H.H. THE RAJAH'S COLLEGE (AUTONOMOUS)

PUDUKKOTTAI-622 001

PG & RESEARCH DEPARTMENT OF CHEMISTRY

B.Sc., CHEMISTRY

COURSE STRUCTURE UNDER CBCS

FOR THE STUDENTS ADMITTED FROM THE ACADEMIC YEAR2023 – 2024 ONWARDS

B.Sc., CHEMISTRY - SYLLABUS

2023-2024

THE VISION AND MISSION OF THE DEPARTMENT

VISION

We provide society with people serving, skilled and problem solving professionals in chemical sciences

MISSION

Provide our society with high quality professionals having a strong education and technical skills in chemistry; with rich cultural, ethical, environmental, and social sensitivities; capacity for critical thinking; and the entrepreneurial skills to solve industrial and environmental problems

INTRODUCTION

B.Sc. Chemistry

Programme Outcome, Programme Specific Outcome and Course Outcome

Chemistry is the study of composition and transformation of matter. A science that is central to energy production, health care, new material development for electronics and other applied fields and environmental protection. Bachelor's degree in Chemistry is the culmination of in-depth knowledge of Inorganic, Organic and Physical chemistry and specialized courses such as Pharmaceutical Chemistry, spectroscopy, Nanoscience, Forensic Science, Cosmetics & Personal Grooming, Food chemistry, Dairy Chemistry and so on. Thus, this programme helps learners in building a solid foundation for higher studies in Chemistry. The hands on experience the students gain in Practical enable them to apply theory to solve problems in everyday life, think critically and innovatively. An aptitude for research is instilled through project work and industrial internship.

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

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

PROGRAMME OUTCOMES (PO) OF B.SC DEGREE PROGRAMME IN CHEMISTRY

- Students will possess basic subject knowledge required for higher studies, professional andapplied courses
- Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
- Students will develop scientific aptitude Integrate skills of analysis, critiquing, application andcreativity.
- Students will employ appropriate digital tools and techniques necessary in analysing data andcreative design.
- Students will gain competence to pursue higher learning, research and careers or will be able toopt for entrepreneurship
- Students will interact meaningfully with others displaying leadership and coordination inexecuting projects.
- Students will demonstrate responsibility as citizens committed to national developmentthrough community outreach, wellness of self and a sustainable environment.

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO1: Students acquire in-depth knowledge of the fundamental concepts in all disciplines ofchemistry.

PSO2: Students can disseminate the basics of chemistry and advanced topics and analyticalskills in organic, inorganic and physical chemistry.

PSO3: Students will be able develop creativity in academics and research.

PSO4: Students will be able apply digital tools to collect, analyse and interpret data and presentscientific findings.

PSO5: gain competence to pursue higher education and career opportunities in chemistry andallied fields.

PSO6: exhibit leadership qualities to work individually and within a team in organizingcurricular, co-curricular and extracurricular activities.

PSO7: apply the concepts of chemistry to solve problems in the community, entrepreneurial andresearch pursuits.

PSO8: exhibit competence in educational, industrial and research pursuits that contributetowards the holistic development of self and community.

Sem I	Credit	H	Sem II	Credit	H	Sem III	Credit	H	Sem IV	Credit	H	Sem V	Credit	H	Sem VI	Credit	H
Part 1. Language – Tamil	3	6	Part..1. Language – Tamil	3	6	Part..1. Language – Tamil	3	6	Part..1. Language – Tamil	3	6	5.1 Core Course – \CC IX	4	5	6.1 Core Course – CC XIII	4	6
Part.2 English	3	6	Part..2 English	3	6	Part..2 English	3	6	Part..2 English	3	6	5.2 Core Course – CC X	4	5	6.2 Core Course – CC XIV	4	6
1.3 Core Course – CC I	5	5	2..3 Core Course – CC III	5	5	3.3 Core Course – CC V	5	5	4.3 Core Course – CC VII Core Industry Module	5	5	5. 3.Core Course CC -XI	4	5	6.3 Core Course – CC XV	4	6
1.4 Core Course – CC II	5	5	2.4 Core Course – CC IV	5	5	3.4 Core Course – CC VI	5	5	4.4 Core Course – CC VIII	5	5	5. 4.Core Course –/ Project with viva-voce CC -XII	4	5	6.4 Elective - VII Generic/ Discipline Specific	3	5
1.5 Elective I Generic/ Discipline Specific	3	4	2.5 Elective II Generic/ Discipline Specific	3	4	3.5 Elective III Generic/ Discipline Specific	3	4	4.5 Elective IV Generic/ Discipline Specific	3	3	5.5 Elective V Generic/ Discipline Specific	3	4	6.5 Elective VIII Generic/ Discipline Specific	3	5
1.6 Skill Enhancement Course SEC-1 **Soft Skill –I (common Paper)**	2	2	2.6 Skill Enhancement Course SEC-2 **Soft Skill-II (common Paper)**	2	2	3.6 Skill Enhancement Course SEC-4, **Entrepreneurial Skills (common Paper)**	1	1	4.6 Skill Enhancement Course SEC-6 **(Nan Muthalvan) NMC - III**	2	2	5.6 Elective VI Generic/ Discipline Specific **(Online Objective)**	3	4	6.6 Extension Activity	1	-
1.7 Skill Enhancement - (Foundation Course)	2	2	2.7 Skill Enhancement Course – **SEC-3(Nan Muthalvan) NMC-I**	2	2	3.7 Skill Enhancement Course SEC-5 **(Nan Muthalvan) NMC -II**	2	2	4.7 Value Education & Gender Studies	2	2	5.7 Skill Enhancement Course SEC-7 **(Nan Muthalvan) NMC - IV**	2	2	6.7 Skill Enhancement / Professional Competency Skill **(Nan Muthalvan) NMC -V**		2
						3.8 E.V.S.	-	1	4.8 E.V.S	2	1	5.8 Summer Internship /Industrial Training (**30Hrs)**	2				
	23	**30**		**23**	**30**		**22**	**30**		**25**	**30**		**26**	**30**		**21**	**30**
Total – 140 Credits																	

B.Sc Chemistry Curriculum Design
First Year
Semester- I

Part	List of Courses	Marks (Max 100)		Credit	Hours per week (L/T/P)
		CIA	UE		
Part-I	Language – Tamil Paper - I	25	75	3	6
Part-II	English Paper - I	25	75	3	6
Part-III	General Chemistry–I CC1	25	75	5	5
	Quantitative Inorganic estimation (titrimetry) and Inorganic Preparations CC2	25	75	5	5
	Mathematics EC1	25	75	3	4
	Botany /Zoology* (Running Paper) EC1				
Part-IV	Skill Enhancement Course SEC-1 – Soft skill and industry awareness - I	25	75	2	2
	Foundation Course FC - – An introduction to general chemistry	25	75	2	2
				23	**30**

Semester-II

Part	List of Courses	Marks (Max 100)		Credit	Hours per week (L/T/P)
		CIA	UE		
Part-I	Language - Tamil Paper - II	25	75	3	6
Part-II	English Paper - II	25	75	3	6
Part-III	General Chemistry–II CC3			5	5
	Qualitative Organic Analysis and preparation of Organic Compounds CC4	25	75	5	5
	Botany /Zoology* (Running Paper) EC1	-	-	-	-
	Mathematics EC 2	25	75	3	4
	Botany /Zoology EC 2 – Practical				
Part-IV	Skill Enhancement Course SEC-2 - Softskill and industry awareness - II	25	75	2	2
	Skill Enhancement Course SEC-3 (Discipline Specific) Nan Mudhalvan Course - I	25	75	2	2
				23	**30**

Second Year

Semester-III

Part	List of Courses	Marks (Max 100)		Credit	Hours per week (L/T/P)
		CIA	UE		
Part-I	Language – Tamil Paper – III / Hindi Paper III	25	75	3	6
Part-II	English Paper - III	25	75	3	6
Part-III	3.3 Core Course – CC V - General Chemistry–III	25	75	5	5
	3.4 Core Course – CC VI Qualitative Inorganic Analysis	25	75	5	5
	3.5 **Elective III Generic/ Discipline Specific - Physics EC 3 & EC4 (Running Paper)**	25	75	3	4
Part-IV	3.6 Skill Enhancement Course SEC-4 - Softskill and industry awareness - III	25	75	1	1
	3.7 Skill Enhancement Course SEC-5 (Nan Muthalvan Course - II) NMC -II	25	75	2	2
	3.8 **E.V.S (Running Paper)**	25	75		1
				22	**30**

Semester-IV

Part	List of Courses	Marks (Max 100)		Credit	Hours per week (L/T/P)
		CIA	UE		
Part-I	Language - Tamil Paper – IV / Hindi Paper IV	25	75	3	6
Part-II	English Paper - IV	25	75	3	6
Part-III	4.3 Core Course – CC VII - General Chemistry–IV	25	75	5	5
	4.4 Core Course – CC VIII - Gravimetric Analysis Practical	25	75	5	5
	4.5 Elective IV Generic/ Discipline Specific - Physics EC 3 & EC4 (Running Paper)	25	75	3	3
Part-IV	4.6 Skill Enhancement Course SEC-6 (Nan Muthalvan Course - III) NMC -III	25	75	2	2
	4.7 Value Education & Gender Studies	25	75	2	2
	4.8 **EVS (Running Paper)**	25	75	2	1
				25	**30**

Third Year

Semester V

Part	List of Courses	Marks (Max 100)		Credit	Hours per week (L/T/P)
		CIA	UE		
Part-III	5.1 Core Course –CC IX - Organic Chemistry - I	25	75	4	5
	5.2 Core Course – CC X - Physical Chemistry -I	25	75	4	5
	5.3.Core Course CC -XI - Physical chemistry Practical	40	60	4	5
	5. 4.Core Course CC XII – Project (with viva-voce)	100		4	5
	5.5 Elective V Generic/ Discipline Specific – Principles of Inorganic Chemistry / Industrial chemistry	25	75	3	4
	5.6 Elective VI Generic/ Discipline Specific (Online Objective) – Water Treatment and Analysis/Biochemistry	25	75	3	4
Part IV	Skill Enhancement Course -SEC-7 (Nan Muthalvan Course IV) NMC-IV	25	75	2	2
	Internship / Industrial Visit / Field Visit (30 Hrs)	25	75	2	
				26	**30**

Semester VI

Part	List of Courses	Marks (Max 100)		Credit	Hours per week (L/T/P)
		CIA	UE		
Part-III	6.1 Core Course – CC XIII - Organic Chemistry -II	25	75	4	6
	6.2 Core Course – CC XIV - Inorganic Chemistry - I	25	75	4	6
	6.3 Core Course – CC XV – Applied Experiments in Chemistry (Practical)	40	60	4	6
	6.4 Elective -VII Generic/ Discipline Specific - Essential of Physical Chemistry/Fundamentals of Spectroscopy	25	75	3	5
	6.5 Elective VIII Generic/ Discipline Specific - EC7 Polymer Science/ Pharmaceutical Chemistry	25	75	3	5
	6.6 Extension Activity - EC	25	75	1	-
Part IV	6.7 Skill Enhancement / Professional Competency Skill (Nan Muthalvan) NMC -V	25	75	2	2
				21	**30**

SEMESTER – I

<table>
<tr><td>Title of the Course</td><td colspan="8">GENERAL CHEMISTRY-I</td></tr>
<tr><td>Paper No.</td><td colspan="8">Core I</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td colspan="2" rowspan="2">23UCH1</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="3">Total</td></tr>
<tr><td>5</td><td></td><td colspan="3">-</td><td colspan="3">5</td></tr>
<tr><td>Prerequisites</td><td colspan="8">Higher secondary chemistry</td></tr>
<tr><td>Objectives of the course</td><td colspan="8">The course aims at giving an overall view of the
• various atomic models and atomic structure
• wave particle duality of matter
• periodic table, periodicity in properties and its application in explaining thechemical behaviour
• nature of chemical bonding, and
• fundamental concepts of organic chemistry</td></tr>
<tr><td rowspan="2">Course Outline</td><td colspan="8">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 H- spectrum; Photoelectric effect, Compton effect; Dual nature of Matter- De- Broglie wavelength-Davisson and Germer experiment Heisenberg’s Uncertainty Principle; Electronic Configuration of Atoms and ions- Hund’s rule, Pauli’exclusion principle and Aufbau principle; Numerical problems involving the core concepts.</td></tr>
<tr><td colspan="8">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</td></tr>
</table>

	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 polarization – 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 A_2, AB, AB_2, AB_3, AB_4; 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 – CO_2, NO_2, CO_3^{2-}, NO_3^- ; limitations of VBT; MO theory - bonding, antibonding and nonbonding orbitals, bond order; MO diagrams of H_2, C_2, O_2, O_2^+, O^{2-}, $O^{2-}N_2$, NO, HF, CO;2 magnetic characteristics, comparison of VB and MO theories. Coordinate bond: Definition, Formation of BF_3, NH_3, NH_4^+, H_3O^+ properties Metallic bond-electron sea model, VB model; Band theory-mechanism of conduction in solids; conductors, insulator, semiconductor – types, applicationsof 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
	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 andnitrobenzene, bond lengths; steric inhibition to resonance. Hyperconjugation - stability of alkenes, bond length, orienting effect of methylgroup, 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	1. Madan, R. D. and Sathya Prakash, *Modern Inorganic Chemistry,* 2^{nd}ed.; S.Chand and Company: New Delhi, 2003. 2. Rao, C.N. R. University General Chemistry, Macmillan Publication: New Delhi, 2000. *3.* Puri, B. R. and Sharma, L. R. *Principles of Physical Chemistry,* 38^{th}ed.;Vishal Publishing Company: Jalandhar, 2002. 4. Bruce, P. Y. and PrasadK. J. R. *Essential Organic Chemistry,* Pearson Education: New Delhi, 2008. 5. Dash UN, Dharmarha OP, Soni P.L. Textbook of Physical Chemistry, Sultan Chand & Sons: New Delhi,2016
Reference Books	1. Maron, S. H. and Prutton C. P. *Principles of Physical Chemistry,*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,* 26^{th}ed.; Goel Publishing House: Meerut, 2001. 4. Atkins, P.W. & Paula, J. *Physical Chemistry,* 10th ed.; Oxford UniversityPress:New York, 2014. *5.* Huheey, J. E. *Inorganic Chemistry: Principles of Structure and Reactivity,* 4^{th} ed .; Addison, Wesley Publishing Company: India,1993.

Website ande-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 electroniceffects 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 ofmolecules 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	**PSO 1**	**PSO 2**	**PSO 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
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'

<table>
<tr><td>Title of the Course</td><td colspan="7">Quantitative Inorganic Estimation (titrimetry) and Inorganic Preparations</td></tr>
<tr><td>Paper No.</td><td colspan="7">Core II</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td>Credits</td><td>5</td><td>Course Code</td><td>23UCH2P</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>-</td><td>2</td><td colspan="3">3</td><td colspan="2">5</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Higher secondary chemistry</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">This course aims at providing knowledge on
laboratory safety
handling glasswares
Quantitative estimation
preparation of inorganic compounds</td></tr>
<tr><td>Course Outline</td><td colspan="7">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.</td></tr>
<tr><td></td><td colspan="7">Unit II
Quantitative Estimation(Volumetric)
Preparation of standard solution, dilution from stock solution
Acid Base
Estimation of Sodium Hydroxide
Estimation of Hydrochloric acid</td></tr>
</table>

	Permanganometry Estimation of sodium oxalate using standard ferrous ammonium sulphate Estimation of Ferrous ion Estimation of Oxalic acid **Dichrometry** Estimation of potassium dichromate 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)
	Unit III Complexometry Estimation of hardness of water using EDTA **Estimations** 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 ofPractical Chemistry*,2nd ed.; Sultan Chand &Sons: New Delhi, 1997. *2.* Nad, A. K.; Mahapatra, B.; Ghoshal, A.; *An advanced course in Practical Chemistry*, 3rd ed.; New Central Book Agency: Kolkata, 2007.
ReferenceBooks	1. Mendham, J.; Denney, R. C.; Barnes, J. D.; Thomas, M.; Sivasankar, B.; *Vogel's Textbook of Quantitative Chemical Analysis*, 6th ed.; PearsonEducation Ltd: New Delhi, 2000.
Website and e-learning source	**Web References:** 1) http://www.federica.unina.it/agraria/analytical-chemistry/volumetric-analysis 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: assess the yield of different inorganic preparations and identify the end point of various 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

CO-PO Mapping (Course Articulation Matrix)

CO /PSO	PSO 1	PSO 2	PSO 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
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

<table>
<tr><td>Title of theCourse</td><td colspan="7">Foundation Course – I – An Introduction to General Chemistry</td></tr>
<tr><td>Paper No.</td><td colspan="7">Foundation Course I</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">FC</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">23UCHSEF1</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td rowspan="2">Instructional hours perweek</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="3">Total</td></tr>
<tr><td>2</td><td>-</td><td colspan="2">-</td><td colspan="3">2</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Higher secondary chemistry</td></tr>
<tr><td>Objectives ofthe course</td><td colspan="7">This course aims at providing an overall view of the
• Chemical calculations and formulas
• Stoichiometric and mole concept
• Chemical Periodicity and Nomenclature of organic compounds
• Analytical Principles in chemistry
• Knowledge of hazardous chemicals and Lab safety</td></tr>
<tr><td rowspan="3">Course Outline</td><td colspan="7">UNIT-I - Basic Concepts of Chemistry I (Introductory Level):
Chemical Calculations Significant figures - SI units - Dimensions - Writing number in scientific notation - Conversion of scientific notation to decimal notation - Factor label method - Calculations using densities and specific gravities - Calculation of formula weight - Understanding Avogadro’s number - Mole concept-mole fraction of the solvent and solute - Conversion of grams into moles and moles into grams - Calculation of empirical formula from quantitative analysis and percentage composition - Calculation of molecular formula from empirical formula.</td></tr>
<tr><td colspan="7">Unit-II -Basic Concepts of Chemistry II (Introductory Level):
Stoichiometric equations - Balancing chemical equation in its molecular form - Oxidation reduction-Oxidation number - Balancing Redox equation using oxidation number - Calculations based on equations. - Mass/Mass relationship - Methods of expressing concentration of solution - Calculations on principle of volumetric analysis - Determination of equivalent mass of an element - Determination of equivalent mass by oxide, chloride and hydrogen displacement method - Calculation of equivalent mass of an element and compounds - Determination of molar mass of a volatile solute using Avogadro’s hypothesis.. Basic ideas of interdisciplinary areas involving Chemistry</td></tr>
<tr><td colspan="7">Unit III Basic Concepts of Chemistry III (Introductory Level):
Periodic Classification Brief history of periodic classification - IUPAC periodic table and IUPAC nomenclature of elements with atomic number greater than 100 - Electronic configuration and periodic table - Periodicity of properties Anomalous periodic properties of elements. Detection of Elements: Detection of carbon and hydrogen - Detection of Nitrogen - Detection of halogens - Detection of sulphur. Basic Concepts of Organic</td></tr>
</table>

	Chemistry Catenation - Classification of organic compounds - Functional groups - Nomenclature - Isomerism - Types of organic reactions - Fission of bonds - Electrophiles and nucleophiles - Carbonium ion Carbanion - Free radicals - Electron displacement in covalent bond.
	UNIT-IV - Analytical Principles: Analytical Principles: Inorganic qualitative analysis - Common ion effect - solubility product - precipitation of cations. Micro scale analysis – Advantages Quantitative Analysis - Theory of titration - acid-base, redox, precipitation and complexometric titrations. Theory of indicators - acid-base, redox, adsorption and metallochromic indicators.
	UNIT-V - Safety measures in Laboratory: Safety measures in Laboratory: Introduction to lab safety - regulatory requirements - labels, material safety. Knowledge of hazard warning information and symbols. Explosive compounds, potentially dangerous mixtures - Fire hazards (idea about flammable solvents, ignition sources used in laboratories, metal hydrides), Emergency procedures in chemical splashes to skin and eyes, burns and electric shock. Reactive inorganic reactants and their toxicity (strong acids, bases, halogens, chromates). Hazards due to chemicals, toxic - solids, liquids, gases, and other harmful substances - carcinogenic substances.
	Recommended Tex 1. Harris, D. C. Quantitative Chemical Analysis. 6 th Ed., Freeman (2007) 2. 2. Levie, R. de, How to use Excel in analytical chemistry and in general scientific data analysis, Cambridge Univ. Press (2001).
	ReferenceBooks 1.Yates, P. Chemical Calculations. 2nd Ed. CRC Press(2007). 2. Harris, D. C. Quantitative Chemical Analysis. 6th Ed., Freeman (2007) 3. Levie, R. de, How to use Excel in analytical chemistry and in general scientific data analysis, Cambridge Univ. Press (2001)

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

CO1: learn about the laws of science and data collection.

CO2: get knowledge on chemical atomism and branches of chemistry

CO3: acquire information aboutinformatio technology and cyber resources.

CO4: discuss about the analytical principles of laboratory experiments.

CO5: have an idea about thelab safety and precautions.

	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	PSO 1	PSO 2	PSO 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
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

<table>
<tr><td>Title of theCourse</td><td colspan="7">Skill Based Elective – I – Soft Skill and Industry Awareness I</td></tr>
<tr><td>Paper No.</td><td colspan="7">SEC I</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">SEC</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">23UCHSE1</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td rowspan="2">Instructional hours perweek</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>2</td><td>-</td><td colspan="3">-</td><td colspan="2">2</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Higher secondary chemistry</td></tr>
<tr><td>Objectives ofthe course</td><td colspan="7">This course aims at providing an overall view of the
• To inculcate positive attitude among the learners
• To introduce goal setting to the learners
• To instill effective communicative skills in the learners
• To expose the learners to the basics of computers
• To initiate the learners into computer applications</td></tr>
<tr><td rowspan="5">Course Outline</td><td colspan="7">UNIT-I - POSITIVE A TTITUDE : attitude --- features of attitudes --- formation of attitudes—psychological factors --- change of attitudes –ways of changing attitude in a person – the power of positive attitude ---the benefits of positive attitude --- developing positive attitude --- obstacles in developing positive attitude -- negative attitude --- the causes of negative attitude ---the consequences of negative attitude ---how to change negative attitude</td></tr>
<tr><td colspan="7">Unit-II - GOAL SETTING—introduction –importance of goal setting – goal definition --- types of goals ---what exactly goal setting --- why people don’t set goals ---how to choose the right goals –SMART GOALS ---Career goals ---benefits of career goal setting ----goal setting tips</td></tr>
<tr><td colspan="7">Unit III COMMUNICATION SKILLS – communication process –types of communication --- barriers to effective communication --- listening skills --- importance of tone of voice --- voice clarity ---verbal expressiveness – tips to develop communication skills ---government initiatives – job roles.</td></tr>
<tr><td colspan="7">UNIT-IV - KNOWING COMPUTER --characteristics of a computer – limitations of a computer –components of hardware---- basics of operating systems ---definition – functions of operating systems – categories of operating systems --- windows features --- start up, shut down ----- opening and closing an application --- manipulating windows --- saving – printing – deleting files –start menu</td></tr>
<tr><td colspan="7">UNIT-V - COMPUTER APPLIICATIONS: Word Processing : launching word, word processing basics, the quick access toolbar, opening a document, saving a document, formatting the text, table manipulation
Using Spread Sheet : elements of electronics spreadsheet, manipulation of cells, formula and function- functions</td></tr>
</table>

Recommended Tex

1. Soft Skills and Industry Awareness - ICT Academy of Tamil Nadu

ReferenceBooks

1. Dr.Alex – Soft Skills, S.Chand, New Delhi
2. Raveendiran et al. Success Through Soft Skills

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

CO1: know to develop positive attitude

CO2: Know how to set goals

CO3: Learners develop effective communicative skills

CO4: Learners know the basics of computers

CO5: Learners know various computer 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	PSO 1	PSO 2	PSO 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
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

<table>
<tr><td>Title of the Course</td><td colspan="7">GENERAL CHEMISTRY-II</td></tr>
<tr><td>Paper No.</td><td colspan="7">Core III</td></tr>
<tr><td>Category</td><td>Core</td><td>Year</td><td>I</td><td>Credits</td><td>5</td><td>Course Code</td><td>23UCH3</td></tr>
<tr><td></td><td></td><td>Semester</td><td>II</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td>Total</td></tr>
<tr><td></td><td>5</td><td></td><td colspan="3">-</td><td>5</td></tr>
<tr><td>Prerequisites</td><td colspan="7">General Chemistry I</td></tr>
<tr><td>23Objectives of the course</td><td colspan="7">This course aims at providing an overall view of the
• chemistry of acids, bases and ionic equilibrium
• properties of s and p-block elements
• chemistry of hydrocarbons
• applications of acids and bases
• compounds of main block elements and hydrocarbons</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT-I
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.</td></tr>
<tr><td></td><td colspan="7">Unit-II</td></tr>
<tr><td></td><td colspan="7">Chemistry of s - Block Elements
Hydrogen: Position of hydrogen in the periodic table. Alkali metals: Comparative study of the elements with respect to oxides, hydroxides, halides, carbonates and bicarbonates. Diagonal relationship of Li with Mg. Preparation, properties and uses of NaOH, Na_2CO_3, KBr, $KClO_3$ alkaline earth metals. Anomalous behaviour of Be.</td></tr>
<tr><td></td><td colspan="7">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.</td></tr>
</table>

	UNIT-III
	Chemistry of p- Block Elements (Group 15-18) General characteristics of elementsof Group 15; chemistry of H_2N-NH_2, NH_2OH, HN_3 and HNO_3. Chemistry of PH_3, PCl_3, PCl_5, $POCl_3$, P_2O_5 and oxy acids of phosphorous (H_3PO_3 and H_3PO_4).
	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 ($HClO_4$). Inter-halogen compounds (ICl, ClF_3, BrF_5 and IF_7), pseudo halogens [$(CN)_2$ and $(SCN)_2$] and basic nature of Iodine.
	Noble gases: Position in the periodic table. Preparation, properties and structure of XeF_2, XeF_4, XeF_6 and $XeOF_4$; uses of noble gases - clathratecompounds.
	UNIT-IV
	Hydrocarbon Chemistry-I **Petroproducts:** Fractional distillation of petroleum; cracking, isomerisation, alkylation, reforming and uses. **Alkenes**-Nomenclature, general methods of preparation – Mechanism of β- elimination reactions – E1 and E2 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 〈 - 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 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.
RecommendedText	1. Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry, 2nd ed, S.Chand and Company, New Delhi. 2. Sathya Prakash, Tuli G D,Basu S K and Madan R D, (2003), Advanced Inorganic Chemistry, 17th ed., S.Chand and Company, New Delhi. 3. Bahl 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.

ReferenceBooks	1. Maron S H and Prutton C P, (1972), Principles of Physical Chemistry, 4th ed., The Macmillan Company, Newyork. 2. Barrow G M, (1992), Physical Chemistry, 5th ed., Tata McGraw Hill, NewDelhi. 3. Lee J D, (1991), Concise Inorganic Chemistry, 4thed., ELBS WilliamHeinemann, London. 4. Huheey J E, (1993), Inorganic Chemistry: Principles of Structure andReactivity, 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,8thed., Goel Publishing House,Meerut.
Website ande-learning source	https://onlinecourses.nptel.ac.inhttp://cactus.dixie.edu/smblack/chem1010/lec ture_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 aromatic hydrocarbons and strength of acids

CO3: classify hydrocarbons, types of reactions, acids and bases, examine the properties s and p-block elements, reaction mechanisms of aliphatic and aromatic hydrocarbons

CO4: explain theories of acids, bases and indicators, buffer action and important compounds of s-block elements

CO5: assess the application of hard and soft acids indicators, buffers, compounds of s and p-block elements and hydrocarbons

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

CO-PO Mapping (Course Articulation Matrix)

CO /PO	**PSO 1**	**PSO 2**	**PSO 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
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

<table>
<tr><td>Title of the Course</td><td colspan="7">QUALITATIVE ORGANIC ANALYSIS AND PREPARATION OF ORGANIC COMPOUNDS</td></tr>
<tr><td>Paper No.</td><td colspan="7">Core IV</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td rowspan="2">23UCH4P</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="3">Total</td></tr>
<tr><td>-</td><td>2</td><td colspan="2">3</td><td colspan="3">5</td></tr>
<tr><td>Prerequisites</td><td colspan="7">General Chemistry II</td></tr>
<tr><td>Objectives ofthe course</td><td colspan="7">This course aims at providing knowledge on
• laboratory safety
• handling glass wares
• analysis of organic compounds
• preparation of organic compounds</td></tr>
<tr><td rowspan="2">Course Outline</td><td colspan="7">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</td></tr>
<tr><td colspan="7">Unit II

Qualitative Organic Analysis
Preliminary examination, detection of special elements - nitrogen, sulphur andhalogens
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</td></tr>
</table>

	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
	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/eucalyptusleaves. **4. Chromatography (any one) (Group experiment)** (i) Separation of amino acids by Paper Chromatography **(Demonstration)**. (ii)Thin Layer Chromatography - mixture of sugars / plant pigments /permanganate/dichromate **(Demonstration)**. (iii) Column Chromatography - extraction of carotene, chlorophyll and xanthophyll from leaves / separation of anthracene - anthracene picrate **(Demonstration)**. 5. **Electrophoresis –** Separation of amino acids and proteins. **(Demonstration)**
ReferenceBooks	1. Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. *Basic Principlesof Practical Chemistry*, 2nd ed.; Sultan Chand: New Delhi, 2012. 2. 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'sTextbook of Practical Organic Chemistry*, 5th ed.;

	Pearson: India,1989.
Website ande-learning source	https://www.vlab.co.in/broad-area-chemical-sciences

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

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

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

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

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

	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	**PSO 1**	**PSO 2**	**PSO 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
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

<table>
<tr><td>Title of the Course</td><td colspan="7">Skill Enhancement
Course II – Soft Skill and Industry Awareness II</td></tr>
<tr><td>Paper No.</td><td colspan="7">SEC- II</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">SEC</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">23UCHSE2</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td>Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td></td><td>2</td><td>-</td><td colspan="3">-</td><td colspan="2">2</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Higher secondary chemistry</td></tr>
<tr><td>Objectives ofthe course</td><td colspan="7">This course aims at providing an overall view of the
• To equip the learners for Group Discussion
• To prepare the learners to attend interviews
• To make the students to learn effective Time Management
• To expose the learners to Retail Sector
• To initiate the learners into Retail Advertising</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I</td></tr>
<tr><td></td><td colspan="7">Group Discussion --- Types of GD – discussion Vs debate – personality traits – advantages of GD --- Dos and Don’ts</td></tr>
<tr><td></td><td colspan="7">Unit II</td></tr>
<tr><td></td><td colspan="7">Selection Interview – Introduction --- interview-meaning --- interview structure --- interview panel – types of interview ---questions looked for in interviews ---preparation before interview -----Body language –dos and don’ts ---standard interview questions ---your answer to questions</td></tr>
<tr><td></td><td colspan="7">UNIT III</td></tr>
<tr><td></td><td colspan="7">Time Management – importance of time ---importance of time management –the Pareto 80 : 20 Principle and Time Management – the time management matrix --- its utilization ---procrastination : causes and effects --- how to overcome procrastination --- effective time management --- tools for effective time management</td></tr>
<tr><td></td><td colspan="7">UNIT IV</td></tr>
<tr><td></td><td colspan="7">Retail Sector – introduction –market size -- investment scenario – advantage india --- government initiatives --- types of stores --- types of Merchandising -- Store operations – store appearance – store security – make it difficult for retail theft to happen --- inventory and stock management --- store organization --- importance of store organization</td></tr>
</table>

	UNIT V Retail Advertising --- integrated marketing communication (IMC) – traditional marketing Vs IMC, Benefits of IMC—management of IMC in Retail --- sales promotion-- objectives, limitations, tools, Enterprise source Planning (ERP), supply chain management – the relationship between ERP, CRM, and SCM --- key features of supply chain management – job roles
RecommendedText	1. Soft Skills and Industry Awareness - ICT Academy of Tamil Nadu
ReferenceBooks	1. Dr.Alex – Soft Skills, S.Chand, New Delhi 2. Raveendiran et al. Success Through Soft Skills
Website and e-learningsource	

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO 1: learners are confident enough to join Group Discussion
CO 2: learners feel well-equipped to attend interviews
CO 3: learners know the value of time and managing it
CO 4: learners know the potential of Retail Sector
CO 5: Learners know about Retail Advertising

	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	PSO 1	PSO 2	PSO 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
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

<table>
<tr><td>Title of the Course</td><td colspan="7">Generic Elective – Allied Chemistry
FOR MATHEMATICS (Semester I & II) STUDENTS</td></tr>
<tr><td>Paper No.</td><td colspan="7">Generic Elective GE I</td></tr>
<tr><td>Category</td><td>GE</td><td>Year
Semester</td><td>I
I & II</td><td>Credits</td><td>3</td><td>Course Code</td><td>23UCHGE1</td></tr>
<tr><td>Instructional hours per week</td><td>Lecture
4</td><td>Tutorial
-</td><td colspan="2">Lab Practice
-</td><td colspan="3">Total
4</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Higher secondary chemistry</td></tr>
<tr><td>Objectives ofthe course</td><td colspan="7">This course aims at providing an overall view of the
• To instruct the atomic orbitals and its hybridization
• To instruct the chemistry of alkanes, alkenes and alkynes
• To instruct the alcohols and carbonyl compounds
• To instruct the solutions and solid state
• To instruct the thermodynamics and phase rule</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I</td></tr>
<tr><td></td><td colspan="7">Atomic Structure and Chemical Bond

Electromagnetic Radiation and Spectrum – Wave mechanical concept and De Broglie equation – Heisenberg uncertainty principle – Schrodinger wave equation – Quantum numbers – Shapes of atomic orbitals – Energies of orbital – electron distribution in atoms – electronic configuration. Periodic Classification – classification of elements – periodic properties: size, atomic and ionic radius, ionization energy, electron affinity, electronegativity – Oxidation number – rules and calculation.

Types of bonds – Ionic bond, lattice energy, Born-Haber cycle – factors favouring the formation of ionic compounds – properties of ionic compounds - Covalent bond – overlap of orbitals – Resonance – Hybridization, types - valance bond theory- molecular orbital theory - bonding and anti-bonding orbitals, bond order.</td></tr>
<tr><td></td><td colspan="7">Unit II</td></tr>
<tr><td></td><td colspan="7">Nomenclature of Organic Compounds and Chemistry of Alkanes, Alkenes and Alkynes

Classification of organic compounds and nomenclare – electronic displacements in organic molecules – inductive effect, mesomeric effect resonance energy and effect of resonance – reactive intermediates: carbocations and carbonium ions, free radicals - Types, Preparation properties and uses of alkanes, alkrnes, alkynes and dienes. Conformation and configuration: representation, confirmation of ethane and n-butane.</td></tr>
<tr><td></td><td colspan="7">UNIT III</td></tr>
</table>

	Alcohols, phenols and carbonyl compounds distinction between primary and secondary and teriary alcohols – preparation and properties of alcohol - -chemistry of polyhydric alcohols: preparation, properties and uses of glycol and glycerol. Classification of phenol. Acidic nature – electrophilic substitution in phenols Aldehydes and ketones: Physical and chemical properties of aldehydes and ketones
	UNIT IV
	Solutions and Solid State Solution: Molarity, molality and normality. Types of solutions, solubility. Factors influencing the solubility, Hendrys law ad its applications. Colligative properties: lowering of vapour pressure, osmotic pressure, elevation of boiling point and depression of freezing point. Solids: Difference between solid, liquid and gases. Crystalline and amorphous solids. Crystallography: Symmetry elements, types of symmetry, unit plane, rational indices and miller indices. Types of crystal systems, space lattice and unit cell, X-ray analysis of crystal, Bragg's equation – simple body center and face center lattices - structure of NaCl and KCl – Liquid crystals: types and applications. Typical critical lattice,unit cell, elements of symmetry.
	UNIT V **Thermodynamics and Phase Rule** Basic terms, properties of a system. Thermodynamic process & types. Thermodynamic function: heat & work. First law of thermodynamics. Mathematical expression mechanical work, enthalpy, heat capacity. Need for second law of thermodynamics, statements, entropy and its significance. Work function and Helmholtz free energy. Chemical potential, endothermic and exothermic reaction. Vant hoff isotherm. Phase, component, degree of freedom, phase rule definition-phase diagram of one component and two component systems.
RecommendedText	1. R.B.Puri & L.R.Sharma, Principal of inorganic chemistry–,Sultan chand,1989. 2.M K Jain , Organic chemistry Shoban Nagin chand and co. 3.R.B.Purie & L.R.Sharma, physical chemistry
ReferenceBooks	1. P.L.Soni, Organic chemistry

Website and e-learningsource	

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO 1: learners are getting knowledge on Chemical Bonding
CO 2: Understand the Chemistry of alcohols and carbonyl compounds
CO 3: know the Chemistry of alkanes, alkenes and alkynes
CO 4: know the fundamentals of Solid state materials
CO 5: know about Thermodynamics and Phase rule

	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	**PSO 1**	**PSO 2**	**PSO 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
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

<table>
<tr><td>Title of the Course</td><td colspan="7">GENERIC ELECTIVE CHEMISTRY PRACTICAL
For Mathematics (I & II Semester) Students</td></tr>
<tr><td>Paper No.</td><td colspan="7">Generic Elective EC II</td></tr>
<tr><td>Category</td><td>Generic Elective</td><td>Year
Semester</td><td>I
I & II</td><td>Credits</td><td>3</td><td>Course Code</td><td>23UCHGE2P</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>-</td><td>1</td><td colspan="3">3</td><td colspan="2">4</td></tr>
<tr><td>Prerequisites</td><td colspan="7"></td></tr>
<tr><td>Objectives of thecourse</td><td colspan="7">This course aims to provide knowledge on the
• basics of preparation of solutions.
• principles and practical experience of volumetric analysis
• identification of organic functional groups
• different types of organic compounds with respect to theirproperties.
• determination of elements in organic compounds..</td></tr>
<tr><td>Course Outline</td><td colspan="7">VOLUMETRIC ANALYSIS
1. Estimation of sodium hydroxide using standard sodium carbonate.
2. Estimation of hydrochloric acid using standard oxalic acid.
3. Estimation of ferrous sulphate using standard Mohr's salt.
4. Estimation of oxalic acid using standard ferrous sulphate.
5. Estimation of potassium permanganate using standard sodium hydroxide.
6. Estimation of magnesium using EDTA.
7. Estimation of ferrous ion using diphenyl amine as indicator.</td></tr>
</table>

	SYSTEMATIC ANALYSIS OF ORGANIC COMPOUNDS The analysis must be carried out as follows:
	(a) Functional group tests [phenol, acids (mono & di) aromatic primary amine, amides (mono & di), aldehydeand glucose]. (b) Detection of elements (N, S, Halogens). (c) To distinguish between aliphatic and aromatic compounds. To distinguish – Saturated and unsaturated compounds.

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

CO 1: gain an understanding of the use of standard flask and volumetric pipettes, burette.
CO 2: design, carry out, record and interpret the results of volumetric titration.
CO 3: analyze the chemical constituents in allied chemical products.
CO4: carry out, record and interpret the results of organic analysis.

CO /PSO	PSO 1	PSO 2	PSO 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
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to PSOs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CO /PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PO's and CO's

Title of the Course	**SKILL ENHANCEMENT COURSE – III NAN MUDHALVAN COURSE - I**						
Paper No.	**Skill Enhancement Course III**						
Category	**SEC III**	**Year**	I	**Credits**	2	**Course Code**	**23UCHNMC1**
		Semester	I & II				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	2	-	-			2	
Prerequisites							

SEMESTER – III

<table>
<tr><td>Title of the Course</td><td colspan="7">GENERAL CHEMISTRY -III</td></tr>
<tr><td>Paper No.</td><td colspan="7">Core V</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td rowspan="2">23UCH5</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>5</td><td></td><td colspan="2">-</td><td colspan="2">5</td></tr>
<tr><td>Prerequisites</td><td colspan="7">General Chemistry – I and II</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">This course aims to provide a comprehensive knowledge on
• The physical properties of gases, liquids, solids and X-ray diffraction ofsolids.
• Fundamentals of nuclear chemistry and nuclear waste management.
• applications of nuclear energy
• Basic chemistry of halo-organic compounds, phenol and other aromaticalcohols.
• Preparation and properties of phenols and alcohols.</td></tr>
<tr><td>Course Outline</td><td colspan="7">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, 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 states for 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.</td></tr>
<tr><td></td><td colspan="7">Unit-II- Liquid and Solid State
Properties of Liquids- Surface tension, viscosity and their applications. Crystalline and amorphous – differences - geometry, isotropy and anisotropy.
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</td></tr>
</table>

	Packing in atomic solids – simple cubic, body centered cubic, face centered and hexagonal close packing; Co-ordination number in typical structures - NaCl, CsCl, ZnS, TiO_2; comparison of structure and properties of diamond and graphite;.numerical problems involving core concepts Defects in solids - stoichiometric and nonstoichiometric defects.
	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)
	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

	UNIT-V – Alcohols and Phenols **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. **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.
Extended Professional Component (is apart of internal component only,Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/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*, SultanChand & 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.

Reference Books	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 - *Text Book of Organic Chemistry*, New Delhi,Sultan Chand & Sons, twenty ninth edition, 2007. 5. J.D. Lee, *Concise Inorganic Chemistry*, Blackwell Science, fifth edition,2005.
Website ande-learning source	**MOOC components** https://nptel.ac.in/courses/104104101 Solid state chemistry https://nptel.ac.in/courses/103106071 Nuclear industries and safety https://nptel.ac.in/courses/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 crystalswith 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 wastemanagement.
CO4: write the nomenclature, physical & chemical properties and basic mechanisms of haloorganic compounds and alcohols.
CO5: investigate the named organic reactions related to phenol; explain the preparation andproperties 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	PSO 1	PSO 2	PSO 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
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

<table>
<tr><td>Title of the Course</td><td colspan="7">QUALITATIVE INORGANIC ANALYSIS</td></tr>
<tr><td>Paper No.</td><td colspan="7">Core VI</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td rowspan="2">23UCH6P</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="3">Total</td></tr>
<tr><td></td><td>2</td><td colspan="2">3</td><td colspan="3">5</td></tr>
<tr><td>Prerequisites</td><td colspan="7">General chemistry</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">To develop the skill on systematic analysis of simple inorganic salts and mixtureof salts.</td></tr>
<tr><td>Course Outline</td><td colspan="7">Semi - Micro Qualitative Analysis
1. Analysis of simple acid radicals: Carbonate, sulphide, sulphate, thiosulphite, chloride, bromide, iodide, nitrate
2. Analysis of interfering acid radicals: Fluoride, oxalate, borate, phosphate,arsenate, arsenite.
3. Elimination of interfering acid radicals and Identifying the group of basic radicals
4. Analysis of basic radicals (group wise): Lead, copper, bismuth, cadmium, tin, antimony, iron, aluminium, arsenic, zinc, manganese, nickel, cobalt, calcium, strontium, barium, magnesium, ammonium
5. Analysis of a mixture - I to VIII containing two cations and two anions (of which one is interfering type)</td></tr>
<tr><td>Skills acquired from this course</td><td colspan="7">Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</td></tr>
<tr><td>Recommended Text</td><td colspan="7">Reference Books:
V. Venkateswaran, R. Veeraswamy and A. R. Kulandivelu, Basic Principles ofPractical Chemistry, Sultan Chand & Sons, New Delhi, second edition, 1997.</td></tr>
<tr><td>Website and e-learning source</td><td colspan="7">https://www.vlab.co.in/broad-area-chemical-sciences</td></tr>
<tr><td colspan="8">Course Learning Outcomes (for Mapping with POs and PSOs)</td></tr>
</table>

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	**PSO 1**	**PSO 2**	**PSO 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
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

<table>
<tr><td>Title of the Course</td><td colspan="7">SOFTSKILL AND INDUSTRY AWARENESS III</td></tr>
<tr><td>Paper No.</td><td colspan="7">Skill Enhancement Course IV</td></tr>
<tr><td>Category</td><td>SEC IV</td><td>Year
Semester</td><td>II
III</td><td>Credits</td><td>1</td><td>Course Code</td><td>23UCHSE4</td></tr>
<tr><td>Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td>Total</td></tr>
<tr><td></td><td>1</td><td>-</td><td colspan="3">-</td><td>1</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Fundamentals in chemistry</td></tr>
<tr><td>Objectives of thecourse</td><td colspan="7">This course aims to providing the students
• knowledge about the vocabulary
• to understand the leadership quality.
• knowledge on Insurance Sector and BPO industry.</td></tr>
<tr><td>Course Outline</td><td colspan="7">Unit I - VOCABULARY ENRICHMENT
Definition and importance – word formation : prefixes and suffixes --- compound words ---- compound nouns – compound adjectives ---synonyms and antonyms ---homonyms – homophones ---- idioms and phrases ----one word substitutes --- confused words – tips for vocabulary enrichment -- oral presentation : techniques and tasks ---self –introduction--- talking about objects --- description of person --- welcome speech --- vote of thanks</td></tr>
<tr><td></td><td colspan="7">Unit II - LEADERSHIP
Need for leadership –definition of leadership --- essence of leadership –functions of effective leaders ---differences between leadership and management ---positive and negative leaders --- different leadership styles ---David McClelland’s classification of leadership – choice of correct leadership style ---emerging perspectives on leadership in organizations</td></tr>
<tr><td></td><td colspan="7">Unit III - BFSI SECTOR
Banking sector -- market size – investments --- what is banking? --- types of banks ---- functions of Bank --- types of bank accounts – E-banking (electronic banking)--- government initiatives --- Financial Services --- Market size – Investments --- Government Initiatives</td></tr>
<tr><td></td><td colspan="7">Unit IV - INSURANCE SECTOR
Market size - Investments – advantage India --- Policy measures --- opportunities --- government initiatives – advantages and uniqueness of India’s Life Insurance Sector—Job roles -----ITES SECTOR --- introduction – IT services sector ---BPO Services sector --- market size – investments --- skill requirements in the IT and ITES industry--- major trends impacting skill requirements</td></tr>
</table>

	Unit V - BUSINESS PROCESS OUTSOURCING (BPO) Advantages of BPO --- disadvantages of BPO ---- classification of BPO HOSPITALITY SECTOR : introduction --- tourism – Indian market --- market size --- investments --- government initiatives --- types of tourism --- opportunities ---- benefits of career – road ahead – Theme parks – facts on Indian amusement park industry --- structure and development of amusement park sector --- tourism – amusement parks ---recreation industry ---amusement parks --- HOTEL INDUSTRY – categorization of hotels --- latest developments --- cruise lines --- India's cruise potential --- time for domestic cruising – cruise lines in India ---- Job Roles
Extended Professional Component (is a part of internal component only, Not to be includedin 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	Soft Skills and Industry Awareness - ICT Academy of Tamil Nadu
Reference Books	Dr.Alex – Soft Skills, S.Chand, New Delhi Raveendiran et al. Success Through Soft Skills
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 effective vocabulary. **CO 2:** explain the leadership **CO 3:** investigate the features of BFSI Sector **CO 4:** explain the potential of Insurance Sector **CO 5:** make awareness to the BPO and Hotel Industry	

CO /PSO	PSO 1	PSO 2	PSO 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
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to PSOs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

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

Level of Correlation between PO's and CO's

Title of the Course	**SKILL ENHANCEMENT COURSE – V NAN MUDHALVAN COURSE - II**						
Paper No.	**Skill Enhancement Course V**						
Category	**SEC V**	**Year**	II	**Credits**	2	**Course Code**	**23UCHNMC2**
		Semester	III				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	2	-	-			2	
Prerequisites							

Title of the Course	**ENVIRONMENTAL STUDIES**						
Paper No.	**EVS**						
Category		**Year**	II	**Credits**		**Course Code**	
		Semester	III & IV				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	1	-	-			1	
Prerequisites							

SEMESTER – IV

<table>
<tr><td>Title of the Course</td><td colspan="7">GENERAL CHEMISTRY IV</td></tr>
<tr><td>Paper No.</td><td colspan="7">Core VII</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td rowspan="2">23UCH7</td></tr>
<tr><td>Semester</td><td>IV</td></tr>
<tr><td>Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td></td><td>5</td><td>-</td><td colspan="3">-</td><td colspan="2">5</td></tr>
<tr><td>Prerequisites</td><td colspan="7">General Chemistry III</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">This course aims to provide a comprehensive knowledge on
Thermodynamic concepts on chemical processes and applied aspects.
thermo chemical calculations
Transition elements with reference to periodic properties and groupstudy of transition metals.
the organic chemistry of ethers, aldehydes and ketones
the organic chemistry of carboxylic acids</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I</td></tr>
<tr><td></td><td colspan="7">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.</td></tr>
<tr><td></td><td colspan="7">UNIT II</td></tr>
<tr><td></td><td colspan="7">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.</td></tr>
</table>

	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, Nickeland 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 $LiAH_4$ 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 $LiAlH_4$ and $NaBH_4$. 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. Claisen ester condensation, Decarboxylation, Hunsdiecker reaction. 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, 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.
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 and L.R. Sharma, *Principles of Physical Chemistry*, ShobanLal 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. 3. P.L. Soni and Mohan Katyal, *Textbook of Inorganic Chemistry*, SultanChand & 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 OrganicChemistry,* Macmillan India Ltd., third edition, 1994.

Reference Books	1. Maron, S. H, and Prutton C. P. *Principles of Physical Chemistry*,4th ed.; The Macmillan Company: Newyork,1972. 2. Lee, J. D. *Concise Inorganic Chemistry,* 4th ed.; ELBS WilliamHeinemann: London,1991. 3. Gurudeep Raj, *Advanced Inorganic Chemistry,* 26th ed.; GoelPublishing House: Meerut, 2001. 4. Atkins, P.W. & Paula, J. *Physical Chemistry*, 10th ed.; OxfordUniversity Press:New York, 2014. 5. Huheey, J. E. *Inorganic Chemistry: Principles of Structure and Reactivity,* 4th ed; Addison Wesley Publishing Company: India,1993.
Website ande-learning source	**MOOC components** https://nptel.ac.in/courses/112102255 Thermodynamics https://nptel.ac.in/courses/104101136 Advanced transition metal chemistry

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

CO1: explain the terms and processes in thermodynamics; discuss the various laws of thermodynamics and thermo chemical calculations.

CO2: discuss the second law of thermodynamics and its application to heat engine; discussthird 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 compoundsincluding 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	PSO 1	PSO 2	PSO 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
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

<table>
<tr><td>Title of the Course</td><td colspan="8">GRAVIMETRIC ANALYSIS PRACTICAL</td></tr>
<tr><td>Paper No.</td><td colspan="8">Core VIII</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td colspan="2" rowspan="2">23UCH8P</td></tr>
<tr><td>Semester</td><td>IV</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="3">Total</td></tr>
<tr><td>-</td><td>-</td><td colspan="3">5</td><td colspan="3">5</td></tr>
<tr><td>Prerequisites</td><td colspan="8">General Chemistry</td></tr>
<tr><td>Objectives of thecourse</td><td colspan="8">The course aims at providing an understanding of
• the laboratory experiments in order to understand the conceptsof gravimetric estimation of metal ions</td></tr>
<tr><td>Course Outline</td><td colspan="8">GRAVIMETRIC ANALYSIS
1. Estimation of calcium as calcium oxalate.
2. Estimation of barium as barium sulphate.
3. Estimation of barium as barium chromate.
4. Estimation of lead as lead sulphate.
5. Estimation of lead as lead chromate.
6. Estimation of nickel as nickel dimethylglyoxime complex.
7. Estimation of Mg as oxinate.
8. Estimation of Zinc as zinc thiocyanate</td></tr>
<tr><td>Skills acquired from this course</td><td colspan="8">Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</td></tr>
<tr><td>Reference Books</td><td colspan="8">1. Sindhu, P.S.Practicals in Physical Chemistry, Macmillan India :New Delhi, 2005.
2. Khosla, B. D.Garg,V. C.; Gulati, A.; Senior Practical PhysicalChemistry, R.Chand : New Delhi, 2011.
3. Gupta, Renu, Practical Physical Chemistry, 1st Ed.; New AgeInternational: New Delhi, 2017.</td></tr>
<tr><td>Website and e-learning source</td><td colspan="8">https://www.vlab.co.in/broad-area-chemical-sciences</td></tr>
</table>

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	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

Title of the Course	**SKILL ENHANCEMENT COURSE – VI NAN MUDHALVAN COURSE - III**						
Paper No.	**Skill Enhancement Course VI**						
Category	**SEC VI**	**Year**	II	**Credits**	2	**Course Code**	**23UCHNMC3**
		Semester	IV				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	2	-	-			2	
Prerequisites							

Title of the Course	VALUE EDUCATION AND GENDER STUDIES						
Paper No.	VE & GS						
Category		Year	II	Credits	2	Course Code	23UVEGS
		Semester	IV				
Instructional hours per week	Lecture	Tutorial	Lab Practice			Total	
	2	-	-			2	
Prerequisites							

<table>
<tr><td>Title of the Course</td><td colspan="7">Generic Elective – Allied Chemistry
FOR PHYSICS, BOTANY AND ZOOLOGY (Semester III & IV) STUDENTS</td></tr>
<tr><td>Paper No.</td><td colspan="7">Generic Elective EC III</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">GE</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">23UCHGE3</td></tr>
<tr><td>Semester</td><td>III & IV</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>4</td><td>-</td><td colspan="3">-</td><td colspan="2">4</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Higher secondary chemistry</td></tr>
<tr><td>Objectives ofthe course</td><td colspan="7">This course aims at providing an overall view of the
• To instruct the atomic orbitals and its hybridization
• To instruct the chemistry of alkanes, alkenes and alkynes
• To instruct the alcohols and carbonyl compounds
• To instruct the solutions and solid state
• To instruct the thermodynamics and phase rule</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I</td></tr>
<tr><td></td><td colspan="7">Atomic Structure and Chemical Bond

Electromagnetic Radiation and Spectrum – Wave mechanical concept and De Broglie equation – Heisenberg uncertainty principle – Schrodinger wave equation – Quantum numbers – Shapes of atomic orbitals – Energies of orbital – electron distribution in atoms – electronic configuration. Periodic Classification – classification of elements – periodic properties: size, atomic and ionic radius, ionization energy, electron affinity, electronegativity – Oxidation number – rules and calculation.

Types of bonds – Ionic bond, lattice energy, Born-Haber cycle – factors favouring the formation of ionic compounds – properties of ionic compounds - Covalent bond – overlap of orbitals – Resonance – Hybridization, types - valance bond theory- molecular orbital theory - bonding and anti-bonding orbitals, bond order.</td></tr>
<tr><td></td><td colspan="7">Unit II</td></tr>
<tr><td></td><td colspan="7">Nomenclature of Organic Compounds and Chemistry of Alkanes, Alkenes and Alkynes

Classification of organic compounds and nomenclare – electronic displacements in organic molecules – inductive effect, mesomeric effect resonance energy and effect of resonance – reactive intermediates: carbocations and carbonium ions, free radicals - Types, Preparation properties and uses of alkanes, alkrnes, alkynes and dienes. Conformation and configuration: representation, confirmation of ethane and n-butane.</td></tr>
<tr><td></td><td colspan="7">UNIT III</td></tr>
</table>

	Alcohols, phenols and carbonyl compounds distinction between primary and secondary and teriary alcohols – preparation and properties of alcohol - -chemistry of polyhydric alcohols: preparation, properties and uses of glycol and glycerol. Classification of phenol. Acidic nature – electrophilic substitution in phenols Aldehydes and ketones: Physical and chemical properties of aldehydes and ketones
	UNIT IV
	Solutions and Solid State Solution: Molarity, molality and normality. Types of solutions, solubility. Factors influencing the solubility, Hendrys law ad its applications. Colligative properties: lowering of vapour pressure, osmotic pressure, elevation of boiling point and depression of freezing point. Solids: Difference between solid, liquid and gases. Crystalline and amorphous solids. Crystallography: Symmetry elements, types of symmetry, unit plane, rational indices and miller indices. Types of crystal systems, space lattice and unit cell, X-ray analysis of crystal, Bragg's equation – simple body center and face center lattices - structure of NaCl and KCl – Liquid crystals: types and applications. Typical critical lattice,unit cell, elements of symmetry.
	UNIT V **Thermodynamics and Phase Rule** Basic terms, properties of a system. Thermodynamic process & types. Thermodynamic function: heat & work. First law of thermodynamics. Mathematical expression mechanical work, enthalpy, heat capacity. Need for second law of thermodynamics, statements, entropy and its significance. Work function and Helmholtz free energy. Chemical potential, endothermic and exothermic reaction. Vant hoff isotherm. Phase, component, degree of freedom, phase rule definition-phase diagram of one component and two component systems.
RecommendedText	1. R.B.Puri & L.R.Sharma, Principal of inorganic chemistry–,Sultan chand,1989. 2.M K Jain , Organic chemistry Shoban Nagin chand and co. 3.R.B.Purie & L.R.Sharma, physical chemistry
ReferenceBooks	2. P.L.Soni, Organic chemistry

Website and e-learningsource	

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO 1: learners are getting knowledge on Chemical Bonding
CO 2: Understand the Chemistry of alcohols and carbonyl compounds
CO 3: know the Chemistry of alkanes, alkenes and alkynes
CO 4: know the fundamentals of Solid state materials
CO 5: know about Thermodynamics and Phase rule

	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	**PSO 1**	**PSO 2**	**PSO 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
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

<table>
<tr><td>Title of the Course</td><td colspan="7">GENERIC ELECTIVE CHEMISTRY PRACTICAL

For Physics, Botany and Zoology (III & IV Semester) Students</td></tr>
<tr><td>Paper No.</td><td colspan="7">Generic Elective EC IV</td></tr>
<tr><td>Category</td><td>Generic Elective</td><td>Year
Semester</td><td>II
III & IV</td><td>Credits</td><td>3</td><td>Course Code</td><td>23UCHGE4P</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>-</td><td>1</td><td colspan="3">3</td><td colspan="2">4</td></tr>
<tr><td>Prerequisites</td><td colspan="7"></td></tr>
<tr><td>Objectives of thecourse</td><td colspan="7">This course aims to provide knowledge on the
• basics of preparation of solutions.
• principles and practical experience of volumetric analysis
• identification of organic functional groups
• different types of organic compounds with respect to theirproperties.
• determination of elements in organic compounds..</td></tr>
<tr><td>Course Outline</td><td colspan="7">VOLUMETRIC ANALYSIS
8. Estimation of sodium hydroxide using standard sodium carbonate.
9. Estimation of hydrochloric acid using standard oxalic acid.
10. Estimation of ferrous sulphate using standard Mohr's salt.
11. Estimation of oxalic acid using standard ferrous sulphate.
12. Estimation of potassium permanganate using standard sodium hydroxide.
13. Estimation of magnesium using EDTA.
14. Estimation of ferrous ion using diphenyl amine as indicator.</td></tr>
</table>

	SYSTEMATIC ANALYSIS OF ORGANIC COMPOUNDS The analysis must be carried out as follows:
	(d) Functional group tests [phenol, acids (mono & di) aromatic primary amine, amides (mono & di), aldehydeand glucose]. (e) Detection of elements (N, S, Halogens). (f) To distinguish between aliphatic and aromaticcompounds. To distinguish – Saturated and unsaturated compounds.
Course Learning Outcomes (for Mapping with POs and PSOs) **On completion of the course the students should be able to** CO 1: gain an understanding of the use of standard flask and volumetric pipettes, burette.CO 2: design, carry out, record and interpret the results of volumetric titration. CO 3: analyze the chemical constituents in allied chemical products. CO4: carry out, record and interpret the results of organic analysis.	

CO /PSO	PSO 1	PSO 2	PSO 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
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to PSOs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CO /PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PO's and CO's

SEMESTER – V

<table>
<tr><td>Title of the Course</td><td colspan="8">ORGANIC CHEMISTRY - I</td></tr>
<tr><td>Paper No.</td><td colspan="8">Core IX</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td colspan="2" rowspan="2">23UCH9</td></tr>
<tr><td>Semester</td><td>V</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>5</td><td>-</td><td colspan="3">-</td><td colspan="2">5</td></tr>
<tr><td>Prerequisites</td><td colspan="8">General Chemistry I,II, III and IV</td></tr>
<tr><td>Objectives of thecourse</td><td colspan="8">This course aims to provide an understanding of
stereoisomerism in chirals and geometric isomerism in olefins,conformations of ethane and butane
preparation and properties of aromatic and aliphatic nitr ocompounds 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.</td></tr>
<tr><td>Course Outline</td><td colspan="8">UNIT I
Stereochemistry
Fischer Projection, Newmann and Sawhorse Projection formulae and their interconversions;
Geometrical isomerism:cis–trans, syn-anti isomerism and 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, butane and cyclohexane.</td></tr>
</table>

	UNIT II **Chemistry of Nitrogen Compounds – I** **Nitroalkanes** Nomenclature, isomerism, preparation from alkyl halides, halo acids, alkanes; physical properties; reactions – reduction, halogenations, Grignard reagent, Pseudo acid character. Nitro - aci nitro tautomerism. **Aromatic nitro compounds** Nomenclature, preparation – nitration, from diazonium salts, physical properties; reactions - reduction of nitrobenzene in different medium, Electrophilic substitution reactions, TNT. **Amines: Aliphatic amines** Nomenclature, isomerism, preparation – Hofmanns' degradation reaction, Gabriel's phthalimide synthesis, Curtius Schmidt rearrangement. Physical properties, reactions – alkylation, acylation, carbylamine reaction, Mannich reaction, oxidation, basicity of amines.
	UNIT III - Chemistry of Nitrogen Compounds – II
	Aromatic amines – Nomenclature, preparation – from nitro compounds, Hofmann's method; Schmidt reaction, properties - basic nature, ortho effect; reactions – alkylation, acylation, carbylamine reaction, reaction with nitrous acid, aldehydes, oxidation, Electrophilic substitution reactions, diazotization and coupling reactions; sulphanilic acid - zwitter ion formation. Distinction between primary, secondary and tertiary amines – aliphatic and aromatic Diazonium compounds Diazomethane, Benzene diazonium chloride - preparations and synthetic applications. **Dyes** Theory of colour and constitution; classification based on structure and application; preparation –methyl orange, alizarin, malachite green.

	UNIT IV **Heterocyclic compounds** Nomenclature and classification. General characteristics – aromatic character and reactivity. Five-membered heterocyclic compounds Pyrrole – preparation - from succinimide, Paal Knorr synthesis; reactions – reduction, basic character, acidic character, electrophilic substitution reactions, ring opening. Furan – preparation from mucic acid and pentosan; reactions – hydrogenation, reaction with oxygen, Diels Alder reactions, formation of thiophene and pyrrole; Electrophilic substitution reaction.
	UNIT V **Six-membered heterocyclic compounds** Pyridine – synthesis - from acetylene, Physical properties; reactions - basic character, oxidation, reduction, electrophilic substitution reactions; nucleophilic substitution- uses Condensed ring systems Quinoline – preparation - Skraup synthesis and Friedlander's synthesis; reactions – basic nature, Chichibabin reaction Isoquinoline – preparation by the Bischler – Napieralski reaction.
Extended Professional Component (is a part of internal component only, Not to be includedin 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.M.K. Jain, S.C.Sharma, Modern Organic Chemistry, Vishal 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, WesleyLongman 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 3. http:/swayam.gov.in 4. 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 ofethane and butane.

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

CO3: explain colour and constitution of dyes and food additives

CO4: discuss preparation and properties of five membered heterocycles like pyrrole, furanand 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	PSO 1	PSO 2	PSO 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
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

<table>
<tr><td>Title of the Course</td><td colspan="7">PHYSICAL CHEMISTRY - I</td></tr>
<tr><td>Paper No.</td><td colspan="7">Core X</td></tr>
<tr><td>Category</td><td>Core</td><td>Year
Semester</td><td>III
V</td><td>Credits</td><td>4</td><td>Course Code</td><td>23UCH10</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>5</td><td>-</td><td colspan="2">-</td><td colspan="2">5</td></tr>
<tr><td>Prerequisites</td><td colspan="7">General Chemistry I,II,III and IV</td></tr>
<tr><td>Objectives of thecourse</td><td colspan="7">The course aims at providing an overall view of
• Gibbs free energy, Helmholtz free energy, Ellingham’s diagramand partial molar properties
• chemical kinetics and different types of chemical reactions
• adsorption, homogeneous and heterogeneous catalysis
• colloids and macromolecules • photochemistry, fluorescence and phosphorescence</td></tr>
<tr><td>Course Outline</td><td colspan="7">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, GibbsDuhem-Margules equation.</td></tr>
</table>

	UNIT II – Chemical Kinetics 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
	UNIT III **Surface Chemistry:** Adsorption – Chemical and physical adsorption and their general characteristics- distinction between them Different types of isotherms – Freundlich and Langmuir. Adsorption isotherms and their limitations – BET theory, kinetics of enzyme catalysed reaction –Michaelis- Menten and Briggs-Haldene equation. 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:** 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
Extended Professional Component (is a part of internal component only, Not to be includedin 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 and L.R. Sharma, Principles of Physical Chemistry,Shoban Lal Nagin Chand and Co., forty eighth edition, 2021. 2. Peter Atkins, and Julio de Paula, James Keeler, Physical Chemistry, Oxford University press, International eleventhedition, 2018. 3. ArunBahl, B.S. Bahl, G. D. Tuli Essentials of physicalchemistry, 28^{th} edition 2019, S, Chand & Co. 4. 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	1. J. Rajaram and J.C. Kuriacose, Chemical Thermodynamics,Pearson, 1st edition, 2013. 2. Keith J. Laidler, Chemical kinetics, third edition, Pearson, 2003. 3. P. W. Atkins, and Julio de Paula, Physical Chemistry, OxfordUniversity press, seventh edition, 2002. 4. K. L. Kapoor, A Textbook of Physical Chemistry, Macmillan
	India Ltd, third edition, 2009. 5. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Shobanlal Nagin Chand and Co. Jalendhar,forty first, edition, 2001
Website and e-learning source	1. https://nptel.ac.in 2. https://swayam.gov.in 3. www.epgpathshala.nic.in

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: explain Gibbs and Helmholtz free energy functions, partial molar quantities and Ellinghams

CO2: apply the concepts of chemical kinetics to predict the rate of the reaction and order ofthe 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	PSO 1	PSO 2	PSO 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
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

<table>
<tr><td>Title of the Course</td><td colspan="7">PHYSICAL CHEMISTRY PRACTICAL</td></tr>
<tr><td>Paper No.</td><td colspan="7">Core XI</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td>Credits</td><td>4</td><td>Course Code</td><td>23UCH11P</td></tr>
<tr><td>Semester</td><td>V</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>-</td><td>2</td><td colspan="3">3</td><td colspan="2">5</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Basic knowledge of physical chemistry</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">To understand the principle of conductivity experiments through conductometric titrations.
To evaluate the order of the reaction, temperature coefficient, and activation energy of the reaction by following pseudo first order kinetics.
To construct the phase diagram of two component system forming congruent melting solid and find its eutectic temperatures and compositions.
To determine the kinetics of adsorption of oxalic acid on charcoal.
To develop the potential energy diagram of hydrogen ion, charge density distribution and Maxwell’s speed distribution by computational calculation.
To determine the molecular weightthe laboratory experiments in order to understand the conceptsof physical changes in chemistry
To determine the rates of chemical reactions colligative properties</td></tr>
<tr><td rowspan="2">Course Outline</td><td colspan="7">UNIT-I: Conductivity Experiments
1.Determination of equivalent conductance of a strong electrolyte & the verification of DHO equation.
2. Verification of Ostwald’s Dilution Law & Determination of pKa of a weak acid.
3. Acid-base titration (strong acid and weak acid vs NaOH).
4. Potentiometric Titrations</td></tr>
<tr><td colspan="7">UNIT-II: Kinetics
1. Study the kinetics of acid hydrolysis of an ester, determine the temperature coefficient and also the activation energy of the reaction.
2. Study the kinetics of the reaction between acetone and iodine in acidic medium by half-life method and determine the order with respect to iodine and acetone.</td></tr>
</table>

	UNIT-III: Heat Molecular weight Determination: Rast's method : Naphthalene, m-dinitrobenzene and diphenyl as solvents. Critical solution temperature of phenol-water system Effect of impurity on CST(1% NaCl or 2% succinic acid solutions) Simple eutectic system: Naphthalene – Biphenyl, Napthalene Diphenylamine Determination of transition temperature: Sodium acetate, Sodium thiosulphate,$SrCl_2.6H_2O$ & $MnCl_24H_2O$ Construction of phase diagram for a simple binary system 1. Naphthalene-phenanthrene 2. Benzophenone- diphenyl amine **Adsorption** Adsorption of oxalic acid on charcoal & determination of surface area (Freundlich isotherm only).
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. B. Viswanathan and P.S.Raghavan, Practical Physical Chemistry, Viva Books, New Delhi, 2009. 2. Sundaram, Krishnan, Raghavan, Practical Chemistry (Part II), S. Viswanathan Co. Pvt., 1996. 3. V.D. Athawale and Parul Mathur, Experimental Physical Chemistry, New Age International (P) Ltd., New Delhi, 2008. 4. E.G. Lewers, Computational Chemistry: Introduction to the Theory and Applications of Molecular and Quantum Mechanics, 2nd Ed., Springer, New York, 2011.
Reference Books	1. J. B. Yadav, Advanced Practical Physical Chemistry, Goel Publishing House, 2001. 2. G.W. Garland, J.W. Nibler, D.P. Shoemaker, Experiments in Physical Chemistry, 8th edition, McGraw Hill, 2009. 3. J. N. Gurthu and R. Kapoor, Advanced Experimental Chemistry, S. Chand and Co., 1987. 4. Shailendra K Sinha, Physical Chemistry: A laboratory Manual, Narosa Publishing House Pvt, Ltd., New Delhi, 2014.

	5. F. Jensen, Introduction to Computational Chemistry, 3rd Ed., Wiley-Blackwell.
Website and e-learning source	https://web.iitd.ac.in/~nkurur/2015-16/Isem/cmp511/lab_handout_new.pdf

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able:

CO1: To recall the principles associated with various physical chemistry experiments.

CO2: To scientifically plan and perform all the experiments.

CO3: To observe and record systematically the readings in all the experiments.

CO4: To calculate and process the experimentally measured values and compare with graphical data.

CO5: To interpret the experimental data scientifically to improve students' efficiency for societal developments.

CO-PO Mapping (Course Articulation Matrix)

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

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 - Low

Title of the Course	**PROJECT (WITH VIVA-VOCE)**						
Paper No.	**Core XII**						
Category	**Core**	**Year**	III	**Credits**	4	**Course Code**	**23UCH12PW**
		Semester	V				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	-		5			5	

<table>
<tr><td>Title of the Course</td><td colspan="7">PRINCIPLES OF INORGANIC CHEMISTRY</td></tr>
<tr><td>Paper No.</td><td colspan="7">DICIPLINE SPECIFIC ELECTIVE I</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">DSE I</td><td>Year</td><td>III</td><td>Credits</td><td>3</td><td>Course Code</td><td>23UCHE1A</td></tr>
<tr><td>Semester</td><td>V</td><td colspan="4"></td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>4</td><td>-</td><td colspan="3">-</td><td colspan="2">4</td></tr>
<tr><td>Prerequisites</td><td colspan="7">General Chemistry I , II, III and IV</td></tr>
<tr><td>Objectives of thecourse</td><td colspan="7">The course aims to provide knowledge on
• nomenclature, isomerism and theory of coordination compounds, and chelate complexes
• crystal field theory, magnetic properties, stability of complexesand Jahn Teller effect
• preparation and properties of metal carbonyls
• Lanthanoids and actinoids
• preparation and properties of inorganic polymers</td></tr>
<tr><td>Course Outline</td><td colspan="7">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.
Crystal field theory –Crystal field splitting of energy levels in octahedral and tetrahedral complexes, Crystal field stabilization energy (CFSE), spectrochemical series - calculation of CFSE in octahedral and tetrahedral complexes - factors influencing the magnitude of crystal field splitting, crystal field effect on ionic radii, lattice energies, heats of ligation with water as a ligand (heat of hydration), interpretation of magnetic properties, spectra of $[Ti(H_2O)6]^{3+}$ - Jahn – Teller effect.</td></tr>
<tr><td></td><td colspan="7">Unit II
Co-ordination Chemistry - II

Stability of complexes in aqueous solution, types of ligands stability constants- factors affecting the stability of a complex ion, thermodynamic and kinetic stability (elementary idea). Comparison of VBT and CFT.
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 ofhardness of water using EDTA, metal ion indicators.
Role of metal chelates in living systems – haemoglobin and</td></tr>
</table>

	chlorophyll
	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. 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 includedin 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 InorganicChemistry, 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, ELBSWilliam 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	1. Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry,2nd ed ., S.Chand and Company, New Delhi. 2. Gopalan R, (2009) Inorganic Chemistry for Undergraduates, IstEdition, University Press (India) Private Limited,Hyderabad 3. Sivasankar B, (2013) Inorganic Chemistry.Ist Edition, Pearson,Chennai 4. Alan G. Sharp (1992), Inorganic Chemistry, 3rd Edition, Addition-Wesley, England 5. Peter Atkins, Tina Overton, Jonathan Rourke and Mark Weller, Inorganic Chemistry, Oxford University Press, sixth edition, 2014.
Website and e-learning source	1. www.epgpathshala.nic.in 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	PSO 1	PSO 2	PSO 3	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

<table>
<tr><td>Title of theCourse</td><td colspan="8">INDUSTRIAL CHEMISTRY</td></tr>
<tr><td>Paper No.</td><td colspan="8">DICIPLINE SPECIFIC ELECTIVE I</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">DSE I</td><td>Year</td><td>III</td><td>Credits</td><td>3</td><td>Course Code</td><td colspan="2">23UCHE1B</td></tr>
<tr><td>Semester</td><td>V</td><td colspan="5"></td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="3">Total</td></tr>
<tr><td>4</td><td>-</td><td colspan="3">-</td><td colspan="3">4</td></tr>
<tr><td>Prerequisites</td><td colspan="8">General Chemistry I,II, III and IV</td></tr>
<tr><td>Objectives of the course</td><td colspan="8">This course is designed to provide knowledge on
classifications and characteristics of fuels
preparation of cosmetics
manufacture of sugar, paper, cement and leather and food processing
applications of abrasives, lubricants and other industrial products
intellectual property rights</td></tr>
<tr><td>Course Outline</td><td colspan="8">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, producergas, carburetted water gas - preparations - uses.

Natural gas: LPG-composition, advantages, application; gobar gas-production, composition, advantages, application. Propellants – rocket fuels (basic idea)</td></tr>
</table>

	UNIT II **Cosmetics** Skin care: powders, ingredients; creams and lotion-cleansing, moisturizing, 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-classification- esters-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; testingand 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, boronnitride, synthetic graphite – composition and uses. **Leather Industry** Structure and composition of skin, hide; Manufacture of leather – pre- tanning process – curing, liming, beating, pickling; methods of tanning- vegetable, chrome – one bath, two bath process; finishing. **Paper Industry** Manufacture of pulp - mechanical, chemical processes; sulphate pulp, rag pulp; manufacture of paper- beating, refining, filling, sizing, colouring, calendaring; cardboard.
	UNIT V **Lubricants** Definition, classification-liquid, semi-solid, solid and synthetic; properties-viscosity index, flash point, cloud point, pour point,aniline point 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 Professional Component (is a part of internal component only, Not to be includedin the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

Recommended Text	1. Sharma, B.K. *Industrial Chemistry*, 9th ed.; Goel Publishing House:Meerut, 1998. 2. Wilkinson, J.B.E. Moore, R.J. *Harry's Cosmeticology*, 7th ed.;Chemical Publishers : New York, 1982. 3. Alex V. Ramani, *Food Chemistry*, MJP publishers: Chennai, 2009. 4. Jayashree Ghosh, *Applied Chemsitry*, S. Chand : New Delhi, 2006. 5. Srilakshmi, B. *Food Science*, 4th ed.; New Age InternationalPublication, 2005.
Reference Books	1. Jain, P.C.; Jain, M. *Engineering Chemistry*, 16th ed.; Dhanapet Rai: Delhi, 1992 2. George Howard, *Principles and Practice of Perfumes and Cosmetics*,Stanley Therones, Cheltenham: UK, 1987. 3. Thankamma Jacob, *Foods, Drugs and Cosmetics - A ConsumerGuide*, Macmillan : London, 1997. 4. ShankuntalaManay, N.; Shadaksharaswamy, M. *Food Facts andPrinciples*, 3rd ed.; New Age Publication, 2008. 5. Neeraj Pandey, KhushdeepDharni, *Intellectual Property Rights*, PHILearning, 2014.
Website and e-learning source	1. http://www.sciencecases.org/irradiation/irradiation_notes.asp 2. http://discovery.kcpc.usyd.edu.au//9.5.5/ 3. https://www.wipo.int/about-ip/en/ 4.www.nptel.ac.in 5. http:/swayam.gov.in

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: summarize the properties of fuels which include petroleum, water gas, natural gas andpropellents

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 propertyrights

	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	PSO 1	PSO 2	PSO 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
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

<table>
<tr><td>Title of theCourse</td><td colspan="7">WATER TREATMENT
AND ANALYSIS
(ONLINE MODE EXAM)</td></tr>
<tr><td>Paper No.</td><td colspan="7">DICIPLINE SPECIFIC ELECTIVE II</td></tr>
<tr><td>Category</td><td>DSE II</td><td>Year
Semester</td><td>III
V</td><td>Credits</td><td>3</td><td>Course Code</td><td>23UCHE2A</td></tr>
<tr><td>Instructional hours per week</td><td>Lecture
4</td><td>Tutorial
-</td><td colspan="2">Lab Practice
-</td><td colspan="3">Total
4</td></tr>
<tr><td>Prerequisites</td><td colspan="7">General Chemistry I,II, III and IV</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">This course is designed to provide knowledge on
classifications of hardness and sterilization
titration method- clark’s process
electrodiaysis and water treatment.
Methods of water analysis
water pollution, B.O.D and C.O.D</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I - Characteristics of water
Introduction - characteristics of water - alkalinity - hardness - unit of hardness - Total solids - Oxidation - transparency - Silica content. -Purification of water for drinking purpose - potability of water - clarification – coagulation, sterilization & disinfection of water - precipitation - ozonisation - Chlorination.</td></tr>
</table>

	UNIT II - Methods of water softening Water softening methods - Clark‘s process - lime soda process - modified lime soda process - permutit or zeolite process - Ion exchange process - demineralization of water. - Determination of hardness of water - Titration method - complexometric method using EDTA - expressing hardness - equivalents of calcium carbonate - problems to determine temporary & permanent hardness.
	UNIT III - Water treatment Hard water and industries - industrial water treatment - boiler feed water method of softening - prevention of plumbo solvency - scales in boilers - consequences - internal conditioning methods. Desalination of brackish water - elecrodiaysis - Reverse osmosis. Modern technologies used in water treatment: Nanotechnology, UV purification, Acoustic nanotube technology and sunspring system.
	UNIT IV - Water analysis Water analysis - sampling of water for analysis - chemical substances affecting potability - colour, turbidity odour, taste, temperature, pH and electrical conductivity. Analysis of solids present in water - suspended solids - dissolved solids - total acidity - alkalinity - free CO_2 - free chlorine - Ca, Mg, Fe, Mn, Ag & Zn. Determination of total mass and total activity of water – Spectrophotometric method, Fluorimetric method, Gross alpha method.
	UNIT V - Water pollution Water pollution: Hydrological cycle –aquatic environment-classification of water pollution – organic pollutants, inorganic pollutants, sediments, radioactive materials, Analysis of chemical

	substances affecting health - NH3, Nitrate, Nitrite, cyanide, sulphate, sulphide, chloride, fluoride - measurement of toxic chemical substances - analysis of chemical substances indicative of pollution - Dissolved oxygen - Bio Chemical Oxygen Demand (BOD) - Chemical Oxygen Demand (COD).
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Sharma, B.K. *Industrial Chemistry*, 9th ed.; Goel Publishing House:Meerut, 1998. 2. Wilkinson, J.B.E. Moore, R.J. *Harry's Cosmeticology*, 7th ed.;Chemical Publishers : New York, 1982. 3. Alex V. Ramani, *Food Chemistry,* MJP publishers: Chennai, 2009. 4. Jayashree Ghosh, *Applied Chemsitry*, S. Chand : New Delhi, 2006. 5. Srilakshmi, B. *Food Science*, 4th ed.; New Age InternationalPublication, 2005.
Reference Books	6. Jain, P.C.; Jain, M. *Engineering Chemistry*, 16th ed.; Dhanapet Rai: Delhi, 1992 7. George Howard, *Principles and Practice of Perfumes and Cosmetics*,Stanley Therones, Cheltenham: UK, 1987. 8. Thankamma Jacob, *Foods, Drugs and Cosmetics - A ConsumerGuide*, Macmillan : London, 1997. 9. ShankuntalaManay, N.; Shadaksharaswamy, M. *Food Facts andPrinciples*, 3rd ed.; New Age Publication, 2008. 10. Neeraj Pandey, KhushdeepDharni, *Intellectual Property Rights*, PHILearning, 2014.

Website and e-learning source	1. http://www.sciencecases.org/irradiation/irradiation_notes.asp 2. 3. http://discovery.kcpc.usyd.edu.au//9.5.5/ 4. 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 water
CO2: explain the titration of clark process.
CO3: explain the electro analysis and water treatment
CO4: explain the water analysis process
CO5: explain the BOD and COD

	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	PSO 1	PSO 2	PSO 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
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

<table>
<tr><td>Title of the Course</td><td colspan="7">BIOCHEMISTRY (ONLINE MODE EXAM)</td></tr>
<tr><td>Paper No.</td><td colspan="7">DICIPLINE SPECIFIC ELECTIVE II</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">DSE II</td><td>Year</td><td>III</td><td>Credits</td><td>3</td><td>Course Code</td><td>23UCHE2B</td></tr>
<tr><td>Semester</td><td>V</td><td colspan="4"></td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>4</td><td></td><td colspan="3">-</td><td colspan="2">4</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Organic Chemistry - I</td></tr>
<tr><td>Objectives of the</td><td colspan="7">The course aims at providing knowledge on</td></tr>
<tr><td>course</td><td colspan="7">• relationship between biochemistry and medicine, composition ofblood
• 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</td></tr>
<tr><td>Course Outline</td><td colspan="7">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.</td></tr>
<tr><td></td><td colspan="7">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.</td></tr>
</table>

	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 Professional Component (is a part of internal component only, Not to be includedin the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

Recommended Text	1. Bahl, B. S.; Bhal, A. *Advanced Organic Chemistry*, 3rd ed.; S. Chand: 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*,6th ed.; Published by the author, 1999. 4. Veerakumari, L. *Biochemistry*, 1st ed.; MJP Publications: Chennai,2004. 5. Jain, J. L.; *Fundamentals of Biochemistry*, 2nd ed.; S.Chand: New Delhi, 1983.
Reference Books	1. Conn, E. E.; Stumpf, P. K. *Outline of Biochemistry*, 5th ed.; WileyEastern: New Delhi, 2002. 2. West, E. S.; Todd, W. R.; Mason, H. S.; Van Bruggen, J. T. *Text Bookof Biochemistry*, 4th ed.; Macmillan: New York, 1970. 3. Lehninger, A. L. *Principles of Biochemistry*, 2nd ed.; CBS Publisher:Delhi, 1993. 4. Rastogi, S. C. *Biochemistry*, 2nd ed.; Tata McGraw-Hill: New Delhi, 2003. 5. Chatterjea, M. N.; Shinde, R. *Textbook of Medical Biochemistry*, 5th ed.; Jaypee Brothers: New Delhi, 2002.
Website and e-learning source	1) http://library.med.utah.edu/NetBiochem/nucacids.html 2)http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/E/EnzymeKinetics.html 3) https://swayam.gov.in/courses/4384-biochemistry Biochemistry 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 peptidesand 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	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to PSOs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

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

Level of Correlation between PO's and CO's

Title of the Course	**SKILL ENHANCEMENT COURSE – VII NAN MUDHALVAN COURSE - IV**						
Paper No.	**Skill Enhancement Course VII**						
Category	**SEC VII**	**Year**	II	**Credits**	2	**Course Code**	**23UCHNMC4**
		Semester	V				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	2	-	-			2	
Prerequisites							

Title of the Course	**SUMMER INTERNSHIP / INDUSTRIAL TRAINING**						
Paper No.	**Internship or Industrial Training**						
Category	**IT**	**Year**	II	**Credits**	2	**Course Code**	**23UIT**
		Semester	V				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
		-	-				
Prerequisites							

SEMESTER – VI

<table>
<tr><td>Title of the Course</td><td colspan="8">ORGANIC CHEMISTRY - II</td></tr>
<tr><td>Paper No.</td><td colspan="8">Core XIII</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td>Credits</td><td>4</td><td>Course Code</td><td colspan="2">23UCH13</td></tr>
<tr><td>Semester</td><td>VI</td><td colspan="5"></td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="3">Total</td></tr>
<tr><td>6</td><td></td><td colspan="3">-</td><td colspan="3">6</td></tr>
<tr><td>Prerequisites</td><td colspan="8">Organic Chemistry – I</td></tr>
<tr><td>Objectives of thecourse</td><td colspan="8">This course aims at providing knowledge on
classification, isolation and discussing the properties ofalkaloids and terpenes
preparation and properties of saccharides
biomolecules
different molecular rearrangement
preparation and properties of organometallic compounds</td></tr>
<tr><td rowspan="2">Course Outline</td><td colspan="8">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.</td></tr>
<tr><td colspan="8">UNIT II
Carbohydrates
Definition and Classification of Carbohydrates with examples. Relative configuration of sugars. Determination of configuration (Fischer’sProof). Definition of enantiomers, diastereomers, epimers and anomers with suitable examples.
Monosaccharides– configuration– D and L hexoses – aldohexoses andketohexoses.
Glucose, Fructose – Occurrence, preparation, properties, reactions,structural elucidation, uses.
Interconversions of sugar series –aldose to ketose and ketose to aldose.
Disaccharides – sucrose, lactose, maltose - preparation, properties anduses (no structural elucidation).
Polysaccharides –starch and cellulose, heteropolysaccharides – hyaluronic acid, heparin.</td></tr>
</table>

	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, DIBAL, DMAP,NBS/NCS, NMP, PCC
	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 andultra-sound in chemical synthesis.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. M.K.Jain, S. C.Sharma, Modern Organic Chemistry, Vishal Publishing, 4th reprint,2009. 2 S.M. Mukherji, and S.P. Singh, Reaction Mechanism in OrganicChemistry, Macmillan IndiaLtd., 3rd edition,2009 3 Arun Bahl and B.S. Bahl, Advanced organic chemistry, NewDelhi, 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, 29th edition, 2007.

	5. C Bandyopadhya; An Insight into Green Chemistry; Published on2020
Reference Books	1. R. T. Morrison and R. N. Boyd, Organic Chemistry, Pearson Education, Asia,6th edition, 2012. 2. T.W.Graham Solomons, Organic Chemistry, John Wiley & Sons,11th edition, 2012. 3. A. Carey Francis, Organic Chemistry, Tata McGraw-HillEducation Pvt. Ltd., New Delhi,7th edition,2009. 4. I. L. Finar, Organic Chemistry, Vol. (1& 2), England, Wesley Longman Ltd, 6th edition, 2006. 5. J. A. Joule, and G. F. Smith, Heterocyclic Chemistry, Wiley, 5th Edition, 2010.
Website and e-learning source	1.www.epgpathshala.nic.in 2.www.nptel.ac.in 3.http:/swayam.gov.in 4. Virtual Textbook of Organic Chemistry 5. https://vlab.amrita.edu/

Course 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	PSO 1	PSO 2	PSO 3	PSO 4	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

<table>
<tr><td>Title of the Course</td><td colspan="8">INORGANIC CHEMISTRY – I</td></tr>
<tr><td>Paper No.</td><td colspan="8">Core XIV</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td colspan="2" rowspan="2">23UCH14</td></tr>
<tr><td>Semester</td><td>VI</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="3">Total</td></tr>
<tr><td>6</td><td></td><td colspan="3">-</td><td colspan="3">6</td></tr>
<tr><td>Prerequisites</td><td>Inorganic</td><td colspan="2">Chemistry – I</td><td></td><td></td><td></td><td colspan="2"></td></tr>
<tr><td>Objectives of thecourse</td><td colspan="8">The course aims to provide knowledge on
• 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</td></tr>
<tr><td rowspan="3">Course Outline</td><td colspan="8">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.</td></tr>
<tr><td colspan="8">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.</td></tr>
<tr><td colspan="8">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.</td></tr>
</table>

	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 includedin 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 InorganicChemistry, 31th ed., Milestone Publishers & Distributors, Delhi.
	2. Satya Prakash, Tuli G. D., Basu S. K., Madan R. D. (2009), AdvancdInorganic Chemistry, 18th Edition, S. Chand & Co., New Delhi 3. Lee J D, (1991), Concise Inorganic Chemistry, 4th ed., ELBS WilliamHeinemann, London. 4. W V Malik, G D Tuli, R D Madan, (2000), Selected Topics in Inorganic Chemistry, Schand and Company Ltd. 5. A. K. De, Text book of Inorganic Chemistry, Wiley East Ltd, seventhedition, 1992

Reference Books	1. Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry,2nded., S.Chand and Company, New Delhi. 2. Gopalan R, (2009) Inorganic Chemistry for Undergraduates, IstEdition, University Press (India) Private Limited, Hyderabad 3. Sivasankar B, (2013) Inorganic Chemistry. Ist Edition, Pearson,Chennai 4. Alan G. Sharp (1992), Inorganic Chemistry, 3rd Edition, Addition-Wesley, England 5. Peter Atkins, Tina Overton, Jonathan Rourke and Mark Weller, Inorganic Chemistry, Oxford University Press, sixth edition, 2014.
Website and e-learning source	1. www.epgpathshala.nic.in 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: 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	PSO 1	PSO 2	PSO 3	PSO 4	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

<table>
<tr><td>Title of the Course</td><td colspan="7">APPLIED EXPERIMENTS IN CHEMISTRY (PRACTICAL)</td></tr>
<tr><td>Paper No.</td><td colspan="7">Core XV</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td>Course Code</td><td>23UCH15P</td></tr>
<tr><td>Semester</td><td>VI</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>-</td><td>3</td><td colspan="3">3</td><td colspan="2">6</td></tr>
<tr><td>Prerequisites</td><td colspan="7">General Chemistry</td></tr>
<tr><td>Objectives of thecourse</td><td colspan="7">The course aims at providing an understanding of
• To learn the applications of volumetric analysis in consumer product.
• To learn the applications of complexometric titrations.
• To understand estimation of hardness, alkalinity and chlorine in water.</td></tr>
<tr><td>Course Outline</td><td colspan="7">TITRIMETRIC QUANTITATIVE ANALYSIS AND PREPARATIONS:
1. Estimation of total hardness of water by EDTA method.
2. Determination of mixture of alkalis by indicator method
3. Estimation of chloride ion in water (in acidic and alkaline medium).
4. Estimation of calcium in commercial milk powder by EDTA method.
5. Estimation of Mg (II) in water by EDTA method.
6. Estimation of chlorine in bleaching powder.
7. Estimation of saponification value of an oil.
8. Preparation of distilled and deionized water.
9. Elementary colorimetric estimation
10.Preparations of chemistry molecules from plants and herbs
11.Analysis of functional group present in the phytochemicals derived from plants and herbs</td></tr>
<tr><td>Skills acquired from this course</td><td colspan="7">Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</td></tr>
<tr><td>Reference Books</td><td colspan="7">1.Venkateswaran V. Veerasamy R. Kulandaivelu A.R.,
Basic principles of Practical Chemistry, 2nd edition, New Delhi, Sultan Chand & sons (1997)</td></tr>
<tr><td>Website and e-learning source</td><td colspan="7">https://www.vlab.co.in/broad-area-chemical-sciences</td></tr>
</table>

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	PSO 1	PSO 2	PSO 3	PSO 4	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

	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	PSO 1	PSO 2	PSO 3	PSO 4	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

<table>
<tr><td>Title of the Course</td><td colspan="7">ESSENTIALS OF PHYSICAL CHEMISTRY</td></tr>
<tr><td>Paper No.</td><td colspan="7">DICIPLINE SPECIFIC ELECTIVE III</td></tr>
<tr><td>Category</td><td>DSE III</td><td>Year
Semester</td><td>III
VI</td><td>Credits</td><td>3</td><td>Course Code</td><td>23UCHE3A</td></tr>
<tr><td>Instructional hours per week</td><td>Lecture
5</td><td>Tutorial
-</td><td colspan="2">Lab Practice
-</td><td colspan="3">Total
5</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Physical Chemistry - I</td></tr>
<tr><td>Objectives of thecourse</td><td colspan="7">The course aims at providing an overall view of the
• phase diagram of one and two component systems
• chemical equilibrium,
• separation techniques for binary liquid mixtures.
• electrical conductance and transport number.
• galvanic cells, EMF and significance of electrochemicalseries.</td></tr>
<tr><td>Course Outline</td><td colspan="7">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.</td></tr>
<tr><td></td><td colspan="7">UNIT II
Chemical equilibrium
Law of mass action – thermodynamic derivation – relationship between $K_p$and K_C –application to the homogeneous equilibria – dissociation of PCl_5 gas,N_2O_4 gas –equilibrium constant and degree of dissociation - formation of HI, NH_3 ,and SO_3 – heterogeneous equilibrium – decomposition of solid calcium carbonate –Lechatelier principle – van’t Hoff reaction isotherm – temperature dependence of equilibrium constant – van’t Hoff reaction isochore – Clayperon equation – ClausiusClayperon equation and its applications</td></tr>
<tr><td></td><td colspan="7">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.</td></tr>
</table>

	UNIT IV **Electrical Conductance and Transference** Arrhenius theory of electrolytic dissociation – Ostwald's dilution law, limitations of Arrhenius theory; behavior of strong electrolytes – interionic effects – Debye Huckel theory –Onsager equation (no derivation), significance of Onsager equation, Debye Falkenhagen effect, Wien effect. Ionic mobility – Discharge of ions on electrolysis (Hittorf's theoretical device), transport number –determination – Hittorf's method, moving boundary method – factors affecting transport number – determination of ionic mobility; Kohlrausch's law- applications; molar ionic conductance and viscosity (Walden's rule); applications of conductance measurements – determination of - degreeof dissociation of weak electrolyte, dissociation constant of weak acid and weak base, ionic product of water, solubility and solubility product of sparingly soluble salts - conductometric titrations – acid base titrations.
	UNIT V **Galvanic Cells and Applications** Galvanic cell, representation, reversible and irreversible cells, EMF and its measurement – standard cell; relationship between electrical energy and chemical energy; sign of EMF and spontaneity of a reaction, thermodynamics and EMF – calculation of ΔG, ΔH, and ΔS from EMF data; reversible electrodes, electrode potential, standard electrode potential, primary and secondary reference electrodes, Nernst equation for electrode potential and cell EMF; types of electrodes – metal/metal ion, metal amalgam/metal ion, metal, insoluble salt/anion, gas electrode, redox electrode; electrochemical series – applications of electrochemical series.Chemical cells with and without transport, concentration cells with and without transport; **Applications of EMF measurements** applications of EMF measurements – determination of activity 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 Professional Component (is a part of internal component only, Not to be includedin 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 and L.R. Sharma, Principles of Physical Chemistry,ShobanLalNagin Chand and Co., forty eighth edition, 2021. 2. Peter Atkins, and Julio de Paula, James Keeler, Physical Chemistry, Oxford University press, International eleventhedition, 2018. 3. ArunBahl, B.S. Bahl, G. D. Tuli Essentials of physicalchemistry, 28th edition 2019, S, Chand & Co. 4. S. K. Dogra and S. Dogra, Physical Chemistry through Problems: New Age International, fourth edition, 1996. 5. J. Rajaram and J.C. Kuriacose, Thermodynamics,ShobanLalNagin Chand and CO., 1986.
Reference Books	1. K. L. Kapoor, A Textbook of Physical Chemistry, MacmillanIndia Ltd, third edition,2009. 2. Gilbert. W. Castellen, Physical Chemistry, Narosa PublishingHouse, third edition, 1985. 3. P. W. Atkins, and Julio de Paula, Physical Chemistry, OxfordUniversity press, seventh edition, 2002. 4. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles ofPhysical Chemistry, Shobanlal Nagin Chand and Co. Jalendhar, forty first, edition, 2001 5. D.N.Bajpai, Advanced Physical Chemistry, S.Chand&Co.,2001

Website and e-learning source	https://nptel.ac.in https://swayam.gov.in https://archive.nptel.ac.in/content/storage2/courses/112108150/pdf/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 solidsolutions.

CO2: apply the concepts of chemical equilibrium in dissociation of PCl_5, N_2O_4 and formation of HI, NH_3, SO_3 and decomposition of calcium carbonate. Demonstrate important principles such as Le chatelier principle, van't Hoff reaction isotherm andClausius-Clayperon equation.

CO3: Identify an appropriate distillation method for the separation of binary liquid mixturessuch as azeotropic mixtures, partially miscible mixtures and immiscible liquids.

CO4: Explain the significance of Arrhenius theory, Debye-Huckel theory, Onsager equationand 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	PSO 1	PSO 2	PSO 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
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

<table>
<tr><td>Title of the Course</td><td colspan="7">FUNDAMENTALS OF SPECTROSCOPY</td></tr>
<tr><td>Paper No.</td><td colspan="7">DICIPLINE SPECIFIC ELECTIVE III</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">DSE III</td><td>Year</td><td>III</td><td>Credits</td><td>3</td><td>Course Code</td><td>23UCHE3B</td></tr>
<tr><td>Semester</td><td>VI</td><td colspan="4"></td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>5</td><td></td><td colspan="3">-</td><td colspan="2">5</td></tr>
<tr><td>Prerequisites</td><td colspan="7">General Chemistry I,II,III and IV</td></tr>
<tr><td>Objectives of thecourse</td><td colspan="7">This course is designed to provide knowledge on
electrical and magnetic properties of organic and inorganiccompounds
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 instructural elucidation
solving combined spectral problems</td></tr>
<tr><td rowspan="2">Course Outline</td><td colspan="7">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</td></tr>
<tr><td colspan="7">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</td></tr>
</table>

	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 from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Gopalan, R.; Subramaniam, P. S.; Rengarajan, K. *Elements ofAnalytical Chemistry*; S Chand: New Delhi, 2003. 2. Usharani, S. *Analytical Chemistry*, 1st ed.; Macmillan: India, 2002. 3. Banwell, C.N.; Mc Cash, E. M. *Fundamentals of MolecularSpectroscopy*, 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.
Reference Books	1. Srivastava, A. K.; Jain, P. C. *Chemical Analysis an Instrumental Approach*, 3rd ed.; 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*, 9th ed.; Harcourt college Publishers: USA, 2013. 4. Madan, R. L.; Tuli, G. D. *Physical Chemistry*, 2nd ed.; 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.
Website and e-learning source	1. http://vallance.chem.ox.ac.uk/pdfs/SymmetryLectureNotes2004.pdf 2.http://chemistry.rutgers.edu/undergrad/chem207/SymmetryGroup The 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	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**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

<table>
<tr><td>Title of the Course</td><td colspan="7">POLYMER SCIENCE</td></tr>
<tr><td>Paper No.</td><td colspan="7">DICIPLINE SPECIFIC ELECTIVE IV</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">DSE IV</td><td>Year</td><td>III</td><td>Credits</td><td>3</td><td>Course Code</td><td>23UCHE4A</td></tr>
<tr><td>Semester</td><td>VI</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td>Total</td></tr>
<tr><td>5</td><td></td><td colspan="3">-</td><td>5</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Knowledge on functional groups and reaction mechanisms</td></tr>
<tr><td>Objectives of thecourse</td><td colspan="7">The course aims at providing an overall view of
• 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</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I
Introduction
Difference between polymer and macromolecule – classification –synthetic and natural, organic and inorganic, thermoplastic and thermosetting. Plastics, elastomers, fibres and liquid resins.

Techniques of polymerization
Bulk, solution, emulsion and suspension polymerization</td></tr>
<tr><td></td><td colspan="7">Unit – II
Kinetics of polymerization
Kinetics of condensation and addition polymerisation; ionic, free radical, copolymerisation and coordination polymerisation reactivity ratios – block and graft copolymers.
Characterisation of polymers

Appearance, feel and hardness, density, effect of heat, solubility, combustion, tensile strength, shear, stress, impact strength, mechanical, thermomechanical and rheological properties of polymers in viscoelastic state.</td></tr>
<tr><td></td><td colspan="7">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</td></tr>
</table>

	Glass Transition Temperature, Heat Distortion Temperature, TGA / DTA,Crystallinity of Polymers: Crystalline Behaviour, Degree of Crystallinity
	UNIT IV Reactions of Polymers-Hydrolysis, Acidolysis, Aminolysis, Additionand Substitution Reactions (One Example Each) Cyclisation, Cross-Linking and Reactions of Specific Functional Groups in the Polymer **Polymer technology** Processing of polymers – casting, thermoforming, moulding – extrusion, compression, blow moulding foaming, lamination, reinforcing – processing of fibres – melt, wet and dry spinning.
	UNIT V **Speciality polymers** Polyelectrolytes, conducting polymers, polymeric supports for solid phase synthesis, biomedical polymers, liquid crystalline polymers, electroluminescent polymers – two examples of each of these polymers. Polyethylene, PVC, PMMA, polyester; rubber – synthetic and natural, vulcanisation of rubber.
	Polymer Degradation Types of Degradation - Thermal, Mechanical, Ultra Sound, Photo
	Radiation and Chemical Degradation Methods. Rubber-Natural and Synthetic-Structure, Mechanism of VulcanisationBiodegradable and Non-Biodegradable Polymers.
Extended Professional Component (is a part of internal component only, Not to be includedin 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. Gowariker V.R, N.V. Viswanthan and Jayadev Sreedhar. PolymerScience. 2. New Delhi: New Age International, 2015 3. Misra G.S. Introductory Polymer Chemistry. New Delhi: WileyEastern, 2010. 4. Bahadur P and Sastry N V. Principles of Polymer Science. NewDelhi: Narosa Publishing House, 2005 5. Ahluwalia, V.K. Anuradha Mishra, *Polymer Science A Text Book,*Ane Books India: New Delhi, 2008. 6. Morrison, R. R.; Boyd, R. N.; Bhattacharjee, S. K. *Organic Chemistry*, 7th ed.; Pearson: New Delhi, 2011.
Reference Books	1. Billmeyer, F.W. Polymer Science. India: Wiley-Interscience, 2007. 2. Seymour, R. B.; CarraherJr.C.E. *Polymer Chemistry: AnIntroduction*, Marcel Dckker Inc : New York, 1981. 3. Sinha, R. *Outlines of Polymer Technology*, Prentice Hall of India:New Delhi, 2000. 4. Joel R. Fried, *Polymer Science and Technology*, 3rd ed.; Prentice Hall of India: New Delhi, 2014.
Website and e-learning source	1. https://polymerdatabase.com 2. http://amrita.vlab.co.in/?sub=2&brch=190&sim=603&cnt=1 3.http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/polymers. htm 4.http://nsdl.niscair.res.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	PSO 1	PSO 2	PSO 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
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

<table>
<tr><td>Title of the Course</td><td colspan="8">PHARMACEUTICAL CHEMISTRY</td></tr>
<tr><td>Paper No.</td><td colspan="8">DICIPLINE SPECIFIC ELECTIVE IV</td></tr>
<tr><td>Category</td><td>DSE IV</td><td>Year</td><td>III</td><td>Credits</td><td>3</td><td>Course Code</td><td colspan="2">23UCHE4B</td></tr>
<tr><td></td><td></td><td>Semester</td><td>VI</td><td colspan="4"></td></tr>
<tr><td>Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td></td><td>5</td><td></td><td colspan="3">-</td><td colspan="2">5</td></tr>
<tr><td>Prerequisites</td><td colspan="8">Knowledge on active chemical compounds and biochemistry</td></tr>
<tr><td>Objectives of thecourse</td><td colspan="8">The course aims at providing an overall view of
• drugs design and drug metabolism
• important Indian medicinal plants, common diseases andantibiotics</td></tr>
<tr><td></td><td colspan="8">• drugs for major diseases like cancer, diabetes and AIDS
• analgesics and antipyretic agents
• significance of clinical tests</td></tr>
<tr><td>Course Outline</td><td colspan="8">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 oftraditional and modern methods of development of drugs – drug design by method of variation – disjunction and conjunction methods.</td></tr>
<tr><td></td><td colspan="8">Unit II
Indian medicinal plants
Some important Indian medicinal plants – tulsi, neem, kizhanelli, mango, semparuthi, adadodai, turmeric and thoothuvalai – uses.</td></tr>
</table>

	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 ; Vinca alkaloids – vincristine, vinblastine.Diabetes– types – management of diabetes – insulin ; oral hypoglycemic agents - sulphonyl ureas – chlorpropamide ; biguanides - metformin – thiazolidinediones .Cardiovascular drugs– cardio glycosides ; anti arrhythmic agents – quinidine, propranolol hydrochloride ; anti- hypertensive 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 –- glucosetolerance test. **Significance of Clinical Tests** Serum electrolytes - blood Glucose - orthotoluidine method**;** Renal functions tests - blood urea, creatinine; liver function tests - serum proteins, albumin globulin ratio, serum bilirubin, enzymes SGOT, SGPT; lipid profile – cholesterol, triglycerides, HDL, LDL, coronary risk index. Urine examination – pH, tests for glucose, albumin and bile pigment.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ 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. Jayashree Ghosh, (1999), A text book of pharmaceutical chemistry,2nd ed., S.Chand& company, New Delhi. 2. Lakshmi S, (2004), Pharmaceutical chemistry, 3rd ed., Sultan chand& sons, Delhi. 3. Tripathi K D, (2018), Essentials of medical pharmacology, 8th ed.,Jaypee brothers medical publishers (P) Limited, New Delhi. 4. Ashutosh Kar, (2018), Medicinal chemistry, 7th ed., New ageinternational (P) Limited, Publishers, New Delhi.
Reference Books	**Reference Books:** 1. Chatwal G R, (2013), Pharmaceutical chemistry, inorganic (vol-I) 6thed ., 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. 4. Intellectual Property Rights, NeerajPandey, Khushdeep Dharni. Publisher: PHI Learning Pvt. Ltd., 2014 ISBN: 812034989X, 9788120349896.
Website and e-learning source	1.http://www.pharmacy.umaryland.edu/faculty/amackere/courses/phar5 31_delete/lectures/qsar_1.pdf 2. http://www.indianmedicinalplants.info/ 3. 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, physio-chemical properties of therapeutic agents, significance of medicinal plants,clinicaltests 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	PSO 1	PSO 2	PSO 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
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to PSOs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

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

Level of Correlation between PO's and CO's

Title of the Course	**SKILL ENHANCEMENT COURSE – VIII NAN MUDHALVAN COURSE - V**						
Paper No.	**Skill Enhancement Course VIII**						
Category	**SEC VIII**	**Year**	III	**Credits**	2	**Course Code**	**23UCHNMC5**
		Semester	VI				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	2	-	-			2	
Prerequisites							

Title of the Course	**EXTENSION ACTIVITY**						
Paper No.	**Extension activity**						
Category	**IT**	**Year**	III	**Credits**	1	**Course Code**	**23UEA**
		Semester	VI				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
		-	-				
Prerequisites							

DEPARTMENT OF CHEMISTRY PROGRAMME SPECIFIC OUTCOMES

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

PSO1: acquire in-depth knowledge of the fundamental concepts in all disciplines ofchemistry.

PSO2: disseminate the basics of chemistry and advanced topics and analytical skillsin organic, inorganic and physical chemistry.

PSO3: uphold ethical values in personal life, research and career.

PSO4: demonstrate laboratory skills, analytical acumen, creatively in academics andresearch.

PSO5: apply digital tools to collect, analyze and interpret data and presents cientificfindings.

PSO6: gain competence to pursue higher education and career opportunities inchemistry and allied fields.

PSO7: exhibit leadership qualities to work individually and within a team in organizing curricular, co-curricular and extracurricular activities.

PSO8: apply the concepts of chemistry to solve problems in the community, entrepreneurial and research pursuits.

PSO9: exhibit competence in educational, industrial and research pursuits that contribute towards the holistic development of self and community.

PSO10: display proactive approach towards sustainable environment through greenlaboratory practices.

PO-PSO MAPPING MATRIX:

PSOs / POs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
PO1	X									
PO2		X								
PO3			X							
PO4				X						
PO5					X					
PO6						X				
PO7							X			
PO8								X		
PO9									X	
PO10										X

III & IV Sem → EXAM
Starts carry over paper

23UES

IV SEM

ENVIRONMENTAL STUDIES

Title of the Course	**ENVIRONMENTAL STUDIES**						
Paper Number							
Category		**Year**	II	**Credits**	2	**CourseCode**	**23UES**
		Semester	IV				
Instructional Hours per week		**Lecture**		**Tutorial**	**Lab Practice**	**Total**	
		2		-	-	2	
Pre-requisite		To understand the various applications of environmental biotechnology.					

Course Outcomes:

The course will empower the undergraduate students by helping them to:

- Gain in-depth knowledge on natural processes that sustain life on various perspectives.
- Predict the role of biotic and abiotic factors in maintaining the balance of ecosystem and consequences of human actions on restoring the different ecosystem.
- Form strategies of conserving various non-renewable resources and utilizing renewable resources
- Understand the values of biodiversity, Adopt strategies of conserving biodiversity Acquire knowledge on control measures to ward off various kinds of pollution hazards.
- Adopt the better methods of disaster management and conventional Indian cultures to preserve environmental ethics
- Acquire values and attitudes towards understanding complex environmental-economic social challenges and participating actively in solving current environmental problems and preventing the future ones.
- Adopt sustainability as a practice in life, society and industry.
- On-field experience in projects of conservation of animals, biodiversity, natural resources and pollution management

Learning Objectives

C1	To introduce the student to the various developed and applications of environmental biotechnology.
C2	To provide knowledge about the scope of bioremediation and bioleaching using GMOs.
C3	To study about pollution of water bodies.
C4	To know about bioremediation.
C5	To study about biomineralization.

Unit 1

Environment – Introduction – Nature – Scope – Content – Need for study: Natural resources – Forest and Energy resources – use and over exploitation –deforestation – Energy resources – reviewable and non reviewable energy resources.

Unit 2

Eco System: Concept – Structure and function – Procedures – consumers and decomposers – Food Chains – Food Webs and Ecological Pyramids – Biodiversity and its conservation : Introduction – definition – genetic – species and eco system diversity – conservation of biodiversity.

Unit 3

Environmental Pollution – Definition – causes – effects and control Measures – Types – Air – Water – Soil – Thermal and Nuclear hazards – solid waste and Management – Disaster Management – Role of an individuals in controlling pollution – Earth Quake –Earth Quake and Cyclone – Flood.

Unit 4

Social issues and the environment: urbanization – urban problems related to energy – Water Shed Management – Environmental ethics: issues and possible solutions – Wasteland reclamation – Climate Change – Global Warming - Acid rain – Ozone layer depletion – Public awareness. **Bioremediation:** Introduction to bioremediation, *ex situ* and *in situ* bioremediation.

Unit 5

Human Population and the environment: Population growth, Variation among nations – Population explosion – Family Welfare Programme – Human rights – HIV/AIDS – Women and Child Welfare – Role of information technology in environment and human health. Biomineralization – bioleaching - Biofilms and biocorrosion.

Recommended Texts	1. Alan Scragg. 1999. Environmental Biotechnology. Pearson Education Limited. 2. Dubey R.C. 2004. A text book of Biotechnology aspects of microbiology, British Sun Publication. 3. Joseph C. Deniel. 1996. Environmental aspects of microbiology, British Sun Publication. 4. Keeshav Thehan. 1997. Biotechnology, New age international)P) Limited, New Delhi. 5. Chandra, A.M and Ghosh, S.K. 2010. Remote sensing and Geographical Information System, Narosa Publishing House Pvt. Ltd. New Delhi.
Reference Books:	1. Sharma, P.D. 2005. Environmental Microbiology, Narosa Publishing House Pvt. Ltd., New Delhi.

	2. Raina Maier M. Iran Pepper L., Charles P. Gerba, 2000, Environmental Microbiology, Academic press, U.K. 3. Alexander N. Glazer and Hiroshi Nikaido. 1994. Microbial Biotechnology. 4. Special issue on Bioremediation and biodegradation. Indian Journal of Experimental Biology, September 2003. Vol. 41(9). National Institute of Science Communication and Information Resources, CSIR New Delhi. 5. Keddy, P.A. 2017. Plant Ecology: Origins, processes, consequences. 2nd ed. Cambridge University Press. ISBN. 978-1107114234.
Web Resources	1. https://www.elsevier.com/books/environmental-biotechnology/vallero/978-0-12-407776-8 2. http://www.freebookcentre.net/biology-books-download/Environmental-Biotechnology.html 3. https://www.amazon.in/INTRODUCTION-ENVIRONMENTAL-BIOTECHNOLOGY-K-Chatterji-ebook/dp/B00K7YGIWI 4. https://books.google.co.in/books/about/Textbook_of_Environmental_Biotechnology.html?id=Q2ROFx0WtBQC&redir_esc=y 5. http://library.umac.mo/ebooks/b28045907.pdf

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	3	2	1	2	2	1	3
CO 2	3	3	2	2	2	3	2	3	2	2
CO 3	2	2	3	3	1	2	1	3	3	3
CO 4	3	3	3	3	3	2	3	3	3	3
CO 5	3	3	2	3	2	3	3	3	2	3

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

IV Sem

VALUE EDUCATION & GENDER STUDIES

[ALL UG COURSES]

Sub Code : 23UVEGS

LEARNING OBJECTIVES :

1. To familiarize the students with value concepts.
2. To make the students aware of different types of values.
3. To make the students to learn about various aspects and factors of Gender
4. To make the students to learn structures of gender inequality
5. To make the students to learn of the areas of gender discrimination

UNIT- I : CONCEPT OF VALUES

Meaning of Value Education – Need and Purpose of Value Education – Significance of Value Education in present context – Types of Values – Values through various genres of literature.

UNIT-II : FAMILY VALUES

Components, Structure and Responsibilities of Family – Neutralization of anger – Adjustability – Threats to family life – Status of women in family and society - Caring for needy and elderly – Time allotment for sharing ideas and concerns.

UNIT-III : CONCEPTS OF GENDER

Sex – Gender – Biological Determinism – Patriarchy – Feminism – Gender Discrimination – Gender Division of Labour – Gender Stereotyping – Gender Sensitivity – Gender Equity – Gender Mainstreaming – Empowerment.

UNIT-IV : STRUCTURES OF GENDER INEQUALITY

Patterns of Gender inequality in terms of caste, class and religion - patterns of violence against women (With special reference to Karnataka) - Female foeticide - Female Infanticide - Child marriage. Dowry – Widowhood – Female commercial sex workers – Domestic violence – Problems of Elderly and single women.

UNIT-V : AREAS OF GENDER DISCRIMINATION

Family – Sex Ratio – Literacy – Health – Governance – Religion – Work Vs Employment – Market – Media – Polities Law – Domestic Violence – Sexual Harassment – State Policies and Planning.

LEARNING OUTCOMES :

1. Students got familiarized with value concepts.
2. Students became aware of different types of values.
3. Students learnt about various aspects and factors of Gender
4. Students are able to distinguish Women's Studies from Gender Studies
5. Students learnt of the areas of gender discrimination

rence:

1. Bhasin Kamala, Understanding Gender: Gender Basics, New Delhi: Women Unlimited, 2004.
2. Rajadurai. S.V, Geetha. V, Themes in Caste Gender and Religion, Tiruchirappalli: Bharathidasan University, 2007.
3. Gender Studies – பாலினக்கல்வி - முனைவர். சி. சேதுராமன் - New Century Book House.
4. T. Anchukandam and J. Kuttainimathathil (Ed) Grow Free Live Free, Krisitu Jyoti Publications, Bangalore (1995)
5. Mani Jacob (Ed) Resource Book for Value Education, Institute for Value Education, New Delhi 2002
6. DBNI, NCERT, SCERT, Dharma Bharti National Institute of Peace and Value Education, Secunderabad, 2002
7. Daniel and Selvamony – Value Education Today, (Madras Christian College, Tambaram and ALACHE, New Delhi, 1990)
8. S. Ignacimuthu – Values for Life – Better Yourself Books, Mumbai, 1991.
9. M.M.M. Mascaronhas centre for Research Education Science and Training for Family Life Promotion – Family Life Education, Bangalore, 1993.
10. Dr. C. Sethuraman – NCBH(P) Ltd. Value education – Chennai.

WEBSITES AND e-LEARNING SOURCES

www.rkmissiondhe/.org/education.html/
www.clallam:;org/lifestyle/education.html/
www.sun.com/../edu/progrmws/star.html/
www.infoscouts.com
www.secretofsuccess.com
www.1millionpapers.com
http://militaryfinance.umuc.edu/education/edu-network.html/