

## Department of Chemistry

### **PROGRAMME OUTCOMES (POs) FOR CHEMISTRY:**

- PO1: Students will develop an appreciation for major concepts of all disciplines of Chemistry.
- PO2: Students will demonstrate critical thinking and scientific methods to design, carry out, record and analyse the result of chemical experiments
- PO3: Students will exhibit enhanced awareness of applying concepts in chemistry to improve environment and society
- PO4: Students will be able to conceive and plan high quality research in multi-disciplinary context
- PO5: Students will exhibit disciplined work habits to conduct rigorous scientific experiments
- PO6: Students will be able to synthesize and leverage knowledge of Complex formation appropriate to the discipline

### **PROGRAMME SPECIFIC OUTCOMES (PSOs):**

- PSO1: Ability to explain structure and function of substance in the specific field of Chemistry.
- PSO2: Enhanced capacity to design and execute experiments displaying sound knowledge of lab equipment and awareness regarding proper handling of chemicals.
- PSO3: Ability to apply chemistry in real life
- PSO4: Better understanding of market for chemical industry, medical science and different fields
- PSO5: Ability to develop critical or life-saving substances/cures/equipment for agricultural, environmental, medical and other uses

## COURSE OUTCOMES

Sem	Course	Title	Outcomes
1 <sup>st</sup>	CC-1	Basics of Organic Chemistry and General Treatment of Reaction Mechanism-1 & Stereochemistry-1	<p>To enable the students to learn about chemical bonding, shape of molecule; thermodynamic, kinetic control of reaction and isomerism.</p> <p>Practical classes will provide insights into the separation of the mixture of compound and determination of pure organic compound.</p>
1 <sup>st</sup>	CC-2	Kinetic Theory and Gaseous State	<p>To enable the students to learn about the first, second law of thermodynamics, chemical kinetics and various types of catalytic reaction specially enzyme kinetics and its significance in biological systems, Kinetic theory of gas and real gas, deviation of real gas from ideal behaviour, different form of real gas and critical phenomena.</p> <p>Practical will help students learn about the pH of buffer solution by colour matching method, rate of chemical reaction and also how it depends upon temperature and the presence/absence of catalysts.</p>
2 <sup>nd</sup>	CC-3	Atomic Structure, Chemical Periodicity, Acid-base Reaction, Redox reactions & Estimation of Metal Ions by Titrimetric Method	<p>This course intends to familiarise students with the structure of an atom which are fundamental units of elements, the basic constituents of the universe. Students will be able to identify varied natures displayed by elements (particle and wave) and their applicability to macro and micro molecules after completing the course.</p> <p>Knowledge of chemical periodicity which involves arrangement of existing elements based on atomic number will help students in recognising and associating properties of different elements. Study of acid-based reactions, pH buffer solutions, common ion effect, solubility product, HSAB principles will help students appreciate their practical applicability and relevance for critical biological systems. The course will equip students with useful tools of quantitative analysis such as Redox titrations.</p>
2 <sup>nd</sup>	CC-4	Stereochemistry-2, General Treatment of Reaction Mechanism-2, Substitution and Elimination Reaction	<p>To enable the students to learn about the chirality arising out of stereoaxis, pro-chirality, conformational analysis of molecule and the mechanism of substitution and elimination reaction.</p> <p>Course will equip students with practical knowledge of synthesis of organic compound and checking of melting point.</p>
3 <sup>rd</sup>	CC-5	Transport Process, Application of	<p>To enable the students to learn about the application of thermodynamics, molar quantities, Nernst distribution law and</p>

		Thermodynamics-1, Foundation of quantum mechanics	<p>its application, chemical equilibrium, specially shifting of equilibrium due to change in external parameters like temperature, Pressure, addition of inert gas etc, viscosity of liquid and its variation with temperature, electrolytic conductance, different terms, factors and application of conductance measurements, beginning of quantum mechanics, wave function, operator algebra and particle in one, two, three dimensional box model.</p> <p>Practical will equip students to conduct measurement of viscosity of unknown solution with respect to water, determine partition coefficient of I<sub>2</sub> between water and organic solvent, equilibrium constant of KI + I<sub>2</sub> = KI<sub>3</sub>, acid-base titration conductometrically, verification of Ostwald dilution law and dissociation constant of weak acid.</p>
3 <sup>rd</sup>	CC-6	Chemical Bonding-Ionic bonding, covalent bonding, metallic bonding, weak chemical force, Radioactivity & separation of metal ions in a mixture-steel	<p>The course provides students an in-depth knowledge of multiple types of compounds (living, non-living), bonding between elements, theories of bonding mechanism such as valence bond theory and molecular orbital theory and the properties associated with different types of bonding. It will also introduce students to diverse aspects of Radioactivity and its practical uses. Students are expected to display sound knowledge of important real life uses of Radioactivity such as nuclear medicine, diagnostic techniques, carbon dating etc and also be proficient in using various techniques available to estimate metal ions in a mixture like steel etc after doing the course.</p>
3 <sup>rd</sup>	CC-7	Chemistry of Alkenes & Alkynes, Aromatic Substitution, Carbonyl and related compounds & Organometallics	<p>To enable the students to learn about preparation, stereochemistry and reaction of alkenes, alkyne and carbonyl compound preparation of organometallic compounds.</p> <p>Course will provide practical insights into detection of elements and functional group in organic molecule.</p>
4 <sup>th</sup>	CC-8	Application of Thermodynamics-2, Electrical Properties of molecules, Quantum Chemistry	<p>To enable the students to learn about the application of thermodynamics, colligative property of solution, binary solution, ionic equilibrium, ionic atmosphere model, electromotive force, different kinds of electrodes and their applications, quantum mechanical treatment of H atom and rigid rotor system.</p> <p>Practical will enable students to learn about the solubility of a sparingly soluble salt in pure water, in electrolyte solution containing common ion, potentiometric ally determination of solubility product, effect of ionic strength on the rate of persulphate-iodide reaction, phenol-water phase diagram.</p>
4 <sup>th</sup>	CC-9	General Principle of Metallurgy, Chemical of s and p- block	<p>This course will provide students practical insights into the production and purification of metals from ore through use of various methods. It will impart basic knowledge related to</p>

		elements, novel gases, inorganic polymers and Co-ordination compounds	different aspects of s and p-block elements, polymers formed by inorganic compounds and coordination compounds. Practical classes will equip students with multiple methods of preparing different inorganic compounds and conducting complexometric titration of metal ions.
4 <sup>th</sup>	CC-10	Nitrogen Compounds, Re-arrangement of organic molecules, the logic of organic synthesis & organic spectroscopy	To enable the students to learn about the rearrangement reaction, spectroscopic analysis of organic molecule and reaction of Nitrogen containing organic compound.  The course will equip students with different techniques to estimate of organic molecules.
5 <sup>th</sup>	CC-11	Coordination chemistry II, transition elements-lanthanoids, actinoids and separation technique involving chromatography, gravimetry and spectrophotometry	This course familiarises students with theories of bonding mechanism and magnetic properties of coordination compounds which are used in extensively in fields like complexometric titration, solvent extraction etc. The course also provides an overview of transition and inner-transition elements. Students will be aware of important techniques of separation of compounds like chromatography, gravimetry etc upon completing the course.
5 <sup>th</sup>	CC-12	Carbo cycles and Heterocycles, Cyclic stereochemistry, Pericyclic compounds, Carbohydrates, Biomolecules, Alkaloids and Terpenoids	To enable the student to learn about the synthesis, reaction of heterocyclic compound and bio molecules, and concept of pericyclic reaction.  The course will provide practical insights into chromatography and structure determination by spectroscopic method of organic compound.
5 <sup>th</sup>	DSE-1	Advanced physical chemistry- crystal structure, statistical thermodynamics and some selected topics	To enable the students to learn about the solid state, statistical thermodynamics, macromolecules, dipole moments and polarization, specific heat of solid, third law of thermodynamics and understand their significance.
5 <sup>th</sup>	DSE-2	Analytical methods in chemistry- qualitative, quantitative aspects of analysis, Optical method of analysis- UV- Visible spectrophotometry, IR spectroscopy, Flame Atomic	This course will make students aware of the theory and techniques of spectroscopy related to UV Visible, IR, Flame AAS, enema and chromatography techniques such as TLC, HPLC, and its application.

		Absorption and emission spectroscopy, electro analytical methods & chromatography solvent extraction and spectrophotometry	
6 <sup>th</sup>	CC-13	Organometallic compounds, bio-inorganic chemistry, reaction kinetics and mechanism & qualitative semi-micro analysis of elements	<p>This course will provide students in depth insights into Organometallic compounds, bio-inorganic chemistry and reaction kinetics. Study of Organometallic compounds such as haemoglobin, chlorophyll, Vitamin B-12 and their preparation, properties and uses are central to understanding complex biological systems. Bio-inorganic studies help students appreciate the role played by metal ions in vital biological systems like enzymes whereas reaction kinetics enable better understanding of the rates of chemical reactions.</p> <p>Practical classes will equip students to undertake semi-micro qualitative analysis of inorganic samples.</p>
6 <sup>th</sup>	CC-14	Molecular Spectroscopy, photochemistry and surface phenomenon	<p>To enable the students to learn about the surface tension of liquid and its measurements, different types of adsorptions, factors, colloidal system, rotational, vibrational, Raman, and NMR spectroscopy and its application, photochemistry and also learn about the different photochemical and photo physical processes.</p> <p>Practical will enable students to learn about the measurement of surface tension of a liquid, CMC of surfactants, pH of buffer solution spectrophotometrically, and also the verification of Beer and Lambert's law</p>
6 <sup>th</sup>	DSE-3	Green Chemistry- Principles and Applications, Example of Green Synthesis/Reaction & some real-world reactions and future scope	<p>This course familiarises students with use of green chemistry in modern chemical transformation and reducing pollution. It enables students to learn about composition and production of bio-degradable products and their application in the real world.</p>