

Department of Chemistry (SF)

M.Sc Chemistry

PROGRAM OUTCOMES (PO)

PO1: Advanced Knowledge and Understanding

Graduates will possess an in-depth understanding of fundamental and advanced concepts across various disciplines, enabling them to apply this knowledge to solve complex problems and conduct innovative research. This encompasses advanced mathematical techniques, theoretical and classical physics, and comprehensive understanding in fields such as condensed matter physics, statistical mechanics, and thermodynamics.

PO2: Analytical and Problem-Solving Skills

Graduates will develop strong analytical skills, allowing them to critically assess and solve problems using various methodologies. They will be adept at utilizing mathematical and computational techniques, including numerical analysis, algorithm development, and programming, to model and solve intricate problems in their respective fields.

PO3: Research Proficiency and Methodological Expertise

Graduates will be equipped with advanced research skills, including literature review, research design, data collection, analysis, and interpretation. They will be capable of conducting independent research, presenting findings, and contributing to the academic community through publications and conferences.

PO4: Experimental and Practical Skills

Graduates will demonstrate proficiency in conducting advanced experiments, utilizing modern laboratory techniques, and adhering to safety protocols. They will be skilled in error analysis, data validation, and the application of practical knowledge to verify theoretical concepts.

PO5: Computational and Numerical Proficiency

Graduates will develop expertise in computational methods and numerical techniques, enabling them to perform simulations and solve complex problems in physics, mathematics, and other related fields. This includes proficiency in programming languages and software tools relevant to their discipline.

PO6: Interdisciplinary Integration and Application

Graduates will integrate knowledge from various disciplines to address complex research questions and practical challenges. They will be able to apply concepts from fields such as genetics, bioinformatics, physiology, and immunology to interdisciplinary problems, fostering innovation and collaboration.

PO7: Communication and Presentation Skills

Graduates will enhance their communication skills, both written and verbal, to articulate

complex concepts clearly and concisely. They will be proficient in presenting research findings, conducting seminars, and participating in comprehensive viva voce examinations.

PO8: Professional Development and Ethical Practices

Graduates will demonstrate professional development, ethical practices, and a commitment to lifelong learning. They will be prepared for professional roles in academia, industry, and beyond, with an understanding of the ethical implications of their work and the importance of continuous professional growth.

PO9: Cultural Sensitivity and Global Awareness

Graduates will cultivate cultural sensitivity and global awareness by engaging with diverse perspectives and traditions. They will appreciate the richness and diversity of their field, enabling them to navigate cultural differences with empathy and understanding.

PO10: Strategic Decision-Making and Management Skills

Graduates will develop strategic decision-making and management skills, enabling them to evaluate financial, organizational, and marketing strategies effectively. They will be adept at financial analysis, investment management, and applying quantitative techniques to support strategic decisions.

PO11: Adaptability to Emerging Trends and Technologies

Graduates will stay abreast of the latest trends and developments in their field, including emerging technologies and contemporary tools. They will be prepared to adapt to new advancements and incorporate innovative techniques into their research and professional practice.

PO12: Environmental and Societal Impact Awareness

Graduates will be aware of the environmental and societal impacts of their work, promoting sustainability and responsible practices. They will be equipped to contribute to conservation efforts, environmental management, and the development of solutions that address societal challenges.

Program Specific Outcomes (PSO)

Program Specific Outcomes (PSO)	Students will be able to.....	Mapped Program Outcomes (PO)
PSO 1: Advanced Understanding of Chemical Structures and Reactions	Gain a comprehensive understanding of various organometallic compounds, including their structures, synthesis methods, bonding, and reactions. Learn about the catalytic properties of organometallic compounds and their applications in chemical processes.	PO1, PO6
PSO 2: Proficiency in Spectroscopic Analysis and Molecular Characterization	Develop expertise in interpreting spectroscopic data from various techniques such as NMR, IR, Raman, and mass spectroscopy. Apply spectroscopic methods to determine molecular structures and identify functional groups in organic and inorganic compounds.	PO4, PO5

<p>PSO 3: Mastery in Experimental Techniques and Laboratory Practices</p>	<p>Acquire practical skills in synthesizing inorganic and organic compounds, analyzing their purity, and preparing exact solutions for quantitative analysis. Demonstrate proficiency in using laboratory instruments like colorimeters, spectrophotometers, and chromatography equipment while adhering to safety protocols.</p>	<p>PO4, PO8</p>
<p>PSO 4: Advanced Knowledge in Chemical Kinetics and Thermodynamics</p>	<p>Gain a deeper understanding of chemical kinetics, including the mechanisms of heterogeneous catalysis, enzyme catalysis, and explosive reactions. Apply principles of classical thermodynamics and statistical thermodynamics to analyze chemical systems and predict reaction rates.</p>	<p>PO1, PO2</p>
<p>PSO 5: Research and Analytical Proficiency</p>	<p>Develop the ability to formulate research problems, compile relevant literature, and plan research designs for experimental investigations. Analyze and interpret experimental data to draw logical conclusions, propose recommendations, and present findings in a coherent project report.</p>	<p>PO3, PO7</p>

PSO 6: Expertise in Computational Chemistry and Theoretical Methods	Familiarize with computational chemistry tools and techniques for calculating chemical properties and quantities that are difficult to obtain experimentally. Understand the principles of quantum mechanics, group theory, and symmetry as applied to molecular structures and properties.	PO5, PO1
PSO 7: Effective Communication and Presentation Skills	Enhance communication skills to effectively articulate chemical concepts, research findings, and problem-solving approaches. Develop the ability to present knowledge, skills, and research outcomes confidently and efficiently in front of expert panels during viva examinations.	PO7, PO8

Course Outcomes(CO)

Course	Course Outcome (CO)	Bloom's Taxonomy	Mapped PSO
Organometallics and Nuclear Chemistry	CO1: To understand about various organometallic compounds, their structure, synthesis, bonding and reactions.	Understanding	PSO1
	CO2: To learn about the catalysis by organometallic compounds.	Understanding	PSO1

	CO3: To study about bioinorganic compounds and their roles in biological systems.	Understanding	PSO1
	CO4: To provide an insight on nuclear chemistry and their applications.	Understanding	PSO1
Structural and Molecular Organic Chemistry	CO1: To understand about the basic concept in organic chemistry.	Understanding	PSO1
	CO2: To learn about various photochemical reactions and physical aspect of organic chemistry.	Understanding	PSO1
	CO3: Students are enabled to understand about the stereochemistry of organic compounds and its various conformers.	Understanding	PSO1
	CO4: Draw various organic reactive intermediates with stereochemistry.	Applying	PSO1
Quantum Chemistry and Group Theory	CO1: To study about the various postulates of quantum mechanics and its applications.	Understanding	PSO6
	CO2: To understand about the quantum mechanics of hydrogen like atoms.	Understanding	PSO6
	CO3: To provide a basic understanding on group theory, symmetry of molecules and its applications.	Understanding	PSO6
	CO4: Understand the group multiplication table, character table and representations of group.	Understanding	PSO6

Thermodynamics, Kinetic Theory and Statistical Thermodynamics	CO1: To understand about the basic concepts of classical thermodynamics.	Understanding	PSO4
	CO2: Understand of the kinetics of the explosive photochemical and unimolecular reactions.	Understanding	PSO4
	CO3: To introduce statistical thermodynamics.	Understanding	PSO4
	CO4: Represent of the rate law of the elementary and chain reaction.	Understanding	PSO4
Inorganic Chemistry Practical-1	CO1: Synthesize Inorganic complexes and also find their purity.	Applying	PSO3
	CO2: Prepare the exact solutions for quantitative analysis.	Applying	PSO3
	CO3: Understand the principle and working of different instrument like colorimeter.	Understanding	PSO3
Organic Chemistry Practical-1	CO1: Understand different purification techniques in organic chemistry like recrystallization, distillation, steam distillation and extraction.	Understanding	PSO3
	CO2: Get awareness of safety techniques and handling of chemicals.	Understanding	PSO3
	CO3: How to follow reaction by using thin layer chromatography.	Applying	PSO3
Physical Chemistry Practical-1	CO1: Prepare the solution of the desired concentration and the desired volume.	Applying	PSO3
	CO2: Plot accurate graphs of the desired scale for the calculations.	Applying	PSO3

	CO3: Maintain laboratory ethics, safety and cleanliness.	Applying	PSO3
Coordination Chemistry	CO1: Understand the effect of various ligand field strengths on d-metal ions and find out ground state terms with their energies, microstates, degeneracy and microstate table for different transition metal ions and complexes.	Understanding	PSO1
	CO2: Understand electronic spectra of complexes w.r.t. spin and orbital selection rules, various transitions, charge transfer spectra and luminescence spectra with LASER application.	Understanding	PSO1
	CO3: Know the magnetic properties of complexes and understand spin-only and effective magnetic moments, Zeeman Effect, properties of complexes with A, E, and T terms.	Understanding	PSO1
Organic Reaction Mechanisms	CO1: Understand various reactions and rearrangements.	Understanding	PSO1
	CO2: Understand and write mechanism of reactions and their applications.	Applying	PSO1
	CO3: Understand how to convert one molecule into another by using oxidising and reducing reagents.	Applying	PSO1
	CO4: Develop interest in writing and finding mechanisms of new reactions.	Creating	PSO1
	CO5: Understand various methods of Carbanion generation and their applications in Organic Synthesis.	Understanding	PSO1

Chemical Bonding and Computational Chemistry	CO1: To expose the students to the field of computational chemistry, this is emerged as a powerful tool in chemistry.	Understanding	PSO6
	CO2: To calculate certain quantities which are difficult to, by other experimental method.	Applying	PSO6
	CO3: To familiarize with programs like GAMES.	Understanding	PSO6
Molecular Spectroscopy	CO1: To lay a foundation on spectroscopic techniques and resonance spectroscopy.	Understanding	PSO2
	CO2: To determine the quantity of ions using colorimetric methods.	Applying	PSO2
	CO3: Understand the principle of Microwave, IR, Raman, Electronic, NMR, ESR and Mossbauer spectroscopy.	Understanding	PSO2
Structural Inorganic Chemistry	CO1: To understand about the various solid state properties, electrical, magnetic and optical properties.	Understanding	PSO1
	CO2: To study about the inorganic chains, rings, cages and metal clusters.	Understanding	PSO1
	CO3: Understand the detail chemistry of s- and p- block elements w.r.t. their compounds, reactions and applications.	Understanding	PSO1
Organic Syntheses	CO1: To understand the various organic reactions.	Understanding	PSO1
	CO2: To learn about the modern synthetic method and reagent.	Understanding	PSO1

	CO3: To introduce the basic concept to retrosynthetic analysis, protecting group chemistry, biosynthesis and biomimetic synthesis.	Understanding	PSO1
	CO4: To learn about the construction of carbocyclic and heterocyclic ring system.	Understanding	PSO1
Chemical Kinetics, Surface Chemistry and Crystallography	CO1: To develop a deeper knowledge in chemical kinetics, mechanism of heterogeneous catalysis, enzyme catalysis and its mechanisms.	Understanding	PSO4
	CO2: To provide an insight into the topics surface chemistry, photochemistry.	Understanding	PSO4
Spectroscopic Methods in Chemistry	CO1: Understand how to interpret nuclear magnetic resonance spectrum.	Understanding	PSO2
	CO2: Know how to solve problems based on H1 and C13 NMR.	Applying	PSO2
	CO3: Know applications of mass spectroscopy in determination of structures.	Understanding	PSO2
	CO4: Understand methods of solving combined problems on all spectroscopic techniques.	Applying	PSO2
Inorganic Chemistry Practical-2	CO1: Gravimetrically and volumetrically analyse the metal ion concentration in a given sample.	Applying	PSO3
	CO2: Apply the knowledge of quantitative analysis for the determination of metals from ores/alloys.	Applying	PSO3

Organic Chemistry Practical-2	CO1: Understand how to carry out different types of reactions and their workup methods.	Applying	PSO3
	CO2: Become aware of green chemistry and role of green chemistry in pollution reduction.	Understanding	PSO3
Physical Chemistry Practical-2	CO1: Plot accurate graphs of the desired scale for the calculations.	Applying	PSO3
	CO2: Understand the principle and working of different instruments like colorimeter, conductometer, spectrophotometer, etc.	Understanding	PSO3
	CO3: Maintain laboratory ethics, safety and cleanliness.	Applying	PSO3
Advanced Inorganic Chemistry	CO1: With perception of providing better knowledge on inorganic spectroscopic methods, inorganic photochemistry and application of group theory.	Understanding	PSO6
	CO2: A general introduction to nanomaterials.	Understanding	PSO5
	CO3: To understand in depth about various analytical methods.	Understanding	PSO5
Advanced Organic Chemistry	CO1: To grasp a better knowledge on green alternatives to organic chemistry.	Understanding	PSO1
	CO2: To apprehend more about supramolecular chemistry.	Understanding	PSO1
	CO3: To learn more about principles of Nano chemistry.	Understanding	PSO5

	CO4: To understand more about the stereo selective transformations.	Understanding	PSO1
	CO5: With an insight to introduce about the chemistry of natural products, biomolecules, medicinal chemistry and drug designing.	Understanding	PSO5
	CO6: To introduce a basic concept on research methodology.	Understanding	PSO5
Advanced Physical Chemistry	CO1: To lay a foundation on fluorescence spectroscopy.	Understanding	PSO2
	CO2: To understand in depth about crystallography, gaseous state, electrochemistry and electromotive force.	Understanding	PSO5
	CO3: To provide a better understanding on diffraction methods, atomic spectroscopic techniques and electroanalytical techniques.	Understanding	PSO5
Project	CO1: In a specialization domain of his/her choice, student manager will be able to choose an appropriate topic for study and will be able to clearly formulate and state a research problem.	Applying	PSO5
	CO2: For a selected research topic, student manager will be able to compile the relevant literature and frame hypotheses for research as applicable.	Applying	PSO5
	CO3: For a selected research topic, student manager will be able to plan a research design including the sampling, observational, statistical and operational designs if any.	Applying	PSO5

	CO4: Based on the analysis and interpretation of the data collected, student manager will be able to arrive at logical conclusions and propose suitable recommendations on the research problem.	Applying	PSO5
	CO5: Student manager will be able to create a logically coherent project report and will be able to defend his/her work in front of a panel of examiners.	Creating	PSO7
Viva	CO1: To acquire knowledge and skills to face the interview panel.	Understanding	PSO7
	CO2: To equip the students with analytical and evaluation abilities to respond to impromptu questions by the panel members.	Analyzing	PSO7
	CO3: To make the students to face the expert panel and present the knowledge, skills and problems in the most efficient way.	Applying	PSO7