Department of Chemistry

Programme Outcome: The expected outcome of the course is to provide students with the concepts, principles, theories and practical applications of chemistry which facilitate them in pursuing their higher studies in chemistry, to boost their career and to apply Chemistry in their everyday life. The program encourages the students towards logical thinking, finding solutions to different issues scientifically, identifying hazard and beneficial elements in environment and society, finding the way to minimize pollutions, learn to use eco friendly parts and materials, thinking about sustainable development and also to make correct decisions when encountered with different challenges in life.

Course Code	Course Name	Course Outcomes
CEMG: Paper-C1P1(A)	GENERAL	This course will provide interest to understand about the basic concepts of atomic model, nucleus, quantum numbers, various principles, electronic configuration, wave function, periodic table, periodic properties, learn to naming of different inorganic and coordination complexes. The students will be aware of the importance and properties of the elements of the periodic table and how to analyst and separate various elements through qualitative estimation.
	INORGANIC	To develop interest and understanding about the basic concepts of oxidation and reduction, power of their oxidizing and reducing strength, standard electrode potential, electrochemical series; redox potentials and its applications, radio activity and its cause, utility and hazardless of nuclear energy, disintegration series, half-life period, radioactive equilibrium, types of nuclear reactions, artificial transmutation reactions, nuclear fission and nuclear fusion, Carbon-14 dating, nuclear forces: n-n, n-p, p-p.
	ORGANIC	From this course the students will be able to learn about the hybridisation of orbitals, the process like resonance, tautomerism, steric inhibition of resonance, hyperconjugation, inductive and field effects, H-bonding, dipole moment- bond moment and group moment, physical properties (m.p., b.p.,solubility) related to molecular structures. Organic reaction mechanism in aliphatic compounds, Electrophilic and free radical addition, Nucleophilic addition, Nucleophilic substitution reactions - SN1, SN2, SNi; Elimination reactions - α and β – eliminations, syn – and anti-elimination; E1 and E2- mechanism. Important reactions with mechanism of aliphatic compounds
	PHYSICAL	From this course the students will have knowledge about theories and laws of gases, different types of velocities possessed by gases, concept of real gases , liquid state and properties of liquids , parameters of thermodynamics, law of thermodynamics, heat engine, Carnot cycle, Carnot engine and its efficiency, concept of entropy, entropy change in simple transformations, physical significance of entropy. Gibb's free energy, Helmholtz free energy, Gibbs Helmholtz equation, criteria for thermodynamic equilibrium and spontaneity of a process. They will also be able to apply the knowledge acquired to solve problem relating to those topics.
CEMG: Paper-C1P2(A)	General	The students can apply their knowledge and understanding about the concepts of different types of bond in chemical compounds. They can also learn lattice energy, Born-Haber cycle, and ionic solids: radius ratio rule and its limitations, ionic potential, polarizing power and polarisability, Fajan's rule. Basic concepts of valence bond theory and its limitations, resonance and resonance energy, hybridization involving s, p, d orbitals; sigma and pi-bonds, bond length, bond order, bond energy, formal charge, dipole moment, percentage of ionic character of covalent bond, VSEPR theory and its applications, concept of equilibrium and equilibrium constant and factors on which equilibrium depends, La-Chatelier principle, simple application, inter relations hip between Kp, Kc and Kx, characteristic of the equilibrium state. Exothermic and endothermic reactions; enthalpy, laws of thermochemistry, bond dissociation energy, Born – Haber cycle.
	INORGANIC	From this course the students will be able to learn about Coordination complexes, Werner's theory, IUPAC nomenclature, different types of ligands, multi dentate ligands, coordination number and stereochemistry ; chelates, inner metallic complexes, types of isomerism in coordination compounds, bonding in coordination compounds: Valence Bond Theory. Double Salts and their applications,Concept of diamagnetism, paramagnetism, ferromagnetism and

		antiferromagnetism,origin of paramagnetic moment: electron spin moment and orbital angularmoment, magnetic susceptibility and magnetic moment; magnetic susceptibility measurement by Gouymethods.
CEMG: Paper-C1P2(B)	INORGANIC (Practical)	This paper will impart skills and knowledge in identification basic and acid radicals through preliminary test such as nature, colour and solubility of compound: Dry Test and Wet test for Acid, Basic and interfering radicals, removal of interfering radical, group separation and group analysis. The students will develop skills and learning about salt analysis and can apply their knowledge in identification of radicals/compounds present in water, food etc.
	ORGANIC (Practical)	The students can prepare some organic compounds like 7-hydroxy-4-methyl coumarin by Pechmann method, dibenzylidene acetone by condensation reaction, and some aniline derivatives via green method.
CEMG: Paper-C1P3(A)	ORGANIC	From this course the students will learn about the Stereochemistry of organic compounds: Types of stereoisomers, Conformation, Conformational nomenclature; relative stability of conformers on the basis of steric effects, conformational analysis of ethane, n-butane. Aromaticity, non-aromaticity, antiaromaticity, homoaromaticity (benzenoid and nonbenzenoid), Preparation and properties of benzene and naphthalene Organic reaction mechanism in aromatic compound, Electrophilic substitution in benzene Synthesis and reactivities of aromatic alcohols, aromatic halides, phenols, carbonyls, amines and carboxylic acids
	PHYSICAL	The students will learn here about the Chemical kinetics: Order and molecularity of a reaction, rate of reaction, rate laws and equations, experimental methods for the determination of order of reactions. Criteria of catalyst, classification, catalyst promoters, catalyst poison, theories of catalysis, applications of catalysts,. Idea about Phase, component, degree of freedom, phase rule equation phase diagram one component systems, Henry's law for solubility of a gas in liquid, Nernst Distribution law, partition coefficient. Type of solution, mode of expressing composition of solution, concept of extensive, intensive, additive, constitutive and colligative properties. Van't-Hoff factor, determination of molecular weight, analogy between ideal gas and dilute solution, abnormal solution properties. From knowledge and understanding of the above topics, they can solve numerical problems, perform calculations and apply to experiments.
CEMG: Paper-C1P3(B)	INORGANIC (Practical)	This paper will impart skills and knowledge in the preparation of some inorganic complexes and double salts like Chrome alum, Potash alum, Potasium – tri(oxalate) Chromate (III), Hexammine Cobalt (III)Chloride, Tris(thiourea) Cu(I) Sulphate, Bis (dimethylglyoximinato)Ni(II), Tetra ammine Cu(II) Sulphate, Tris(oxalate)ferrate(III).
	ORGANIC (Practical)	The students can acquire the skill and concept of analyzing and identifying some organic functional groups like phenolic-OH, -COOH, -CHO, >CO, $-NH_2$, $-NO_2$, $-CONH_2$, >C=C< present in some organic sample. They can also learn to determine m.p, solubility test of such compounds also.
CEMG: Paper-C1P4(A)	ORGANIC	From this course the student will learn about Synthetic applications of active methylene compounds and Grignards reagent concept of five and six membered heterocycles, nomenclature,aromatic character, structure, synthesis and chemical reactivity and chemistry of some heterocyclic compounds, Idea of carbohydrate monosaccharides, constitution, reactions and mechanism of reaction of glucose and fructose cyclic structures, pyranose and furanose forms. Synthesis, physical and chemical properties of amino acids determination of C and N terminal amino acid residues of peptides.

	PHYSICAL	The student will learn and acquire knowledge about the Arrhenius theory, mode of transport of electricity through solution, transport number of ions and its determination, conductance's, ionic mobility, electrolytes, Kohlrausch's law and its applications, measurement of conductance of solutions and applications. Solubility of sparingly soluble salts. Ostwald dilution law, ionization of water, pH, buffer solution, buffer capacity, mechanism of buffer, Henderson equation, hydrolysis of salts, common ion effect, solubility product and its application, ionic strength. Study of some electrochemical cells, concept of some physical properties like boiling point, parachor, refractive index, molar refraction, optical activity, specific and molar rotation, dielectric constant, induced and orientation polarization, polar and non-polar molecules, dipole moment and its methods of determination, Clausius-Mossotti equation, ionic character of bonds. Adsorption; Freundlich and Langmuir isotherms, Surface Catalysis. Application of adsorption. Concept and properties of Colloids, stability of colloids; Hurdy – Schulze rule, Electro-kinetic Phenomena, micelles .
CEMG: Paper-C1P4(A)	ORGANIC (Practical)	The students can acquire the skill and concept of analyzing and qualitative estimations of some organic compounds like aniline using brominating mixture and glucose by Benedict's reagent.
	PHYSICAL (Practical)	Students will learn how to determine the surface tension of a supplied liquid solvent/ solution by drop volume method, determination of the coefficient of viscosity of a given liquid/solvent using Oswald viscometer and determination of the partition coefficient of iodine between water and an organic solvent. These works develops the skill of the students to handle equipments as well as determination of different physical parameters.
CEMG: Paper-C1P5(A)	GENERAL	This paper is a studies and concept on different **Acid-Base Concept,** Solvent dependence of acidity and basicity, Ionic product of water, The pH scale, Buffer solutions, Hard and Soft acids and based and their classifications, Acid-base strength and hardness and softness, symbiosis, Nature of solid state, laws of crystallography, Weiss and Miller indices, unit cell, crystal systems, Bravis lattice, symmetry elements, types of crystals, crystal forces. X-ray diffraction of crystals, Bragg's law. Detailed concept of acid base indicators; types criteria and selection of indicators.
	INORGANIC	From this, the student will learn about the s-and p-Block Elements:The oxides and hydroxides of alkali and alkaline earth elements, Boron hydrides, Silicates, Silicones, oxyacids of sulphur, d-Block Elements: First row Transition Series: (3d) electronic configuration ,Oxidation states, Reactivities, colourand Magnetic properties. Preparation, properties and structure of Potassium ferro and ferricyanide, Lithium aluminium hydride, Sodiumcobaltinitrite, Nesseler's reagent, Sodium borohydride, Ferrocene,Sodium nitropuruside.
CEMG: Paper-C1P5(B)	INORGANIC (Practical)	Students have acquired the skill and knowledge about the acid-base titration, redox titration in practical ground. They are able to carry out the quantitative estimation of Na_2CO_3 & $NaHCO_3$ present in a mixture by acid-base titration method, estimation of Fe (II) and Fe (III) by redox titration using $K_2Cr_2O_7$, $KMnO_4$ solutions individually,, estimation of Cu (II) by iodometric method.
	PHYSICAL (Practical)	Students will learn how to determine the pH of a buffer solution by colour matching method, determination of concentration of HCl/NaOH by Conductometric Titration, determination of concentration of supplied $BaCl_2$ by

		standard Na_2SO_4/K_2SO_4 conductometrically, determination of Order of a Reaction – Hydrolysis of Ester. These works develops the skill of the students to handle equipments as well as determination of different physical parameters.
CEMH: **Paper-VI**	PROJECT	This paper will impart skills and knowledge of writing project paper after doing some hands' on experiments or trainings.