

B.Sc (H) CHEMISTRY

Course Outcomes

Paper No.	Paper Name
CC - I	Inorganic Chemistry I: Atomic Structure & Chemical Bonding (Theory)
CO-1	<ul style="list-style-type: none">• Introduction of quantum mechanical model of the atom, quantum numbers, electronic configuration, radial and angular distribution curves and shapes of various orbitals
CO-2	<ul style="list-style-type: none">• Learn to draw the plausible structures and geometries of molecules using Radius Ratio Rules, VSEPR theory and molecular orbital diagrams
CO-3	<ul style="list-style-type: none">• Understand the importance and application of chemical bonds, intermolecular and intramolecular weak chemical forces and their effect on melting points, boiling points, solubility and energetics of dissolution
CO-4	<ul style="list-style-type: none">• Learn the concept and periodic trends in atomic radii, ionic radii, ionization energy and electron affinity of elements
CO-5	<ul style="list-style-type: none">• Understand the concept of lattice energy
CO-6	<ul style="list-style-type: none">• Learn Band theory and its application in rationalizing the conductivity of metals, semiconductors and insulators
CC - I	Inorganic Chemistry I: Atomic Structure & Chemical Bonding (Practical)
CO-1	<ul style="list-style-type: none">• Learn the calibration and use of apparatus
CO-2	<ul style="list-style-type: none">• Learn to prepare solutions of titrants of different Molarity/Normality
CO-3	<ul style="list-style-type: none">• Learn the principles of acid-base titrations and redox titrations
CO-4	<ul style="list-style-type: none">• Learn to determine strength of solutions
CO-5	<ul style="list-style-type: none">• Basic understanding of various common indicators and their selection criterion
CC-II	Physical Chemistry I: States of Matter & Ionic Equilibrium (Theory)
CO-1	<ul style="list-style-type: none">• To understand the basics and advanced concepts related to state of matter i.e. Gaseous State, Liquid State and Solid State
CO-2	<ul style="list-style-type: none">• To understand the basics of Acids and Bases and calculate the pH of various acidic and Basic solutions
CO-3	<ul style="list-style-type: none">• To understand the concept of Buffer Solutions and can prepare the Buffer solutions as per the requirement
CO-4	<ul style="list-style-type: none">• To derive the various mathematical expressions to define the physical properties of Solids, Liquids and Gases
CO-5	<ul style="list-style-type: none">• To derive the various equations dealing with the calculation of pH of Acids and Bases, Buffer Solutions
CC-II	Physical Chemistry I: States of Matter & Ionic Equilibrium (Practical)
CO-1	<ul style="list-style-type: none">• To determine the Surface tension of Unknown Liquids using Stalagmometer
CO-2	<ul style="list-style-type: none">• To determine the Viscosity of Unknown Liquids using Viscometer
CO-3	<ul style="list-style-type: none">• To determine the pH of different unknown solution using pH-meter
CO-4	<ul style="list-style-type: none">• To determine the concentration of unknown Acid using pH-meter
CO-5	<ul style="list-style-type: none">• To prepare different Buffer Solutions

CO-6	<ul style="list-style-type: none"> To determine the Surface tension of Unknown Liquids using Stalagmometer
CC-III	Organic Chemistry I: Basics & Hydrocarbons (Theory)
CO-1	<ul style="list-style-type: none"> Understand the basic concepts in Organic Chemistry to be used in the subsequent semesters.
CO-2	<ul style="list-style-type: none"> Learn the details of hybridization, electronic displacement and their applications.
CO-3	<ul style="list-style-type: none"> Detailed study of the chemistry of hydrocarbons aliphatic and aromatic.
CO-4	<ul style="list-style-type: none"> Enhance the knowledge on various reaction mechanisms through correlation with the fundamental properties of the reactants.
CO-5	<ul style="list-style-type: none"> Learn about free radical substitution, electrophilic addition and electrophilic aromatic substitution.
CO-6	<ul style="list-style-type: none"> Familiarize with the stereochemical aspects which will help in understanding the actual course of reaction.
CC-III	Organic Chemistry I: Basics & Hydrocarbons (Practical)
CO-1	<ul style="list-style-type: none"> Hands on experience on organic preparations namely nitration, bromination.
CO-2	<ul style="list-style-type: none"> Develop an understanding on techniques like crystallization, melting point determination, boiling point determination along with the hands on experience.
CO-3	<ul style="list-style-type: none"> Development of the ability to do separation of mixtures of amino acids, sugars by various chromatographic techniques.
CO-4	<ul style="list-style-type: none"> Develop the skills on the detection of extra elements in the unknown organic compounds which has application in the subsequent semesters.
CO-5	<ul style="list-style-type: none"> Learn the separation technique, thin layer chromatography (TLC) for the separation of a mixture of o-and p-nitrophenol and o-and p-aminophenol.
CO-6	<ul style="list-style-type: none"> Aware of the effect of impurities on the melting point – mixed melting point of two unknown organic compounds.
CC-IV	Physical Chemistry II: Chemical Thermodynamics & its Applications (Theory)
CO-1	<ul style="list-style-type: none"> Understand the Laws of Thermodynamics, State Functions, Path Functions, Intensive & Extensive variables
CO-2	<ul style="list-style-type: none"> To derive the various mathematical expressions of First Law, Second Law, Third Law, ΔU, ΔH, ΔS, ΔG, ΔA for ideal and real gases under different conditions
CO-3	<ul style="list-style-type: none"> Explain and derive the mathematical relations for partial molar properties
CO-4	<ul style="list-style-type: none"> Understand and derive the thermodynamic relations explaining colligative properties and their applications
CO-5	<ul style="list-style-type: none"> Explain various Enthalpies of reactions and derive the mathematical relations for these enthalpies of reaction.
CC-IV	Physical Chemistry II: Chemical Thermodynamics & its Applications (Practical)
CO-1	<ul style="list-style-type: none"> To determine the heat capacity of beaker for different volume of water using calorimeter

CO-2	<ul style="list-style-type: none"> To determine the enthalpy of Neutralization and Ionization for Acids and Bases.
CO-3	<ul style="list-style-type: none"> To determine the basicity of diprotic acids
CO-4	<ul style="list-style-type: none"> To determine the enthalpy of hydration
CO-5	<ul style="list-style-type: none"> To determine the effect of concentration on elevation in boiling point, variation in elevation in boiling point by adding electrolytes and non-electrolytes
CC-V	Inorganic Chemistry II: s- and p-Block elements (Theory)
CO-1	<ul style="list-style-type: none"> Understanding the principles of different metallurgical procedures with respect to different metals.
CO-2	<ul style="list-style-type: none"> Comparison of different properties of s and p block elements. Intergroup and intragroup comparison.
CO-3	<ul style="list-style-type: none"> Comparative study of listed compounds of s and p block elements.
CO-4	<ul style="list-style-type: none"> Detailed study of specific compounds of p block elements mentioned in the syllabus w.r.t. their synthesis, structure, properties, bonding and uses
CC-V	Inorganic Chemistry II: s- and p-Block elements (Practical)
CO-1	<ul style="list-style-type: none"> To understand the principle of Iodometry and Iodimetry
CO-2	<ul style="list-style-type: none"> Estimation of different oxidizing and reducing agents by the above methods
CO-3	<ul style="list-style-type: none"> Introduction of complexometric titrations using EDTA solutions
CO-4	<ul style="list-style-type: none"> Estimation of different metals like Zinc, Calcium, Magnesium by complexometry
CO-5	<ul style="list-style-type: none"> Preparing inorganic compounds
CO-6	<ul style="list-style-type: none"> Chromatographic separation of cations
CC-VI	Organic Chemistry II: Halogenated Hydrocarbons and Oxygen Containing Functional Groups (Theory)
CO-1	<ul style="list-style-type: none"> Provides better understanding of the organic functional groups and their reactivity.
CO-2	<ul style="list-style-type: none"> Helps in designing the synthesis of molecules of synthetic utility by functional group transformation.
CO-3	<ul style="list-style-type: none"> Learn about halogenated hydrocarbon, alcohol, phenol, ether, epoxides, carbonyl compounds, carboxylic acids and their derivatives.
CO-4	<ul style="list-style-type: none"> Detailed study of important name reactions.
CO-5	<ul style="list-style-type: none"> Description of tautomerism and synthetic application of diethyl malonate and ethyl acetoacetate.
CC-VI	Organic Chemistry II: Halogenated Hydrocarbons and Oxygen Containing Functional Groups (Practical)
CO-1	<ul style="list-style-type: none"> Hands-on practice on organic synthesis discussed theoretically in theory course.
CO-2	<ul style="list-style-type: none"> Understanding the problem faced during the said procedure and precautions needs to be adopted.
CO-3	<ul style="list-style-type: none"> Learning tests of various functional groups such as alcohols, phenols carbonyl compounds carboxylic acids which has further applications.

CO-4	<ul style="list-style-type: none"> Learn organic synthesis such as acetylation, benzylation, oxidation, selective reduction of m- dinitro benzene etc.
CO-5	<ul style="list-style-type: none"> Preparation of semicarbazone, s-benzyl isothiuronium salt.
CO-6	<ul style="list-style-type: none"> Learn about carrying out Aldol condensation.
CC-VII	Physical Chemistry III: Phase Equilibrium and Electrochemical Cells (Theory)
CO-1	<ul style="list-style-type: none"> To impart the students the knowledge on phase rule, its applications and alloys, their importance, composition and applications.
CO-2	<ul style="list-style-type: none"> To demonstrate the application of spectroscopic and electrochemical methods in mechanistic studies of photochemical reactions
CO-3	<ul style="list-style-type: none"> To make students familiar with a broad variety of photochemical systems and their applications
CC - VII	Physical Chemistry III: Phase Equilibrium and Electrochemical Cells (Practical)
CO-1	<ul style="list-style-type: none"> Basic learning of the laboratory procedure for the determination of critical solution temperature and composition at CST of the phenol water system
CO-2	<ul style="list-style-type: none"> To study the effect of impurities of sodium chloride and succinic acid on CST of the phenol water system
CO-3	<ul style="list-style-type: none"> Learning of the procedure to construct the phase diagram using cooling curves
CO-4	<ul style="list-style-type: none"> Perform experiment for distribution of acetic/ benzoic acid between water and chloroform or cyclohexane
CO-5	<ul style="list-style-type: none"> Experiments of Potentiometric titrations of various types
CC-VIII	Inorganic Chemistry III: Coordination Chemistry (Theory)
CO-1	<ul style="list-style-type: none"> Understanding the general chemistry of transition elements with reference to electronic configuration, oxidation state, electrode potential, colour, electronic spectra. Complex formation tendency etc.
CO-2	<ul style="list-style-type: none"> Study the chemistry of some transition elements like Cr, Fe and Mn in reference to its compound for ex. Peroxo compounds, potassium permanganate, potassium ferrocyanide, potassium ferricyanide, sodium nitroprusside and sodium cobaltinitrite.
CO-3	<ul style="list-style-type: none"> Understanding the concept of bonding in transition elements
CO-4	<ul style="list-style-type: none"> Study various theories of bonding like valence bond theory, crystal field theory, ligand field theory and molecular field theory.
CO-5	<ul style="list-style-type: none"> Understanding the application of crystal field theory.
CO-6	<ul style="list-style-type: none"> To study the chemistry of lanthanides and actinides.
CO-7	<ul style="list-style-type: none"> Understanding the inorganic reaction mechanisms like substitution reactions in square planar complexes, trans- effect, theories of trans effect. thermodynamic and kinetic stability of complexes
CC -VIII	Inorganic Chemistry III: Coordination Chemistry (Practical)
CO-1	<ul style="list-style-type: none"> Understanding the basic principles of gravimetry, chemistry involved in gravimetry analysis, terms applied in gravimetric analysis like co-precipitation, post precipitation, digestion etc.
CO-2	<ul style="list-style-type: none"> Understanding the application of gravimetric analysis in estimation of

	Nickel as bis(dimethyl glyoximato)nickel(II)
CO-3	<ul style="list-style-type: none"> Understanding the application of gravimetric analysis in estimation of Cu as CuSCN
CO-4	<ul style="list-style-type: none"> Understanding the application of gravimetric analysis in estimation of iron as Fe_2O_3 by precipitating iron as $\text{Fe}(\text{OH})_3$
CO-5	<ul style="list-style-type: none"> Understanding the basic principles of UV-vis spectrophotometer.
CO-6	<ul style="list-style-type: none"> Understanding the application of spectrophotometer in calculation of 10Dq and verification of spectrochemical series.
CO-7	<ul style="list-style-type: none"> Study the application of reaction mechanism with reference to reaction of ammine complexes of Ni(II)
CO-8	<ul style="list-style-type: none"> Understanding the synthesis of some co-ordination compounds like Tetraamminecopper (II) sulphate, $[\text{Cu}(\text{NH}_3)_4] \text{SO}_4 \cdot \text{H}_2\text{O}$, Acetylacetonate complexes of $\text{Cu}^{2+}/\text{Fe}^{3+}$, Tetraamminecarbonatocobalt (III) nitrate and Potassium tri(oxalato)ferrate(III)
CC-IX	Organic Chemistry III: Nitrogen Containing functional groups, Polynuclear Hydrocarbons, Heterocyclic Chemistry, Alkaloids and Terpenes (Theory)
CO-1	<ul style="list-style-type: none"> Understanding chemistry of nitrogen containing functional groups, polynuclear hydrocarbons, heterocyclic compounds and natural compounds.
CO-2	<ul style="list-style-type: none"> Learn about chemistry of amines, diazonium salt, nitro compounds, nitriles and isonitriles.
CO-3	<ul style="list-style-type: none"> Detailed study of polynuclear hydrocarbon such as naphthalene, anthracene and phenanthrene.
CO-4	<ul style="list-style-type: none"> General method of synthesis of furan, pyrrole, thiophene, pyridine, indole, quinoline & isoquinoline & their reactions.
CO-5	<ul style="list-style-type: none"> Study of Hoffmann's exhaustive methylation & Emde's method.
CO-6	<ul style="list-style-type: none"> Illustration of structural elucidation of organic compound which are very helpful in future studies in chemistry.
CO-7	<ul style="list-style-type: none"> Structure elucidation of nicotine.
CC-IX	Organic Chemistry III: Nitrogen Containing functional groups, Polynuclear Hydrocarbons, Heterocyclic Chemistry, Alkaloids and Terpenes (Practical)
CO-1	<ul style="list-style-type: none"> Qualitative analysis of unknown organic compounds such as alcohols, carboxylic acids etc. Students get an idea how to identify an unknown organic compound, which is very useful in subsequent semesters.
CO-2	<ul style="list-style-type: none"> Systematic analysis involves alcohols, carboxylic acid, phenols, carbonyl compounds and esters.
CO-3	<ul style="list-style-type: none"> Isolation of natural compound, which is useful in further studies.
CO-4	<ul style="list-style-type: none"> Learn about extraction of caffeine from tea leaves.
CO-5	<ul style="list-style-type: none"> Understand quantitative organic chemistry experiments.
CO-6	<ul style="list-style-type: none"> Learn about aniline estimation by acetylation & bromate-bromide method.
CC - X	Physical Chemistry IV: Conductance & Chemical Kinetics (Theory)
CO-1	<ul style="list-style-type: none"> To explain the conductance and its variation with dilution, molar and equivalent conductance

CO-2	<ul style="list-style-type: none"> To explain migration of ions under the influence of external potential
CO-3	<ul style="list-style-type: none"> To explain and derive the mathematical expressions of different rate laws
CO-4	<ul style="list-style-type: none"> Learn the basics and theories of rate of reaction and enzyme catalyzed reactions
CO-5	<ul style="list-style-type: none"> Have an understanding of laws of absorption of light energy and reactions catalyzed by light i.e. photochemical reactions
CC - X	Physical Chemistry IV: Conductance & Chemical Kinetics (Practical)
CO-1	<ul style="list-style-type: none"> To use colorimeter for the determination of conductance of different solutions.
CO-2	<ul style="list-style-type: none"> Demonstrate the application of colorimeter for studying various acid - base titrations
CO-3	<ul style="list-style-type: none"> To carry out different experiments in laboratory to study the kinetics of acid hydrolysis
CO-4	<ul style="list-style-type: none"> Experimentally study the kinetics of Iodine -persulphate reaction
CO-5	<ul style="list-style-type: none"> Experimentally Study the kinetics of saponification
CO-6	<ul style="list-style-type: none"> Carry out experiments to compare the strength of different acids, hydrolysis constants
CO-7	<ul style="list-style-type: none"> To demonstrate the effect of change of concentration of reactants and effect of temperature on rate of reactions
CC - XI	Organic Chemistry IV: Biomolecules (Theory)
CO-1	<ul style="list-style-type: none"> Understand and demonstrate how structure of biomolecules determine their reactivity and biological functions. Learn about Enzymes, cofactors and their actions and functions.
CO-2	<ul style="list-style-type: none"> Understand the structure and functions of DNA and RNA. Learn the concept of heredity through the study of genetic code, replication, transcription and translation.
CO-3	<ul style="list-style-type: none"> Demonstrate understanding the metabolic pathways, their interrelationship, regulation and energy production from biochemical processes
CO-4	<ul style="list-style-type: none"> Learn about the structure, synthesis, properties and functions of proteins and their precursors.
CO-5	<ul style="list-style-type: none"> Learn about the class of molecules which complete our basic needs i.e. food, shelter and clothing.
CO-6	<ul style="list-style-type: none"> Be able to understand the structure and properties of oils and fats and their precursors.
CC - XI	Organic Chemistry-IV: Biomolecules (Practical)
CO-1	<ul style="list-style-type: none"> Learn about the estimation of glucose by Fehling's solution.
CO-2	<ul style="list-style-type: none"> Understand the titration curve of amino acid (glycine).
CO-3	<ul style="list-style-type: none"> Learn how to estimate protein by Lowry's method.
CO-4	<ul style="list-style-type: none"> Understand the action of salivary amylase on starch under optimum conditions.
CO-5	<ul style="list-style-type: none"> Learn how to isolate and estimate DNA from plant source e.g. onion, peas, cauliflower.
CO-6	<ul style="list-style-type: none"> Learn how to determine Saponification value and Iodine value of any oil or fat and their significance also.

CC - XII	Physical Chemistry V: Quantum Chemistry & Spectroscopy (Theory)
CO-1	<ul style="list-style-type: none"> Developing understanding of matter and energy beyond classical notion to explore at atomic and subatomic level
CO-2	<ul style="list-style-type: none"> Understanding the shortcomings and inadequacies of classical mechanics
CO-3	<ul style="list-style-type: none"> Providing tools and techniques of problem solving in quantum chemistry
CO-4	<ul style="list-style-type: none"> Honing abilities to compare spectroscopy and quantum chemistry
CC - XII	Physical Chemistry V: Quantum Chemistry & Spectroscopy (Practical)
CO-1	<ul style="list-style-type: none"> Basic understanding of the colorimeter and its working
CO-2	<ul style="list-style-type: none"> To perform various experiments based on the Lambert-Beer's Law
CO-3	<ul style="list-style-type: none"> Kinetic studies using spectroscopic method
CO-4	<ul style="list-style-type: none"> Understanding of the Spectrophotometer and various experiments related to it
CO-5	<ul style="list-style-type: none"> To use colorimeter to study rate of reactions
CC - XIII	Inorganic Chemistry IV: Organometallic Chemistry & Bioinorganic Chemistry (Theory)
CO-1	<ul style="list-style-type: none"> Understanding of the basic principles of qualitative inorganic analysis
CO-2	<ul style="list-style-type: none"> Rationalization of the stability of metal carbonyls and related species
CO-3	<ul style="list-style-type: none"> Understand the nature, structure and reactivity of metal carbonyls, Zeise's salt and ferrocene
CO-4	<ul style="list-style-type: none"> Identify important structural features of the metal alkyls tetrameric methyl lithium and dimeric trialkyl aluminium and explain the concept of multi-center bonding in these compounds
CO-5	<ul style="list-style-type: none"> Introduction to important features of catalysis and mechanisms of Wilkinson's catalyst, Zeigler- Natta catalyst and manufacturing of synthetic gasoline by Fischer-Tropsch process
CO-6	<ul style="list-style-type: none"> Basic knowledge of sources, effects of excess and deficiency of trace metals. Understanding the toxicity of certain metal ions, reasons for toxicity and their antidotes.
CO-7	<ul style="list-style-type: none"> Basic understanding of the use of chelating agents in medicine and the role of cisplatin in cancer therapy
CO-8	<ul style="list-style-type: none"> Learn the applications of iron in biological systems with particular reference to haemoglobin, myoglobin, ferritin and transferrin
CO-9	<ul style="list-style-type: none"> Understand the functioning of sodium-potassium pump in organisms
CO-10	<ul style="list-style-type: none"> Understand and describe the active sites and action cycles of the metalloenzymes carbonic anhydrase and carboxypeptidase
CC - XIII	Inorganic Chemistry IV: Organometallic Chemistry & Bioinorganic Chemistry (Practical)
CO-1	<ul style="list-style-type: none"> Understanding the basic principles of qualitative inorganic analysis
CO-2	<ul style="list-style-type: none"> Identification of different anions and cations present in a mixture
CO-3	<ul style="list-style-type: none"> Identification and removal of interfering ions in a mixture
CC - XIV	Organic Chemistry-V: Spectroscopy and Applied Organic Chemistry (Theory)
CO-1	<ul style="list-style-type: none"> Understand the basic principles of UV-Visible, IR and NMR Spectroscopic techniques

CO-2	<ul style="list-style-type: none"> Know how to use spectroscopic techniques to determine structure and stereochemistry of known and unknown compounds
CO-3	<ul style="list-style-type: none"> Develop a sound understanding of the structure of pharmaceutical compounds. They will also understand the importance of different classes of drugs and their applications for treatment of various diseases.
CO-4	<ul style="list-style-type: none"> Learn about the chemistry of natural and synthetic polymers and polymerization including fabrics and rubbers
CO-5	<ul style="list-style-type: none"> Understand the chemistry of biodegradable and conducting polymers and appreciate the need of biodegradable polymers with the emphasis on basic principles.
CO-6	<ul style="list-style-type: none"> Learn about the theory of colour and constitution as well as the chemistry of dyeing.
CO-7	<ul style="list-style-type: none"> Know applications of various types of dyes including those in foods, medicines and textiles.
CC - XIV	Organic Chemistry-V: Spectroscopy and Applied Organic Chemistry (Practical)
CO-1	<ul style="list-style-type: none"> Learn about the systematic qualitative analysis and identification of the monofunctional organic compounds e.g. aromatic hydrocarbons, aryl halides, carbohydrates, nitro compounds, amines, amides etc.
CO-2	<ul style="list-style-type: none"> Understand the identification of some simple bifunctional organic compounds e.g. salicylic acid, cinnamic acid, nitrophenols.
CO-3	<ul style="list-style-type: none"> Learn about the identification of the simple organic compounds by IR and NMR spectra (if spectra is provided).

DISCIPLINE SPECIFIC ELECTIVE COURSES (DSE)

Paper No.	Paper Name
DSE - II	Inorganic Materials of Industrial Importance (Theory)
CO-1	<ul style="list-style-type: none"> Understand the composition and application of different kinds of glass. Also get learning about glazing of ceramics and the factors affecting their porosity. Develop an understanding about the manufacturing of cement and the mechanism of setting of cement.
CO-2	<ul style="list-style-type: none"> Understand the suitability of fertilizers for different kinds of crops and soil.
CO-3	<ul style="list-style-type: none"> Student will learn the process of formulation of paints and the basic principle behind the protection offered by the surface coatings.
CO-4	<ul style="list-style-type: none"> Understand the principle, working and applications of different types of batteries.
CO-5	<ul style="list-style-type: none"> This topic lists and explains the properties of engineering materials for mechanical construction used in day to day life.
CO-6	<ul style="list-style-type: none"> Learn about the synthesis and properties of nano-dimensional materials, various semiconductors, superconducting oxides and their applications in different industries.
DSE - II	Inorganic Materials of Industrial Importance (Practical)
CO-1	<ul style="list-style-type: none"> Enable the students to synthesize pigments and nanoparticles in laboratory.

CO-2	<ul style="list-style-type: none"> Hands on experiments for the qualitative estimation of ions in fertilizers and alloys.
CO-3	<ul style="list-style-type: none"> Hands on experiments for the extraction of ions from alloys and their quantitative estimation
CO-4	<ul style="list-style-type: none"> Learn about the analysis of one or more ions by different quantitative estimation methods like gravimetry, iodometry, complexometry and potentiometry.
DSE-III	Application of Computers in Chemistry (Theory)
CO-1	<ul style="list-style-type: none"> Get accustomed with computer and programming skills
CO-2	<ul style="list-style-type: none"> Application of algorithm and various mathematical methods to solve problems of chemistry computationally using BASIC languages
CO-3	<ul style="list-style-type: none"> Handling the data and graphical representation in Excel, Q-Basic and other softwares
DSE -III	Application of Computers in Chemistry (Practicals)
CO-1	<ul style="list-style-type: none"> To write computer programs for using Q-Basic for different problems based on solving roots of equation in chemistry
CO-2	<ul style="list-style-type: none"> To write programs using different numerical methods
CO-3	<ul style="list-style-type: none"> To write programs on least square curve fitting method
CO-4	<ul style="list-style-type: none"> To write computer programs for graphical display of various chemistry related problems such as vander waals isotherm, compressibility and pressure curves, pH metric titrations, conductometric titrations, lambert beer law and many more
CO-5	<ul style="list-style-type: none"> To use excel for handling and manipulating data
DSE -IV	Analytical Methods in Chemistry (Theory)
CO-1	<ul style="list-style-type: none"> To enable the students to perform experiments with accuracy and precision
CO-2	<ul style="list-style-type: none"> Basic understanding of method development for analysis of different samples
CO-3	<ul style="list-style-type: none"> Understand basic principle and working of important instruments like Flame Photometer, UV-vis spectrophotometer and thermal analyser
CO-4	<ul style="list-style-type: none"> Estimation of metal ions from aqueous solution using UV-vis spectrophotometer
CO-5	<ul style="list-style-type: none"> Estimation of macronutrients using Flame photometry
CO-6	<ul style="list-style-type: none"> Learn separation of analytes by chromatography
CO-7	<ul style="list-style-type: none"> Learn extraction of different components using solvent extraction
CO-8	<ul style="list-style-type: none"> Learn basic principle of electroanalytical methods and titrations
DSE - IV	Analytical Methods in Chemistry (Practical)
CO-1	<ul style="list-style-type: none"> Learning method development for analysis of different samples
CO-2	<ul style="list-style-type: none"> Learn separation of analytes by chromatography
CO-3	<ul style="list-style-type: none"> Learn to separate amino acids from organic acids by ion exchange chromatography
CO-4	<ul style="list-style-type: none"> Learn to determine exchange capacity of cation and anion exchange resins
CO-5	<ul style="list-style-type: none"> Learn extraction of components using solvent extraction
CO-6	<ul style="list-style-type: none"> Learn to estimate metal ions from aqueous solution using UV-vis spectrophotometer

CO-7	<ul style="list-style-type: none"> Learn to determine the composition of soil
DSE - V	Molecular Modelling & Drug Design (Theory)
CO-1	<ul style="list-style-type: none"> Understand the basics of molecular modelling
CO-2	<ul style="list-style-type: none"> Compare the computational and experimental results
CO-3	<ul style="list-style-type: none"> Aware of quantum mechanical, molecular dynamics and monte carlo simulations
CO-4	<ul style="list-style-type: none"> Learn QSAR role in drug designing and cheminformatics
CO-5	<ul style="list-style-type: none"> Hands-on through Argus lab and other softwares for geometry optimization of the molecules and so lving related problems
CO-6	<ul style="list-style-type: none"> Understand the basics of molecular modelling
DSE - V	Molecular Modelling & Drug Design (Practical)
CO-1	<ul style="list-style-type: none"> To optimize the geometrical parameters of molecules like shape, Bond length, bond angle using Argus Lab using different basis sets
CO-2	<ul style="list-style-type: none"> To plot HOMO, LUMO and ESP maps and explain the electron rich and deficient sites
CO-3	<ul style="list-style-type: none"> To perform conformational analysis of different molecules
CO-4	<ul style="list-style-type: none"> To compare the basicity of different compounds using mulliken charges and ESP maps
CO-5	<ul style="list-style-type: none"> To compute enthalpy of hydrogenation and Resonance
CO-6	<ul style="list-style-type: none"> Docking studies using Argus Lab
DSE - 8	Green Chemistry (Theory)
CO-1	<ul style="list-style-type: none"> Learn environment pollution and its impact
CO-2	<ul style="list-style-type: none"> Learn causes of environmental pollution such as depletion of natural resources, climate change, ozone depletion, heaps and heaps of landfills piling up.
CO-3	<ul style="list-style-type: none"> Role of chemistry in environment pollution
CO-4	<ul style="list-style-type: none"> Need to develop sustainable practices to remove the negative aspects of conventional chemistry.
CO-5	<ul style="list-style-type: none"> Enhance the industrial as well as well as economic and societal growth.
CO-6	<ul style="list-style-type: none"> Learn different aspects of green chemistry to enhance innovative skills, critical thinking and valuable skills to solve various environmental issues.
CO-7	<ul style="list-style-type: none"> Learn to develop environmentally efficient and benign reformations for conventional protocols.
CO-8	<ul style="list-style-type: none"> Learn green chemistry concepts such as twelve principles of green chemistry to develop the basic understanding of toxicity, hazard and risk of chemical substances.
CO-9	<ul style="list-style-type: none"> Understand the concept of stoichiometric calculations and relate them to green chemistry metrics, atom economy and their difference from percentage yield.
CO-10	<ul style="list-style-type: none"> Learn, to design safer chemical, products and processes, as compared to conventional alternatives to prevent accidents.
CO-11	<ul style="list-style-type: none"> Use of renewable feed stock for energy efficient process and protection of the environment, renewable energy sources,
CO-12	<ul style="list-style-type: none"> Learn important reactions in various green solvents.

CO-13	<ul style="list-style-type: none"> Learn various green alternatives of energy such as Microwave, ultrasound for chemical reactions.
CO-14	<ul style="list-style-type: none"> Understand the role of catalyst and bio catalyst, photocatalyst.
CO-15	<ul style="list-style-type: none"> Learn to enhance profits and productivity, without generation of waste.
CO-16	<ul style="list-style-type: none"> Learn success stories and real world cases which motivate to practice green chemistry.
CO-17	<ul style="list-style-type: none"> Learn various career opportunities generated using Green chemistry.
DSE - 8	Green Chemistry (Practical)
CO-1	<ul style="list-style-type: none"> Learn about Safer starting materials such as preparation and characterization of metal nanoparticles using plant extracts.
CO-2	<ul style="list-style-type: none"> Learn to prepare biodiesel using renewable resources
CO-3	<ul style="list-style-type: none"> Learn to use of enzymes as catalysts as an alternative of toxic and harmful chemical catalysts.
CO-4	<ul style="list-style-type: none"> Learn to use green solvents such as liquid CO₂ generated from dry ice to extract d-limonene from orange peel.
CO-5	<ul style="list-style-type: none"> Learn to perform mechanochemical solvent free, solid–solid synthesis of azomethine
CO-6	<ul style="list-style-type: none"> Learn to utilize alternative sources of energy such as microwave, photocatalytic reactions to carry out different chemical reactions
CO-7	<ul style="list-style-type: none"> Also learn to utilize various and by products obtained in above preparations as starting materials for new reactions like use of nanoparticles as catalyst for a reaction, conversion of glycerol a byproduct of biodiesel into a useful product.
DSE - 9	Industrial Chemicals & Environment (Theory)
CO-1	<ul style="list-style-type: none"> Study in detail the listed industrial chemicals and gases w.r.t. production, uses, storage and hazards
CO-2	<ul style="list-style-type: none"> Introduction to different segments of environment and their importance
CO-3	<ul style="list-style-type: none"> Understand different chemical aspects of pollution. viz: air, water, energy etc
CO-4	<ul style="list-style-type: none"> Considering the sources, effects and controlling measures for different pollutants
CO-5	<ul style="list-style-type: none"> Industrial effluents and their treatment methods.
CO-6	<ul style="list-style-type: none"> Details of topics as biocatalysis, green chemistry and their applicability
DSE - 9	Industrial Chemicals & Environment (Theory)
CO-1	<ul style="list-style-type: none"> Measurement of different water quality parameters - DO, BOD, COD
CO-2	<ul style="list-style-type: none"> Analysis of bleaching powder
CO-3	<ul style="list-style-type: none"> Measurement of other water quality parameters--alkalinity, dissolved CO₂, chloride ion, sulphate ion
CO-4	<ul style="list-style-type: none"> Preparation of boric acid

SKILL ENHANCEMENT ELECTIVE COURSES (SEC)

Paper No	Paper Name
SEC 1	IT Skills for Chemists (Theory)
CO-1	<ul style="list-style-type: none"> Understanding of mathematical techniques and basic computer skills in order to solve chemistry problems.
CO-2	<ul style="list-style-type: none"> Learning the concept of uncertainty and error in experimental data.
CO-3	<ul style="list-style-type: none"> Provides understanding of different software for data tabulation, calculation, graph plotting, data analysis and document preparation.
CO-4	<ul style="list-style-type: none"> Understanding of mathematical techniques and basic computer skills in order to solve chemistry problems.
SEC 1	IT Skills for Chemists (Practical)
CO-1	<ul style="list-style-type: none"> Hands on exercises on computers that helps in preparing a word processing document having tables, chemical structures and chemical equations.
CO-2	<ul style="list-style-type: none"> Solving chemistry problems and simulating graphs using basic computer skills.
CO-3	<ul style="list-style-type: none"> Usage of software for tabulating data, plotting graphs and charts, carry out statistical analysis of the data.
CO-4	<ul style="list-style-type: none"> Hands on exercises on computers that helps in preparing a word processing document having tables, chemical structures and chemical equations.
SEC 3	Chemical Technology and Society (Theory)
CO-1	<ul style="list-style-type: none"> To understand the basic concept of technology for societal benefits
CO-2	<ul style="list-style-type: none"> Prepare hypothesis for introduction clean technology
CO-3	<ul style="list-style-type: none"> Identify the consequences of technology to society and mitigate problems caused by technology
CO-4	<ul style="list-style-type: none"> To modernize aerospace using chemical technology.
CO-5	<ul style="list-style-type: none"> To understand the technology used in industries
CO-6	<ul style="list-style-type: none"> To know about various applications of chemical technology in medicinal chemistry
CO-7	<ul style="list-style-type: none"> The use of chemical technology in green chemistry
SEC 4	Cheminformatics (Theory)
CO-1	<ul style="list-style-type: none"> An Understanding of History of Cheminformatics and Molecular modelling
CO-2	<ul style="list-style-type: none"> To represent molecules and reactions using notations like SMILES, Matrix representations etc.
CO-3	<ul style="list-style-type: none"> To understand the importance of Molfiles and Sdfiles
CO-4	<ul style="list-style-type: none"> To carry out search for chemical structures using sub-structure, full structure, similarity search, three dimension search using different softwares available predict the properties of compounds using LEFR, QSAR, QSPR and Toxicity
CO-5	<ul style="list-style-type: none"> To understand the structure spectra correlation
CO-6	<ul style="list-style-type: none"> To understand the basics of Drug designing and apply that for prediction of good candidates for drug discovery
SEC 4	Cheminformatics (Practical)

CO-1	<ul style="list-style-type: none"> To perform data mining using online databases
CO-2	<ul style="list-style-type: none"> To represent chemical information using SMILES, InChi and other In-silico representation
CO-3	<ul style="list-style-type: none"> To draw molecules using softwares like ChemDraw, MarvinSketch, ORTEP, Chimera, Rasmol and Pymol
CO-4	<ul style="list-style-type: none"> To carry out drug designing using molecular modelling tool, Structure - Homology modelling tools, Docking and screening tools
CO-5	<ul style="list-style-type: none"> To Build a ligand and asses its activity and toxicity
SEC 6	Intellectual Property Rights (Theory)
CO-1	<ul style="list-style-type: none"> Understand the theoretical concepts of Intellectual Property Laws, and to differentiate between the different kinds of IP.
CO-2	<ul style="list-style-type: none"> They will come to know the existing legal framework relating to IP in India.
CO-3	<ul style="list-style-type: none"> Comprehend the importance of IP and its significance in their respective domains.
CO-4	<ul style="list-style-type: none"> This course will motivate the students to make their career in multifaceted field of intellectual Property.
CO-5	<ul style="list-style-type: none"> The student learn the Basic concept of Intellectual Property.
CO-6	<ul style="list-style-type: none"> The students will get familiar about The World Intellectual Property Organization (WIPO), WTO and TRIPS Agreement.
CO-7	<ul style="list-style-type: none"> The students will have the brief Introduction and will understand the Criteria for obtaining patents.
CO-8	<ul style="list-style-type: none"> The students will understand the meaning of mark and Trademark, the various Categories of Trademark.
CO-9	<ul style="list-style-type: none"> The students will understand the concept of Geographical Indication.
CO-10	<ul style="list-style-type: none"> The students with get knowledge about the Plant Variety Protection and Farmer's Right.
CO-11	<ul style="list-style-type: none"> We will teach students the Enforcement of Intellectual Property Rights.
CO-12	<ul style="list-style-type: none"> Understand the theoretical concepts of Intellectual Property Laws, and to differentiate between the different kinds of IP.
SEC 7	Analytical Clinical Biochemistry (Theory)
CO-1	<ul style="list-style-type: none"> To understand the structure of biomolecules and determines their reactivity and biological uses.
CO-2	<ul style="list-style-type: none"> Gain an insight into concept of heredity through biological processes like replication, transcription and translation
CO-3	<ul style="list-style-type: none"> Understand the application of chemistry in biological systems
CO-4	<ul style="list-style-type: none"> Demonstrate an understanding of the biochemistry of diseases.
CO-5	<ul style="list-style-type: none"> Understand the basic principles of drug-receptor interaction and structure activity relation (SAR).
CO-6	<ul style="list-style-type: none"> To understand in brief about the different forms of lipid in our body like membrane lipids, cholesterol, lipoproteins, liposomes etc.
SEC 7	Analytical Clinical Biochemistry (Practical)
CO-1	<ul style="list-style-type: none"> Gain insight into qualitative analysis of lipids ad proteins
CO-2	<ul style="list-style-type: none"> Understand the concept of saponification number, iodine number and acid

	value of different lipids sample
CO-3	<ul style="list-style-type: none"> • Estimation of DNA sample using diphenylamine method
CO-4	<ul style="list-style-type: none"> • Estimation of proteins by Lowry's method
CO-5	<ul style="list-style-type: none"> • Demonstrate the methods to determine the enzyme activity
SEC 8	Green Methods in Chemistry (Theory)
CO-1	<ul style="list-style-type: none"> • Learn the concept of environmental pollution and its impact.
CO-2	<ul style="list-style-type: none"> • Role of chemistry in environment pollution
CO-3	<ul style="list-style-type: none"> • Need to develop good practices in chemistry to remove the negative aspects of conventional chemistry
CO-4	<ul style="list-style-type: none"> • Learn the positive, less hazardous and beneficial aspects of chemistry.
CO-5	<ul style="list-style-type: none"> • Understand the concept of toxicity, hazard and risk of chemical substances, environmental law.
CO-6	<ul style="list-style-type: none"> • Learn green methods that aid to design and develop materials and processes to reduce the use and generation of hazardous substances in industry.
CO-7	<ul style="list-style-type: none"> • Understand various green chemistry concepts such as twelve principles of green chemistry
CO-8	<ul style="list-style-type: none"> • Understand to utilize renewable resources for sustainable development.
CO-9	<ul style="list-style-type: none"> • Learn to develop and utilize safer starting materials and synthetic routes for less hazardous substances
CO-10	<ul style="list-style-type: none"> • Learn to develop biodegradable materials such as plastics, antifoulants etc.
CO-11	<ul style="list-style-type: none"> • Learn to use green solvents as potential alternative of conventional solvents.
CO-12	<ul style="list-style-type: none"> • Learn important energy efficient reactions using green methods.
CO-13	<ul style="list-style-type: none"> • Learn to understand the role of different types of catalysts.
CO-14	<ul style="list-style-type: none"> • Learn success stories and real world cases which motivate to practice green chemistry.
SEC 8	Green Methods in Chemistry (Practical)
CO-1	<ul style="list-style-type: none"> • Learn to Prepare and characterize nanoparticles using plant extracts.
CO-2	<ul style="list-style-type: none"> • Learn to Prepare biodiesel from vegetable oil.
CO-3	<ul style="list-style-type: none"> • Learn to extract of D-limonene from orange peel using liquid CO₂ prepared from dry ice.
CO-4	<ul style="list-style-type: none"> • Learn to perform mechanochemical solvent free, solid-solid synthesis of azomethine
CO-5	<ul style="list-style-type: none"> • Learn to perform solvent free, microwave assisted one pot synthesis of phthalocyanine complex of copper(II).
CO-6	<ul style="list-style-type: none"> • Also learn to perform design an experiment by utilizing the products and by-products obtained in above preparations which become waste otherwise if not used.
SEC 9	Pharmaceutical Chemistry (Theory)
CO-1	<ul style="list-style-type: none"> • Gain insight into retro-synthesis approach in relation to drug design and drug discovery.

CO-2	<ul style="list-style-type: none"> Learn synthetic pathways of major drug classes
CO-3	<ul style="list-style-type: none"> Understand the fermentation process and production of ethanol, citric acids, antibiotics and some classes of vitamins
CO-4	<ul style="list-style-type: none"> Information about the sources of drugs like marine, biological, minerals and plant tissue culture
CO-5	<ul style="list-style-type: none"> Study of pharmaceutical aids like talc, diatomite, kaolin, bentonite, gelatin and natural colours
SEC 9	Pharmaceutical Chemistry (Practical)
CO-1	<ul style="list-style-type: none"> Understand the method of synthesis of drugs (Aspirin, Paracetamol, sulphacetamide, Ibuprofen)
CO-2	<ul style="list-style-type: none"> Gain insight into the methods of qualitative analysis of drugs and their properties
CO-3	<ul style="list-style-type: none"> Demonstrate the method for the determination of alcohol content in liquid drug
CO-4	<ul style="list-style-type: none"> Understand difference between the iodometric and iodimetric titrations
CO-5	<ul style="list-style-type: none"> Learn the steps for the analysis of Vitamin C tablet available commercially
SEC 10	Chemistry of Cosmetics & Perfumes (Theory & Practical)
CO-1	<ul style="list-style-type: none"> Learn basic of cosmetics, various cosmetic formulation, ingredients and their roles in cosmetic products.
CO-2	<ul style="list-style-type: none"> Learn the use of safe, economic and body-friendly cosmetics
CO-3	<ul style="list-style-type: none"> Prepare new innovative formulations.

GENERIC ELECTIVES (GE)

Paper No	Paper Name
GE - 1	Atomic Structure, Bonding, General Organic Chemistry & Aliphatic Hydrocarbons (Theory)
CO-4	<ul style="list-style-type: none"> Solving the conceptual questions by applying the learnt concepts about the quantum mechanical model of the atom, quantum numbers, electronic configuration, radial and angular distribution curves, s, p, and d orbital shapes, and periodicity in atomic radii, ionic radii, ionisation energy, and electron affinity of elements
CO-5	<ul style="list-style-type: none"> Constructing viable molecular shapes and geometries (homo- & hetero-nuclear diatomic molecules)
CO-6	<ul style="list-style-type: none"> To understand how to Solve the conceptual questions using the knowledge gained by studying the quantum mechanical model of the atom, quantum numbers, electronic configuration, radial and angular distribution curves, shapes of s, p, and d orbitals, and periodicity in atomic radii, ionic radii, ionization energy and electron affinity of elements.
CO-7	<ul style="list-style-type: none"> Understand the Shapes of s, p and d atomic orbitals, nodal planes, discovery of spin, spin quantum number (s) and magnetic spin quantum number (ms).
CO-8	<ul style="list-style-type: none"> Rules for filling electrons in various orbitals, electronic configurations of the atoms, stability of half-filled and completely filled orbitals, concept of

	exchange energy, relative energies of atomic orbitals, anomalous electronic configurations.
CO-9	<ul style="list-style-type: none"> Know about the Draw the plausible structures and geometries of molecules using radius ratio rules, VSEPR theory and MO diagrams (homo- & hetero-nuclear diatomic molecules).
CO-10	<ul style="list-style-type: none"> Understand about the hybridization in inorganic complex with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements.
CO-11	<ul style="list-style-type: none"> Understand the concept of resonance and resonating structures in various inorganic and organic compounds.
CO-12	<ul style="list-style-type: none"> Learn and understand the fundamental concepts of organic chemistry
CO-13	<ul style="list-style-type: none"> To write mechanism of different organic reactions
CO-14	<ul style="list-style-type: none"> To understand the stereochemistry of organic compounds
CO-15	<ul style="list-style-type: none"> Understand and explain the preparation, Physical properties and chemical reactions associated with Aliphatic hydrocarbons
GE - 1	Atomic Structure, Bonding, General Organic Chemistry & Aliphatic Hydrocarbons (Practical)
CO-1	<ul style="list-style-type: none"> Understanding the basic concept of titrimetric analysis
CO-2	<ul style="list-style-type: none"> Carrying out redox, acid base titrations for understanding the principles of the above titrations.
CO-3	<ul style="list-style-type: none"> Carry out purification via crystallization and distillation of organic compound and confirm same using melting point and boiling point
CO-4	<ul style="list-style-type: none"> Carry out chromatography for separation of mixtures and sugars
CO-5	<ul style="list-style-type: none"> Separate the components in a mixture of two amino acids
GE - 3	Solutions, Phase Equilibrium, Conductance, Electrochemistry & Functional Group Organic Chemistry (Theory)
CO-1	<ul style="list-style-type: none"> Understanding thermodynamic aspects of equilibria between phases.
CO-2	<ul style="list-style-type: none"> Learning the concept of conductance and its variation with dilution, migration of ions in solutions and applications of conductance measurement.
CO-3	<ul style="list-style-type: none"> Understanding the applications of thermodynamic principles to solutions.
CO-4	<ul style="list-style-type: none"> Illustration of Nernst distribution law and its applications.
CO-5	<ul style="list-style-type: none"> Understanding the concept of EMF and calculating thermodynamic properties and other parameters from the EMF measurements.
CO-6	<ul style="list-style-type: none"> Understanding the relevance of structure of biomolecules and to determine chemical properties, reactivity and biological uses.
CO-7	<ul style="list-style-type: none"> Designing synthetic routes for various organic compounds
GE - 3	Solutions, Phase Equilibrium, Conductance, Electrochemistry & Functional Group Organic Chemistry (Practical)
CO-1	<ul style="list-style-type: none"> To construct phase diagram of simple eutectic systems
CO-2	<ul style="list-style-type: none"> To determine CST of Phenol-water impurities and study the effect of impurities on CST
CO-3	<ul style="list-style-type: none"> To perform conductometric titrations
CO-4	<ul style="list-style-type: none"> To perform potentiometric titrations

CO-5	<ul style="list-style-type: none"> To find the functional group present in a organic compound using systematic analysis
GE - 4	Chemistry of s- and p-block elements, states of matter and Chemical Kinetics (Theory)
CO-1	<ul style="list-style-type: none"> Understanding the most common modes of metal occurrence based on typical electrode potentials
CO-2	<ul style="list-style-type: none"> Developing a thorough understanding Ellingham diagrams for metal oxide reduction with carbon as the reducing agent.
CO-3	<ul style="list-style-type: none"> Understanding of the metallurgical processes like cyanide method for silver and gold. Electrolytic, oxidative refining, van Arkel-de Boer procedure, and Mond's process and all methods for purifying metals (Al, Pb, Ti, Fe, Cu, Ni, Zn)
CO-4	<ul style="list-style-type: none"> Critical thinking skills for understanding the concepts of Electronic configuration, atomic and ionic size, ionisation enthalpy, electronegativity (Pauling, Winker, and Allred-Rochow scales) all such aspects of periodicity in s- and p-block elements.
CO-5	<ul style="list-style-type: none"> Understanding of concepts of Inert pair effect, diagonal relationship, and anomalous behaviour of the first member of each group), oxidation states with reference to elements in unusual and rare oxidation states like carbides and nitrides), inert pair effect, diagonal relationship, and anomalous behaviour of the first member of each group s- and p-Block Elements Compounds Diborane and the multicentre bonding idea
CO-6	<ul style="list-style-type: none"> Understanding following compounds' structure, bonding, and essential features such as oxidation/reduction, acidic/basic nature, and uses in industrial and environmental chemistry : Nitrogen hydrides, Phosphorous and Sulphur halides and oxohalides
CO-7	<ul style="list-style-type: none"> Understanding and deriving the mathematical expressions for ideal gas law, real gas law and comment on deviation from ideal behaviour
CO-8	<ul style="list-style-type: none"> Derive and explain the Maxwell Boltzman distribution, critical constants and viscosity of gases
CO-9	<ul style="list-style-type: none"> Explain and derive mathematical equations to explain properties of liquids
CO-10	<ul style="list-style-type: none"> Understand symmetry elements in Solid state
CO-11	<ul style="list-style-type: none"> Understand rate of reaction and derive different rate of equation, theories of reaction rates and explain experimental observations
GE - 4	Chemistry of s- and p-block elements, states of matter and Chemical Kinetics (Practicals)
CO-1	<ul style="list-style-type: none"> To perform semi-micro qualitative analysis to determine the anion and cation in a mixture
CO-2	<ul style="list-style-type: none"> To use stalagmometer to determine the surface tension of unknown liquids
CO-3	<ul style="list-style-type: none"> To use viscometers to determine the viscometer of unknown liquids
CO-4	<ul style="list-style-type: none"> To study the kinetics of reaction using different methods
GE -5	Chemistry of d-block elements, Quantum Chemistry and Spectroscopy (Theory)
CO-1	<ul style="list-style-type: none"> Understand the chemistry of d & f block elements, Latimer diagrams, VBT and CFT

CO-2	<ul style="list-style-type: none"> Understanding the basic principles of quantum mechanics: operators
CO-3	<ul style="list-style-type: none"> Provides understanding of basic concepts of microwave
CO-4	<ul style="list-style-type: none"> Illustration of Lambert-Beer's law
GE -5	Chemistry of d-block elements, Quantum Chemistry and Spectroscopy (Practical)
CO-1	<ul style="list-style-type: none"> Learn about the Estimation of the amount of nickel present in a given solution as bis - (dimethylglyoximato) nickel(II) or aluminium as oxinate in a given solution gravimetrically.
CO-2	<ul style="list-style-type: none"> Understand about the Estimation of (i) Mg^{2+} or (ii) Zn^{2+} by complexometric titrations using EDTA.
CO-3	<ul style="list-style-type: none"> Learn about the Estimation of total hardness of a given sample of water by complexometric titration.
CO-4	<ul style="list-style-type: none"> Determination of the composition of the Fe^{3+} - salicylic acid complex / Fe^{2+} - phenanthroline complex in solution by Job's method.
CO-5	<ul style="list-style-type: none"> Verify Lambert-Beer's law and determine the concentration of $CuSO_4/KMnO_4/K_2Cr_2O_7/CoSO_4$ in a solution of unknown concentration
CO-6	<ul style="list-style-type: none"> Know about the chemical Kinetics; Study the kinetics of the following reactions. 1. Initial rate method: Iodide-persulphate reaction 2. Integrated rate method: Saponification of ethyl acetate.
GE -6	Organometallic, Bioinorganic chemistry, Polynuclear hydrocarbons and UV, IR Spectroscopy (Theory)
CO-1	<ul style="list-style-type: none"> Inorganic chemistry topics, organometallics and bioinorganic chemistry were discussed in detail, and students accomplished better insights about basic terminology involved.
CO-2	<ul style="list-style-type: none"> Students were excited and curiously learned about basic concepts on structure elucidation of various polynuclear aromatic compounds and their important reactions.
CO-3	<ul style="list-style-type: none"> They were explained about active methylene compounds, particularly ethylacetoacetate.
CO-4	<ul style="list-style-type: none"> An extensive discussions were made on the basic spectroscopic techniques and their usage in structure elucidation of known compounds.
CO-5	<ul style="list-style-type: none"> Based on the discussion and assignments attempted by the students, the course played an important role to obtain better insight about polynuclear, heteronuclear aromatic compounds, and spectral analysis.
GE -6	Organometallic, Bioinorganic chemistry, Polynuclear hydrocarbons and UV, IR Spectroscopy (Practical)
CO-1	<ul style="list-style-type: none"> Students were exposed to the basic/preliminary separation technique, paper chromatography, which plays an important role while isolation or divorce of metal ions or organic compounds.
CO-2	<ul style="list-style-type: none"> A few inorganic preparations were dictated and discussed in detail, in turn students revealed their insightful questions, which were further elaborated with appropriate responses by the class teachers.
CO-3	<ul style="list-style-type: none"> An extensive discussions were made on the basic spectroscopic techniques and their usage in structure elucidation of known compounds.
CO-4	<ul style="list-style-type: none"> Separately, systematic qualitative analysis of organic compounds was

	explained, performed and demonstrated to the students.
CO-5	<ul style="list-style-type: none"> Students were exposed to the basic/preliminary separation technique, paper chromatography, which plays an important role while isolation or divorce of metal ions or organic compounds.
GE - 7	Molecules of Life (Theory)
CO-1	<ul style="list-style-type: none"> Learn and demonstrate how the structure of biomolecules determines their chemical properties, reactivity and biological uses.
CO-2	<ul style="list-style-type: none"> Gain an insight into mechanism of enzyme action and inhibition.
CO-3	<ul style="list-style-type: none"> Know and understand the basic principles of drug-receptor interaction and SAR.
CO-4	<ul style="list-style-type: none"> Understand biological processes like replication, transcription and translation.
CO-5	<ul style="list-style-type: none"> Demonstrate an understanding of metabolic pathways, their inter-relationship, regulation and energy production from biochemical processes.
GE - 7	Molecules of Life (Practical)
CO-1	<ul style="list-style-type: none"> Learn about separation of amino acids by paper chromatography
CO-2	<ul style="list-style-type: none"> Understand the titration curve of amino acid (glycine)
CO-3	<ul style="list-style-type: none"> Learn how to estimate protein by Lowry's method.
CO-4	<ul style="list-style-type: none"> Understand the action of salivary amylase on starch under optimum conditions.
CO-5	<ul style="list-style-type: none"> Learn how to determine Saponification value and Iodine value of any oil or fat and their significance also.
CO-6	<ul style="list-style-type: none"> Learn how to isolate and estimate DNA from plant source e.g. onion, cauliflower.
CO-7	<ul style="list-style-type: none"> Learn to perform qualitative test for presence of carbohydrates such as Molisch Test, Rapid furfural test, Tollen's test and Fehling's Test