

## PROGRAMME OUTCOMES AND COURSE OUTCOMES:

NAME OF THE DEPARTMENT: Department of Chemistry

### Programme Outcome (POs):

Chemistry plays a pivotal role for understanding the natural world from any perspective and also imparts the understanding of substances, their inter conversions and the making of materials for the benefit of humans. Chemistry utilizes the natural substances and creates artificial ones. This applied science is being explored to understand the behavior of living organisms and to develop new drug molecules for alleviating the complex diseases in diversified manner.

**The undergraduate B.Sc. (Honours and General) programme in Chemistry enables the students:**

**PO-1:** To understand the fundamental chemical theories and their applications.

**PO-2:** To become familiar with the different branches of Chemistry like Organic, Inorganic, Physical, Analytical, Environmental, Industrial, Biochemistry etc.

**PO-3:** To acquire critical thinking skill, analytical skill, problem solving skill and data analysis skill.

**PO-4:** To develop the ability to design, synthesize, separate and characterize the compounds.

**PO-5:** To understand the cause of environmental pollution like air pollution, water pollution, soil pollution etc in molecular level.

**PO-6:** To understand the role of Chemistry to combat differential environmental pollution issues and how to develop sustainable world.

**PO-7:** To inculcate planning and exploration of scientific ideas and research oriented skill among the students.

**PO-8:** To explore the knowledge how computer may be useful in solving chemical problems.

**PO-9:** To make the students efficient enough to work in chemical industry and scientific laboratories in time bound manner.

**PO-10:** To develop scientific temperament, motivation and desire for applying knowledge of chemical science for the welfare of the society

COURSE CODE	COURSE NAME	COURSE OUTCOME
CC1	Inorganic Chemistry-I	<p>After completion of the course, students should be able to:</p> <p><b>CO 1:</b> Learn the basic and advanced theories of atomic structure along with their applications</p> <p><b>CO 2:</b> Understand the periodicity of the elements</p> <p><b>CO 3:</b> Learn chemical bonding with a modern approach</p> <p><b>CO 4:</b> Know the concept and applications of oxidation and reduction</p> <p><b>CO 5:</b> Learn the experimental techniques of titrimetric analysis and acid-base titrations in laboratory</p> <p><b>CO 6:</b> Estimate the iron solution by oxidation-reduction titrimetry in laboratory</p>
CC2	Physical Chemistry-I	<p>After completion of the course, students should be able to:</p> <p><b>CO 1:</b> Learn kinetic molecular model of a gas and behaviour of real gases</p> <p><b>CO 2:</b> Know the physical properties, structures and application of liquids</p> <p><b>CO 3:</b> Understand electrolysis and electrolytic conductance and their applications</p> <p><b>CO 4:</b> Learn the structures and properties of solids</p> <p><b>CO 5:</b> Determine the surface tension, viscosity, cell constant and conductance of electrolytes experimentally</p>
CC3	Organic Chemistry-I	<p>The course enable the students:</p> <p><b>CO 1:</b> To understand the basic theories of organic reaction mechanism</p> <p><b>CO 2:</b> To explore the fundamental aspects of world of stereochemistry</p> <p><b>CO 3:</b> To know the important reaction mechanism of aliphatic hydrocarbons</p> <p><b>CO 4:</b> To know how to do conformational analysis in both cyclic and acyclic systems</p> <p><b>CO 5:</b> To familiar with the properties and reactions of aromatic hydrocarbon</p> <p><b>CO 6:</b> To learn the experimental method for the determination of melting point, boiling point</p>

		<b>CO 7:</b> To learn practically how to do paper and thin layer chromatography.
CC4	Physical Chemistry-II	<p>The course helps the students:</p> <p><b>CO 1:</b> To learn the basic concept of chemical thermodynamics which include the first law, second law and third law of thermodynamics</p> <p><b>CO 2:</b> To know the details of thermochemistry</p> <p><b>CO 3:</b> To understand the advance course of chemical equilibrium</p> <p><b>CO 4:</b> To know about the solutions and colligative properties</p> <p><b>CO 5:</b> To learn the experimental methods for the determination of heat capacity and enthalpy in laboratory</p>
CC5	Inorganic Chemistry-II	<p>The course enable the students:</p> <p><b>CO 1:</b> To understand the general principle of metallurgy</p> <p><b>CO 2:</b> To know the theories of acids and bases and their application in chemical science</p> <p><b>CO 3:</b> To explore the chemistry of <i>s</i> and <i>p</i> block elements</p> <p><b>CO 4:</b> To learn the preparation, properties, structure and uses of some compounds of p-block elements</p> <p><b>CO 5:</b> To learn the properties, structures and reactions of noble gases</p> <p><b>CO 6:</b> To familiar with the properties, synthesis and applications of inorganic polymers</p> <p><b>CO 7:</b> To learn how to do iodometric titrations experimentally</p> <p><b>CO 8:</b> To become expertise in inorganic preparations experimentally</p>
CC6	Organic Chemistry-II	<p>The course enable the students:</p> <p><b>CO 1:</b> To learn the chemistry of alkyl and aryl halides</p> <p><b>CO 2:</b> To know the synthetic uses of organo-magnesium and organolithium compounds</p> <p><b>CO 3:</b> To understand the chemistry of alcohols, phenols, ethers and epoxides</p> <p><b>CO 4:</b> To learn the chemistry of carbonyl compounds and the use of reagents and name reactions associated with them</p> <p><b>CO 5:</b> To learn the properties, synthesis and reactions of carboxylic acid</p> <p><b>CO 6:</b> To familiar with the synthetic uses of active</p>

		<p>methylene compounds</p> <p><b>CO 7:</b> To learn the chemistry of organo-sulfur compounds</p> <p><b>CO 8:</b> To learn the methods of preparation of variety classes of organic compounds experimentally</p>
CC7	Physical Chemistry-III	<p>The course helps the students:</p> <p><b>CO 1:</b> To understand the concept of phase equilibria</p> <p><b>CO 2:</b> To learn the theories of chemical kinetics</p> <p><b>CO 3:</b> To explore the world of catalysis and surface chemistry</p> <p><b>CO 4:</b> To learn the experimental methods for construction of phase diagram and critical solution temperature</p> <p><b>CO 5:</b> To learn how to execute reaction kinetics experiments in laboratory</p> <p><b>CO 6:</b> To familiar with the experiment based on adsorption theory</p>
CC8	Inorganic Chemistry-III	<p>After completion of the course, students should be able to:</p> <p><b>CO 1:</b> Learn the basic and advanced level of coordination chemistry with special reference to nomenclature, structure, colour and magnetic properties</p> <p><b>CO 2:</b> Know detailed physical and chemical properties of transition elements, lanthanoids and actinoids</p> <p><b>CO 3:</b> Understand the concept, theories and applications of bioinorganic chemistry</p> <p><b>CO 4:</b> Learn the experimental methods of gravimetric analysis of nickel, iron, copper and aluminium</p> <p><b>CO 5:</b> Learn the experimental methods for the preparation of inorganic compounds</p> <p><b>CO 6:</b> Know the technique of separation of metal ion by paper chromatography</p>
CC9	Organic Chemistry-III	<p>The course enable the students:</p> <p><b>CO 1:</b> To understand the preparation, reactions and synthetic application of nitrogen containing functional groups</p> <p><b>CO 2:</b> To know the chemistry of naphthalene, anthracene and phenanthrene</p> <p><b>CO 3:</b> To learn the nomenclature, structure, synthesis and reactivity of some five and six membered</p>

		<p>heterocyclic compounds</p> <p><b>CO 4:</b> To learn the isolation, structure elucidation and synthesis of some alkaloids and terpenoids</p> <p><b>CO 5:</b> To know the experimental process of qualitative analysis of unknown organic compound in laboratory</p>
CC10	Physical Chemistry-IV	<p>The course helps the students:</p> <p><b>CO 1:</b> To understand the basic and advanced theories of electrochemistry</p> <p><b>CO 2:</b> To know the theories of electrical and magnetic properties of atoms and molecules and their application thereof</p> <p><b>CO 3:</b> To learn conductometric titration experimentally</p> <p><b>CO 4:</b> To learn potentiometric titration experimentally</p>
CC11	Organic Chemistry-IV	<p>The course enable the students:</p> <p><b>CO 1:</b> To learn the nomenclature, classification, physical properties, synthesis and reactions of amino acids and peptides</p> <p><b>CO 2:</b> To know the structures synthesis and reactions of nucleic acids</p> <p><b>CO 3:</b> To understand the classification and characteristics of enzyme along with enzyme action and inhibition</p> <p><b>CO 4:</b> To learn the basic concept of lipids</p> <p><b>CO 5:</b> To develop the concept of energy in biosystems</p> <p><b>CO 6:</b> To know the classification, structure, synthesis and therapeutic uses of some important pharmaceutical compounds</p> <p><b>CO 7:</b> To familiar with the methods of estimation of amino acid and protein experimentally</p> <p><b>CO 6:</b> To know how to determine saponification value and iodine number of oil and fat experimentally</p>
CC12	Physical Chemistry-V	<p>The course enable the students:</p> <p><b>CO 1:</b> To introduce themselves with the concept of quantum chemistry in elaborate manner</p> <p><b>CO 2:</b> To learn molecular spectroscopy such as rotational, vibrational, electronic and Raman spectroscopy</p> <p><b>CO 3:</b> To understand nuclear magnetic resonance and electron spin resonance spectroscopy</p> <p><b>CO 4:</b> To learn the photochemistry</p> <p><b>CO 5:</b> To study UV/visible spectroscopy of selected organic and inorganic compounds by spectrophotometer</p>

		<p><b>CO 7:</b> To familiar with method of estimation of amino acid and protein experimentally</p> <p><b>CO 6:</b> To learn the application of colourimetry methods experimentally</p>
DSE-I	Analytical Methods in Chemistry	<p>The course enable the students:</p> <p><b>CO 1:</b> To know the statistical treatment of analytical data analysis</p> <p><b>CO 2:</b> To learn optical methods of analysis which include UV/Visible spectrometry, infrared spectrometry and emission spectrometry</p> <p><b>CO 3:</b> To learn thermal methods of analysis and electroanalytical methods</p> <p><b>CO 4:</b> To understand the separation techniques which include solvent extraction methods, different types of chromatography</p> <p><b>CO 5:</b> To know how to do stereoisomeric separation and analysis</p> <p><b>CO 6:</b> To familiar with the paper chromatographic separation of metal ions and monosaccharides experimentally</p> <p><b>CO 7:</b> To learn the thin layer chromatography technique to separate the active ingredients of plants, flowers and juices</p> <p><b>CO 8:</b> To learn solvent extraction methods experimentally</p> <p><b>CO 9:</b> To know how to do analysis of soil experimentally</p>
DSE-II	Research Methodology for Chemistry	<p>The course enable the students:</p> <p><b>CO 1:</b> To learn how to do literature survey which include print sources, digital sources and information technology and library resources</p> <p><b>CO 2:</b> To learn the methods of scientific research and writing scientific papers</p> <p><b>CO 3:</b> To know the idea of chemical safety and ethical handling of chemicals</p> <p><b>CO 4:</b> To learn the data analysis methods</p> <p><b>CO 5:</b> To understand the basic electronic circuits used in analytical instruments</p>
CC13	Inorganic Chemistry-IV	<p>The course helps the students:</p> <p><b>CO 1:</b> To learn the basic principle involved in the analysis of cations and anions in inorganic qualitative analysis</p>

		<p><b>CO 2:</b> To learn the basic and advanced level chemistry of organometallic compounds which include preparation, properties, structure, reactivity and bonding of metal carbonyls, Ziese's salt and ferrocene</p> <p><b>CO 3:</b> To know the structure, bonding and properties of metal alkyls</p> <p><b>CO 4:</b> To study industrial processes catalysed by organometallic compounds</p> <p><b>CO 5:</b> To learn the reaction mechanism and kinetics involved in inorganic complexes</p> <p><b>CO 6:</b> To do the qualitative semimicro analysis of inorganic mixtures containing 3 anions and 3 cations in laboratory</p>
CC14	Organic Chemistry-IV	<p>The course helps the students:</p> <p><b>CO 1:</b> To learn organic spectroscopy which include UV spectroscopy, IR spectroscopy and NMR spectroscopy</p> <p><b>CO 2:</b> To know the classification, synthesis and application of dyes</p> <p><b>CO 3:</b> To learn the chemistry of carbohydrates in details</p> <p><b>CO 4:</b> To study the chemistry and applications of organic polymers</p> <p><b>CO 5:</b> To know how to prepare selected polymer and dye in laboratory</p> <p><b>CO 6:</b> To do the qualitative analysis of unknown organic compounds in laboratory</p>
DSE-III	Inorganic Materials of Industrial Importance	<p>The course enable the students:</p> <p><b>CO 1:</b> To know the classification, properties, industrial manufacturing methods and application of glass, ceramics and cement</p> <p><b>CO 2:</b> To learn the manufacturing process of different categories of fertilizers</p> <p><b>CO 3:</b> To understand the chemistry of surface coatings</p> <p><b>CO 4:</b> To learn the classification, composition and manufacturing processes of important alloys</p> <p><b>CO 5:</b> To study the theories and industrial applications of catalysis</p> <p><b>CO 7:</b> To familiar with the basics of chemical explosives and their industrial preparations</p> <p><b>CO 6:</b> To learn how to analyse and estimate the various chemicals present in fertilizers, alloys and cement experimentally</p>

DSE-IV	Industrial Chemicals and Environment	<p>The course helps the students:</p> <p><b>CO 1:</b> To learn the manufacturing process, application, analysis and hazards of selected industrial gases and inorganic chemicals</p> <p><b>CO 2:</b> To learn the industrial metallurgy with special reference to ferrous and nonferrous metals</p> <p><b>CO 3:</b> To know the ecosystem, air pollution and air pollutant</p> <p><b>CO 4:</b> To know water pollution and water pollutant</p> <p><b>CO 5:</b> To study the sources of energy and nuclear pollution</p> <p><b>CO 6:</b> To know the importance of biocatalysis in Green chemistry and chemical industry</p> <p><b>CO 7:</b> To determine the dissolved oxygen, chemical oxygen demand, biological oxygen demand, percentage of available chlorine in laboratory</p> <p><b>CO 8:</b> To learn how to analyse water sample in laboratory by chemical method</p>