

Department of Chemistry

After the completion of B.Sc. Honours Degree Programme, the students will be able to achieve the following outcomes:

PO1: Professional knowledge: Acquire comprehensive knowledge of major concepts, theoretical principles and experimental findings of various subjects in pure sciences.

PO2: Critical thinking and Cognitive skills: Convey the intricate science information effectively and efficiently, analyze and solve the problems related to plants, animal sciences without relying on assumptions and guesses.

PO3: Environment and sustainability: Understand the impact of the scientific solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO4: Effective Communication: Demonstrate familiarity with and will be able to analyze both verbally and in writing issues and forms of contemporary art with a clear understanding of historical precedents.

PO5: Instruments and Experiments: Acquire the skills in handling scientific instruments, planning and performing in laboratory experiments and drawing logical inferences from the scientific experiments.

PO6: Research and Analysis: Demonstrate analytical skill and proficiency in a range of tools and techniques used in research in science and interdisciplinary programmes.

PO7: Employability and higher Education: Show proficiency in professional, employability and develop soft skills required for higher education and placements.

PO8: Ethics: Imbibe ethical, moral and social values in personal and social life leading to highly cultured and civilized personality in the field of science.

PO9: Science and Society: Apply reasoning acquired by the scientific knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional science practice.

PO10: Interdisciplinary Learning: Integrate academic curriculum with other co-curricular goals, such as career development, life-long learning, develop interdisciplinary learning and opportunity to extend their knowledge across all disciplines.

PO11: Nation Building: Introspect and evolve into dynamic and creative individuals capable of socially productive, constructive actions that positively impact our Nation and the World at large.

Programme Specific Outcomes: B.Sc. Chemistry (Hons.)

After successful completion of the programme, student will be able to:

PSO1: Gain the knowledge of Chemistry through theory and practical's.

PSO2: Explain nomenclature, stereochemistry, structures, reactivity, and mechanism of the chemical reactions.

PSO3: Identify chemical formulae and solve numerical problems.

PSO4: Use modern chemical tools, Models, Chem-draw, Charts and Equipments.

PSO5: Know structure-activity relationship.

PSO6: Understand good laboratory practices and safety.

PSO7: Develop research-oriented skills.

PSO8: Comprehend and handle the sophisticated instruments/equipments.

PSO9: Acquire awareness towards gender, environment, sustainability, human values, and professional ethics and understand the difference between acting, responding, reacting to various social issues.

SEMESTER – I

CHE CC101 : Inorganic Chemistry-1

Course Outcomes:

After completion of the course, student will be able to:

CO1: Understand fundamental properties of atoms, molecules, periodicity of elements in the periodic table and the various states of matter with an emphasis on the particulate nature of matter. Quantum mechanical treatments of atoms and molecules.

CO2: Understand Fundamentals of acid/base reactions, redox reactions and precipitation reactions.

CO3: Analysis the structures and important bonding parameters

CO4: Evaluate the idea of a mole and the use of stoichiometry and “gas laws” governing the physical/chemical behaviour of gases.

SEMESTER – I

CHE CC102 : Physical Chemistry-I

Course Outcomes:

After completion of these course, student will be able to:

CO1: Understand the structure of solids in its influence on physical-chemical properties, phase relations, chemical synthesis, reaction kinetics as well as characterization methods

CO2: Evaluate mathematical expressions for different properties of gas, liquid and solids and understand their physical significance

CO3: Understand the crystal structure and calculate related properties of cubic systems

CO4: Analysis the concept of ionization of electrolytes with emphasis on weak acid and base and hydrolysis

SEMESTER – II

CHE CC203 : Organic Chemistry-I

Course Outcomes:

After completion of the course, student will be able to:

CO1: Understand the hybridization and geometry of atoms and the three-dimensional Structure of organic molecules.

CO2: The reactivity and stability of an organic molecule based on structure, including conformation stereochemistry and mechanism for organic reactions.

CO3: how to design syntheses of organic molecules

CO4: how to determine the structure of organic molecules using IR and NMR spectroscopic techniques.

SEMESTER – II

CHE CC204 : Physical Chemistry-II

Course Outcomes:

After completion of the course, student will be able to:

CO1: Understand concepts in thermodynamics, different thermodynamic quantities such as heat and work and how they are measured, related or transformed from one to the other.

CO2: Understand states of matter and how they depend on temperature and pressure as well as how they co-exist in phase equilibria.

CO3: Understand transport of ions and thermodynamic functions with applications to electron transfer in biological systems

CO4: Understand chemical kinetics; how reaction rates are measured and represented in rate laws, and applications of chemical kinetics in studying enzyme mechanisms and the basic (colligative) properties of solutions

SEMESTER – III

CHE CC305 : Inorganic Chemistry-II

Course Outcomes:

After completion of the course, student will be able to:

CO1: Learn the fundamental principles of metallurgy and understand the importance of recovery of by products during extraction.

CO2: Understand the basic and practical applications in various fields of metals and alloy behaviour and their manufacturing processes.

CO3: Understand chemistry of s- & p-block elements.

CO4: Understand structure, bonding and properties of s- & p-block elements

SEMESTER – III

CHE CC306 : Organic Chemistry-II

Course Outcomes:

After completion of the course, student will be able to:

CO1: Understand preparation, properties and reactions of haloalkanes, haloarenes

CO2: Learn oxygen containing functional groups.

CO3: Understand the functional group transformations.

CO4: Propose plausible mechanisms for any relevant reaction.

SEMESTER – III

CHE CC307 : Physical Chemistry III

Course Outcomes:

After completion of the course, student will be able to:

CO1: Gain the knowledge of different types of cell, their working and applications

CO2: Understand the concept of different types of Phases and their applications

CO3: Learn surface- and interfacial phenomena

CO4: Understand the interactions between colloidal particles and explain colloidal stability and instability.

SEMESTER – IV

CHE CC408 : Inorganic Chemistry III

Course Outcomes:

After completion of the course, student will be able to:

- CO1:** Understand chemistry of d & f-block elements
- CO2:** Gain Knowledge on the chemistry of coordination compounds and their properties.
- CO3:** Understand Latimer diagram, VBT and CFT for bonding in coordination compounds and synthesis & characterisation of coordination compounds
- CO4:** Analysis Inorganic reaction mechanism

SEMESTER – IV

CHE CC409 : Organic Chemistry III

Course Outcomes:

After completion of the course, student will be able to:

- CO1:** Understand structure and properties of different N containing functional groups like amines, nitro, nitriles & isonitries and benzene diazonium chloride and the synthetic application of benzene diazonium chloride.
- CO2:** Comprehend the Polynuclear Hydrocarbon Structure elucidation and properties of different polynuclear hydrocarbons like naphthalene and anthracene.
- CO3:** Analysis the Different synthetic methods of synthesis of different heterocyclic compounds and the mechanism of different chemical reactions.
- CO4:** Synthesis and structure of different alkaloids and terpenes and their medicinal importance.

SEMESTER – IV

CHE CC410 : Physical Chemistry IV

Course Outcomes:

After completion of the course, student will be able to:

CO1: Understand chemistry of conductance and its variation with dilution, migration of ions in solutions

CO2: Understand different types of galvanic cells, their Nernst equations, measurement of emf, calculations of thermodynamic properties and other parameters from the emf measurements.

CO3: Rate law and rate of reaction, theories of reaction rates and catalysts; both chemical and enzymatic.

CO4: Gain the knowledge of photochemical reactions.

SEMESTER – V

CHE CC511 : Organic Chemistry IV

Course Outcomes:

After completion of the course, student will be able to:

CO1: Understand the biosynthesis of lipids, amino acids and nucleic acids, regulation of pathways, structure and function of biosynthetic enzymes, mechanisms of action of biosynthetic enzymes

CO2: Understand the nucleic acid structure – building blocks of both DNA and RNA, secondary structures, tertiary structures.

CO3: Understand the Concept of Bioenergetics, role of ATP in cellular reaction and free energy change, catabolic and anabolic reactions in biological system. Electron transfer agents in biological redox system. Pathways of carbohydrate catabolism Calorific values of food

CO4: Analysis the classification of pharmaceutical compound and the synthesis and uses of antipyretics antibiotics, antacids, & medicinal properties of haldi & neem.

SEMESTER – V

CHE CC512 : Physical Chemistry IV

Course Outcomes:

After completion of the course, student will be able to:

CO1: Understand limitations of classical mechanics and solution in terms of quantum mechanics for atomic and molecular systems.

CO2: Apply quantum mechanics operator, quantization, probability distribution.

CO3: Understand uncertainty principle and application of quantization to spectroscopy.

CO4: Interpret various types of spectra and their application in structure elucidation.

SEMESTER – VI

CHE CC613 : Inorganic Chemistry IV

Course Outcomes:

After completion of the course, student will be able to:

CO1: Understand the classification based on nature of metal-carbon bond.

CO2: Understand chemistry and applications of 3d elements including their oxidation states and important properties of the familiar compounds potassium dichromate, potassium permanganate and potassium ferrocyanide.

CO3: Analysis the toxicity of metal ions through the study of Hg²⁺ and Cd²⁺ in the physiological system.

CO4: Apply the methods to catalyze the reaction by organometallic compounds

SEMESTER – VI

CHE CC614 : Organic Chemistry V

Course Outcomes:

After completion of the course, student will be able to:

CO1: Understand general principal of UV, IR and NMR Spectroscopy and its application in the identification of organic molecules.

CO2: Understand Biological importance of carbohydrates and structure of different monosaccharides, disaccharides and polysaccharides.

CO3: Analysis different types of dyes, their synthesis and application in textile.

CO4: Apply different types of polymerization reaction and their application in the preparation of various polymers and their usefulness in different industries like automotive, packaging, aerospace etc.

SEMESTER – V

CHE GE101 : Physical Chemistry & Organic Chemistry

Course Outcomes:

After completion of the course, student will be able to:

CO1: Understand the basic quantum chemistry and atomic structures of atoms.

CO2: Understand the chemical bonding from the valence bond model and molecular orbital theory.

CO3: Understand the fundamentals of electronic structure and bonding in conjugated and aromatic system.

CO4: Analysis the reactivity patterns of conjugated and aromatic molecules

SEMESTER – II

CHE GE202 : Physical Chemistry & Functional Group Organic Chemistry - I

Course Outcomes:

After completion of the course, student will be able to:

CO1: Understand application of mathematical tools to calculate thermodynamic properties and physical phenomena associated to chemical thermodynamics and its relationship with thermo dynamic quantities.

CO2: Understand relationship between microscopic properties of molecules with macroscopic thermodynamic observables and derivation of rate equations from mechanistic data.

CO3: Analysis how to predict the outcome of organic reactions using a basic understanding of the general reactivity of functional groups and mechanism.

CO4: Design the nucleophilic substitution reactions.

SEMESTER – III

CHE GE303 : Physical Chemistry & Functional Group Organic Chemistry-II

Course Outcomes:

After completion of the course, student will be able to:

CO1: Explain the concepts of different types of binary solutions-miscible, partially miscible and immiscible along with their applications.

CO2: Explain the thermodynamic aspects of equilibria between phases and draw phase diagrams of simple one component and two component systems.

CO3: Explain the factors that affect conductance, migration of ions, different types of galvanic cells, their Nernst equations, measurement of emf, calculations of thermodynamic properties.

CO4: Understand and demonstrate how the structure of biomolecules determines their chemical properties, reactivity and biosynthesis of carbohydrates, amino acids and nucleic acids.

SEMESTER – IV

CHE GE404 : Physical Chemistry & Inorganic Chemistry

Course Outcomes:

After completion of the course, student will be able to:

CO1: Understand chemistry of s- and p-block elements.

CO2: Understand chemical kinetics; how reaction rates are measured and represented in rate laws, and applications of chemical kinetics in studying enzyme mechanisms.

CO3: Analysis Chemistry of different types of phases such as solid and liquid phase.

CO4: Analysis the basic (colligative) properties of solutions.

SEMESTER – V

CHE DSE501 : Inorganic Materials Of Industrial Importance

Course Outcomes:

After completion of the course, student will be able to:

CO1: Understand composition and applications of the different kinds of glass, glazing of ceramics and the factors affecting their porosity.

CO2: Understand suitability of fertilizers for different kinds of crops and soil.

CO3: Apply process of formulation of paints and the basic principle behind the protection offered by the surface coatings.

CO4: Analysis principle, working and applications of different batteries and synthesis and properties of nano-dimensional materials, various semiconductor and superconductor oxides.

SEMESTER – V

CHE DSE502 : Analytical Methods In Chemistry

Course Outcomes:

After completion of the course, student will be able to:

CO1: Understand how to perform experiment with accuracy and precision.

CO2: Understand how to test contaminated water samples.

CO3: Gain the knowledge of geometrical isomers and keto-enol tautomers to analysis.

CO4: Analysis how to determine composition of soil and macronutrients using Flame photometry and UV-vis spectrophotometer

SEMESTER – VI

CHE DSE603 : Industrial Chemicals And Environment

Course Outcomes:

After completion of the course, student will be able to:

CO1: Understand Different sources of energy The different toxic gases and their toxicity hazards.

CO2: Analysis the Manufacturing processes, handling and storage of inorganic chemicals and hazardous effects of the inorganic chemicals on human beings and vegetation.

CO3: Understand the Composition of air, various air pollutants, effects and control measures of air pollutants.

CO4: Gain the knowledge of Different sources of water, water quality parameters, impacts of water pollution, water treatment.

SEMESTER – VI

CHE DSE604 : Dissertation

Course Outcomes:

After completion of the course, student will be able to:

CO1: Do survey, study and cite published literature on a particular area of interest.

CO2: Correlate the experimental observations with theoretical understanding.

CO3: Interpret results, write a report and submit to the supervisor.

CO4: Develop scientific writing skills

SEMESTER – III

IRS SEC301: Inter-Religious Studies (Value Based)

Course Outcomes

After the completion of the course, the student will be able to:

- CO1:** Develop Inter-religious harmony & better understanding of other religions.
- CO2:** Interpret the different religions of the world.
- CO3:** Identify the common elements that bind different religions together.
- CO4:** Acquaint with the salient features of different religions.

SEMESTER – IV

CHE SEC402 : Basic Analytical Chemistry

Course Outcomes:

After completion of the course, student will be able to:

- CO1:** Handle analytical data and determine composition and pH of soil, which can be useful in agriculture.
- CO2:** Do quantitative analysis of metal ions in water.
- CO3:** Separate mixtures using separation techniques.
- CO4:** Estimate macro nutrients using Flame photometry.