SRI SARADA COLLEGE FOR WOMEN(AUTONOMOUS)
SALEM -16
Reaccredited with 'B++' Grade by NAAC
Affiliated to Periyar University

PG & RESEARCH DEPARTMENT OF CHEMISTRY

OUTCOME BASED SYLLABUS

B.Sc. CHEMISTRY

(For the students admitted in 2024 – 25)

PROGRAMME OUTCOMES (PO) OF B.Sc. DEGREE PROGRAMME IN CHEMISTRY	
Programme	**B.Sc.**
Programme Code	
Duration	**3 Years for UG**
Program (Pos)	**PO1 : Disciplinary Knowledge** have firm subject knowledge required for higher studies, professional and applied courses. **PO2 : Problem Solving Skill** apply basic practical skills & technical knowledge along with domain knowledge of different subjects in the science & humanities stream. **PO3 : Critical Thinking/ Analytical Reasoning** develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity. **PO4 : Digital literacy** employ appropriate digital tools and techniques in analysing data and creative design. **PO5 : Employment/ Entrepreneurship Skill** gain competence to pursue higher learning, research and to opt for job opportunities or entrepreneurship. **PO6 : Leadership Quality** interact effectively with others displaying leadership and team spirit. **PO7 : Contribution to Society** demonstrate responsibility as citizens for national development through community outreach, wellness of self and a sustainable environment. **PO8 : Research and Development** inculcate creativity in academics and research **PO9 : Self directed learning** apply digital tools to collect, analyse and interpret data and present scientific findings. **PO10: Life long Learning** Exhibit competence in educational, industrial and research pursuits that contribute towards the holistic development of self and community.
Programme Specific Outcome (PSOs)	**PSO1- Disciplinary Knowledge** Gain in-depth knowledge of the fundamental concepts in all disciplines of chemistry. **PSO2 – Scientific Reasoning** Capability to integrate the basics of chemistry and advanced topics and analytical. Skills in organic, inorganic and physical chemistry. **PSO3 – Multicultural Competence** Imbibe leadership qualities to work individually and within a team in organizing curricular, co-curricular and extracurricular activities. **PS04 – Professional Ethics/ Entrepreneurship Skill** Apply the concepts of chemistry to solve problems in the community, entrepreneurial and research pursuits. **PSO5 – Self Directed Learning** Gain competence to pursue higher education and career opportunities in chemistry and allied fields.

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS) SALEM-16
PG & RESEARCH DEPARTMENT OF CHEMISTRY
B.Sc. CHEMISTRY
PROGRAMME STRUCTURE UNDER CBCS
(From the academic year 2023-24 onwards)
Total Credits: 140 + Extra Credits (Maximum 28)

FIRST YEAR

SEMESTER - I

Part	Course	Course Title	Code	No. of Hours	Credit
I	Language	Tamil -I Hindi-I Sanskrit-I	24ULTC1 24ULHC1 24ULSC1	6	3
II	English	English-I	24ULEC1	6	3
III	Core Course -I	General Chemistry-I	24UCHCC1	5	5
	Core Course -II	Core Practical- I: Quantitative Inorganic Estimation (Titrimetry) and Inorganic Preparations	24UCHCCQ1	4	3
	Elective – I (GE)	Theory of Equations and Differential Calculus	24UCHMGEC1	5	5
IV	Skill Enhancement Course-I (NME)	Food Chemistry	24UCHSEC1	2	2
	Skill Enhancement Foundation Course	Foundation Chemistry	24UCHSEFC	2	2
	Total			**30**	**23**
V	• Articulation and Idea Fixation Skills • Physical Fitness Practice – 35 hours per semester				
	• Advanced Diploma Course in Applied Chemistry Level- 1: Certificate Course 100 hours per year				

SEMESTER - II

Part	Course	Course Title	Code	No. of Hours	Credit
I	Language	Tamil -II Hindi-II Sanskrit-II	24ULTC2 24ULHC2 24ULSC2	6	3
II	English	English-II	24ULEC2	6	3
III	Core Course -III	General Chemistry-II	24UCHCC2	5	5
	Core Course -IV	Core Practical- II: Qualitative Organic Analysis and Preparation of Organic Compounds	24UCHCCQ2	4	3
	Elective – II (GE)	Integral Calculus and Laplace Transform	24UCHMGEC2	3	3
		Theory of Equations and laplace Transform using sage Math-Practical	24UCHMGECQ	2	2
IV	Skill Enhancement Course-II (NME)	Dairy Chemistry	24UCHSEC2	2	2
	Skill Enhancement Course-III (Indian Knowledge System)	Inherited Knowledge in Cosmetic Chemistry	24UCHSEC3	2	2
	Total			**30**	**23**
V	• Articulation and Idea Fixation Skills • Physical Fitness Practice – 35 hours per semester • Certificate Course in Yoga – 30 hours – 1 Extra Credit				
	• Advanced Diploma in Applied Chemistry Level -1: Certificate Course 100 hours per year– 2 Extra Credits • Extra credits are given for extra skills and courses qualified in MOOC/NPTEL				

SECOND YEAR

SEMESTER - III

Part	Course	Course Title	Code	Hours per week (L/T/P)	Credits
I	Language	Tamil-III Hindi-III Sanskrit-III	24ULTC3 24ULHC3 24ULSC3	6	3
II	English	English – III	24ULEC3	6	3
III	Core Course- V	General Chemistry-III	24UCHCC3	5	5
	Core Course -VI	Core Practical- III Qualitative Inorganic Analysis	24UCHCCQ3	4	3
	Elective -III (GE)	Physics-I	24UCHPGEC3	3	3
		Physics Practical-I	24UCHPGECQ1	2	2
IV	Skill Enhancement Course -IV	Entrepreneurial Skills in Chemistry (Entrepreneurial Skill)	24UCHSEC4	1	1
	Skill Enhancement Course -V	Pesticide Chemistry	24UCHSEC5	2	2
	EVS	Environmental Studies	24UEVSC	1	-
		Total		**30**	**22**
V		Articulation and Idea Fixation skills			
		Physical Fitness Practice – 35 hours per Semester			
		Advanced Diploma in Applied Chemistry Level -2: Diploma Course 100 hours per year			
		Extra credits are given for extra skills and courses qualified in MOOC/NPTEL			

SEMESTER -IV

Part	Course	Course Title	Code	Hours per week (L/T/P)	Credits
I	Language	Tamil-IV Hindi-IV Sanskrit-IV	24ULTC4 24ULHC4 24ULSC4	6	3
II	English	English – IV	24ULEC4	6	3
III	Core Course- VII	General Chemistry-IV	24UCHCC4	5	5
	Core Course -VIII	Physical Chemistry Practical- I	24UCHCCQ4	3	3
	Elective -IV (GE)	Physics-II	24UCHPGEC4	3	3
		Physics Practical-II	24UCHPGECQ2	2	2
IV	Skill Enhancement Course -VI	Instrumental methods of Chemical Analysis	24UCHSEC6	2	2
	Skill Enhancement Course -VII	Forensic Science	24UCHSEC7	2	2
	EVS	Environmental Studies	24UEVSC	1	2
		Total		**30**	**25**
V		Articulation and Idea Fixation skills			
		Physical Fitness Practice – 35 hours per Semester			
		Advanced Diploma in Applied Chemistry Level -2: Diploma Course 100 hours per year			
		Extra credits are given for extra skills and courses qualified in MOOC/NPTEL			

*Internship/Field visit/ Industrial visit will be carried out during the summer vacation of the second year and 2 credits will be included in the Fifth Semester Mark Statement.

Title of the Course	GENERAL CHEMISTRY-I						
Course No.	Core Course – I						
Category	Core	Year	I	Credits	5	Course Code	24UCHCC1
		Semester	I				
Instructional hours per week	Lecture	Tutorial		Lab Practice		Total	
	4	1		-		5	
Prerequisites	Higher secondary chemistry						
Objectives of the course	The course aims at giving an overall view of the - various atomic models and atomic structure - wave particle duality of matter - periodic table, periodicity in properties and its application in explaining the chemical behaviour - nature of chemical bonding, and fundamental concepts of organic chemistry.						
Course Outline	**UNIT-I** **15 Hours** **Atomic structure and Periodic trends** History of atom (J.J.Thomson, Rutherford); Moseley's Experiment and Atomic number, Atomic Spectra; Black-Body Radiation and Planck's quantum theory - Bohr's model of atom; The Franck-Hertz Experiment; Interpretation of H spectrum; Photoelectric effect, Compton effect; Dual nature of Matter- de Broglie wavelength-Davisson and Germer experiment Heisenberg's Uncertainty Principle; Electronic Configuration of Atoms and ions- Hund's rule, Pauli's exclusion principle and Aufbau principle; Numerical problems involving the core concepts. **UNIT-II** **15 Hours** **Introduction to Quantum mechanics** Classical mechanics, Wave mechanical model of atom, distinction between a Bohr orbit and orbital; Postulates of quantum mechanics; probability interpretation of wavefunctions, Formulation of Schrodinger wave equation - Probability and electron density-visualizing the orbitals - Probability density and significance of Ψ and Ψ^2. **Modern Periodic Table** Cause of periodicity; Features of the periodic table; classification of elements - Periodic trends for atomic size- Atomic radii, Ionic, crystal and Covalent radii; ionization energy, electron affinity, electronegativity-electronegativity scales, applications of electronegativity. Problems involving the core concepts						

UNIT-III   **15 Hours**

Structure and bonding - I

Ionic bond Lewis dot structure of ionic compounds; properties of ionic compounds; Energy involved in ionic compounds; Born Haber cycle – lattice energies, Madelung constant; relative effect of lattice energy and solvation energy; Ion polarisation – polarising power and polarizability; Fajan's 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   **15 Hours**

Structure and bonding - II

VB theory – application to hydrogen molecule; concept of resonance - resonance structures of some inorganic species – CO_2, NO_2, CO_3^{2-}, NO_3^-; limitations of VBT; MO theory - bonding, antibonding and nonbonding orbitals, bond order; MO diagrams of H_2, C_2, O_2, O_2^+, O_2^-, O_2^{2-}, N_2, NO, HF, CO; 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, applications of semiconductors Weak Chemical Forces - Vander Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interactions, Instantaneous dipole-induced dipole interactions. Repulsive forces; Hydrogen bonding – Types, special properties of water, ice, stability of DNA; Effects of chemical force, melting and boiling points.

UNIT-V   **15 Hours**

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

Resonance – resonance energy, conditions for resonance - acidity of phenols, basicity of aromatic amines, stability of carbonium ions, carbanions and free radicals, reactivity of vinyl chloride, dipole moment of vinyl chloride and nitrobenzene, bond lengths; steric inhibition to resonance. Hyperconjugation - stability of alkenes, bond length, orienting effect of methyl group, dipole moment of aldehydes and nitromethane

Types of organic reactions- addition, substitution, elimination and rearrangements

Extended Professional Component (is a part of internal component only, not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / 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. 1. Madan, R. D. and Sathya Prakash, *Modern Inorganic Chemistry,* S. Chand and Company: New Delhi, 2nd Ed., 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,* Vishal Publishing Company: Jalandhar, 38th Ed., 2002. 4. Bruce, P. Y. and Prasad K. J. R. *Essential Organic Chemistry*, Pearson Education: New Delhi, 2008. 5. Dash U.N, Dharmarha OP, Soni P.L. Textbook of Physical Chemistry, Sultan Chand & Sons: New Delhi,2016
Reference Books	1. Maron, S. H. and Prutton C. P. *Principles of Physical Chemistry,* The Macmillan Company: Newyork, 4thEd.,1972. 2. Lee, J. D. *Concise Inorganic Chemistry,* ELBS William Heinemann: London, 4th Ed.,1991. 3. Gurudeep Raj, *Advanced Inorganic Chemistry,* Goel Publishing House: Meerut, 26thEd., 2001. 4. Atkins, P.W. & Paula, J. *Physical Chemistry*, Oxford University Press:New York, 10th Ed., 2014. *5.* Huheey, J. E. *Inorganic Chemistry: Principles of Structure and Reactivity,* Addison, Wesley Publishing Company: India, 4th Ed., 1993..
Website and e-learning source	1) https://onlinecourses.nptel.ac.in 2) http://www.mikeblaber.org/oldwine/chm1045/notes_m.htm 3) http://www.ias.ac.in/initiat/sci_ed/resources/chemistry/Inorganic.html 4) https://swayam.gov.in/course/64-atomic-structure-and-chemical-bonding 5) https://www.chemtube3d.com/

Course Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: explain the atomic structure, wave particle duality of matter, periodic properties, bonding, and properties of compounds.

CO2: classify the elements in the periodic table, types of bonds, reaction intermediates, electronic effects in organic compounds and types of reagents.

CO3: apply the theories of atomic structure, bonding, to calculate energy of a spectral transition, electronegativity, percentage ionic character and bond order.

CO4: evaluate the relationship existing between electronic configuration, bonding, geometry of molecules and reactions, structure, reactivity and electronic effects

CO5: construct MO diagrams, predict trends in periodic properties, assess the properties of elements, and explain hybridization in molecules, nature of H – bonding and organic reaction mechanisms.

CO-PO mapping (Course Articulation matrix)

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

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	2	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	13	15	15
Weighted percentage of Course Contribution to PSO	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date : 02.05.2023

Title of the Course	QUANTITATIVE INORGANIC ESTIMATION (TITRIMETRY) AND INORGANIC PREPARATIONS						
Course No.	Core Course-II: Core Practical-I						
Category	Core	Year	I	Credits	3	Course Code	24UCHCCQ1
		Semester	I				
Instructional hours per week	Lecture	Tutorial		Lab Practice		Total	
	1	-		3		4	
Prerequisites	Higher Secondary Chemistry						
Objectives of the course	This course aims at providing knowledge on ● laboratory safety ● handling glasswares ● Quantitative estimation ● preparation of inorganic compounds						
Course Outline	**UNIT I** **10 Hours** **Chemical Laboratory Safety in Academic Institutions** Introduction - importance of safety education for students, common laboratory hazards, assessment and minimization of the risk of the hazards, prepare for emergencies from uncontrolled hazards; concept of MSDS; importance and care of PPE; proper use and operation of chemical hoods and ventilation system; fire extinguishers-types and uses of fire extinguishers, demonstration of operation; chemical waste and safe disposal. **Common Apparatus Used in Quantitative Estimation (Volumetric)** Description and use of burette, pipette, standard flask, measuring cylinder, conical flask, beaker, funnel, dropper, clamp, stand, wash bottle, watch glass, wire gauge and tripod stand. **Principle of Quantitative Estimation (Volumetric)** Equivalent weight of an acid, base, salt, reducing agent, oxidizing agent; concept of mole, molality, molarity, normality; primary and secondary standards, preparation of standard solutions; theories of acid-base, redox, complexometric, iodimetric and iodometric titrations; indicators – types, theory of acid–base, redox, metal ion and adsorption indicators, choice of indicators. **UNIT II** **25 Hours** **Quantitative Estimation (Volumetric)** Preparation of standard solution, dilution from stock solution **Permanganometry** Estimation of sodium oxalate using standard ferrous ammonium sulphate **Dichrometry** Estimation of ferric alum using standard dichromate (external indicator) Estimation of ferric alum using standard dichromate (internal indicator) **Iodometry** Estimation of copper in copper sulphate using standard dichromate **Argentimetry (Demonstration Experiment)** Estimation of chloride in barium chloride using standard sodium chloride/ Estimation of chloride in sodium chloride (Volhard's method)						

	UNIT III	25 Hours
	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	1. Venkateswaran, V, Veeraswamy, R. & Kulandivelu, A.R. *Basic Principles of Practical Chemistry,* Sultan Chand & Sons: New Delhi, 2nd Ed.,1997. 2. Nad, A. K, Mahapatra, B.& Ghoshal, A, *An advanced course in Practical Chemistry,* New Central Book Agency: Kolkata, 3rd Ed., 2007.	
Reference Books	1.Mendham, J, Denney, R. C, Barnes, J. D, Thomas, M, Sivasankar, B, *Vogel's Textbook of Quantitative Chemical Analysis*, 6th Ed., Pearson Education Ltd: New Delhi, 2000.	
Website and e-learning source	1)http://www.federica.unina.it/agraria/analytical-chemistry/volumetricanalysis 2)https://chemdictionary.org/titration-indicator/	

Course outcomes (For mapping with POs and PSOs)

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

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

CO2: compare the methodologies of different titrimetric analysis.

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

CO4: assess the yield of different inorganic preparations and identify the end point of various titrations.

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date : 02.05.2023

Title of the Course	**THEORY OF EQUATIONS AND DIFFERENTIAL CALCULUS (I B.Sc. Chemistry)**						
Course No.	Elective – I (GE)						
Category	**ELECTIVE COURSE**	**Year**	**I**	**Credits**	**5**	**Course Code**	**24UCHMGEC1**
		Semester	**I**				

Instructional Hours per week	**Lecture**	**Tutorial**		**Lab Practice**		**Total**	
	5	**-**		**-**		**5**	

Prerequisite	12th Standard Mathematics
Objectives of the Course	1.To acquire knowledge in a theory of equations, Differential calculus, and Differential equations. 2.To understand the method of solving algebraic equations using the transformation of equations. 3.To promote problem-solving ability in differential equations.

Course Outcomes:

Students will be able to

CO1: learn the concepts of matrices, theory of equations, differential calculus, ordinary and partial differential equations

CO2: Analyze various methods to find roots of polynomial equations and inspect Horner's method and Newton's method to find approximate real roots

CO3: Understand the concept of the angle between the radius vector and the tangent, radius of curvature, pedal equation, and Descartes rule of signs and solve related problems

CO4: Solve specific types of ordinary and partial differential equations.

CO5: Analyze the method of Variation of parameters to solve ordinary differential equations, Lagrange's method to solve partial differential equations

Course Outline	**Unit - I** **Theory of Equations** **15 Hours** 　　　Relation between the roots and coefficients of an equation, Imaginary and irrational roots, Symmetric functions of the roots of an equation in terms of its coefficients (up to cubic equations), and Reciprocal equation. **Chapter 6 (Page No: 6.2 - 6.37)**
	Unit - II **15 Hours** 　　　Transformation of equation (Definition only), Multiplication of roots by m (Definition only), Diminishing the roots of an equation, Removal of a term, Descartes' rule of sign, Descartes's rule of signs for negative roots of an equation, Horner's method, Newton's method of evaluating a real root correct to given decimal places. **Chapter 6 (Page No: 6.38 - 6.67)**
	Unit - III **15 Hours** **Differential Calculus** 　　　The angle between the radius vector and the tangent, Angle of the intersection of two curves, the Length of a perpendicular from the pole to the Tangent, Pedal equation, The Cartesian formula for the radius of curvature, and the Parametric formula for the radius of curvature. **Chapter 10 & 11(Page No: 10.1 - 10.23, 11.1 - 11.22)**
	Unit – IV **15 Hours** **Ordinary Differential Equations**

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

Title of the Course	FOOD CHEMISTRY					
Course No.	Skill Enhancement Course-I					
Category	NME	Year	I	Credits	2	Course Code	24UCHSEC1
		Semester	I				
Instructional hours per week	Lecture	Tutorial		Lab Practice		Total	
	2	-		-		2	
Prerequisites	Higher secondary chemistry						
Objectives of the course	This course aims at giving an overall view of the ● Types of food ● Food adulteration and poisons ● Food additives and preservation ● Beverages ● Vitamins and Minerals						
Course Outline	**UNIT-I** 6 Hours **Food Adulteration** Sources of food, types, advantages and disadvantages- Food Adulteration- contamination of wheat, rice, milk, butter etc. with clay stones, water and toxic chemicals- common adultrants, ghee adulteration and their detection; Detection of adulterated foods by simple analytical techniques. **UNIT-II** 6 Hours **Food Poison** Food Poisons- natural poisons (alkaloids-nephrotoxin)- pesticides, (DDT, BHC, Malathion, Monocrotophos)- Chemical poisons- First aid for poison consumed victims. **UNIT III** 6 Hours **Food additives** Food additives- artificial sweeteners- Saccharin- Cyclamate, and Aspartate. Food flavours- esters, aldehydes and heterocyclic compounds – food colours- emulsifying agents- preservatives- leavening agents; Baking powder- yeast- tastemakers- MSG- vinegar. **UNIT-IV** **Beverages** 6 Hours Beverages- soft drinks- soda- fruit juices - alcoholic beverages- examples. Carbonation- addiction to alcohol- diseases of liver and social problems. **UNIT-V** **Vitamins and Minerals** 6 Hours Vitamins- A, C, K, E, B_1, B_2 and B_6, sources, requirements, deficiency diseases; Minerals- important minerals- Na, K, Mg, Fe, S and P, sources, functions, requirements and deficiency diseases.						
Recommended Text	1. Jayashree Ghosh. A, *Text Book of Pharmaceutical Chemistry*, S. Chand, & Co 3rdEd., 2003. 2. Jayashree Ghosh, *Fundamental Concepts of Applied Chemistry,* S.Chand & Co 1st Ed., 2006.						

Reference Books	1. Belitz, H. D, Werner Grosch, *Food Chemistry Springer Science and Buisness Media*, 4th Ed, 2009. 2. Swaminathan M, *Food Science and Experimental Foods*, Ganesh and Company, 1979. 3. Hasenhuettl, Gerard. L, & Hartel, Richard. W., *Food Emulsifiers and their Applications Springer* New York 2nd Ed. 2008. 4. Belitz, H. D, Grosch, W, Schieberle, P, *Food chemistry,* Springer,4th revised and Extended Ed, 2009. 5. John, M, deMan John W, Finley, W. Jefferey Hurst, ChangYong Lee, *Principles of Food Chemistry*, Springer, 4th Ed, 2018.
Website and e-learning source	1) https://gcwgandhinagar.com/econtent/document/1589361321Unit%20V%20Food%20adulteration.pdf 2) https://ccsuniversity.ac.in/bridge-library/pdf/Toxicology-2704-Health-&-hygiene-open-elec-Unit-III-Food-Poisoning-types-symptoms-treatments.pdf 3) https://egyankosh.ac.in/bitstream/123456789/73121/1/Unit-7.pdf. 4) https://ccsuniversity.ac.in/bridge-library/pdf/FST-Paper%20II%20Food%20Beverages-%20IV-Semester.pdf 5) https://egyankosh.ac.in/bitstream/123456789/12390/1/Unit-9.pdf

Course Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: explain about food adulteration- contamination of wheat, rice, milk, butter.

CO2: identify food poisons like natural poisons (alkaloids-nephrotoxin), pesticides, DDT, BHC, Malathion, Monocrotophos

CO3: describe food additives, artificial sweeteners, saccharin, cyclamate and aspartate in the food industries

CO4: classify beverages and illustrate their importance

CO5: outline the sources of vitamins and minerals and its significance

Board of Studies Date : 02.05.2023

Title of the Course	FOUNDATION CHEMISTRY						
Course No.	Foundation Course						
Category	SEFC	Year	I	Credits	2	Course Code	24UCHSEFC
		Semester	I				
Instructional hours per week	Lecture		Tutorial		Lab Practice		Total
	2		-		-		2
Prerequisites	Higher secondary chemistry						
Objectives of the course	This course aims at providing basic knowledge on - principles of volumetric and inorganic semi-micro analysis - fundamental concepts of inorganic, organic and physical chemistry						
Course Outline	**UNIT I** **6 Hours** **Basic concepts in volumetric and inorganic semi micro analysis** Principles of volumetric analysis – Equivalent weight, concentration terms - molarity, molality, formality, normality, volume/volume and weight/volume percentage, ppm, normal, decinormal solutions – simple problems. Basic principles of inorganic semi micro analysis – common anions, interfering anions, separation of cations into various groups. Common ion effect, ionic product, solubility product and their applications in qualitative analysis. **UNIT II** **6 Hours** **Introduction to atomic structure and chemical bonding** Charges and masses of fundamental particles like proton, neutron, electron, meson and positron. Atomic structure - atomic orbitals and concept of atomic orbitals, shapes of s, p and d orbitals, difference between orbit and orbitals, sigma and pi bonds, oxidation state, acidity, basicity of simple molecules, definition and examples of reducing, oxidising agents, oxides, oxo acids, metallic and non-metallic elements, chemical bonding – types, ionic bond, covalent bond, co-ordinate bond, hydrogen bonding, vander Waal's bond, metallic bond, definition of ions, atoms, molecules, compound, mixture, co-ordination complex- neutral, cationic, anionic, co-ordination number, ligands, types. **UNIT III** **6 Hours** **IUPAC nomenclature of organic compounds** Introduction to organic chemistry - general classification of organic compounds- cyclic, acyclic, open chain and closed chain with examples- homologous series, functional groups, IUPAC nomenclature of organic compounds (Alkanes, alkenes, alkynes, alcohols, aldehydes, ketones, ethers, acids, esters, amines).							

	UNIT IV　　　　　　　　　　　　　　　　　　**6 Hours** **Gaseous and liquid state** Mathematical concepts applied to chemistry- some useful physical constants, important conversion factor, Greek alphabets, States of Matter - colloidal state, gaseous state- statements of gas laws- Boyle's law, Charles law, Avogadro law, ideal gas equation, liquid state- vapour pressure, surface tension, viscosity, solutions- pH range, simple calculations involving pH and pOH. **UNIT V**　　　　　　　　　　　　　　　　　　**6 Hours** **Chemical equilibria and chemical kinetics** Chemical equilibria- law of mass action, homogeneous and heterogeneous equilibria with examples, chemical kinetics - rate of reaction, order and molecularity of reaction, first and second order reaction with examples, Arrhenius equation and its terms, energy barrier diagram for exothermic and endothermic reactions.
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Venkateswaran, V.; Veeraswamy, R.; Kulandivelu, A.R. *Basic Principles of Practical Chemistry,* Sultan Chand &Sons: New Delhi, 2nd Ed.,1997. 2. Madan, R. D. and Sathya Prakash, *Modern Inorganic Chemistry*, S. Chand and Company: New Delhi, 2nd Ed., 2003. 3. Jain, M.K & Sharma, S.C, *Modern Organic Chemistry,* Vishal Publishing, 4th reprint, 2003. 4. Puri, B. R. & Sharma, L. R. *Principles of Physical Chemistry*, Vishal Publishing Company: Jalandhar, 38th Ed.,2002.
Reference Books	1. Morrison R.T, & Boyd, R.N, *Organic Chemistry*, Pearson Education, Asia, 6th Ed, 2012. 2. Lee, J. D. *Concise Inorganic Chemistry*, 4th Ed.; ELBS William Heinemann: London, 1991. 3. Atkins, P.W. & Paula, J. *Physical Chemistry*, Oxford University Press: New York, 10th Ed., 2014.
Website and e-learning source	1) https://onlinecourses.nptel.ac.in 2) http://www.mikeblaber.org/oldwine/chm1045/notes_m.htm 3) http://www.ias.ac.in/initiat/sci_ed/resources/chemistry/Inorganic.html 4) https://swayam.gov.in/course/64-atomic-structure-and-chemical-bonding 5) https://www.chemtube3d.com/

Course Outcomes (for Mapping with POs and PSOs)
On completion of the course the students should be able to
CO1: explain basic principles of inorganic semi micro analysis and titrimetry
CO2: classify different types of bonds in compounds and explain the atomic structure
CO3: assign the nomenclature of organic compounds based on IUPAC
CO4: solve problems related to concentration terms and pH of solutions
CO5: apply the mathematical concepts and physical constants in solving problems

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation Between PSO's and CO

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

Board of Studies Date : 02.05.2023

Title of the Course	GENERAL CHEMISTRY-II							
Course No.	Core Course -III							
Category	Core	Year	I	Credits	5	Course Code	24UCHCC2	
		Semester	II					
Instructional hours per week	Lecture		Tutorial		Lab Practice		Total	
	4		1		-		5	
Prerequisites	General Chemistry I							
Objectives of the course	This course aims at providing an overall view of the ● chemistry of acids, bases and ionic equilibrium ● applications of acids and bases ● properties of s and p-block elements ● chemistry of hydrocarbons ● compounds of main block elements and hydrocarbons							
Course Outline	**UNIT-I** **15 Hours** **Acids, bases and Ionic equilibria** Concepts of Acids and Bases - Arrhenius concept, Bronsted-Lowry concept, Lewis concept, Relative strengths of acids, bases and dissociation constant; dissociation of poly basic acids, ionic product of water, pH scale, pH of solutions; Degree of dissociation, common ion effect, factors affecting degree of dissociation; acid-base indicators, theory of acid -base indicators – action of phenolphthalein and methyl orange, titration curves - use of acid -base indicators. Buffer solutions – types, mechanism of buffer, action in acid and basic buffer, Henderson-Hasselbalch equation. Salt hydrolysis - salts of weak acids and strong bases, weak bases and strong acids, weak acids and weak bases - hydrolysis constant, degree of hydrolysis and relation between hydrolysis constant and degree of hydrolysis. Solubility product - determination and applications, numerical problems involving the core concepts**.** **UNIT-II** **15 Hours** **Chemistry of s - Block Elements** Hydrogen: Position of hydrogen in the periodic table. Alkali metals: Comparative study of the elements with respect to oxides, hydroxides, halides, carbonates and bicarbonates. Diagonal relationship of Li with Mg. Properties and uses of $NaOH$, Na_2CO_3, KBr, $KClO_3$, alkaline earth metals. Anomalous behaviour of Be. **Chemistry of p- Block Elements (Group 13 & 14)** Preparation and structure of diborane and borazine. Chemistry of borax. Extraction of Al and its uses. Alloys of Al. Comparison of carbon with silicon. Percarbonates- per monocarbonates and per dicarbonates.							

UNIT-III   **15 Hours**
Chemistry of p- Block Elements (Group 15-18)
General characteristics of elements of Group 15; chemistry of H_2N-NH_2, NH_2OH, HN_3 and HNO_3. Hybridisation and structure of PH_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 - Classification and properties of oxides - oxides of sulphur and selenium – Oxo acids of sulphur (Caro's and Marshall's acids).
Chemistry of Halogens: General characteristics of halogen with reference to electronegativity, electron affinity, oxidation states and oxidizing power. Peculiarities of fluorine. Halogen acids (HF, HCl, HBr and HI), oxides and oxo 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. Hybridisation and structure of XeF_2, XeF_4, XeF_6 and $XeOF_4$; uses of noble gases - clathrate compounds.

UNIT-IV   **15 Hours**
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 – E_1 and E_2 mechanism - factors influencing – stereochemistry – orientation – Hofmann and Saytzeff rules. Reactions of alkenes – addition reactions – mechanisms – Markownikoff's rule, Kharasch effect, oxidation reactions – hydroxylation, 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), vulcanization.
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.

UNIT-V   **15 Hours**
Hydrocarbon Chemistry - II
Benzene: Source, structure of benzene, stability of benzene ring, molecular orbital picture of benzene, aromaticity, Huckel's (4n+2) rule and its applications. Electrophilic substitution reactions - General mechanism of aromatic electrophilic substitution - nitration, sulphonation, halogenation, Friedel-Craft's alkylation and acylation.

	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 alpha - 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.

Title of the Course	QUALITATIVE ORGANIC ANALYSIS AND PREPARATION OF ORGANIC COMPOUNDS						
Course No.	Core Course – IV: Core Practical -II						
Category	Core	Year	I	Credits	3	Course Code	24UCHCCQ2
		Semester	II				
Instructional hours per week	Lecture	Tutorial	Lab Practice			Total	
	1	-	3			4	
Prerequisites	General Chemistry II						
Objectives of the course	This course aims at providing knowledge on • laboratory safety • handling glass wares • analysis of organic compounds • preparation of organic compounds						

Course Outline	**UNIT I** 10 Hours
	
	Safety rules, symbols and first-aid in chemistry laboratory.
	Basic ideas about Bunsen burner, its operation and parts of the flame.Chemistry laboratory glassware –basic information and uses
	
	UNIT II 25 Hours
	
	Qualitative Organic Analysis
	Preliminary examination, detection of special elements - nitrogen, sulphur and halogens
	Aromatic and aliphatic nature, Test for saturation and unsaturation, identification of functional groups using solubility tests
	Confirmation of functional groups
	      • monocarboxylic acid, dicarboxylic acid
	      • monohydric phenol, polyhydric phenol
	      • aldehyde, ketone, ester
	      • carbohydrate (reducing and non-reducing sugars)
	      • primary, secondary, tertiary amine
	      • monoamide, diamide, thioamide
	      • anilide, nitro compound
	      • Preparation of derivatives for functional groups						

	UNIT III **25 Hours**
	
	Preparation of Organic Compounds
	
	  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/eucalyptus leaves. 4. **Chromatography (any one) (Group experiment)** (i) Separation of amino acids by Paper Chromatography (ii)Thin Layer Chromatography - mixture of sugars / plant pigments dichromate/permanganate (iii) Column Chromatography - extraction of carotene, chlorophyll and xanthophyll from leaves / separation of anthracene - anthracene picrate. 5. **Electrophoresis –** Separation of amino acids and proteins. **(Demonstration)** 6. Isolation of casein from milk/Determination of saponification value of oil or fat/Estimation of acetic acid from commercial vinegar. (Any one Group experiment) (4,5& 6–not for ESE)
Reference Books	1. Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. *Basic Principles of Practical Chemistry*, Sultan Chand: New Delhi, 2nd Ed., 2012. 2. Manna, A.K. *Practical Organic Chemistry*, Arunabha Sen, Books and Allied (P) LTD: Kolkata,2018. 3. Gurtu, J. N; Kapoor, R. *Advanced Experimental Chemistry (Organic)*, Sultan Chand: New Delhi, 1987. 4. Furniss,B. S.; Hannaford, A. J.; Smith, P. W. G.; Tatchell, A.R. *Vogel's Textbook of Practical Organic Chemistry*, Pearson: India, 5th Ed.,1989.
Website and e-learning source	https://www.vlab.co.in/broad-area-chemical-sciences

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

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

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

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

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

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

Board of Studies Date : 02.11.2023

Title of the Course		**INTEGRAL CALCULUS AND LAPLACE TRANSFORM (FOR I B.Sc. CHEMISTRY)**					
Paper Number		**ELECTIVE II (GE)**					
Category	**ELECTIVE COURSE**	**Year**	**I**	**Credits**	**3**	**Course Code**	**24UCHMGEC2**
		Semester	**II**				
Instructional Hours per week		**Lecture**	**Tutorial**	**Lab Practice**		**Total**	
		3	**-**	**-**		3	
Prerequisite		12th Standard Mathematics					
Objectives of the Course		1.To acquire the knowledge in integral calculus, Fourier series and Laplace transform 2. To understand the method of doing problems using the above concepts. 3. To analyse is the different methods of solving differential equations using the Laplace transform					

Course Outcomes:

Students will be able to

CO1: learn the notions of multiple integrals and Laplace transforms

CO2: Understand the change of order of integration, Fourier coefficients, odd and even functions and solved related problems.

CO3: analyse the properties of integration to evaluate double and triple integrals and Fourier series.

CO4: interpret the properties of Laplace transform, inverse Laplace transform and solve the related problems.

CO5: apply Laplace transform and inverse Laplace transform to solve the differential equations

Course Outline	
	Unit – I (Hours: 9) **Integral Calculus** Multiple Integrals, Evaluation of double integrals, Double integral in polar co- ordinates. **Chapter 20 (sections 20.1-20.17)**
	Unit – II (Hours: 9) Triple integrals, Change of order of integration. applications of double and triple integrals to area volume and centroid. **Chapter 20 (sections 20.18 -20.44)**
	Unit – III (Hours: 9) **Fourier Series** Definition, Finding Fourier series for a given periodic function with period 2π, Fourier series for odd and even functions. **Chapter 21 (sections 21.1-21.40)**
	Unit – IV (Hours: 9) **Laplace Transform** Definition, Laplace transform of elementary functions, Linearity property, shifting property, Change of Scale property, Laplace transform of derivatives. **Chapter 27 (sections 27.1-27.20)**
	Unit – V (Hours: 9) Inverse Laplace transform, solving differential equations using Laplace

	transform. (Simultaneous equations are to be excluded). **Chapter 27 (sections 27.23-27.57)** **(Section 5: Examples1-10 only, Exercise 4:1-26only)**
Skills acquired from the course	Knowledge, Problem-Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	P.R.Vittal, Allied Mathematics**,** Margham Publications, Chennai-1
Reference Books	S. Narayanan and T. K. Manicavachagam Pillay, Calculus - Volume III, S. Viswanathan (Printers and Publishers), Pvt., Ltd,2011.
Web resources	1. https://nptel.ac.in

Title of the Course	THEORY OF EQUATIONS AND LAPLACE TRANSFORM USING SAGE MATH- PRACTICAL (FOR I B.Sc CHEMISTRY)						
Paper Number	EC – PRACTICAL						
Category	ELECTIVE COURSE	Year	I	Credits	2	Course Code	24UCHMGECQ
		Semester	II				
Instructional Hours per week	Lecture	Tutorial	Lab Practice		Total		
	-	-	2		2		
Prerequisite	Basic knowledge in data and representations						
Objectives of the Course	The main objectives of this course are: 1. To work with interpolation and approximation methods in finding roots using SageMath. 2. To utilize SageMath to perform symbolic and numerical integration. and Laplace Transforms						

Course Outcomes:

Students will be able to

CO1: learn the notions of approximation of solutions, Laplace transforms, inverse Laplace transform and basic operations, commands within SageMath

CO2: understand the fundamental principles of ordinary differential equations and numerical integrations using SageMath to solve them accurately

CO3: apply the Laplace, Inverse Laplace Transforms to solve linear differential equations in SageMath.

CO4: analyze the application of SageMath in solving differential equations in simplifying and solving complex problems.

CO5: evaluate multiple integrals, and non-linear equations with accuracy using SageMath while demonstrating critical thinking skills

Course Outline	**Unit I: Theory of Equations** Problems on Finding the roots of the equations using the SageMath. **(Page No: 139-140)**
	Unit II: Non-Linear Equations Numerical Solution: Location of solutions of Algebraic equations and Iterative Approximation Methods using SageMath. **(Page No: 263-278)**
	Unit III: Multiple integral Available Integration Functions, Multiple Integrals using SageMath **(Page No: 305-317)**
	Unit IV: Laplace Equations Solving problems on Laplace transforms using SageMath **(Page No: 225)**
	Unit V: Inverse Laplace Transforms

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

Title of the Course	DAIRY CHEMISTRY						
Course No.	Skill Enhancement Course-II						
Category	NME	Year	I	Credits	2	Course Code	24UCHSEC2
		Semester	II				
Instructional hours per week	Lecture	Tutorial	Lab Practice			Total	
	2	-	-			2	
Prerequisites	Higher secondary chemistry						
Objectives of the course	This course aims at providing an overall view of the ● chemistry of milk and milk products ● processing of milk ● preservation and formation of milk products.						
Course Outline	**UNIT I** **6 Hours** **Composition of Milk** Milk-definition-general composition of milk- constituents of milk - lipids, proteins, carbohydrates, vitamins and minerals - physical properties of milk - colour, odour, acidity, specific gravity, viscosity and conductivity -Factors affecting the composition of milk - adulterants, preservatives with neutralizer-examples and their detection- estimation of fat, acidity and total solids in milk. Comparison of A1 and A2 milk **UNIT II** **6 Hours** **Processing of Milk** Microbiology of milk - destruction of micro - organisms in milk, physico – chemical changes taking place in milk due to processing - boiling, pasteurization – types of pasteurization -Bottle, Batch and HTST (High Temperature Short Time) – Vacuum pasteurization – Ultra High Temperature Pasteurization. **UNIT III** **6 Hours** **Major Milk Products** Cream - definition - composition - chemistry of creaming process - gravitational and centrifugal methods of separation of cream -. Butter - definition -composition - theory of churning – desi butter - salted butter, estimation of acidity and moisture content in butter. Ghee - major constituents - common adulterants added to ghee and their detection - rancidity- definition - prevention - antioxidants and synergists - natural and synthetic. Perspectives for food technology and health benefits of A2 milk and milk products.						

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

Course Learning Outcomes (for Mapping with POs and PSOs)   **On completion of the course the students should be able to**
CO 1: discuss about general composition of milk – constituents and its physical properties.   **CO 2:** describe pasteurization of milk and various types of pasteurization -Bottle, Batch and Ultra High Temperature Pasteurization.

CO 3: distinguish between cream and butter, their composition and how to estimate fat in cream and Ghee

CO 4: explain about homogenized milk, flavoured milk, vitaminised milk and toned milk.

CO 5: Summarize different types of drying process of milk.

Board of Studies Date : 02.11.2023

Title of the Course	INHERITED KNOWLEDGE IN COSMETIC CHEMISTRY						
Course No.	Skill Enhancement Course-III (Indian Knowledge System)						
Category	SEC	Year	I	Credits	2	Course Code	24UCHSEC3
		Semester	II				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	2	-	-		2		
Prerequisites	Higher secondary Chemistry						
Objectives of the course	This course aims at familiarizing the students with ● formulations of various types of cosmetics and their significance ● hair, skin and dental care ● makeup preparations and personal grooming						
Course Outline	**UNIT I** **6 Hours** **Skin care: Ancient and modern perspective** Indian Knowledge system for cosmetics- Dinacharya for healthy skin, ayurvedic formulations for skin care- cosmetic tailams, Ghritas and Kosta etc. Nutrition of the skin, skin care and cleansing of the skin; face powder – ingredients; creams and lotions – cleansing, moisturizing all purpose, skin tonics – key ingredients, skin lightness.						
	UNIT II **6 Hours** **Ancient formulations for Hair care and Dental care** Sanskrit origin of shampoo, types of shampoo- traditional and modern- powder, cream, liquid and gel, ingredients; tips from ancient Indian system for hair care- Kayakalpa-vettiver bath. Dental care -Dantashauscha- Neem and babul sticks, Oil pulling, Tooth pastes – ingredients – mouth wash.						
	UNIT III **6 Hours** **Types of Make up** Base – foundation – types – ingredients; lipstick-ancient Indian origin, eyeliner, mascara, eye shadow, concealers, rouge.						
	UNIT IV **6 Hours** **Natural and Synthetic Perfumes** Indian perfume Industry-attars- -essential oils- Medicinal values of herbal products, some important perfume oil, dhavana oil, musk, ambrette oil, champaka oil and oil of vettiver, synthetic – classification emphasizing characteristics –esters – alcohols – aldehydes – ketones.						
	UNIT V **6 Hours** **Traditional Beauty treatments** Mukhabhyangam(gentle facial massage)- Facials - types – advantages – disadvantages; face packs – harmless face pack formulations from ancient Indian origin types- multani mitti face pack, turmeric face pack; bleach - types – advantages– disadvantages; eyelash tinting; perming-types; hair colouring and dyeing.						

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

Course Learning Outcomes (for Mapping with POs and PSOs)
On completion of the course the students should be able to
CO1: recall the composition of various cosmetic products
CO2: explain chemical aspects and applications of hair care and dental care and skin care products.
CO3: categorize chemical aspects and applications of perfumes and skin care products.
CO4: analyze the methods of beauty treatments, their advantages and disadvantages.
CO5: summarize the hazards of cosmetic products.

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

Board of Studies Date : 02.11.2023

Title of the Course	GENERAL CHEMISTRY – III						
Paper No.	Core Course V						
Category	Core	Year	II	Credits	5	Course Code	24UCHCC3
		Semester	III				
Instructional hours per week	Lecture	Tutorial	Lab Practice			Total	
	4	1	-			5	
Prerequisites	General Chemistry – I and II						
Objectives of the course	This course aims to provide a comprehensive knowledge on - the physical properties of gases, liquids, solids and X-ray diffraction of solids. - fundamentals of nuclear chemistry and nuclear waste management. - applications of nuclear energy - basic chemistry of halo-organic compounds, phenol and other aromatic alcohols. - preparation and properties of phenols and alcohols.						
Course Outline	**UNIT I** **15 Hours** **Gaseous state** Kinetic molecular model of a gas: postulates and derivation from the kinetic gas equation; The Maxwell –Boltzmann distribution of speed of molecules- average, root mean square and most probable velocity and average kinetic energy, law of equipartition of energy, degrees of freedom and molecular basis of heat capacities. Collision frequency; collision diameter; mean free path and viscosity of gases. Real gases: Deviations from ideal gas behaviour, (Andrew's and Amagat's plots); compressibility factor, Z, and its variation with pressure for different gases. equations of states for real gases-van der Waal's equation; Virial equation; Boyle temperature; Numerical problems based on equations of 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 the core concepts**.** **UNIT-II** **15 Hours** **Liquid and Solid State** Properties of Liquids- Surface tension, viscosity and their applications. Crystalline and amorphous – differences - geometry, isotropy and anisotropy, melting point; isomorphism, polymorphism. Crystals –size and shape; laws of crystallography; symmetry elements – plane, centre and axis; Miller indices, unit cells and space lattices; classification of crystal systems; Bravais lattices; X – ray diffraction – Bragg's equation Packing in atomic solids – simple cubic, body centered cubic, face centered and hexagonal close packing; Co-ordination number in typical structures - NaCl, CsCl, ZnS, TiO_2; comparison of structure and properties of diamond and graphite; numerical problems involving core concepts Defects in solids - stoichiometric and nonstoichiometric defects. **Liquid crystals** – Mesomorphic state- Classification of thermotropic liquid crystals-smectic-nematic-cholesteric-disc shaped and polymer liquid crystals-applications.						

UNIT-III	**15 Hours**

Nuclear Chemistry

Natural radioactivity - α, β and γ rays; half-life period; Fajan–Soddy group displacement law; Geiger–Nattal rule; isotopes, isobars, isotones, mirror nuclei, iso diaphers; nuclear isomerism; radioactive decay series; magic numbers; units – Curie, Rutherford, Roentgen; nuclear stability - neutron- proton ratio; binding energy; packing fraction; mass defect. Simple calculations involving mass defect and B.E., decay constant and $t^{1/2}$ and radioactive series.
Isotopes – uses – tracers – determination of age of rocks by radiocarbon dating. (Problems to be worked out)

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

UNIT-IV	**15 Hours**

Halogen derivatives
Aliphatic halogen derivatives
Nomenclature and classes of alkyl halides – isomerism, physical properties, Chemical reactions. Nucleophilic substitution reactions – S_N1, S_N2 and S_Ni mechanisms with stereochemical aspects and effect of solvent.
Di, Tri & Tetra Halogen derivatives: Nomenclature, classification, preparation, properties and applications.

Aromatic halogen compounds
Nomenclature, preparation, properties and uses
Mechanism of nucleophilic aromatic substitution – benzyne intermediate.

Aryl alkyl halides
Nomenclature, benzyl chloride – preparation – preparation properties and uses
Alcohols: Nomenclature, classification, preparation, properties, use; conversions – ascent and descent of series; test for hydroxyl groups. Oxidation of diols by periodic acid and lead tetraacetate.

UNIT-V	**15 Hours**

Phenols
Nomenclature; classification, Preparation from diazonium salts, cumene, Dow's process, Raching process; properties – acidic character and effect of substitution on acidity. Reactions – Fries, claisen rearrangement, Electrophilic substitution reactions, Reimer - Teimen, Kolbe, Schmidt, Gatermann synthesis, Libermann, nitro reaction, phthalein reaction.

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

	Aromatic alcohols Nomenclature, benzyl alcohol – methods of preparation – hydrolysis, reduction of benzaldehyde, Cannizzaro reaction, Grignard synthesis, physical properties, reactions – reaction with sodium, phosphorus pentachloride, thionyl chloride, acetic anhydride, hydrogen iodide, oxidation – substitution on the benzene nucleus, uses. Thiols: Nomenclature, structure, preparation and properties.
Extended Professional Component (is a part of internal component only, not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Puri, B.R, Sharma, L.R. and Pathania, M.S. *Principles of Physical Chemistry*, 46th Ed, Vishal Publishing, 2020. 2. Puri, B.R. Sharma L.R. and Kalia K.C., *Principles of Inorganic Chemistry*, Milestone Publishers and Distributors, New Delhi, 13th Ed, 2009. 3. Soni P.L. and Mohan Katyal, *Textbook of Inorganic Chemistry*, Sultan Chand & amp; Sons, 20th, 2006. 4. Jain, M. K. Sharma S. C, *Modern Organic Chemistry*, Vishal Publishing, 4th Ed, 2003. 5. Mukherji, S.M. and Singh S.P., *Reaction Mechanism in Organic Chemistry*, Macmillan India Ltd., 3rd Ed, 1994.
Reference Books	1. Graham Solomons T. W., *Organic Chemistry*, John Wiley & Sons, 5th Ed, 1992. 2. Carey Francis A., *Organic Chemistry*, Tata McGraw-Hill Education Pvt., Ltd., New Delhi, 7th Ed, 2009. 3. Finar I. L., *Organic Chemistry*, Wesley Longman Ltd, England, 6th Ed, 1996. 4. Soni P. L. and Chawla H. M. - *Text Book of Organic Chemistry*, New Delhi, Sultan Chand & Sons, 29th Ed 2007. 5. Lee J.D., *Concise Inorganic Chemistry*, Blackwell Science, 5th Ed, 2005.
Website and e-learning source	**MOOC components** https://nptel.ac.in/courses/10410410 1 Solid state chemistry https://nptel.ac.in/courses/10310607 1 Nuclear industries and safety https://nptel.ac.in/courses/10410611 9s Introduction to organic chemistry

Course Learning Outcomes (for Mapping with POs and PSOs)
On completion of the course the students should be able to
 CO1: explain the kinetic properties of gases by using mathematical concepts.
 CO2: describe the physical properties of liquid and solids; identify various types of crystals with respect to its packing and apply the XRD method for crystal structure determinations.
 CO3: investigate the radioactivity, nuclear energy and it's production, also the nuclear waste management.
 CO4: write the nomenclature, physical & chemical properties and basic mechanisms of halo organic compounds and alcohols.
 CO5: investigate the named organic reactions related to phenol; explain the preparation and properties of aromatic alcohol including thiol.

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

Board of Studies Date: 23.04.2024

Title of the Course	QUALITATIVE INORGANIC ANALYSIS					
Paper No.	Core Course- VI: Core Practical-III					
Category	Core	Year	II	Credits	2	Course Code	24UCHCCQ3
		Semester	III				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total	
	1	-	3		4	
Prerequisites	General chemistry					
Objectives of the course	To develop the skill on systematic analysis of simple inorganic salts and mixture of salts.					
Course Outline	**Semi - Micro Qualitative Analysis** 1. Analysis of simple acid radicals: Carbonate, sulphide, sulphate, thiosulphite, chloride, bromide, iodide, nitrate 2. Analysis of interfering acid radicals: Fluoride, oxalate, borate, phosphate, arsenate, arsenite. 3. Elimination of interfering acid radicals and identifying the group of basic radicals 4. Analysis of basic radicals (group wise): Lead, copper, bismuth, cadmium, tin, antimony, iron, aluminium, arsenic, zinc, manganese, nickel, cobalt, calcium, strontium, barium, magnesium, ammonium 5. Analysis of a mixture - I to VIII containing two cations and two anions (of which one is interfering type)					
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.					
Recommended Text	**Reference Books:** Venkateswaran V, Veeraswamy R. and Kulandivelu A. R., Basic Principles of Practical Chemistry, Sultan Chand & Sons, New Delhi, 2nd Ed, 1997.					
Website and e-learning source	https://www.vlab.co.in/broad-area-chemical-sciences					

Course Learning Outcomes (for Mapping with POs and PSOs)

On successful completion of the course the students should be able to
CO 1: acquire knowledge on the systematic analysis of Mixture of salts.
CO 2: identify the cations and anions in the unknown substance.
CO 3: identify the cations and anions in the soil and water and to test the quality of water.
CO 4 : assess the role of common ion effect and solubility product

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

Board of Studies Date: 23.04.2024

Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
24UCHPGEC3	**PHYSICS - I**	Generic				3	3	75

COURSE	**GENERIC ELECTIVE-I**
COURSE TITLE	**PHYSICS - I**
CODE	**24UCHPGEC3**
CREDITS	**3**
HOURS	**3**
COURSE OBJECTIVES	To impart basic principles of Physics that which would be helpful for students who have taken programmes other than Physics.

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

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

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

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

MAPPING WITH PROGRAM OUT COMES:

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

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

COURSE	GENERIC ELECTIVE –I
COURSE TITLE	PHYSICS PRACTICAL - I
CODE	24UCHPGECQ1
CREDITS	2
HOURS	2
COURSE OBJECTIVES	Apply various physics concepts to understand Properties of Matter and waves, set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results

ANY Seven only

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

Note : Use of digital balance permitted

Board of Studies Date : 02.05.2023

Title of the Course	ENTREPRENEURIAL SKILLS IN CHEMISTRY						
Paper No.	**Skill Enhancement Course -IV**						
Category	**NME**	**Year**	**II**	**Credits**	**1**	**Course Code**	**24UCHSEC4**
		Semester	**III**				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	-	**-**	**1**			**1**	
Prerequisites	General Chemistry						
Objectives of the course	The course aims at providing training to ● develop entrepreneur skills in students ● to provide hands on experience to prepare and develop products ● develop start ups						
Course Outline	**UNIT -I** **Food Chemistry** Food adulteration-contamination of food items with clay stones, water and toxic chemicals -Common adulterants. Food additives, Natural and synthetic anti-oxidants, glazing agents (hazardous effect), food colourants, Preservatives, leavening agents, Baking powder and baking soda, yeast, MSG, vinegar. **Dyes** Classification – Natural, synthetic dyes and their characteristics – basic methods and principles of dyeing						

	UNIT II
	
	 Hands on Experience (Students can choose any four)
	 Detection of adulterants in food items like coffee, tea, pepper, chilli powder, turmeric powder, butter, ghee, milk, honey etc., by simple techniques.
	 Preparation of Jam, squash and Jelly, Gulkand, cottage cheese.
	 Preparation of products like candles, soap, detergents, cleaning powder, shampoos, pain balm, tooth paste/powde rand disinfectants in small scale.
	 Extraction of oils from spices and flowers.
	 Testing of water samples using testing kit.
	 Dyeing – cotton fabrics with natural and synthetic dyes
	 Printing – tie and dye, batik.
	 Identification of Food Colourants
	     a) Caramel
	     b) Cochineal
	     c) Turmeric
	     d) Annatto
	     e) Chlorophyll
	     f) Betanin.						

	Skills acquired from this course	Entrepreneurial skills.
	Recommended Text	1. George S &Muralidharan V, (2007) Fibre to Finished Fabric – A Simple Approach, Publication Division, University of Madras, Chennai. 2. Appaswamy G P, A Handbook on Printing and Dyeing of Textiles. 3. Michael Scotter, Food Additives and Contaminants.
	Reference Books	Shyam Jha, Rapid detection of food adulterants and contaminants (Theory and Practice),Elsevier, e Book ISBN 9087128004289, 1st Ed,2015
	Website and e-learning source	https://www.vlab.co.in/broad-area-chemical-sciences https://hal.archives-ouvertes.fr/hal-00680179,2012

Course Learning Outcomes (for Mapping with POs and PSOs)
On completion of the course the students should be able to
CO 1: identify adulterated food items by doing simple chemical tests.
CO 2: prepare cleaning products and become entrepreneurs
CO 3: educate others about adulteration and motivate them to become entrepreneurs.

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

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

Title of the Course	PESTICIDE CHEMISTRY						
Paper No.	Skill Enhancement Course -V						
Category	SEC	Year	II	Credits	2	Course Code	24UCHSEC5
		Semester	III				
Instructional hours per week	Lecture	Tutorial	Lab Practice			Total	
	2	-	-			2	
Prerequisites	Fundamentals in chemistry						
Objectives of the course	This course aims to providing the students ● knowledge about the various types of pesticides and their toxicity. ● to understand the accumulation of pesticides in in the form of residues and its analysis. ● knowledge on choice of alternate and eco-friendly pesticides.						
Course Outline	**Unit I** **Introduction**: History of pesticides. Chemistry of Pesticides: Brief introduction to classes of pesticides (Chemical class, targets), structures, chemical names, physical and chemical properties. **Toxicity of pesticides**: Acute and chronic toxicity in mammals, birds, aquatic species etc. Methods of analysis of pesticides. **Insecticides:** Classification and study of following insecticides with respect to structure, chemical name, physical properties, chemical properties, synthesis, degradation, metabolism, formulations, Mode of action, uses, toxicity. Organophosphates and Phosphothionates: Acephate, Chlorpyriphos, Monocrotophos, and parathion-methyl. Organochlorine – Endosulfan, heptachlor; Carbamate: Cartap hydrochloride, Methomyl, Propoxur.						
	Unit II **Pesticides residues:** Introduction- application of agrochemicals, dissemination pathways of pesticides, causes of pesticide residues, remedies. Pesticides residues in atmosphere- entry into atmosphere, action of pesticides, effects on environments. Pesticides residues in water - entry into water systems, action and effect in aquatic environment. Pesticides residues in soil. entry into soil, absorption, retention and transport in soil, effects on microorganism, soil condition and fertility, decomposition and degradation by climatic factors and microorganism. **Pesticide Residues effect and analysis:** Effects of pesticides residue on human life, birds and animals- routes for exposure to pesticides, action of pesticides on living system. Analysis of pesticides residues- sample preparation, extraction of pesticides residues (soil, water and vegetables/fruits) simple methods and schemes of analysis, multi-residue analysis.						

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

Course Learning Outcomes (for Mapping with POs and PSOs)
On completion of the course the students should be able to
   CO 1: Identify the pesticides and their toxicity with respect to structure and category.
   CO 2: explain the preparation and property of pesticides
   CO 3: investigate the pesticide residues, prevention and care
   CO 4: demonstrate the extraction and analytical methods of pesticide residues
   CO 5: make awareness to the public on bio-pesticides

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

Level of Correlation between PSO's and CO's

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

Level of Correlation between PO's and CO's

Board of Studies Date: 23.04.2024

Title of the Course	GENERAL CHEMISTRY-IV						
Paper No.	Core Course -VII						
Category	Core	Year	II	Credits	5	Course Code	24UCHCC4
		Semester	IV				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	5	-	-		5		
Prerequisites	General Chemistry III						
Objectives of the course	This course aims to provide a comprehensive knowledge on - thermodynamic concepts on chemical processes and applied aspects. - thermochemical calculations - transition elements with reference to periodic properties and group study of transition metals. - the organic chemistry of ethers, aldehydes, ketones and carboxylic acids.						
Course Outline	**UNIT I** **Thermodynamics I** **15 Hours** Terminology – Intensive, extensive properties, state, path functions; isolated, closed and open systems; isothermal, adiabatic, isobaric, isochoric, cyclic, reversible and irreversible processes; First law of thermodynamics – Concept and significance of heat (q), work (w), internal energy (E), enthalpy (H); calculations of q, w, E and H for reversible, expansion of ideal gases under isothermal conditions; relation between heat capacities (Cp & Cv); Joule Thomson effect- inversion temperature. Thermochemistry - heats of reactions, standard states; effect of temperature (Kirchhoff's equations) and pressure on enthalpy of reactions; Hess's law and its applications; Measurement of heat of reaction –Zeroth law of thermodynamics-Absolute Temperature scale.						
	UNIT II **Thermodynamics II** **15 Hours** Second Law of thermodynamics - Limitations of first law, spontaneity and randomness; Carnot's cycle; Concept of entropy, entropy change for reversible and irreversible processes, entropy of mixing, calculation of entropy changes of an ideal gas with changes in temperature, volume and pressure. Free energy and work functions - Need for free energy functions, Gibbs free energy, Helmholtz free energy - their variation with temperature, pressure and volume, criteria for spontaneity; Gibbs-Helmholtz equation – derivations and applications; Maxwell relationships, thermodynamic equations of state; Thermodynamics of mixing of ideal gases, Ellingham Diagram-application. Third law of thermodynamics - Nernst heat theorem; Applications of third law - evaluation of absolute entropies from heat capacity measurements, exceptions to third law.						

	UNIT III
	General Characteristics of d-block elements **15 Hours** **Transition Elements**- Electronic configuration - General periodic trend variable valency, oxidation states, stability of oxidation states, colour, magnetic properties, catalytic properties and tendency to form complexes. Comparative study of transition elements and non-transition elements – comparison of II and III transition series with I transition series. Group study of Titanium, Vanadium, Chromium, Manganese, Iron, Cobalt, Nickel and Zinc groups.
	UNIT IV
	Ethers and Epoxides **15 Hours** Nomenclature, isomerism, general methods of preparations, reactions involving cleavage of C-O linkages, alkyl group and ethereal oxygen. Zeisel's method of estimation of methoxy group. Reactions of epoxides with alcohols, ammonia derivatives and $LiAlH_4$ **Aldehydes and Ketones** Nomenclature, structure and reactivity of aliphatic and aromatic aldehydes and ketones; general methods of preparation and physical properties. Nucleophilic addition reactions, base catalysed reactions with mechanism- Aldol, Cannizzaro's reaction, Perkin reaction, Benzoin condensation, Haloform reaction, Knoevenagel reaction. Oxidation of aldehydes. Reduction: Clemmensen reduction, Wolf - Kishner reduction, Meerwein – Pondorf Verley reduction, reduction with $LiAlH_4$ and $NaBH_4$. Addition reactions of unsaturated carbonyl compounds: Michael addition.
	UNIT V
	Carboxylic Acids: **15 Hours** Nomenclature, structure, preparation and reactions of aliphatic and aromatic monocarboxylic acids. Physical properties, acidic nature, effect of substituent on acidic strength. HVZ reaction, Claisen ester condensation, Bouveault Blanc reduction, decarboxylation, Huns diecker reaction.Formic acid-reducing property. **Carboxylic acid Derivatives:** Preparations of aliphatic and aromatic acid chlorides, esters, amides and anhydrides. Nucleophilic substitution reaction at the acyl carbon of acyl halide, anhydride. Schottan- Baumann reaction. Claisen condensation, Dieckmann and Reformatsky reactions, and Curtius rearrangement. **Active methylene compounds:** Keto – enol tautomerism. Preparation and synthetic applications of diethyl malonate and ethyl acetoacetate **Halogen substituted acids** – nomenclature; preparation by direct halogenation, iodination from unsaturated acids, alkyl malonic acids **Hydroxy acids** – nomenclature; preparation from halo, aldehydic and ketonic acids, ethylene glycol – action of heat on α, β and γ hydroxy acids.

Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/JAM /TNPSC others to be solved (To be discussed during the tutorial hours).
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Puri B.R. & Sharma L.R., *Principles of Physical Chemistry*, Shoban Lal Nagin Chand and Co., 33rd Ed., 1992. 2. Kapoor K. L. *A Textbook of Physical chemistry*, (volume-2 and 3), Macmillan, India Ltd, 3rd Ed., 2009. 3. Soni P.L. & Mohan Katyal, *Textbook of Inorganic Chemistry*, Sultan Chand & Sons, 12th Ed., 2006. 4. Jain M. K. & Sharma S. C. *Modern Organic Chemistry*, Vishal Publishing, 4th reprint, 2003. 5. Mukherji S.M. & Singh S.P. *Reaction Mechanism in Organic Chemistry*, Macmillan India Ltd., 3rd Ed., 1994.
Reference Books	1. Maron, S. H. &Prutton C. P. *Principles of Physical Chemistry,*4th 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 University Press:New York, 2014. 5. Huheey, J. E. *Inorganic Chemistry: Principles of Structure and Reactivity,* 4th Ed., Addison Wesley Publishing Company: India,1993.
Website and e-learning source	**MOOC components** 1. https://nptel.ac.in/courses/112102255 Thermodynamics 2. https://nptel.ac.in/courses/104101136 Advanced transition metal chemistry 3. https://testbook.com/chemistry/aldehydes-ketones 4. https://chem.libretexts.org/Reactions_of_Epoxides_-_Ring-opening\ 5. https://archive.nptel.ac.in/courses/112/106/112106133/

Course Outcomes

On completion of the course the students should be able to

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

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

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

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

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

CO-PO Mapping (Course Articulation Matrix)

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

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

Board of Studies Date: 04.11.2024

Title of the Course	**PHYSICAL CHEMISTRY PRACTICAL - I**						
Paper No.	Core Course-VIII: Core Practical-IV						
Category	**Core**	**Year**	**II**	**Credits**	**3**	**Course Code**	**24UCHCCQ4**
		Semester	**IV**				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	-	**-**	**3**			**3**	
Prerequisites	General Chemistry						
Objectives of the course	The course aims at providing an understanding of - the laboratory experiments in order to understand the concepts of physical changes in chemistry - the rates of chemical reactions - colligative properties and adsorption isotherm						
Course Outline	**UNIT-I** **Chemical kinetics** 1. Determination of rate constant of acid catalysed hydrolysis of an ester (methyl acetate (or) ethyl acetate). 2. Determination of order of reaction between iodide and persulphate (initial rate method). 3. Polarimetry: Determination of rate constant of acid catalysed inversion of cane sugar **Thermochemistry** 4. Determination of heat of neutralisation of a strong acid by a strong base. 5. Determination of heat of hydration of copper sulphate						
	UNIT II **Electrochemistry** **Conductometry** 6. Determination of cell constant 7. Determination of equivalent conductance of strong electrolyte 8. Determination of dissociation constant of acetic acid **Potentiometry** 9. Potentiometric titration of HCl against NaOH						
	UNIT III **Colligative property** 10. Determination of molecular weight of an organic compound by Rast method using naphthalene or diphenyl as solvent 11. Determination of molar depression constant K_f of the given solvent. **Adsorption** 12. Construction of Freundlich isotherm for the adsorption of acetic acid on activated charcoal.						
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.						

Reference Books	1. Sindhu, P.S.*Practicals in Physical Chemistry*, Macmillan India : New Delhi, 2005. 2. Khosla, B. D.Garg,V. C.; Gulati, A.; *Senior Practical Physical Chemistry,* R.Chand : New Delhi, 2011. 3. Gupta, Renu, *Practical Physical Chemistry*, 1st Ed.; New Age International: New Delhi, 2017.	
Website and e-learning source	https://www.vlab.co.in/broad-area-chemical-sciences	

Course Outcomes
On completion of the course the students should be able to
CO1: describe the principles and methodology for the practical work
CO2: explain the procedure, data and methodology for the practical work.
CO3: apply the principles of electrochemistry, kinetics for carrying out the practical work.
CO4: demonstrate laboratory skills for safe handling of the equipment and chemicals

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

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date: 04.11.2024

Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
24UCHPGEC4	PHYSICS –II	Elective - II	2	1	-	3	3	70

COURSE OBJECTIVES	To understand the basic concepts of optics, modern Physics, Relativity, quantum physics, semiconductor physics and electronics

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

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

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

COURSE OUTCOMES	**CO1**	Explain the concepts of interference diffraction using principles of super position of waves and rephrase the concept of polarization based on wave patterns
	CO2	Outline the basic foundation of different atom models and various experiments establishing quantum concepts. Relate the importance of interpreting improving theoretical models based on observation.
	CO3	Summarize the properties of nuclei, nuclear forces structure of atomic nucleus and nuclear models. Solve problems on delay rate half-life and mean-life. Interpret nuclear processes like fission and fusion. Understand the importance of nuclear energy in nuclear field.
	CO4	To describe the basic concepts of relativity like equivalence principle, inertial frames and Lorentz transformation. Extend their knowledge on concepts of relativity and vice versa.
	CO5	Summarize the working of semiconductor devices like junction diode, Zener diode, transistors and full wave bridge rectifier.

MAPPING WITH PROGRAM OUT COMES:

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

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

Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
24UCHPGECQ2	PHYSICS PRACTICAL- II	Elective	-	-	2	2	2	60

COURSE	Elective Course (GE)
COURSE TITLE	PHYSICS PRACTICAL – II
CREDITS	2
COURSE OBJECTIVES	1.Apply the concepts of Light, electricity and magnetism and waves, 2. Set up experiments to verify theories, quantify and analyse the observations. 3.To do error analysis and correlate results

Any Eight

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

Board of Studies Date : 02.11.2023

Title of the Course	INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS						
Paper No.	Skill Enhancement Course -VI						
Category	SEC	Year	II	Credits	2	Course Code	24UCHSEC6
		Semester	IV				
Instructional hours per week	Lecture	Tutorial	Lab Practice			Total	
	2	-	-			2	
Prerequisites	General Chemistry						
Objectives of the course	The course aims at providing an overall view of the ● operation and troubleshooting of chemical instruments ● fundamentals of analytical techniques and its application in the characterization of compounds ● theory of chromatographic separation and ● thermo / electro analytical techniques ● stoichiometry and the related concentration terms						
Course Outline	**UNIT-I** **Qualitative and Quantitative Aspects of Analysis 6 Hours** S.I Units, Distinction between Mass and Weight. Moles, Milli moles, Milli equivalence, Molality, Molarity, Normality, Percentage by Weight and Volume, ppm, ppb. Density and Specific Gravity of Liquids. Evaluation of analytical data, Errors – Types of Errors, Accuracy, Precision, Minimization of Errors. Significant Figures. Methods of Expressing Precision: Mean, Median, Average Deviation, Standard Deviation.						
	UNIT II **Atomic Absorption Spectroscopy: 6 Hours** Basic principles of instrumentation (source, monochromator, detector, choice of flame and Burner designs) - Techniques of atomization and sample introduction-Techniques for the quantitative estimation of trace level of metal ions from water samples.						
	UNIT III **UV-Visible and IR Spectroscopy 6 Hours** Origin of spectra, interaction of radiation with matter, Beer-Lambert's law and its validity. **UV-Visible Spectrometry:** Basic principles, instrumentation for single and double beam instrument. **Infrared Spectroscopy:** Basic principles of instrumentation for double beam instrument; sampling techniques.						
	UNIT IV **Thermal and Electro-analytical Methods of Analysis 6 Hours** TGA and DTA- Principle, Instrumentation, factors affecting TGA/DTA, Thermal analysis of calcium oxalates. Electroanalytical methods: polarography - principle, instrumentation and applications.						

	UNIT V **Separation and purification techniques 6 Hours** Principle of Solvent Extraction and Liquid- Liquid Extraction, Chromatography: Column, TLC, Paper - Principle, Choice of adsorbents, solvents, preparation of Column and elution - development of chromatograms and Rf value.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Vogel, Arthur I: *A Test book of Quantitative Inorganic Analysis* (Rev. by G.H. Jeffery and others) 5th Ed., The English Language Book Society of Longman. 2. Gopalan R., Subramanian P. S. and Rengarajan K., *Elements of Analytical Chemistry*, Sultan Chand, New Delhi, 2007. 3. Skoog, Holler & Crouch, *Principles of Instrumental Analysis*, Cengage Learning, 6th Indian Reprint (2017). 4. Speyer R., *Thermal Analysis of Materials*, CRC Press, 1993. 5. Day R.A. & Underwood A.L., *Quantitative Analysis*, 6th Ed., Prentice Hall of India Private Ltd., New Delhi, 1993
Reference Books	1. Skoog D. A., West D. M. & Holler F. J., *Analytical Chemistry: An Introduction,* 5th Ed., Saunders college publishing, Philadelphia, 1998. 2. Dash U N, *Analytical Chemistry*; Theory and Practice, Sultan Chand and sons Educational Publishers, New Delhi, 2011. 3. Christian, Gary D; *Analytical Chemistry*, 6th Ed., John Wiley & Sons, New York, 2004. 4. Mikes, O. & Chalmes, R.A. *Laboratory Handbook of Chromatographic & Allied Methods*, Elles Harwood Ltd. London 6. Jeffery G.H., Bassett J., Mendham J. & R.C. Denney, *Vogel's Textbook of Quantitative Chemical Analysis,* 6th Ed., Pearson Education, 2000

Website and e-learning sources	1. http://www.epa.gov/rpdweb00/docs/marlap/402-b-04-001b-14- final.pdf 2. http://eric.ed.gov/?id=EJ386287 3. http://www.sjsu.edu/faculty/watkins/diamag.htm 4. http://www.britannica.com/EBchecked/topic/108875/separation-and-purification 5. http://www.chemistry.co.nz/stoichiometry.htm

Course Outcomes
On completion of the course the students should be able to

CO1: apply error analysis in the calibration and use of analytical instruments.
CO2: explain theory, instrumentation and application of flame photometry, atomic absorption spectrometry, UV visible and Infrared spectroscopy.
CO3: able to discuss instrumentation, theory and applications of thermal and electrochemical techniques.
CO4: assess the use of chromatographic techniques in the separation and identification of mixtures.
CO5: develop skill in the preparation of solutions.

	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

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date : 04.11.2024

Title of the Course	FORENSIC SCIENCE						
Paper No.	Skill Enhancement Course -VII						
Category	SEC	Year	II	Credits	2	Course Code	24UCHSEC7
		Semester	IV				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	2	-	-		2		
Prerequisites	General Chemistry						
Objectives of the course	This course aims at giving an overall view of ● crime detection through analytical instruments ● forgery and its detection ● medical aspects involved						
Course Outline	**UNIT I** **Poisons** **6 Hours** Poisons - types and classification - diagnosis of poisons in the living and the dead -clinical symptoms - Heavy metal contamination (Hg, Pb, Cd) of sea foods - use of neutron activation analysis in detecting arsenic in human hair. **UNIT-II** **Crime Detection** **6 Hours** Accidental explosion during manufacture of matches and fireworks (as in Sivakasi). Human bombs - possible explosives (gelatin sticks and RDX) - metal detector devices and other security measures for VVIP-composition of bullets and detecting powder burns. **UNIT-III** **Forgery and Counterfeiting** **6 Hours** Documents - different types of forged signatures - writing deliberately modified - uses of ultraviolet rays -comparison of type written letters – checking silver line water mark in currency notes – alloy analysis using AAS to detect counterfeit coins – detection of gold purity in 22 carat ornaments – detecting gold plated jewels -authenticity of diamond. **UNIT-IV** **Tracks and Traces** **6 Hours** Tracks and traces - small tracks and police dogs - foot prints - costing of foot prints -residue prints, walking pattern or tyre marks – miscellaneous traces and tracks – glass fracture - tool marks - paints - fibres - Analysis of biological substances - blood, semen, saliva, urine and hair - detecting steroid consumption in athletes and racehorses.						

	UNIT-V **Medical Aspects** **6 Hours** Metabolite analysis using mass spectrum - Gas chromatography-Arson -natural fires and arson - burning characteristics and chemistry of combustible materials -nature of combustion. Ballistics - classification - internal and terminal ballistics -laboratory examination of barrel washing and detection of powder residue by chemical tests.
Recommended Text	1. Iqbal S.A, Liviu .M, *Textbook of forensic chemistry*, Discovery publishing house private limited, 2011. 2. Kelly M. Elkins, *Introduction to Forensic Chemistry*, CRC Press, Taylor & Francis Group, 2019. 3. Javed I. Khan, Thomas J. Kennedy, Donnell R. Christian, Jr., *Basic principles of Forensic chemistry*, Humana Press, 1st Ed, 2012. 4. Bapuly A.K, *Forensic Science – Its application in crime investigation,* Paras Medical Publisher, Hyderabad 2006. 5. Sharma B.R. *Scientific Criminal Investigation*, Universal Law Publishing Co. Pvt. Ltd, New Delhi 2006.
Reference Books	1. Richard Saferst in and Criminalistics-An Introduction to Forensic Science (College Version), Sopfestein, Printice Hall, 8th Ed. 2. Suzanne Bell, Forensic Chemistry, Pearson, 2nd international Ed, 2014. 3. Jay Siegel, *Forensic chemistry: Fundamentals and applications*, Wiley- Blackwell, first edition, 2015. 4. Max M. Houck & Jay A. Segal, *Fundamentals of Forensic Science*, Elsevier Academic press 2006. 5. Henry C. Lee, Timothy Palmbach, Marilyn T. Miller, Henry Lee's Crime Scene Book Elsevier Academic press 2006
Website and e-learning source	1. http://www.library.ucsb.edu/ist/03-spring/internet.html 2. http://www.wonder how to.com/topic/forensic-science/

Course Outcomes

On completion of the course the students should be able to

CO 1: describe the types of poisons and classification of poisons in the living and the dead organisms.

CO 2: get awareness on Human bombs, possible explosives (gelatin sticks and RDX) and metal detector devices.

CO 3: detect the forgery documents, different types of forged signatures

CO4: gain the knowledge in identification and analysis of biological substances - blood, saliva, hair etc.,

CO 5: have an exposure on handling fire explodes.

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 – Low

Board of Studies Date: 04.11.2024