

Programme Outcomes
DEPARTMENT OF CHEMISTRY
BSc Chemistry

Programme Outcomes	After successful completion of three year degree program in Chemistry, a student should be able to,
	PO – 1: Demonstrate, solve and understanding of the major concepts in all the various disciplines of Chemistry.
	PO – 2: Solve the problems and also think methodically, independently and draw a logical conclusion.
	PO – 3: Employ critical thinking and the Scientific knowledge to design, carry out, record and analyze the results of chemical reactions.
	PO – 4: Create an awareness of the impact of the Chemistry on the environment, society, and development outside the scientific community.
	PO – 5: Find out the green route for chemical reaction for sustainable development.
	PO – 6: Use modern techniques and Chemistry softwares.
Programme Specific Outcomes	Gains strong foundation in theoretical principals in the different areas of Chemistry such as Analytical Chemistry, Environmental Chemistry Inorganic Chemistry, Physical Chemistry and Organic Chemistry.
	Learns problem solving approach and skills in Physical Chemistry and Analytical Chemistry.
	Develops Skills in the Practicals & also to analyze the results In the different areas of Chemistry.
	Gains sound knowledge in the case studies of the analysis of drug samples and also the analysis of different parameters of Water and Air.
	Gains hands on experience on the safe handling of Chemicals, reagents and Sophisticated Equipment.
	Understands Nomenclature, reactions, Mechanisms of various reactions of different functional groups in Organic Chemistry and develops skills to apply to different synthetic methodologies.

COURSE OUTCOMES	
SEMESTER - 1	
Course	Outcomes
After completion of these courses students should be able to;	
General Chemistry-I	CO – 1 :
	Understand the basics of Atomic Structure, Trends in the periodic table, derivation of Schrodinger wave equation.
	CO – 2
	Understand the basics of Chemical bonding, Molecular Orbital theory & Valance bond theory, hybridization and discussion on structures of molecules
	CO – 3
	Study about the basics of Nomenclature , Hybridisation and Electron displacement effects, aromaticity. To study about the types of reagents ,Organic reactive intermediates and types of Organic reactions.
	CO – 4
	Understands the basics of Stereochemistry ,RS Configurations, E & Z configurations,Enantiomers, diastereomers, Conformations of ethane and butane and cyclohexane.
CO – 5	
Have a detailed study on the Kinetic Theory of gases - laws –Derivation of Kinetic gas equation – Vanderwaals equation- critical constants. Have thorough understanding on the basics of Maxwells distribution of molecular velocities –RMSV, AV,MPV and Collision diameter , Collision frequency,Mean free path & liquefaction of gases.	
General Chemistry Practical - I (Volumetric Analysis & Chromatography)	CO -1, 2, 3 and 4
	Practical training in doing Volumetric Analysis, which includes Acidimetry, Alkalimetry, Permanganometry, Dichrometry, Iodometry and Complexometric titrations involving EDTA Titrations.
	Paper Chromatographic separation and finding of Rf Values of Amino acids
	Identification and Separation of Sugars by Paper Chromatography.
SEMESTER - 2	
General Chemistry-II	CO – 1
	Study Chemical Energetics, Review of Thermodynamics and the Laws of Thermodynamics, Principles of Thermochemistry, Calculation of Bond Energy and Kirchhoff's Equation, Third Law of Thermodynamics, Concepts of Entropy and Evaluation of absolute Entropy.
	CO – 2
	To study Concepts of Chemical equilibrium,Lechatliers Principle...variation of equilibrium constant with temperature. Strong and weak Electrolytes, Degree of Ionization, Ionization of weak acids and Bases, Salt hydrolysis,pH Scale, Common Ion effect, Buffer solutions and Solubility Product and its Applications
CO – 3	

	<p>Study the Hydrogen, Hydrides and S-Block Elements: Hydrogen Isotopes, Hydrides-Types and Hydrogen Bonding. Study of Alkali Metals and Alkaline Earth Metals - Halides, Oxides, Hydroxides, Organometallics Compounds.</p>
	CO – 4
	<p>Study the preparations , properties of Alkanes and Cycloalkanes and mechanism of Halogenations of methane., Baeyers strain theory. Study the preparation . properties and main reactions and mechanisms of alkenes and alkynes.</p>
	CO – 5
	<p>To study the Benzene Chemistry, its preparations , properties, Mechanisms of Electrophilic substitution reactions, orientation in electrophilic substitution.</p>
General Chemistry Practical - II (Physical Chemistry Practicals)	CO -1, 2, 3 and 4
	Experiments in Physical Chemistry, which includes
	Determination of Rate Constants of ester hydrolysis, Kinetics of Persulphate oxidation, Determination of Distribution Constants, Determination of CST of phenol- Water system, Determination of Transition Temperatures and Construction of Phase Diagrams.
SEMESTER - 3	
Physical Chemistry - I	CO – 1
	Study the Solid state - Laws of Crystallography and X-ray diffraction studies- Derivation of Bragg's Equation, Determination of structures of NaCl, CsCl and KCl.
	CO – 2
	To Study Chemical Kinetics, Derivation of Rate Constants, Half Life period, Pseudo order reactions, Determination of Order of Reactions, Activation Energy and Theory of Reactions.
	CO – 3
	To Study Catalysis , Adsorption and Photochemistry- Derivation of Michaelis-Menten Constant, Theories of Catalysis. Theories of Adsorption - Laws of Photochemistry, Jablonski Diagram- Fluorescence and Phosphorescence- Quantum Yield.
	CO – 4
	Study of Dilute Solutions and Colligative Properties- Raoult's Law, Molecular weight determinations, Laws of Osmotic Pressure, Elevation of Boiling Point and Depression of Freezing point. Thermodynamic derivations.
CO – 5	
Study of Phase Equilibrium, Derivation of Gibb's Phase rule, Phase equilibria of One Component and Two Component Systems, Raoult's and Henry's Law, Lower and Upper consolute temperature, Azeotropes, Nernst distribution Law-Thermodynamic derivations.	
Inorganic Chemistry - I	CO – 1
	To Study Nuclear Chemistry- Packing fraction, mass defect, binding Energy of Nucleus, Nuclear Models, Nuclear Fission and Fusion Reactions, Radioactivity- half life period , Group displacement Law, radioactive decay series, Isotopes-separation and Applications

	<p>CO – 2</p> <p>Principles of Qualitative Inorganic Analysis-Principles of Solubility and Solubility Product.Separation of metal ions-Sulphide separations. Application Solubility product principle in Qualitative and Quantitative Analysis. Spot Tests, Separation and Purification of mixtures.</p>
	<p>CO – 3</p> <p>Study of Acids and Bases and Non aqueous Solvents- Acid Base Theories, Hard & Soft Acids and Bases (HSAB), Acid Base Strength & Hardness and Softness.</p>
	<p>CO – 4</p> <p>To Study the P-Block Elements- Boron, Carbon and Nitrogen Groups</p>
	<p>CO-5</p> <p>To Study the Oxygen-Sulphur family, Halogens and Noble gases.</p>
Basic Analytical Chemistry	<p>CO – 1</p> <p>Laboratory Glassware- Types and Care, Principles of Stoichiometry- Mole and Equivalent Concepts, Concentration Systems. Calculations involving various types of Concentration systems.</p>
	<p>CO – 2</p> <p>Principles of Titrimetric Analysis-Primary Standard and Secondary Standard Solutions. Acid-Base Titrations, Redox Titrations, Complex formation Titrations and Precipitation Titrations.</p>
	<p>CO – 3</p> <p>Statistical Evaluation of Analytical Data-Ways of Expressing Accuracy and Precision of Data. Types of Errors- Methods of reporting data.Significant figures. Statistical treatment of indeterminate errors-confidence limits Q-Test and Linear Regression of Data.</p>
Physical and Inorganic Chemistry Practical	<p>CO -1, 2, 3 and 4</p>
	<p>Physical Chemistry Practicals-</p>
	<p>Determination of Surface Tension, Determination of Viscosity and Determination of Melting Points</p>
	<p>Inorganic Chemistry Practicals-</p> <p>Semimicro Inorganic Analysis of a Mixture containing Two Cations and Two Anions of which one Anion being an interfering radical.</p>
SEMESTER - 4	
Physical Chemistry - II	<p>CO – 1 & CO-2</p> <p>To Study Electrochemistry - Specific Conductance and Equivalent conductance -measurement, Kohlrausch law, Debye-Huckle-Onsager equation, Transport number-Hittorf method, Determination of Ka of Acids. Determination of Ksp.</p>
	<p>Types of Reversible Electrodes- Nernst Equation, Derivation of Cell EMF and Single Electrode Potential.Electrochemical Cells. Determination of pH and Potentiometric Titrations. Buffers- Hendersen-Hazel equation. And Hydrolysis of Salts.</p>
	<p>CO – 3</p>
	<p>Elementary Quantum Mechanics-Black Body Radiation, Photoelectric effect, Compton effect,Heisenberg's uncertainty Principle, Schrodinger wave equation, Postulates of Quantum mechanics, particle in one</p>

	dimensional Box.
	CO – 4
	Molecular Spectroscopy-Microwave spectroscopy and Infrared spectroscopy
	CO – 5
	Raman Spectroscopy, Electronic spectroscopy and Optical activity and Polarization, Dipolemoment studies and refractivity methods, Magnetic properties.
Organic Chemistry - I	CO – 1
	To Study Alkyl halides and Aryl halides-Preparation, Properties.
	CO – 2
	To Study Alcohols and Phenols-Preparation Properties.
	CO – 3
	To Study Carbonyl Compounds-Aldehydes and Ketones, Carboxylic acids and their derivatives, synthetic applications of Diethyl malonate and Acetoacetic ester.
	CO – 4
	To Study Organic Nitrogen Compounds- Nitro Compounds, Aliphatic and Aromatic Amines, Diazonium salts.
CO-5	
To Study Heterocyclic Compounds- Five and Six membered Heterocyclic compounds.	
Analytical and Clinical Biochemistry	CO – 1
	Biological Chemistry-Elementary Treatment of Digestion and absorption of Carbohydrates, Proteins and Fats
	CO – 2
	Enzymes and Hormones- Elementary Treatment. Micronutrients and their Biological role in Human Systems.
CO – 3	
Biochemical Analysis of Blood and Urine.	
Physical and Organic Chemistry Practical	CO -1, 2, 3 and 4
	Experiments in Physical Chemistry, which includes
	Determination of Rate Constants of ester hydrolysis, Kinetics of Persulphate oxidation, Determination of Distribution Constants, Determination of pH using Quine hydrone electrode, Determination of Chromate using Spectrophotometry.
	Separation of Organic Mixtures
SEMESTER - 5	
Inorganic Chemistry – III	CO – 1
	To study in detail about the Principles of Metallurgy and extraction of Some important metals.
	CO – 2
	To study in detail about the Chemistry of Lanthanides and Actinides Main focus is on the variable oxidation states, magnetic properties and extraction of some lanthanides & actinides elements.
CO – 3	

	To study in detail about the fundamentals of
	Co ordination Chemistry – Nomenclature – Werner’s theory – valence bond theory. EAN
	CO – 4
	To study about the pearsons HSAB concept – Chemistry of halogens and Interhalogen Compounds
	CO-5
	To study in detail about the theory Bonding in metals - Valence bond theory and Crystal defects – Schottky and Frenkel Defects.
Organic Chemistry – III	CO – 1
	Detailed study on the Chemistry of Five membered and Six membered Heterocycles – Synthesis , properties and their Mechanisms.
	CO – 2
	Study on the Chemistry of Carbohydrates – Monosacharides – dermination of structure and their chemical properties of Glucose and fructose and brief introduction to disachharides and poly sachharides.
	CO – 3
	To study the chemistry of Polymers – Addition and Condensation polymerisation and preparation of differet polymers.
	CO – 4
	Detailed study on the preparation preoperties of amino aciids - peptides and proteis – structure of RNA and DNA.
CO-5	
A brief introductory study on fats oils and detrgens and synthesis of some important dyes.	
Physical Chemistry – III	CO – 1
	Detailed study on Phase equilibrium – one component and two component systems – Nernst Distribution law
	CO – 2 & CO – 3
	To study in detail about the Chemistry of Chemical Kinetics – Order , molecularity of reactions – First order and second order reactions – collision theory and Arrhenius Equation – Chemistry of Catalysis and Michaelis and Menten equation.
	CO – 4
	TO study the chemistry of Adsorption – Langmuir Adsorption Isotherm - Basic Principles of PhotoChemistry.
	CO-5
Study on basics of computers.	
Environmental Chemistry – III	CO – 1
	Basic termirnology and Intoduction .
	CO – 2 & CO – 3
	Chemistry of Airpollutants and their effects and experimental determination of some important Air pollutants by using High volume Air sampler and Spectrophotometer.
CO – 4	
Study of the Chemistry of some important air pollutants and their effects.	

	CO-5
	Elementary study on Radioactive and Noise Pollution.
Practical - V (Gravimetric Analysis & Inorganic Preparation)	CO -1, 2, 3 and 4
	Training in doing Gravimetric Analysis of Barium, Lead, Copper, Nickel, Magnesium and Chloride and Sulphate ions.
	Preparation of Inorganic Complexes such as Nickel-DMG complex, Copper tetraammine complex, Lead-Thiourea complex and trioxalato chromate complexes.
Practical - VI (Organic Qualitative Analysis & Organic Preparation)	CO -1, 2, 3 and 4
	Organic Qualitative Analysis of general Organic functional groups such as Phenols, Esters, Carboxylic acids, Carbohydrates, Amines, Aldehydes, Ketones, Amides, Diamides, Nitro compounds
	Confirmation of functional groups by preparing Derivatives.
	Preparation of Organic compounds using Acetylation, Benzoylation, Nitration etc.,
SEMESTER - 6	
Inorganic Chemistry – III	CO – 1
	To study in detail about the Crystal Field Theory – Octahedral and Tetrahedral Complexes-Ligand Field theory.
	CO – 2 & CO - 3
	To study in detail about the Magnetic & spectral properties of transition complexes – spectral series and Orgel energy diagrams.
	CO – 4
	A brief study on Organometallic Chemistry
	CO – 5
To study on the basics of Bio Inorganic Chemistry and Inorganic Polymers.	
Organic Chemistry – III	CO – 1
	To study Organic Spectroscopy on UV and IR
	CO – 2 Detailed study on NMR and its applications to Organic Molecules.
	CO – 3
	Detailed study of the mechanisms and applications of some important named reactions.
	CO – 4
	To study the synthetic applications of enolates – Chemistry of Diethylmalonate – Ethylacetoacetate & Enamines
	CO – 5
To study the Chemistry of Natural product with special focus on Terpenoids and alkaloids – synthesis and structural elucidation of Alpha terpenol – menthol – Nicotine and coniine.	
Physical Chemistry – III	CO – 1 & CO – 2
	A detailed and thorough study on ElectroChemistry and EMFs of Cells.
	CO – 3
	Elementary study on Quantum Chemistry with focus on the Postulates of quantum mechanics- Schrodinger wave equation – partial in one dimension box.
	CO – 4 & Co - 5

	To study in detail about the Molecular spectroscopy on Microwave – IR – Raman – Electronic Spectroscopy –basic study on PHYSICAL PROPERTIES AND MOLECULAR STRUCTURE
Environmental Chemistry – II	CO – 1 & CO - 2
	A detailed study on different types of water pollution methods- their effects and their control.
	CO – 3
	Study on the different methods of Sewage treatment and solid waste treatment
	CO – 4
	Introduction to different experimental methods for the analysis of various parameters of water.
	CO – 5
A brief study on the Chemistry of Food additives & their effects.	
Practical - VII (Physical Chemistry Practical)	CO -1, 2, 3 and 4
	Experiments in Physical Chemistry, which includes
	Determination of Rate Constants of ester hydrolysis, Kinetics of Persulphate oxidation, Determination of Distribution Constants, Determination of CST of phenol- Water system, Determination of Transition Temperatures and Construction of Phase Diagrams.
Practical - VIII (Instrumental Methods of Analysis)	CO -1, 2, 3 and 4
	Instrumental Methods of Analysis, which includes
	Colorimetric determinations of Manganese and Iron
	Conductometric determination of weak and Strong Acids.
	Ionization Constant of weak acid
pH metric determination of Weak and Strong Acids.	