharmacy.umaryland.edu/faculty/amackere/courses/phar5
e-learning source	31_delete/lectures/qsar_1.pdf
	2. http://www.indianmedicinalplants.info/
	https://www.wipo.int/about-ip/en/

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

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.

CO2: Discuss the development of drugs, structural activity, disease types, physiochemical properties of therapeutic agents, significance of medicinal plants, clinical tests and factors for patentability.

CO3: Apply the principles involved in structural activity and drug designing, functions ofhaematological agents; estimation of clinical parameters and therapeutic application of drugs for major diseases.

CO4: explain classification of analgesics and anasthetics, and physiological functions of plasma protiens

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

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	3.0	3.0	3.0	3.0	3.0
PSOs					

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

SEMESTER: VI

PART: V

23UCHEF66 PROFESSIONAL COMPETENCY SKILL: **CHEMINFORMATICS**

Credit: 2 H/W: 2

Prerequisites	Basic Knowledge in Chemistry						
Objectives of the	The course aims at providing knowledge to						
Course	1.explain the primary and secondary structures of proteins with						
	stereochemistry.						
	2. retrieve chemical information from structural and visualization tools.						
	3. make students familiar on existing databases and their application.						
	4. give a clear view on algorithms which is involved in bimolecular networks.						
	5.know about structure based drug design						
Course Outline	UNIT – I: Cheminformatics						
	Introduction-coordinates-Bonds-Bondlengths-Bond angle-electrostatic,						
	vander Walls and nonbonded interactios-hydrogen bonding- Chemical						
	structure-Conformation-representation of strutural information-Types						
	of representation of structural information.						
	UNIT – II: Introduction To Macromolcule Structure Determination & Classification						
	Protein structure-organisation of protein structure-methods in protein structure determination- factors determining the stability of proteins-protein structure and conformational Properties. PDB format-classification using PDB format -SCOP-principal levels-family, super family, fold & fold class.						
	UNIT – III: Chemical Information						
	History of scientific information -communication-chemical literature-						
	chemical information- chemical information search-chemical						
	information sources-chemical name and formula searching-analytical						
	chemistry-chemical history-biography-directories and industry sources						
	UNIT – IV: Database Management						
	Introduction to data and Database-storage of structural data in a data						
	base-Important data storage organisations - Types of storage data base-						
	data base searching-structure research, using structural keys &						
	employing similarity search-canonical structure-Substructure search-						
	types of binary screen-structural key & finger print-similarity search-						

ı	TOTAL ALC: A D. ID. D.							
	UNIT – V: Structure-Based Drug Design							
	Introduction to drugs, Chemical structural data files- Structure based							
	drug design- Drug action & enzymes- Drug action & receptors-							
	Design- Ligand Based Design and De Novo Drug Design Virtual							
	screening/docking of ligandsPharmacophore Design, Molecular							
	similarity and molecular descriptors.							
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	Knowledge, Problem solving, Analytical ability, Professional							
From this course Recommended Text	Competency, Professional Communication and Transferable skills. 3. Stereochemistry, by David G. Morris, Eddie Abel 4. Computer-Aided Drug Design: Methods and Applications, T.J.							
TCAL								
	Perun C.L. Propst							
	5. Chemical Information Sources (Mcgraw-Hill Series in Advanced Chemistry), Gary Wiggins.							
	6. Trends in Bioinformatics. By Dr. P. Shanmughavel. 2006							
	Pointer publishers, Jaipur, India.							
	7. Principles Of Bioinformatics, Dr.P.Shanmugavel,2005,Pointer							
	Publishers, Jaipur, India.							
Reference Books	1. Thomas Engel (2006). "Basic Overview of Chemoinformatics". J. Chem. Inf. Model. 46 (6): 2267–77. doi:10.1021/ci600234z. PMID 17125169							
	2. Molecular Modeling: Basic Principles and Applications, 3rd Edition, Hans-Dieter Höltje, Wolfgang Sippl, Didier Rognan, Gerd Folkers							
	3. Martin, Yvonne Connolly (1978). Quantitative Drug Design: A Critical Introduction. Medicinal Research series. Vol. 8 (1st ed.). New York, NY: Marcel Dekker. ISBN 9780824765743.							
	4. Schaum's Outline of Probability and Statistics, Murray R							
	 Spiegel, John J. Schiller, R. Alu Srinivasan. 5. Gasteiger J.; Engel T., eds. (2004). Chemoinformatics: A Textbook. New York, NY: Wiley. ISBN 3527306811. 							

Website and e-learning source 7. https://www.sciencedirect.com/topics/chemistry/chemoinformatics 8. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7432360/ 9. https://chem.libretexts.org/Courses/Intercollegiate Courses/Cheminformatics 10. https://github.com/PatWalters/resources/blob/main/cheminformatics resources.md

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

CO1: Understand the mathematical implementation in molecular networks.

CO2: Evaluate the importance of protein structure in drug designing

CO3: Describe chemical data retrieval from the databases.

CO4: Know the various tools in proteomics, genomics and metabolomics.

CO5: Structure based designing of ligand with a help of QSAR.

	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	3.0	3.0	3.0	3.0	3.0
Contribution to Pos					

Level of Correlation between PSO's and CO's

SEMESTER: V	23UCHEX67	Credit: 1
PART: V	EXTENSION ACTIVITY	H/W: -

 $(Refer\ to\ the\ Regulations)$