

Department of Chemistry



PROGRAMME NAME : B.Sc CHEMISTRY

PROGRAMME OUTCOMES

PO 1	Understand the basics of science and apply their knowledge in day-to-day life
PO 2	Develop skills to carry out experiments in various branches of science.
PO 3	Have enough scientific knowledge to go for higher studies and become entrepreneur
PO 4	Identify, formulate and solve the technological problems of the industry
PO 5	Effective written and oral communication skills especially the ability to transmit complex technical information in a clear and concise manner
PO 6	Understand the issues of environmental contexts and sustainable development.
PO 7	Acquire professional ethics and act in a non-biased manne

SL. NO.	COURSE NAME	COURSE OUTCOME	
1	INORGANIC CHEMISTRY I	CO 1	Recall the structure of an atom and explain the theories and concepts that go with it.
		CO 2	Identify and classify the elements, as well as knowing the periodic properties
		CO 3	Discuss the theories of chemical bonding and how they are used to explain the structure and properties of various molecules
		CO 4	Compare the general characters of s and p block elements.
		CO 5	Classify the types of volumetric analysis and choose suitable indicators for various titrations
2	PHYSICAL SCIENCES I	CO 1	Recognise their own ability to improve their own competence in using the language
		CO 2	Use language for speaking with confidence in an intelligible and acceptable manner
		CO 3	Understand the importance of reading for life

		CO 4	Read independently unfamiliar texts with comprehension
		CO 5	Understand the importance of writing in academic life
		CO 6	Write simple sentences without committing error of spelling or grammar
3	ALLIED CHEMISTRY I	CO 1	Apply theories of chemical bonding predict the geometry of molecules and their stability
		CO 2	Analyze the types of reagents and intermediates involved in different organic reactions.
		CO 3	Explain the methods of preparation and uses of important drugs for long life.
		CO 4	Outline the preparation, properties and applications of cement, glass and explosives.
		CO 5	Discuss the methods of preparation and importance of drugs for long life .
4	INORGANIC QUANTITATIVE (VOLUMETRIC) ANALYSIS -I	CO 1	Develop the practical skill in quantitative analysis and analyze the principle of different titrations.
		CO 2	Determine the amount of acid and alkali in the given solution.
		CO 3	Apply the principles of permanganometric titration and estimate amount of oxalate and ferrous ammonium sulphate
5	INORGANIC QUANTITATIVE ANALYSIS	CO 1	Apply the principles of volumetric analysis to determine the concentration of acids/bases/ions
		CO 2	Determine volumetrically the amount of acids and bases in the given solution
		CO 3	Estimate the amount of inorganic compounds using permanganometric titrations

6	ORGANIC CHEMISTRY I	CO 1	Recall basic concepts of organic chemistry and Nomenclature of organic compounds.
		CO 2	Analyse different types of organic reactions and apply their mechanisms to various reaction.
		CO 3	Discuss the structure and relative reactivities of various carbonyl compounds.
		CO 4	Outline the preparation and discuss the properties and uses of organometallic and sulphur containing organic compounds
		CO 5	Explain the theories and conformational isomers of acyclic/cyclic compounds
7	PROFESSIONAL ENGLISH FOR PHYSICAL SCIENCE II	CO 1	Attend interviews with boldness and confidence.
		CO 2	Adapt easily into the workplace context, having become communicatively competent.
		CO 3	Apply to the Research & Development organizations/ sections in companies and offices with winning proposals.
8	CHEMISTRY II	CO 1	Analyse the chemical and biological applications of coordination compounds
		CO 2	Explain the electronic effects and apply these to organic compounds.
		CO 3	Define electromotive force and Analyse its uses
		CO 4	Discuss structure and biological functions of carbohydrates ,aminoacids.
		CO 5	Analyse common diseases and important tablets used to cure the diseases.
9	INORGANIC QUANTITATIVE (VOLUMETRIC) ANALYSIS II	CO 1	Outline the principles of Iodometric, dictrometric and complexometric titrations

		CO 2	Estimate Iodometrically the amount of Cu^{2+} and dichromate
		CO 3	Determine the concentrations of metal ions (Zn^{2+} , Pb^{2+} , Mg^{+} and Cu^{2+}) using complexometric titrations
10	INORGANIC QUALITATIVE ANALYSIS	CO 1	Develop the practical skill on qualitative analysis
		CO 2	Analyse the given inorganic simple salt using preliminary and other specific and confirmatory tests to report for interfering acid radicals.
		CO 3	Illustrate the interfering radicals and to carry out systematic analysis and identifying the cations given in the simple salt.
11	PHYSICAL CHEMISTRY I	CO 1	Compare the behaviour of ideal and real gases.
		CO 2	Develop knowledge on the concept of vapour pressure and Distinguish ideal solutions from non ideal solutions
		CO 3	Analyze the structure of crystals and explains the imperfections in crystal systems
		CO 4	Explain the activity of isotopes and Discuss the applications of radio isotopes
		CO 5	Discuss the kinetics of photochemical reactions and Illustrate the photo physical process
12	GREEN CHEMISTRY	CO 1	Apply the Principles of Green Chemistry in various reactions
		CO 2	Assess the quality of green solvents in Chemical process
		CO 3	Explain the efficiencies of green catalyst
		CO 4	Distinguish the Problems of Ordinary reactions and Green reactions
		CO 5	Illustrate the importance of green energy technology.

13	FOOD CHEMISTRY	CO 1	Analyse the needs of foods to human and other living things.
		CO 2	List out important Nutrients, Vitamins and Minerals to the human
		CO 3	Discuss on food additives and preservative methods
		CO 4	Explain the food adulterations and analyse adulterants available in the common foods
		CO 5	Illustrate the various food regulation laws and standards.
14	FOOD SCIENCE	CO 1	Find the sources of food and list out major food groups
		CO 2	Summarizes the food additives and explain its significance.
		CO 3	Explain the food preservation and functions of food preservatives
		CO 4	Identify the adulterants available in the food.
		CO 5	Examine the food and what are the food quality standards used to assess the food.
15	WATER MANAGEMENT	CO 1	Classify the water pollution and analyse the water pollutants
		CO 2	List out different water quality parameters and discuss its importance.
		CO 3	Elaborate water purification processes and show the advantages of different methods
		CO 4	Apply various methods to treat waste water and analyze the treated water
		CO 5	Develop the water storage methods
16	ORGANIC PREPARATION & INORGANIC QUALITATIVE ANALYSIS I	CO 1	List out the compounds to be prepared and discuss the procedure for preparations
		CO 2	Discuss the principle of qualitative analysis and apply the principle for the analysis of given salt.

		CO 3	Analyse systematically the given salt mixture and determine the acidic and basic radicals present in it.
17	INORGANIC CHEMISTRY II	CO 1	Explain the basic concepts of acids and bases and analyze the general characteristics of non-aqueous solvents.
		CO 2	Compare the general characteristics of d and f block elements and select the suitable transition and inner transition elements for specific uses.
		CO 3	Elaborate the Principle and Procedure of metal extraction and identify most useful compounds of metals.
		CO 4	Discuss the various compounds of halogens and noble gases
		CO 5	Summarize the methods to analyze data in the experiments
18	PHARMACEUTICAL CHEMISTRY	CO 1	List out common diseases and explain the reasons.
		CO 2	Summarize the common drugs and specify its (function) action.
		CO 3	Analyze drugs action and metabolism.
		CO 4	Explain different chronic diseases and its treatment
		CO 5	Find the chemicals to treat health disorder and elaborate various medicinal plants to treat disease.
19	INDUSTRIAL CHEMISTRY	CO 1	Explain suitable water purification techniques.
		CO 2	Summarize the fuels of petroleum and biofuels.
		CO 3	Discuss the electrical insulating material and list out the commercial batteries and its uses.
		CO 4	Explain the corrosion and its prevention.

		CO 5	Identify the chemicals used in day to day life.
20	DAIRY CHEMISTRY	CO 1	Identify the components in the milk and analyze the properties of milk.
		CO 2	Illustrate the processing of milk and Elaborate the changes in properties during processing
		CO 3	List out the milk products and determine the constituents in it
		CO 4	Explain the fermentation of milk and list out the fermented milk products.
		CO 5	Analyzed the condensed milk and Distinguish Cow and buffalo milk.
21	CHEMISTRY IN EVERYDAY LIFE	CO 1	Outline the daily used Cosmetics.
		CO 2	List out the soaps and detergents and classify the soaps.
		CO 3	Explain about the nutrients from food materials.
		CO 4	Discuss the fertilizers and pesticides necessary for the grow of plants.
		CO 5	Distinguish fibres, yarns & Fabrics and Identify the dyes used in dyeing.
22	MAJOR PRACTICAL IV	CO 1	Define acidic and basic radicals and list out the anions and cations to be analyzed
		CO 2	Discuss the principle of qualitative analysis and apply the principle for the analysis of given salt mixture..
		CO 3	Analyse systematically the given salt mixture and determine the acidic and basic radicals present in it.
23	ORGANIC CHEMISTRY II	CO 1	Interpret the elements of symmetry and apply Cahn Ingold Prelog's rule.
		CO 2	Discuss the geometrical configuration (Cis/Trans and /or E or Z) and know the conformational analysis

		CO 3	Analyse the structure and reactions of Carbohydrates.
		CO 4	Identify the aromatic organic compounds Using Huckel's rule and study the electrophilic and nucleophilic substitution reactions
		CO 5	List out the important heterocyclic compounds and analyse its aromatic characters.
24	CHEMISTRY II	CO 1	Explain the basic concepts of thermodynamics.
		CO 2	Identify the importance of I, II & III laws of thermodynamics
		CO 3	Construct the phase diagram for different heterogeneous system in equilibrium.
		CO 4	Find the applications of solubility product principle and explain different types of conductometric titrations in the laboratory to find the end point
		CO 5	Discuss the various types of molecular spectroscopy and examine the molecules to be active in UV-Visible, IR, Raman Spectroscopy.
25	POLYMER CHEMISTRY	CO 1	Classify the polymers based on their characters and structures.
		CO 2	Explain the mechanisms and techniques of polymerization.
		CO 3	Discuss the applications of various organic and inorganic polymers.
		CO 4	Summarize the advantages and disadvantages of polymer processing and degradation techniques.
		CO 5	List out the important applications of conducting polymers , biopolymers and explain the plastic waste management.
26	BIO CHEMISTRY	CO 1	Compare the characters of amino acids and proteins.

		CO 2	Explain the important properties and functions of carbohydrates.
		CO 3	Classify the lipids and analyse its specific functions.
		CO 4	List out the various enzymes involved in biochemical reactions and specify its catalytic activities.
		CO 5	Distinguish DNA & RNA and find the functions of components in blood.
27	SEMESTER V MAJOR ELECTIVE II MORDERN INSTRUMENTAL ANALYTICAL TECHNIQUES	CO 1	Discuss the application of various chromatographic techniques
		CO 2	Explain the principles and analytical applications of Thermoanalytical techniques.
		CO 3	Determine the concentration of metal ions using suitable electro analytical techniques.
		CO 4	Outline the principle and applications of various spectroanalytical methods
		CO 5	Analyze the basic concepts of radioanalytical methods and analytical application
28	APPLIED CHEMISTRY	CO 1	Define fuels and Explain various types of fuels
		CO 2	Choose the suitable paints, pigments, lubricants and adhesives for day to day life activities.
		CO 3	Analyze the highly useful fertilizers, pesticides, insecticides and fungicides to improve crop yield.
		CO 4	Discuss the oils, soaps and detergents which are necessary for human health and other activities
		CO 5	Outline the industrially important compounds for the human development activities.
29	PHYSICAL CONSTANT DETERMINATION	CO 1	Examine the elements other than carbon & Hydrogen present in the organic compounds.

		CO 2	Find the functional group present in the given organic compound
		CO 3	Determine the physical constant for the organic substances
30	GRAVIMETRIC ESTIMATION & INORGANIC PREPARATION	CO 1	Discuss the principle of gravimetric estimation and explain the procedure for the estimation of ions
		CO 2	Estimate the amount of metal ions available in the given solution and compare the accuracy with other methods.
		CO 3	Illustrate the procedure for the preparation of various metal complexes
31	INORGANIC CHEMISTRY III	CO 1	Apply the valency bond and crystal field theories to coordination compounds and analyse its spectral and magnetic properties
		CO 2	Compare the various substitution reactions of Coordination Compounds and deduce the stability of the complexes.
		CO 3	Discuss the various organometallic compounds and find its applications.
		CO 4	Analyse the characteristics of metal complexes using various Spectroscopy.
		CO 5	Identify the biologically important metals & compounds and analyze their uses.
32	ORGANIC CHEMISTRY III	CO 1	Understand the reaction mechanism and effect of substituents of phenols and aromatic acid
		CO 2	Discuss various types of rearrangements.
		CO 3	Demonstrate various theories of colour and constituents and discuss the structure of naphthalene and anthracene.
		CO 4	Elaborate the structure of alkaloids and terpenoids.

		CO 5	Apply Woodward Fieser rule to conjugated dienes & α, β unsaturated ketones and IR & NMR spectroscopy to compounds
33	PHYSICAL CHEMISTRY III	CO 1	Explain the applications of EMF measurements.
		CO 2	Apply the rate constant expressions for various reactions.
		CO 3	Discuss the applications of Le Chatelier's Principle & Hammett equation and Identify the applications of Interface chemistry
		CO 4	Classify the molecules into various groups based on group theory.
		CO 5	Explain the principles and applications of NMR, ESR & NQR Spectroscopy.
34	TEXTILE CHEMISTRY	CO 1	Identify the natural and man made fibres and Analyse its characters.
		CO 2	Explain the characteristics of different natural fibres
		CO 3	Illustrate the properties and uses of manmade fibres.
		CO 4	Elaborate the dyeing process of fibres.
		CO 5	Define Printing of fibres and Distinguish between dyeing and printing processes of fibres.
35	NANOCHEMISTRY	CO 1	Define the different nanosized materials and analyze their peculiar properties.
		CO 2	List out the various physical, chemical and biological methods of synthesis of nanomaterials
		CO 3	Choose the suitable analytical techniques to characterize nanoparticles.
		CO 4	Elaborate the various applications of nanomaterials and nanocomposites.
		CO 5	Summarize the important nanocompounds and Explain their specific uses.

PROGRAMME NAME : M.Sc CHEMISTRY**PROGRAMME OUTCOMES**

PO - 1	Function as responsible individuals with ethical values, accountable to the community.
PO - 2	Gain detailed knowledge of the major areas of chemistry including a wide range of factual information and experimentally observed phenomena.
PO - 3	Apply chemical concepts in new situations and computational software in chemistry efficiently.
PO - 4	Think critically and analyze chemical problems.
PO - 5	Work effectively and safely in a laboratory environment.
PO - 6	Present scientific and technical information resulting from laboratory experimentation by means of oral presentation, scientific poster or a written report.
PO - 7	Pursue higher education / employable/ entrepreneur.
PO - 8	Work in teams as well as independently in academia, industry or government.

SL. NO.	COURSE NAME	COURSE OUTCOME	
1	AROMATICITY AND ORGANIC REACTION MECHANISM	CO1	Analyze and predict the aromaticity of compounds and the nomenclature of bicyclic and tricyclic systems.
		CO2	Develop skills for identifying the kinetics of reactions.
		CO3	Demonstrate the generation, stability, and reactivity of carbenes, nitrenes and free radicals
		CO4	Explain and analyze the mechanism of substitution, elimination and addition reactions in aliphatic systems.
		CO5	Infer the major types of nucleophilic substitution reactions on aromatics with their specific reactivity

2	FUNDAMENTALS OF INORGANIC CHEMISTRY, NUCLEAR CHEMISTRY AND INORGANIC POLYMERS	CO1	Recall the basic concepts of atomic structure, periodic table, periodic properties and chemical bonding of elements
		CO2	Explain poly acids, cage compounds and Inorganic polymers
		CO3	Apply the concept of hybridization to identify the structure of molecules by VBT, MOT and VSEPR theory.
		CO4	Distinguish hard and soft acids and bases and explain their relative strengths.
		CO5	Explain various nuclear reactions and the analytical applications of radio isotopes.
3	QUANTUM MECHANICS AND SPECTROSCOPY – I	CO1	Explain the mathematical and physical aspects of quantum mechanics which illustrates the relationship between mathematics and fundamental of quantum mechanics.
		CO2	Solve quantum mechanical problems.
		CO3	Analyze the quantum mechanical aspects in various areas of applications in chemistry.
		CO4	Explain the basic idea of quantization of energy and spectroscopy and apply to the rotational spectra of diatomic molecules.
		CO5	Explain the basic principles of vibrational spectra of diatomic molecules including both IR and Raman spectra.
4	1.1 GREEN CHEMISTRY – TECHNIQUES AND APPLICATIONS	CO1	Explain the basic principles of green chemistry, alternative energy sources and green metrics
		CO2	Apply the green catalysis in chemical reactions.
		CO3	Identify the role of important green solvents in organic reactions.
		CO4	Illustrate name reactions and analyze the various green reactions using microwave techniques.

		CO5	Explain the principles of renewable energy resources and generate its importance to the environment.
5	1.2 CHEMISTRY OF INDUSTRIAL PRODUCTS AND FORMULATION	CO1	Acquire knowledge of paints and pigments and investigate its drying mechanism
		CO2	Apply and formulate the role of cosmetics in industries.
		CO3	Identify the fibre for paper making and evaluate its properties.
		CO4	Apply processing operations of milk and milk products in day to day life.
		CO5	Explain types of textile fibres and analyze its characters by various treatments
6	1.3 FORENSIC CHEMISTRY	CO1	Acquire knowledge on forensic science and apply through biometric and finger printing technique.
		CO2	Interpret the different methods of finger printing and characterization of blood stains
		CO3	Analyze the selected drugs, inks and paints using different techniques.
		CO4	Identify the samples using forensic toxicology methods and DNA finger printing
		CO5	Explain the proper applications of computer network in forensic science to investigate the crimes.
7	ORGANIC CHEMISTRY PRACTICAL - I	CO1	Explain the basic separation procedures of organic mixtures.
		CO2	Select the separation methods to separate the organic mixtures.
		CO3	Classify the functional groups using systematic procedure.
		CO4	Determine the physical properties of organic compounds
		CO5	Develop skills to isolate natural products from plants.
8	INORGANIC CHEMISTRY PRACTICAL - I	CO1	Recall the procedure for the identification of more familiar metal ions

		CO2	Explain the principles and techniques and have skills of qualitative analysis of familiar and less familiar cations in a mixture.
		CO3	Analyze a metal ion in the presence of another metal ion
9	PHYSICAL CHEMISTRY PRACTICAL - I	CO1	Explain the principles of conductometric titrations and estimate the strength of solutions.
		CO2	Explain the basic principles of thermometry and determine the heat of solution as well as the amount of solute present in the solution.
		CO3	Determine the solubility product of sparingly soluble salts using conductometric technique.
10	SEMESTER - I STEREOCHEMISTRY, ORGANIC REAGENTS AND PHOTOCHEMISTRY	CO1	Recognize three dimensional structures of any organic molecule with orientation of atoms or groups.
		CO2	Analyze the conformation and the reactivity of acyclic and sixmembered cyclic compounds.
		CO3	Develop the skill to choose the appropriate reagents for organic reactions.
		CO4	Illustrate the fundamental concepts of photochemistry and its application in organic reactions
		CO5	Explain the core concepts of Pericyclic reactions and its mechanisms in organic substrates and to predict whether the chemical reaction is thermal or photochemical
11	COORDINATION COMPOUNDS AND SOLID STATE CHEMISTRY	CO1	Recall the basic terms in coordination chemistry, Applications and limitations of CFT.
		CO2	Explain the stability and reactions of various coordination complexes
		CO3	Compare the magnetic properties of Octahedral, Tetrahedral and Square planar coordination complexes.

		CO4	Classify the types of defects in solids and apply this knowledge to identify the type of defect present in compounds
		CO5	Distinguish metals, semiconductors and insulators and explain the properties and applications of semiconductors.
12	ELECTROCHEMISTRY AND SPECTROSCOPY - II	CO1	Explain the concepts of electrochemistry and basic ideas of electrochemical processes.
		CO2	Analyze the applications of electrochemistry such as batteries and fuel cells.
		CO3	Illustrate the electroanalytical techniques such as Polarography, Differential pulse polarography, Stripping voltammetry. Cyclic voltammetry, etc
		CO4	Explain the basic principles of nuclear magnetic resonance (NMR) and Electron paramagnetic resonance (EPR) spectroscopy techniques
		CO5	Illustrate the principles of Nuclear quadrupole resonance and Mössbauer spectroscopy techniques and Mass spectrometry.
13	2.1 NANOSCIENCE AND NANOTECHNOLOGY	CO1	Explain the unique properties and structure of nanomaterials.
		CO2	Trace the different methods of synthesis of nanomaterials
		CO3	Acquire knowledge about polymer based nanocomposites and applications of bio-nanocomposites.
		CO4	Evaluate the synthesis and potential applications of carbon nanotubes and grapheme.
		CO5	Apply nanotechnology in bio-medical field
14	2.2 MEDICINAL CHEMISTRY	CO1	Categorize the drug delivery system and gain knowledge on molecular docking.

		CO2	Acquire knowledge about structure activity relationship of drugs
		CO3	Explain the structure and functions of antiseptics, antibiotics and differentiate bacterial and fungal cell walls.
		CO4	Illustrate the synthesis and mode of actions of some important drugs.
		CO5	Create certain developments in cancer chemotherapy and cardiovascular drugs.
15	2.3 INDUSTRIAL PROCESSES AND CATALYSIS	CO1	Acquire knowledge on unit operations and unit process in industry
		CO2	Explain reverse osmosis and how to apply it in the pretreatment of water.
		CO3	Distinguish homogeneous and heterogeneous catalysis and analyze the advantages of heterogeneous catalysis in industry.
		CO4	Evaluate the role of catalysis in petrochemical industry.
		CO5	Save the environment from hazardous industrial chemical waste.
16	ORGANIC CHEMISTRY PRACTICAL - II	CO1	Develop the skills to estimate organic compounds
		CO2	Estimate the amount of organic compound using quantitative organic estimation methods
		CO3	Illustrate various organic reactions and their utility in organic preparations
		CO4	Acquire the skills to isolate useful compounds from natural sources
		CO5	Determine the physical properties of organic compounds
17	INORGANIC CHEMISTRY PRACTICAL - II	CO1	Describe the principles, techniques and skills related to quantitative determination of ions in a mixture by complexometric titration
		CO2	Estimate one metal ion in presence of another metal ion by complexometric method.
		CO3	Estimate the amounts of components present in Solder alloy.

		CO4	Prepare and analyze the Inorganic complexes and estimate them by volumetric methods
		CO5	Describe the basic principle of calorimetry and apply it for the estimation of ions present in solution.
18	PHYSICAL CHEMISTRY PRACTICAL - II	CO1	Explain the basic principles of conductometric titrations and determine the Dissociation constant of weak acids.
		CO2	Illustrate the principles of distribution law and estimate the distribution of solute in two immiscible solvents.
		CO3	Outline the basic principles of thermometry and determine the solution enthalpy of solute in solvent.
19	SEMESTER - III ORGANIC SPECTROSCOPY AND REARRANGEMENTS	CO1	Describe the basic principles of UV, IR, ORD and CD, and the applications of UV-Visible spectroscopy, IR spectroscopy, ORD and CD in structural elucidation of organic compounds.
		CO2	Interpret the ^1H NMR and ^{13}C NMR spectral data to elucidate the structure of organic compounds
		CO3	Explain the fragmentation pattern in Mass spectrometry and use them in structural elucidation
		CO4	Interpret the 2D NMR spectrum and solve structure related problems
		CO5	Illustrate the types and mechanisms of the prescribed rearrangement reactions and their applications in Organic synthesis.
20	SPECTRAL METHODS-I, ORGANO METALLIC AND ANALYTICAL METHODS	CO1	Describe the principles and applications of electronic and photo electronic spectroscopic techniques in coordination compounds.
		CO2	Determine absolute configuration of chelate complexes by applying ORD and CD.
		CO3	Recall the EAN rule and explain the 18 & 16 electron rules to determine the stability of complexes.

		CO4	Classify terminal and bridging carbonyl groups in metal carbonyls using IR spectra.
		CO5	Categorize the different types of organometallic catalysts and explain their applications
		CO6	Describe the principles and applications of thermo analytical techniques and determine the stability of complexes.
21	GROUP THEORY AND CHEMICAL THERMODYNAMICS	CO1	Explain the basic concepts of group theory and construct character tables for various point groups.
		CO2	Analyze the symmetry of molecules and apply the group theory into spectroscopy and hybridizations
		CO3	Illustrate the relationship between group theory and quantum mechanics
		CO4	Summarize the concepts of statistical thermodynamics and the interlinking between the quantum mechanics and thermodynamics.
		CO5	Explain the irreversible thermodynamic processes and apply to biological and non-linear systems.
22	SCIENTIFIC RESEARCH METHODOLOGY	CO1	Select research problem and various funding agencies
		CO2	Write the research report and make effective presentations
		CO3	Apply software for identifying plagiarism
		CO4	Describe the forms of IPR and its significance.
		CO5	Describe the surface probe microscopic techniques to analyze the sample surfaces.
23	ORGANIC CHEMISTRY PRACTICAL - I	CO1	Estimate the amount of organic compounds using quantitative organic estimation methods
		CO2	Develop the skills to handle corrosive and toxic chemicals in organic preparations

		CO3	Categorize organic reactions and their mechanisms relevant to organic preparations
		CO4	Carry out microscale organic preparations
		CO5	Determine the physical properties of organic compounds
24	INORGANIC CHEMISTRY PRACTICAL - III	CO1	Describe the concept of volumetric and Gravimetric analysis.
		CO2	Explain the principles for volumetric and gravimetric methods of estimation of cations present in a mixture.
		CO3	Separate and estimate mixture of metal ions quantitatively
		CO4	Analyze and estimate the contents of Ores and Alloys
25	PHYSICAL CHEMISTRY PRACTICAL - III	CO1	Explain the principles of potentiometric titrations and apply for various reactions such as neutralization, redox and precipitation reactions.
		CO2	Determine the Dissociation constant of weak acids, pH of buffer and solubility product of sparingly soluble salts potentiometrically
		CO3	Describe the principles of chemical kinetics and study the kinetics of a system
		CO4	Illustrate the principles of adsorption process and carry out experiments to find out whether a particular adsorption process is Freundlich or Langmuir Adsorption isotherm.
26	SEMESTER - IV SYNTHETIC STRATEGIES IN ORGANIC CHEMISTRY	CO1	Illustrate the prescribed organic name reactions with their mechanisms and apply in organic synthesis.
		CO2	Design organic synthetic steps employing disconnection approach in the synthesis of drugs, natural products etc.
		CO3	Identify suitable reagent for important organic reactions and building appropriate bonds

		CO4	Explain the structural elucidation of cholesterol and various synthetic approaches of steroids in Natural Products synthesis.
		CO5	Infer the structural elucidation and the synthesis of vitamins and terpenoids
27	BIOINORGANIC, SPECTRAL METHODS-II AND PHOTOCHEMISTRY	CO1	Describe the role of metalloporphyrins and metalloenzymes in various biological processes.
		CO2	Apply metal complexes as drugs and probes of nucleic acids
		CO3	Explain the applications of Mossbauer, NMR and EPR Spectroscopy in inorganic compounds and interpret the data.
		CO4	Explain the photophysical and photochemical properties of metal complexes
		CO5	Develop photochemical conversion, storage of solar energy and green photocatalyst.
28	CHEMICAL KINETICS, PHOTOCHEMISTRY AND SURFACE CHEMISTRY	CO1	Explain kinetic theory of gases and phase rule and its applications
		CO2	Describe the concepts of chemical kinetics and make use of it in understanding reaction mechanisms
		CO3	Illustrate various photochemical processes and experimental techniques in photochemistry
		CO4	Explain the basic ideas of radiation chemistry and its applications.
		CO5	Describe the concepts of Adsorption processes and catalysis.
29	SELECTED TOPICS IN CHEMISTRY	CO1	Describe the importance and applications of Computational Chemistry methods
		CO2	Be competent in separation and purification techniques
		CO3	Explain the corrosion monitoring methods and application of corrosion inhibitors.

		CO4	Develop various types of sensors.
		CO5	Choose contrasting agents in medical diagnosis.
30	COMPUTATIONAL SOFTWARE IN CHEMISTRY - LABORATORY COURSE	CO1	Use chemical software for drawing chemical structures, reaction schemes and generation of their names.
		CO2	Perform molecular docking in structural molecular biology and computer assisted drug design which enhance their employability in academia and industry
		CO3	Calculate the single point energy, energy gap, dipole moment, resonance energy, equilibrium constant, electrophilicity index, dimerisation energy etc.
		CO4	Interpret spectral data (UV, IR, NMR spectrum)
		CO5	Investigate intermolecular interactions and packing in crystalline materials using Hirshfeld surface analysis.
31	PROJECT	CO1	Identify research problem, carry out literature survey and use of different experimental/spectroscopic techniques.
		CO2	Develop interdisciplinary solutions to a variety of chemical problems.
		CO3	Communicate research findings efficiently in written (report) and verbal (viva-voce) forms
		CO4	Use terminology appropriate to the field of study correctly and contextually
		CO5	Motivate themselves and acquire basic knowledge for carrying out research work.