Course Outcomes of Chemistry

YEAR	Paper	Course	
SEM-1	**Inorganic Chemistry-1** **CEMA-CC-1-1-TH**	**CO1**	❖ Get idea about the structure of atoms**,** Pauli's Exclusion Principle, Hund's rules and multiplicity, Aufbau principle,Term symbols of atoms and ions. ❖ Idea of various types of acid-base concept, Pauling's rules, leveling effect of solvents, Drago-Wayland Equation, Superacids, HSAB principle, pH, buffer, Acid-base neutralisation curves; indicator, choice of indicators. ❖ Elementary idea on standard redox reactions, Nernst equation, redox potentials on complex formation, precipitation and change of pH, redox indicators, redox potential diagram and their applications and various types of electroanalytical methods. The solubility product and common ion effect.
	INORGANIC CHEMISTRY LABCEMA-CC-1-1-P	**CO2**	❖ Estimation of carbonate, bicarbonate, hydroxide and free alkali in mixture. ❖ Estimation of Fe(II/III), Cu(II), Mn(II) in a mixture by oxidation – reduction titrations.
	ORGANIC CHEMISTRY-1A	**CO3**	❖ Concepts of shapes & hybridisation, of molecules, resonance, inductive effect, field effect, mesomeric effect,resonance energy, bond polarization and bond polarizability, electromeric effect, steric effect, ❖ MO theory, bonding and antibonding interactions, concept of HOMO, LUMO and SOMO; Concepts of aromaticity, antiaromaticity, homoaromaticity; non-aromatic molecules; Frost diagram. ❖ Knowledge of VBT and MOT, hybridization on bondproperties: bond dissociation energy (BDE) and bond energy;bond distances, bond angles, polarity of molecules and dipole moments; relative stabilities of isomeric hydrocarbons. ❖ Knowledge of ionic, radical and pericyclic reaction mechanism; addition, elimination and substitution reactions type,nature of bond cleavage and bond formation, curly arrow rules in representation of mechanistic steps; reagent type: electrophiles and nucleophiles (elementary idea).
	CEMA-CC-1-2-P(ORGANIC LAB)	**CO4**	❖ Separation of binary mixture of solids based upon solubility, purification of any one of the separated components bycrystallization and determination of its melting point.
	PHYSICAL CHEMISTRY-1	**CO5**	❖ Fundamental concept of basics physical chemistry, concept of Kinetic Theory and Gaseous state: General treatmentof Maxwell's distribution of speed and energy, Concept of Real gases and Virial equation. ❖ Transport processes such as Diffusion and Viscosity. ❖ Basic concepts of chemical kinetics, different reactions order, temperature dependence of rate constants andHomogeneous catalysis.
	PHYSICAL CHEMISTRY-LabCEMA-CC-1-2-P	**CO6**	❖ Study of kinetics of decomposition of H_2O_2, Ester ❖ Study of viscosity of unknown liquid (glycerol, sugar) with respect to water. ❖ Determination of solubility of sparingly soluble salt

	ORGANIC CHEMISTRY-IB	**CO7**	❖ Concepts of stereochemistry: Bonding geometries of carbon compounds: concept of asymmetry; Fischer, sawhorse,flying wedge and Newman projection formulae and their inter translations. Concept of chirality and symmetry: ❖ Reaction Mechanism, Reactive intermediates: carbocations, non-classical cabocations, carbanions, carbon radicals,carbenes.
	ORGANIC CHEMISTRY: (1B) LAB	**CO8**	❖ Determination of boiling point of organic liquids.
SEM-2	**ORGANIC CHEMISTRY -2** **CEMA-CC-2-3-TH**	**CO9**	❖ Stereochemistry: mainly chirality arising out of stereoaxis, concept of prostereoisomerism, conformation. ❖ Reaction thermodynamics, Tautomerism, Reaction kinetics, Substitution and Elimination Reactions, Free-radicalsubstitution reaction.
	ORGANIC CHEMISTRY LABCEMA-CC-2-3-P	**CO10**	❖ Organic Preparations, yield percentage calculation
	INORGANIC CHEMISTRY **CEMA-CC-2-4-TH**	**CO11**	❖ Chemical bonding: geometry and shape of the molecules, various properties of ionic and covalent compounds. (i) *Ionic bond:* size effects, radius ratio rule and its application, Packing of ions in crystals. Born-Landé equation,Born-Haber cycle, Solvation energy. (ii) *Covalent bond:* Polarizing power and polarizability, ionic potential, Fazan's rules, Lewis structures, formalcharge.Valence Bond Theory, Bent's rule, Dipole moments, VSEPR theory, ❖ Idea about MO concept of bonding and MO diagrams of some homonuclear and heteronuclear diatomic molecules, qualitative idea of valence bond and band theories. hydrogen bonding, receptor-guest interactions etc ❖ Radioactivity idea of Nuclear models: concept of nuclear quantum number, magic numbers. Types of different types of nuclear reactions such as artificial radioactivity, transmutation of elements, fission, fusion and spallation. radio carbon dating, age of rocks and minerals, hazards of radiation.
	INORGANIC CHEMISTRY LABCEMA-CC-2-4-P	**CO 12**	❖ Estimation of vitamin C, arsenite, antimony available chlorine in bleaching powder iodimetrically. ❖ Estimation of of Cu in brass, Cr and Mn in Steel and Fe in cement.

	PHYSICAL CHEMISTRY-2 CEMA-CC-3-5-TH	**CO13**	❖ Concept of Chemical Thermodynamics including the laws of thermodynamics and the applications of thermodynamics ❖ It gives the idea of Electrochemistry.
	PHYSICAL CHEMISTRY LABCEMA-CC-3-5-P	**CO14**	❖ Experiment dealing with instruments such as conductometer, potentiometer and calorimeter.

SEM-3	**INORGANIC CHEMISTRY -3** **CEMA-CC-3-6-TH**	**CO15**	❖ Idea of modern periodic table, measurement of screening constant, electronegativity, relativistic effect, inert paireffect and group trends. ❖ The chemistry of reactivity and relative stability of *s* and *p* block elements and their corresponding compounds ❖ The chemistry of noble gases especially xenon and their compound are known.

			❖ Knowledge of some inorganic and organic polymers with synthesis, structural aspects and applications. ❖ IUPAC nomenclature and Isomerism of various types of coordination compounds, Werner's theory of coordination complexes, different types of ligands.
	INORGANIC CHEMISTRY LABCEMA-CC-3-6-P	**CO16**	❖ Separation of the selective metal ions from its binary mixture by complexometric titration and paperchromatographic Separation ❖ Estimation of the Ni(II) using dimethylglyoxime (DMG), copper as CuSCN, Al(III) as $Al(oxine)_3$(aluminiumoxinate) by gravimetry.
	ORGANIC CHEMISTRY -3 **CEMA-CC-3-7-TH**	**CO17**	❖ chemistry of alkenes and alkynes and the name reactions involved and idea about Electrophilic aromaticsubstitution, and Nucleophilic aromatic substitution ❖ Learning the chemistry of carbonyl compounds in detail and depth including reactions involving exploitationof acidity of α- H of C=O ❖ Chemistry of Organometallics, including Grignard reagents, organolithiums etc.
	ORGANIC LAB CEMA-CC-3-7-P	**CO18**	❖ Students will learn to identification of pure organic compounds (solids/liquids) by systematic and specialtests ❖ quantitatively estimate organic compounds like glycine, glucose, sucrose etc.
	SEC 2 (ANALYTICAL CLINICAL BIOCHEMISTRY	**CO19**	❖ Biomolecules like carbohydrates, proteins, lipids, enzymes, lipoproteins and their biochemical nature. ❖ As an analytical tool, analysis of samples of blood and urine systematically. ❖ qualitatively and quantitatively learn the tehniques of estimation of carbohydrates, cholesterol, proteins,nucleic acids etc.
	ORGANIC CHEMISTRY-4 CEMA-CC-4-8-TH	**CO20**	❖ Chemistry of nitrogen compounds involving preparation and reactions of amines, nitro compounds, alkylnitriles and isonitriles, diazonium salts etc. ❖ Rearrangement reactions involving migration to electron deficient nitrogen atoms and allied systems ❖ Retrosynthetic analysis: disconnections; synthons, strategy of ring synthesis, asymmetric synthesis etc. ❖ Organic spectroscopy: basic facts and formula followed by problem solving of structure of organiccompounds by the application of the knowledge of UV-VIS, IR and NMR spectroscopy.
	ORGANIC LABCEMA-CC-4-8-P	**CO21**	❖ learn the techniques of Qualitative Analysis of Single Solid Organic Compounds.

SEM-4	**PHYSICAL CHEMISTRY - 3 CEMA-CC-4-9-TH**	**CO22**	❖ Various applications of chemical thermodynamics such as colligative properties and phase equilibria. ❖ Concept of fundamentals of Quantum mechanics with special emphasis of the concept of operators,commutation of operators with examples such as particle in a box. ❖ Fundamentals of crystallography and crystal structure.
	PHYSICAL CHEMISTRY LABCEMA-CC-4-9-P	**CO23**	❖ Experimental techniques such as polarimetry, thermometry with phenol-water system and pH-metry.
	INORGANIC CHEMISTRY-4 CEMA-CC-4-10-TH	**CO24**	❖ Explanation of the relative stability of different d-orbital splitting energy levels of different geometry, spectrochemical series, magnetism and colour with the help of crystal field theory. L-S coupling, orgel diagram and its transition, spectral transitionrule and charge transfer spectra. ❖ General characteristics and properties of 3d, 4d, and 5d transition elements. ❖ Electronic configuration, oxidation states, colour, spectral and magnetic properties of lanthanides and actinides. ❖ The idea of inorganic substitution reaction of square planar and octahedral complexes and the thermodynamic and kinetic stability are also imported to students.
	INORGANIC CHEMISTRY-LAB CEMA-CC-4-10-P	**CO25**	❖ Preparation of selective inorganic coordination complexes. ❖ determination of 10Dq by spectrophotometric method and λmax value of $[Mn(acac)_3]$ and $[Fe(acac)_3]$ complexes
	SEC 3 (PHARMACEUTICALS CHEMISTRY)	**CO26**	❖ Emphasis of drugs and pharmaceuticals of representative class analgesics agents, antipyretic agents, anti- inflammatory agents and antiviral agents (Central Nervous System agents, Cardiovascular, antileposy, HIV-AIDSrelated drugs
SEM- 5	**PHYSICAL CHEMISTRY - 4 CEMA-CC-5-11-TH**	**CO27**	❖ Concept of the various quantum mechanical systems such as simple harmonic oscillator, Hydrogen atom problem and also understand the concept of chemical bonding with theories such as LCAO and Born-Oppenheimer approximation, MO theory. ❖ Concept of Statistical Thermodynamics. ❖ Numerical analysis with ideas about different numerical methods with applications in chemistry.
	PHYSICAL CHEMISTRY CEMA-CC-5-11-P	**CO28**	❖ Computer programs (Using FORTRAN or C or C ++) based on numerical methods.
	ORGANIC CHEMISTRY - 5 CEMA-CC-5-12-TH	**CO29**	❖ Chemistry of polynuclear aromatic hydrocarbons and their derivatives, their preparation, conformation andreactivity of alicyclic compounds ❖ Mechanism, stereochemistry, regioselectivity of pericyclic reactions ❖ Idea of biomolecules like carbohydrates and amino acids, proteins, nucleic acids-their basic chemistry,preparation
	ORGANIC LAB CEMA-CC-5-12-P	**CO30**	❖ Chromatographic separation techniques. ❖ Analysis of organic spectra to solve structural problems on organic compounds.

	DSE-A-2: **APPLICATIONS OFCOMPUTERS IN CHEMISTRY**	**CO31**	❖ Computer Programming Basics on (FORTRAN): ❖ Spreadsheet Software (MS Excel) ❖ Analysis of the Statistical data by T test and the F test. ❖ Practicals.
	DSE-B-1: **INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE**	**CO32**	❖ Discussion about the Silicate Industries, Fertilizers, Surface Coatings on the materials and their application. ❖ Introduction of Solidstate electrolyte, battery, Fuel cells, Solar cell and polymer cell. ❖ Different catalysis and their activity in industrial applicationand introduction about explosives. ❖ Practical application of the materials

SEM- 6	**INORGANIC CHEMISTRY-5 CEMA-CC-6-13-TH**	**CO33**	❖ Role and fuctions of metal ions (specially Na^{+}, K^{+}, Mg^{2+}, Ca^{2+}, $Fe^{3+/2}$+, $Cu^{2+/+}$, and Zn^{2+}), metalloprotiens andchelation effect of some metals (Pt, Au) as drugs for different diseases. ❖ It gives the idea of structure and chemistry of several organometallic complexes.
	INORGANIC CHEMISTRY-LAB CEMA-CC 6-13-P	**CO34**	❖ Identification the compositions (basic and acid radical) of unknown inorganic mixtures by qualitativesemimicroanalysis.
	PHYSICAL CHEMISTRY-5 CEMA-CC-6-14-TH	**CO35**	❖ Concept of Molecular spectroscopy such as rotational and vibrational spectroscopy, surface phenomena suchas adsorption, surface tension and colloids. ❖ Learning of the concept of Photochemistry and Theory of reaction rate. ❖ Development of concept on Dipole moment and polarizability.
	PHYSICAL CHEMISTRY LABCEMA-CC-6-14-P	**CO36**	❖ Experiments involving colorimetry, spectrophotometry and experiments related to surface tension aswell as determination of CMC of micelles.
	DSE-A-3: GREEN CHEMISTRY AND CHEMISTRY OF NATURAL PRODUCTS	**CO37**	❖ Discussion about the green chemistry and green synthesis the future trends of green chemistry forsustainability. ❖ Acquire knowledge on the chemistry ofnatural compounds like terpenes and alkaloids. ❖ Carry out six green syntheses in the laboratory
	DSE-B4: DISSERTATIO N	**CO38**	❖ Carry out research /review on a topic as assigned. ❖ Preparation of project report and digital presentation