Department: CHEMISTRY
Programme Specific Outcomes

Programme offered by the Department	Outcomes
B.A/B.SC MAJOR	**PSO1**: **Comprehensive Chemistry Knowledge**: Students will develop a comprehensive understanding of organic, inorganic, physical, and analytical chemistry, fostering sustainable thinking through green chemistry principles. This approach enables them to tackle complex problems holistically, preparing them for interdisciplinary exploration and the creation of innovative, methodologies. **PSO2**: **Expert Problem-Solving Skills**: The program emphasizes theoretical and applied problem-solving skills, equipping students with experimental and analytical tools to address modern challenges in molecular design, industrial processes and multidisciplinary fields. **PSO3**: **Advanced Study and Employment Preparation**: Graduates will be ready for postgraduate study or immediate employment, mastering fundamental and advanced concepts to contribute effectively in research and development and in the specialized chemical industries too. **PSO4**: **Cognitive and Critical Thinking Development**: The curriculum fosters critical thinking, creativity, and research skills, encouraging students to explore and apply chemistry in innovative and ethical ways, promoting independent thought and continuous learning. **PSO5: Competitive Examination Readiness**: The program prepares students for achieving success in competitive exams like IIT-JAM, CUET PG, BHU PET, UPSC Civil Services Examination etc.
B.A/B.SC MDC	**PSO1. Core competency:** The students are expected to gain knowledge of the fundamental concepts of organic, inorganic, physical chemistry and industrial chemistry through theory and practical. These fundamental concepts would be reflected in solving the problems methodically and independently with a logical conclusion and handling instruments and chemicals in laboratory. **PSO2**. **Scientific Communication Skills**: The course curriculum embraces basics and advanced training in order to make a graduate student capable of expressing the subject through technical writing as well as through oral presentation.

	PSO3. Critical thinking: Students are expected to achieve logical thinking to carry out scientific investigation objectively, coherent arguments, critical ideas and theories by following scientific approach to knowledge development. **PSO4. Skill development and job opportunity:** Chemistry graduates are expected to achieve sufficient knowledge how to synthesize a chemical compound and perform necessary characterization and analysis in support of the formation of the product by using modern analytical tools and advanced technologies. Because of this course curriculum DSC chemistry graduates have lot of opportunity to get job not only in academic and administrative field but also in industry. **PSO5. Environmental Awareness:** As an inhabitant of this green planet a Chemistry graduate student should have many social responsibilities. The course curriculum is designed to teach green chemistry which follows the green routes for the synthesis of chemical compounds and also find out new greener routes for sustainable development. The course also helps them to understand the causes of environmental pollution and thereby applying environmentally friendly policies instead of environmentally hazard ones in every aspect. **PSO6. Research motivation:** Chemistry graduates are expected to be technically well trained with research skills in chemistry, including proper laboratory notebook and record keeping skills, recognizing hazards, minimizing risks, and safe laboratory practices. So, they can easily involve themselves in theory and laboratory-based research activities.
B.A/B.SC MINOR	**PSO1**.Students graduated with Chemistry General will learn all the fundamental concepts, principles, theories and practical application of chemistry which facilitates the students in pursuing their higher studies in chemistry to boost their career. **PSO2**.The entire course is designed with good number of basic chemistry experiments to enhance the analytical, practical and comprehensive skill of the students to enable themselves to work in industry. **PSO3**.They are able to employ critical thinking, and efficient problem-solving skills in the four basic areas of chemistry (analytical, inorganic, organic, and physical) which improves their effective written and oral communication skills.

	PSO4. They know the proper theatrical procedures, respective calculations, instrument handling and regulations for safe use of chemicals, as a result they are able to conduct experiments, analyse data, and interpret results. **PSO5.** They are able to use modern library searching and retrieval methods to obtain information about a topic, chemical, chemical technique, or an issue relating to chemistry. **PSO6**. Since B. Sc. Degree is the minimum requirement for applying the jobs, hence after successful completion of the course the students will be eligible to appear for various competitive examinations and pursue higher education.

Semester	Course Code	Course Title	Course outcome
I	CHEMMAJ101	Organic Chemistry-I	• The course focuses on nurturing the fundamental ideas of organic chemistry such as structure and bonding, electronic displacement and their effect on the physical and chemical properties of the molecules • The knowledge of the different reaction intermediates and their stability will help them to understand the course of reactions • The course enables to gain knowledge of chemistry of aliphatic hydrocarbon like alkanes, alkenes and alkynes through preparations, reactivity and possible reactions. • Focuses on understanding of aromatic character of arenes, polycyclic, heterocyclic and ionic species and electrophilic substitution reactions in benzenoid systems applying directing effects of substituents.
	CHEMMAJ102	Inorganic Chemistry-1	By the end of this course, students will be able to: • Atomic Structure: Explain Bohr's theory, wave mechanics, and quantum principles like Schrödinger's equation and Heisenberg's Uncertainty Principle. • Interpret quantum numbers, wave functions (ψ) and (ψ^2), and orbital shapes (s, p, d, f). • Apply Pauli's Exclusion Principle, Hund's Rule, and Aufbau's Principle to electronic configurations. • Periodicity of Elements: • Classify elements by s, p, d, and f blocks using the periodic table. • Analyze trends in atomic/ionic radii, ionization enthalpy, electron gain enthalpy, and electronegativity using relevant scales. • Understand the shielding effect, nuclear charge, and Slater's rules in relation to periodic properties. • Chemical Bonding: • Differentiate between ionic and covalent bonds and predict properties using VSEPR theory and molecular orbital theory. • Calculate lattice energy with the Born-Landé equation and apply the Born-Haber cycle. • Explain hybridization, multiple bonds, and Fajan's rule for ionic distortion. • Students' will learn to analyse inorganic mixtures.

			• These outcomes enable students to apply theoretical concepts in chemistry to analyze molecular structures, trends, and bonding interactions effectively.
II	CHEMMAJ203	Physical Chemistry-I	Students would gain an understanding of: • the concept of kinetic theory of gas, Maxwell's distribution law and deviation of gases from ideal behavior • surface tension and viscosity measurement.
	CHEMMAJ204	Organic Chemistry-II	• The knowledge of stereochemistry enable the students to learn different projection formulas and to identify the symmetry properties, conformational analysis of acylic and cyclic hydrocarbons and absolute configuration (R/S, DL, E/Z) of organic molecules • Also it gives idea of optical activity of chiral compounds, its measurements, racemisation and resolution of enantiomeric mixtures. • This unit focuses on streochemical aspects of basic reactions encountered in organic chemistry such as addition, elimination and substitution reactions. • Deals with the chemistry of halogenated hydrocarbons. Focuses on methods of preparation of alkyl and aryl halides through emphasising on different mechanisms considering the reactivity of different types of halides.

III	CHEMMAJ305	Inorganic Chemistry-II	Upon completing this course, students will be able to: Chemical Bonding: • Analyze ionic character in covalent compounds using dipole moment and electronegativity differences. • Understand metallic bonding through valence bond and band theories, and explore semiconductors and defects in solids. • Explain weak chemical forces (van der Waals, hydrogen bonding) and their effects on properties like melting points and solubility. • Metallurgy: • Apply Ellingham diagrams to predict metal oxide reduction and understand electrolytic and hydrometallurgical

			processes. • Describe purification methods such as the Kroll process, Mond's process, and zone refining. • Acids and Bases: • Compare Brönsted-Lowry and Lewis acid-base theories and classify acids using the HSAB principle. • Use the HSAB concept to predict the reactivity and strength of acids and bases. • Oxidation-Reduction and Titrimetric Analysis: • -Solve redox equations and apply standard electrode potentials to chemical reactions. • Perform acid-base and redox titrations, preparing standard solutions for quantitative analysis. • These outcomes equip students with the theoretical knowledge and practical skills needed to analyze chemical bonding, industrial processes, acid-base behavior, and redox reactions.
	CHEMMAJ30 6	Physical Chemistry-II	Students would gain an understanding of: • Different laws of Thermodynamics and their applications. • Chemical potential and its applications. • The concept of various colligative properties.

	POOCSEC339	Pharmaceutical Chemistry	• The course will instil the requisite rationale into the students by catering the basic knowledge of drugs and its pharmacology. • The course deals with the design and synthesis of few important drugs viz. Aspirin, Ibuprofen, Sulfadrugs , Metmorfin , Chloroquine , Pantoprazole, AZT-Zidovudine ,Dapsone, L- Dopa etc. • Studen gain knowledge about biological importance of Vitamins (A,D,E,K,B,C,H)
IV	CHEMMAJ40 7	Organic Chemistry-III	• The course deals with the chemistry of monohydric and dihydric alcohols including preparations, reactivity and reactions. • Understands Nucleophilic additions and nucleophilic addition elimination reactions in carbonyl compounds. • Provides better understanding of reaction mechanisms through various name reactions such as aldol and benzoin condensation, Perkin, Cannizzaro, Wittig reaction etc, Baeyer Villeger, Swern oxidation. • Deals with various oxidising and reducing agents and synthetic applications of active methylene compounds. • Helps to get insight about preparations, relative acidity and reactions of mono, di carboxylic acids, unsaturated acids and hydroxyl acids. • Also deals with reactivity of different acid derivatives, acid and alkaline hydrolysis of esters and other reactions acid derivatives.
	CHEMMAJ408	Inorganic Chemistry -III	By the end of this course, students will be able to: • Chemistry of s- and p-Block Elements: • Explain the inert pair effect, oxidation states, diagonal relationships, allotropy, and catenation. • Describe the bonding, properties, and

			uses of compounds like boric acid, boron nitrides, diborane, carboranes, silanes, and oxoacids of nitrogen, phosphorus, and chlorine. • Classify hydrides and analyze the structure and behavior of polyhalides, interhalogens, pseudohalogens, and halogens. • Noble Gases: • Discuss the occurrence, uses, and inertness of noble gases and their clathrates. • Analyze the bonding and molecular shapes of noble gas compounds (XeF_2, XeF_4, XeF_6) using VSEPR, Valence Bond, and Molecular Orbital theories. • Inorganic Polymers: • Compare inorganic polymers with organic polymers and explore the synthesis, structure, and applications of silicones, siloxanes, borazines, phosphazenes, and silicates. • Qualitative Inorganic Analysis: • Identify and analyze anions and cations, including complex mixtures with interfering ions or insoluble components. • Apply spot tests and special reactions to identify specific radicals, developing practical skills for qualitative inorganic analysis. These outcomes prepare students to understand and apply core concepts in inorganic chemistry and develop hands-on analytical skills.

V	CHEMMAJ509	Physical Chemistry-III	Students would gain an understanding of: • ionic equilibrium involving dissociationof weak acid and weak base, sparingly soluble salts in aqueous medium and buffer solutions. • the concept of chemical equilibrium • the principles of thermodynamics to thestudy of equilibrium relationship within or between phases, corresponding to homogeneous and heterogeneous phase equilibria respectively.

	CHEMMAJ51 0	Organic Chemistry-IV	• This course provides the basic insight: to the chemistry of the nitrogenous organic compounds like aliphatic and aromatic amines, nitro compounds and their reactions and synthesis, chemistry of diazonium compounds and their applications in organic synthesis.
	CHEMMAJ511	Inorganic Chemistry-IV	Upon completing this course, students will be able to: Coordination Chemistry: • Explain Werner's theory, Valence Bond Theory, and Crystal Field Theory (CFT) for coordination complexes. • Evaluate factors influencing crystal field splitting energy (10 Dq) and distinguish between octahedral, tetrahedral, and square planar geometries, including Jahn-Teller distortions. • Apply IUPAC nomenclature and understand isomerism, stereochemistry, chelate effect, and the stability of coordination complexes. Transition Elements: • Analyze the trends in electronic configuration, variable valency, catalytic behavior, and complex formation across transition elements. • Use Latimer and Bsworth diagrams to assess oxidation states and stability. • Compare the chemistry of Ti, V, Cr, Mn, Fe, and Co in different oxidation states. Lanthanoids and Actinoids: • Describe electronic configurations, magnetic properties, lanthanide contraction, and separation techniques using ion-exchange methods. Quantitative Estimation and Titrimetry: • Perform iodo/iodimetry, permanganometry, dichrometry, and complexometric titrations for the estimation of metals like Fe, Cu, and Ca in mixtures and compounds. These outcomes equip students with a strong foundation in coordination chemistry and transition metal chemistry, along with essential practical skills in quantitative chemical analysis.
	CHEMMAJ51 2	Physical Chemistry-IV	Students would gain an understanding of: • The application of quantum

			mechanics in some simple chemical systems such as hydrogen atoms or hydrogen like ions. • A deep insight into the basic principles of photochemistry and various photochemical processes.
VI	CHEMMAJ61 3	Organic Chemistry-V	This course provides students a comprehensive understanding of the • natural occurrence, structure, and physiological effects of alkaloids, with detailed insight into Hygrine and Nicotine. • They will also learn about terpenoid classification, the isoprene rule, and the structure elucidation of key compounds like Citral. • Students will explore flavonoid synthesis, structure determination, and biosynthesis pathways, focusing on significant compounds such as Quercetin and Myrcetin. Additionally, they will study the chemistry of various dyes, including Azo, Triphenyl Methane, and natural dyes, alongside an introduction to retrosynthesis for advanced organic synthesis planning
	CHEMMAJ614	Inorganic Chemistry-V	Upon completing this course, students will be able to: Organometallic Compounds: • Classify organometallic compounds based on bond types and understand the concept of hapticity. • Analyze the structures and preparation methods of metal carbonyls, applying the 18-electron rule and evaluating the synergic effects with IR data. • Discuss the preparation, structure, and aromaticity of ferrocene and Zeise's salt, comparing their reactivity with benzene. • Explain the structure and bonding in methyl lithium, trialkyl aluminium, and Grignard reagents, including the Ziegler-Natta polymerization mechanism. Reaction Kinetics and Mechanism: • Understand substitution reactions in square planar and octahedral complexes, including the trans-effect and ligand field effects on reaction rates. • Evaluate the thermodynamic and kinetic stability of coordination

			complexes. • Catalysis by Organometallic Compounds: • Analyze the mechanisms of industrial catalytic processes, such as alkene hydrogenation (Wilkinson's catalyst), hydroformylation, and the Fischer-Tropsch reaction. • Gravimetric Analysis and Inorganic Preparations: • Perform gravimetric analysis for elements like Ni, Cu, Fe, and Al. • Prepare inorganic compounds, including complex salts such as tetraamminecopper(II) sulfate and potassium tris(oxalate)ferrate(III). These outcomes equip students with advanced knowledge in organometallic chemistry, kinetics, catalysis, and analytical techniques.
	CHEMMAJ615	Physical Chemistry-V	Students would gain an understanting of: • Order of a reaction and its determination. • Kinetics of complex reactions. • Types of catalysis and their industrial applications, enzyme catalysis. • Types of adsorption and different adsorption isotherms. • Classification, preparation and properties of colloids.
	CHEMMAJ616	Spectroscopy	• Obtain a deep insight into the molecularspectroscopy and develop an idea about the application of spectroscopy in analyzing chemical samples. • Understand the application of quantum mechanics in some simple chemical systems such as hydrogen atoms or hydrogen like ions.
VII	CHEMMAJ71 7	Research Methodology	This course provides the students • a foundational understanding of research methodology, encompassing the objectives and phases of research. They will learn to craft effective research proposals and conduct

			comprehensive literature reviews using diverse sources. • Students will explore various research designs, focusing on principles of safety in chemical laboratories and methods for chemical waste disposal. Proficiency in experimental techniques such as chromatography and spectroscopic tools will be developed. • Additionally, students will enhance their skills in data interpretation, report writing, oral presentations, and uphold ethical standards, including plagiarism and intellectual property rights.
	CHEMMAJ718 (Without research)	Green Chemistry	Upon completing this course, students will be able to: • Apply the principles of green chemistry to design eco-friendly synthetic methods. • Evaluate green chemistry metrics like atom economy and reaction mass efficiency. • Understand catalysis in organic reactions, including homogeneous and heterogeneous processes. • Analyze key industrial applications such as alkene metathesis, Wacker Process, and Fischer-Tropsch reaction.
	CHEMMAJ718 (With research)	Project/ dissertation/ literature survey	Upon completing this course, students will be able to: • Conduct independent research and critically analyze scientific literature. • Develop problem-solving skills through practical applications. Present research findings effectively through written reports and oral presentations. • Demonstrate project management skills, including planning, data collection, and analysis.
	CHEMMAJ719	Physical Chemistry-VI	Students would gain an understanding of: • The theories of conductance and electrochemistry. • Applications of conductance measurement. • Gain knowledge about different types ofelectrodes and applications

			of electrolysis in metallurgy and industry.
VIII	CHEMMAJ820	Organic Chemistry VI	• Photochemistry enables the students to explore reactions of molecules under light, often visualized in a Jablonski diagram. Key processes include olefin cis-trans isomerization, , Paternò–Büchi reaction, Norrish types I/II, ketone photo reduction, di-π-methane rearrangement, and arene photochemistry. Solid-state photoreactions are also significant. • Radical generation (ESR detection) involves initiators, addition/substitution reactions, cyclization, allylic halogenation, and auto-oxidation. • These topics provide foundational understanding of organic reaction mechanisms, especially pericyclic reactions critical in synthetic chemistry. • It helps students to grasp stereochemistry, reaction predictability, and mechanistic pathways, essential for rationalizing complex organic transformations in research and pharmaceutical applications.
	CHEMMAJ821	Inorganic Chemistry	• Upon completing this course, students will be able to: • • - Analyze magnetic properties, including paramagnetism, diamagnetism, and ferro-/antiferro-magnetism, using concepts like spin-orbit coupling, Curie equations, and Zeeman effects. • - Determine magnetic susceptibility through experimental methods like Gouy's balance and Evan's method. • - Explore nuclear reactions and their applications in activation analysis and radiotracer methods. • - Apply nuclear and radioanalytical techniques, including Particle-Induced X-ray Emissions (PIXE), to chemical and medical applications.
	CHEMMAJ822 (Without research)	Biochemistry	• Understand classification, acyclic and cyclic structure and reactions of mono saccharides (Glucose, Fructose), mutarotation, Disaccharide and Polysaccharides.

			• Able to learn determination of structure of peptides by detection of N-terminal and C-terminal amino acids; Synthesis of peptides using different NH_2 and COOH protecting groups. • Analyze the structure and function of metalloproteins, including hemoglobin and metalloenzymes. • Understand the biological roles and toxicity of metal ions in biological systems. • Characterize protein structures and their stabilization, enzyme kinetics, and inhibition mechanisms. • Assess the composition and properties of nucleic acids, oils, and fats, including their hydrogenation and rancidity processes.
	CHEMMAJ822 (With research)	Project work	Upon completing this course, students will be able to: • Conduct independent research and critically analyze scientific literature. • Develop problem-solving skills through practical applications. • Present research findings effectively through written reports and oral presentations. • Demonstrate project management skills, including planning, data collection, and analysis.
	CHEMMAJ823 (Without research)	Polymer Chemistry & Analytical Chemistry	• Different mechanisms of polymerization and polymerization techniques. • Evaluate the kinetic chain length of polymers based on their mechanism. • Learn about different methods of finding out the average molecular weight of polymers. • Natural and synthetic rubbers. • Biodegradable polymers. • Evaluate analytical data through sampling, error analysis, and statistical methods, ensuring accuracy and precision.

			• Understand and apply solvent extraction techniques for the separation of metal ions and organic species. • Utilize ion-exchange methods for deionization and determination of ion concentrations in various solutions. • Demonstrate proficiency in chromatographic techniques for the separation and purification of compounds.
	CHEMMAJ823 (With research)	Project work	Upon completing this course, students will be able to: • Conduct independent research and critically analyze scientific literature. • Develop problem-solving skills through practical applications. • Present research findings effectively through written reports and oral presentations. • Demonstrate project management skills, including planning, data collection, and analysis.
I Minor	CHEMMN101	Physical Chemistry I	• Develop a broad idea about gases, liquids and solids. • Concepts of equilibrium in terms of free energy change, Le Chatelier's principle. • Gain knowledge of electrolytes, salt hydrolysis, and solubility product principle.
II MINOR	CHEMMIN202	Inorganic Chemistry	• Students will explain Bohr's theory, wave mechanics, and quantum principles, interpret quantum numbers, wave functions, and orbital shapes, and apply Pauli's Exclusion Principle, Hund's Rule, and Aufbau's Principle to electronic configurations. • Students will classify elements by blocks, analyze periodic trends, differentiate bonding types, calculate lattice energy, explain hybridization, and apply theories like VSEPR to assess molecular properties and inorganic mixtures.

III MINOR	CHEMIN303	Organic Chemistry	• This course develops foundational knowledge in organic chemistry, emphasizing molecular structure, bonding, and electronic effects on physical and chemical properties. • Students will explore the stability of reaction intermediates, gain insights into aliphatic hydrocarbons (alkanes, alkenes, alkynes). • Understand the aromatic character of arenes, polycyclic, and heterocyclic compounds. Emphasis is placed on electrophilic substitution reactions in benzenoid systems and substituent directing effects.
IV (MINOR)	CHEMMIN404	Physical Chemistry II	• Learn about the fundamentals of thermodynamics and laws of thermodynamics. • To grow the concept of reaction rate, order of a reaction and activation energy. • Gain knowledge of types of catalysis, enzyme catalysis. • Acquire knowledge about classification, preparation and properties of colloids.
V MINOR	CHEMMIN505	Inorganic Chemistry-II	• Students will analyze trends in transition elements' configurations, valency, catalysis, and complexation; use Latimer and Bsworth diagrams for oxidation states; and compare Ti, V, Cr, Mn, Fe, and Co chemistries. Lanthanoids/actinoids' configurations, magnetism, lanthanide contraction, and ion-exchange separations are also covered. • Students will compare acid-base theories, classify acids using HSAB principles, solve redox equations, apply electrode potentials, and conduct acid-base and redox titrations for analysis. • Students will explore Werner's theory, Valence Bond, and Crystal Field theories, analyze crystal field splitting, distinguish complex geometries, and study isomerism, stereochemistry, and

			stability in coordination complexes.
VI MINOR	CHEMMIN606	Organic Chemistry-II	• The course covers halogenated hydrocarbons, preparation of alkyl/aryl halides, reaction mechanisms, and the chemistry of monohydric/dihydric alcohols, including their preparations, reactivity, and reactions. • The course covers nucleophilic addition and addition-elimination reactions in carbonyl compounds, reaction mechanisms through name reactions (e.g., aldol, Wittig), and the use of oxidizing/reducing agents and active methylene compounds in synthetic applications.
VII MINOR	CHEMMIN707	Green Chemistry	• Upon completing this course, students will be able to: • -apply the principles of green chemistry to design eco-friendly synthetic methods. • evaluate green chemistry metrics like atom economy and reaction mass efficiency. • understand catalysis in organic reactions, including homogeneous and heterogeneous processes. • analyze key industrial applications such as alkene metathesis, Wacker Process, and Fischer-Tropsch reaction.
VIII MINOR	CHEMMIN808	Biochemistry	• This course covers the structure, reactions, and classification of monosaccharides, disaccharides, and polysaccharides, • peptide structure determination and synthesis, • metalloprotein function, roles of metal ion in biological systems0 • protein structure and enzyme kinetics, and • the composition and properties of nucleic acids, oils, and fats, including • hydrogenation and rancidity.

B.A/B.SC MDC			
Semester	**Course Code**	**Course Title**	**Course outcome**
I	CHEMDSC101	PHYSICAL CHEMISTRY-I	Upon completing this course, students will be able to: • Understand and derive the mathematical expressions for ideal gas law, real gas law and comment on deviation from ideal behaviour . • Derive van der Waals equation of state, its derivation and application • Derive and explain the Maxwell Boltzman distribution, critical constants and viscosity of gases, isotherms of real gases and their comparison with van der Waals isotherms. • Derive mathematical equations to explain properties of liquids; vapor pressure, surface tension and coefficient of viscosity. • Understand symmetry elements in solid state, Miller indices, X-ray diffraction, Bragg's law, crystal structures of NaCl, and KCl.
II	CHEMDSC202	INORGANIC CHEMISTRY-I	This course deals with • Introduction of quantum mechanical model of the atom, quantum numbers, electronic configuration, radial and angular distribution curves and shapes of various orbitals. • Periodic trends in atomic radii, ionization energy, electronegativity and electron affinity of s, p, d and f blocks elements. • Importance and application of chemical bonds, inter-molecular and intramolecular weak chemical forces and their effect on melting points, boiling points, solubility and energetics of dissolution. • Qualitative analysis of water-soluble inorganic mixtures to find three ionic species.

III	CHEMDSC303	ORGANIC CHEMISTRY-I	After completing the course students will learn: • Basic concepts in Organic Chemistry to be used in the subsequent semesters. • Details of hybridization, electronic displacement and their applications. • Detailed study of the chemistry of hydrocarbons aliphatic and aromatic. • Various reaction mechanisms through correlation with the fundamental properties of the reactants. • About free radical substitution, electrophilic addition and electrophilic aromatic substitution. • Purification of organic compounds by crystallization and determination of the melting points.
IV	CHEMDSC404	PHYSICAL CHEMISTRY-II	After completing the course students will learn: • Laws of Thermodynamics, state functions, path Functions, intensive & extensive variables. • Various mathematical expressions of First Law, Second Law, Third Law, ΔU, ΔH, ΔS, ΔG, ΔA for ideal and real gases under different conditions. • Basics and theories of rate of reaction, mathematical expressions of different rate laws, Arrhenius equation, collision theory and activated Complex theory of bimolecular reactions. • Homogeneous and Heterogeneous catalysis, acid-base catalysis, Enzyme catalysed reactions. • Practical knowledge of kinetics of acid hydrolysis and enthalpy of neutralization of hydrochloric acid.

V	CHEMDSC505	INORGANIC CHEMISTRY-II	Upon completing this course, students will learn • General chemistry of transition elements with reference to electronic configuration, oxidation state, electrode potential, colour, electronic spectra, complex formation tendency etc. • Various theories of bonding like valence bond theory, crystal field theory, ligand field theory and molecular field theory. • Application of crystal field theory in octahedral, tetrahedral and square planar symmetry, stabilization energy (CFSE), spectrochemical series. tetragonal distortion of octahedral geometry, Jahn-Teller distortion. • Chemistry of lanthanides and actinides. • Experimental knowledge of Acid- base titration and Redox titration.
V	CHEMDSC506	ORGANIC CHEMISTRY-II	This course provides • Better understanding of the organic functional groups and their reactivity. • Knowledge in designing the synthesis of molecules of synthetic utility by functional group transformation. • Basic information regarding halogenated hydrocarbon, alcohol, phenol, ether, epoxides, carbonyl compounds, carboxylic acids and their derivatives. • Details studies of various important name reactions. • Practical experience in detection of special elements (N, S, Cl, Br, I) and functional groups in organic compounds.

VI	CHEMDSC607	GREEN CHEMISTRY	Upon completing this course, students will learn • Important reactions in various green solvents. • Various green alternatives of energy such as Microwave, ultrasound for chemical reactions . • Role of catalyst, bio catalyst and photocatalyst. • About renewable feed stock for energy efficient process and protection of the environment, renewable energy sources. • To perform solid-state synthesis of benzillic acid and solvent-free microwave-assisted one-pot synthesis of phthalocyanine complex of copper.
VI	CHEMDSC608	BIOCHEMISTRY	This course provides • Basic understanding demonstrate how structure of biomolecules determines their reactivity and biological functions. Learn about Enzymes, cofactors and their actions and functions. • Knowledge about the structure, synthesis, properties and functions of proteins and their precursors. • Information to understand the structure and properties of oils and fats and their precursors. • Details structure and functional importance of metalloproteins, including hemoglobin and metalloenzymes.
VII	CHEMDSC709	PHYSICAL CHEMISTRY-III	From this course the student will learn about • Laws in electrochemistry and electrical properties like solubility product and common ion effect and conductance etc. and apply them in experiments.

			• Learn about strong acids and bases and weak acid and bases and derivation of hydrolysis constant for their salts, • Electrochemical cells, types of electrodes and to determine their EMF. • Different type of Cconductometric titrations and Potentiometric titrations experiments
VII	CHEMDSC710	INORGANIC CHEMISTRY-III	After completing this course Students will understand • The core criteria of the periodic table; preparation, physical, chemical properties, structure and uses of compounds of elements belonging to s, p, d and f blocks; advance studies on bonding and structures in coordinate compounds, uses and practical on qualitative analysis. • Nature of bonding and molecular shape of noble gas compounds using Valence bond, MO treatment and VSEPR theory respectively. • Synthesis, structural aspects and application of silicones and siloxanes. Borazines, silicates, phosphazenes, and polysulphates. • How to analyze four radicals qualitatively from inorganic mixture.

VIII	CHEMDSC811	ORGANIC CHEMISTRY-III	From this course the student will • Understand chemistry of nitrogen containing functional groups, polynuclear hydrocarbons, heterocyclic compounds and natural compounds. • .Learn about chemistry of amines, diazonium salt, nitro compounds, nitriles and isonitriles. • Study general method of synthesis of furan, pyrrole, thiophene, pyridine, indole, quinoline, isoquinoline and their reactions. • Understand the structure and functions of DNA and RNA with concept of heredity through the study of enetic code, replication, transcription and translation.
VIII	CHEMDSC812	INDUSTRIAL CHEMISTRY	From this course the student will • Understand the composition and application of different kinds of glass and ceramics and the factors affecting their porosity. • Develop an understanding about the composition, manufacturing of cement and the mechanism of setting of cement. • Learn different types of fertilizers and their suitability for different kinds of crops and soil. • Learn the process of formulation of paints and the basic principle behind the protection offered by the surface coatings. • Understand the principle, working and applications of different types of batteries such as Pb acid and Li-Battery.