DEPARTMENT OF CHEMISTRY

B.SC SINGLE MAJOR CHEMISTRY
Programme Specific Outcomes 2024-25

PSO 1: Fundamental Concepts of Chemistry o Develop a strong foundation in inorganic, organic, and physical chemistry to understand the principles governing chemical reactions and properties of matter.

PSO 2: Analytical and Laboratory Skills o Acquire hands-on experience in qualitative and quantitative chemical analysis, spectroscopy, chromatography, and other modern analytical techniques.

PSO 3: Organic Reaction Mechanisms and Synthesis of understand the mechanisms of organic reactions, stereochemistry, and the synthesis of organic compounds with applications in pharmaceuticals and industry.

PSO 4: Physical Chemistry and Thermodynamics o Learn concepts of thermodynamics, kinetics, electrochemistry, quantum chemistry, and their applications in chemical and industrial processes.

PSO 5: Inorganic Chemistry and Coordination Compounds o Study the structure, bonding, and applications of coordination compounds, transition metals, and organometallic chemistry.

PSO 6: Gain expertise in UV-Vis, IR, NMR, Mass Spectroscopy, and X-ray diffraction for structural analysis and material characterization.

PSO 7: Develop critical thinking, analytical reasoning, and research methodologies to solve complex chemical problems and contribute to scientific advancements.

DEPARTMENT OF CHEMISTRY

2024-25

Name of the Programme: B.Sc

Name of the Course: Chemistry (Single Major)

SEMESTER-I

Course Code-01: ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCE

Course Outcomes: On completion of the course, student will able to

1. Apply critical thinking skills to solve complex problems involving complex numbers, trigonometric ratios, vectors, and statistical measures.

2. To explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to connect their knowledge of physics to everyday situations

3. To explain the basic principles and concepts underlying a broad range of fundamental areas of chemistry and to connect their knowledge of chemistry to daily life.

4. Understand the interplay and connections between mathematics, physics, and chemistry in various applications. Recognize how mathematical models and physical and chemical principles can be used to explain and predict phenomena in different contexts.

5 To explore the history and evolution of the Internet and to gain an understanding of network security concepts, including threats, vulnerabilities, and countermeasures.

Course code-02: ADVANCES IN MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

Course Outcomes: On completion of the course, student will able to

1. Explore the applications of mathematics in various fields of physics and chemistry, to understand how mathematical concepts are used to model and solve real-world problems.

2. To explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to connect their knowledge of physics to everyday situations.

3. Understand the different sources of renewable energy and their generation processes and advances in nonmaterial's and their properties, with a focus on quantum dots. To study the emerging field of quantum communication and its potential applications. To gain an understanding of the principles of biophysics in

studying biological systems. Explore the properties and applications of shape memory materials.

4. Understand the principles and techniques used in computer-aided drug design and drug delivery systems, to understand the fabrication techniques and working principles of nanosensors. Explore the effects of chemical pollutants on ecosystems and human health.

5. Understand the interplay and connections between mathematics, physics, and chemistry in various advanced applications. Recognize how mathematical models and physical and chemical principles can be used to explain and predict phenomena in different contexts.

6. Understand and convert between different number systems, such as binary, octal, decimal, and hexadecimal. Differentiate between analog and digital signals and understand their characteristics. Gain knowledge of different types of transmission media, such as wired (e.g., copper cables, fiber optics) and wireless (e.g., radio waves, microwave, satellite)

SEMESTER-II

Course Code- 03: GENERAL AND INORGANIC CHEMISTRY

Course Outcomes: At the end of the course the student will be able to

1. Understand the structure of atom and the arrangement of elements in the periodic table.
2. Understand the nature and properties of ionic compounds.
3. Identify the structure of a given inorganic compound.
4. Explain the existence of special types of compounds through weak chemical forces.
5. Define acids and bases and predict the nature of salts.

Course Code-04: INORGANIC CHEMISTRY- I

Course outcomes: At the end of the course, the student will be able to:

1. Understand the basic concepts of p-block elements.
2. Explain the concepts of d-block elements
3. Distinguish lanthanides and actinides.
4. Describe the importance of radioactivity.

SEMESTER-III

Course Code-05: FUNDAMENTALS IN ORGANIC CHEMISTRY

Course outcomes: At the end of SEMESTER the student will be able to

1. Understand and explain the differential behavior of organic compounds based on fundamental concepts learnt.
2. Formulate the mechanism of organic reactions by recalling and correlating the fundamental properties of the reactants involved.
3. Learn and identify many organic reaction mechanisms.
4. Correlate and describe the stereo-chemical properties of organic compounds and reactions.

Course Code 6: ORGANIC CHEMISTRY (Halogen and Oxygen containing organic compounds)

Course outcomes: At the end of the course, the student will be able to:

1. Understand the concept of SN1andSN2and SNi mechanisms.
2. Describe the reactivity of alcohols and phenols.
3. Achieve the skills required to propose various mechanisms
4. Apply the concepts for synthesizing various oxygen containing organic compounds
5. Interconvert the monosaccharides.

Course Code 7: PHYSICAL CHEMISTRY - I (Solutions & Electro Chemistry)

Course outcomes: At the end of the SEMESTER the student will be able to

1. Understand the ideal and non ideal behavior of solutions.
2. Determine the molecular mass of non-volatile solutes.
3. Discuss the basic concepts of Photochemistry.
4. Apply the principles of electrical conductivity.
5. Explain the importance of emf and its applications

COURSE CODE 8: INORGANIC AND PHYSICAL CHEMISTRY

Course outcomes: At the end of the SEMESTER the student will be able to:

1) Apply IUPAC nomenclature for Coordination compounds
2) Understand the various theories, structure and stereo chemistry of coordination compounds.
3) Explain the reaction mechanism in complexes.
4) Apply the 18 electron rule.
5) Discuss the basic concepts of thermodynamics.

SEMESTER-IV

COURSE CODE 9: **PHYSICAL CHEMISTRY -II** (States of Matter, Phase Rule & Surface Chemistry)

Course outcomes: At the end of the SEMESTER the student will be able to:

1. Explain the difference between solids liquids and gases in terms of intermolecular interactions.
2. Differentiate ideal and real gases.
3. Discuss the basic concepts of two component systems
4. Apply the concepts of adsorption.
5. Understand the basic concepts of crystallography.

Course Code 10: GENERAL AND PHYSICAL CHEMISTRY

Course outcomes: At the end of the SEMESTER the student will be able to:

1. Correlate and describe the stereo chemical properties of organic compounds.
2. Explain the biological significance of various elements present in the human body.
3. Apply the concepts of ionic equilibrium for the qualitative and quantitative analysis.

4. Determine the order of a chemical reaction.

5. Describe the basic concepts of enzyme catalysis

Course Code 11: Nitrogen containing Organic Compounds & Spectroscopy

Course outcomes: At the end of the semester the student will be able to:

1. Distinguish primary secondary and teritiary amines and their properties.

2. Describe the preparation and properties of amino acids.

3. Explain the reactivity of nitro hydrocarbons.

4. Discuss heterocyclic compounds with N, O and S. 5. Apply the concepts of UV and IR to ascertain the functional group in an organic compound.

SEMESTER-V

Course Code 12A: Analytical methods in Chemistry

Students after successful completion of the course will be able to:

1) Identify the importance of solvent extraction and ion exchange method.

2) Acquire knowledge on the basic principles of volumetric analysis and gravimetric analysis.

3) Demonstrate the usage of common laboratory apparatus used in quantitative analysis.

4) Understand the theories of different types of titrations.

5) Gain knowledge on different types of errors and the minimization methods.

Course Code 13A: Chromatography and Instrumental methods of Analysis

Students after successful completion of the course will be able to:

1) Identify the importance of chromatography in the separation and identification of compounds in a mixture

2) Acquire a critical knowledge on various chromatographic techniques.

3) Demonstrate skills related to analysis of water using different techniques.

4) Understand the principles of spectro chemistry in the determination of metal ions.

5) Comprehend the applications of atomic spectroscopy.

Course Code 14A: Synthetic Organic Chemistry

Students after successful completion of the course will be able to:

1) Identify the importance of reagents used in the synthesis of organic compounds.

2) Acquire knowledge on basic concepts in different types of pericyclic reactions

3) Understand the importance of retro synthesis inorganic chemistry.

4) Comprehend the applications of different reactions in synthetic organic chemistry.

Course Code 14A: Analysis of Organic Compounds

Students after successful completion of the course will be able to:

1) Identify the importance of mass spectrometry in the structural elucidation of organic compounds.

2) Acquire the knowledge on structural elucidation of organic compounds.

3) Understand various chromatography methods in the separation and identification of organic compounds.

4) Demonstrate the knowledge gained in solvent extraction for the separate the organic compounds.