M.Sc ANALYTICAL CHEMISTRY

Programme Outcomes

PO1: Be able to demonstrate basic knowledge in the core areas of chemistry (analytical, general, inorganic, organic, physical, applied chemistry etc).

PO2: Have firm foundations in the fundamentals and application of current chemical and scientific theories in Inorganic, Organic, Physical and Analytical Chemistry.

PO3: Be versatile in classical laboratory techniques, use instrumental methods for analysis as well as synthesis and follow standardised procedures and regulations in handling and disposal of chemicals.

PO4: Become post graduates with the skills to critically assess and solve problems requiring the application of chemical principles.

PO5: Equip students with effective scientific communication skills

SEMESTER – I

Course	Outcomes After completion of these courses a student will gain knowledge in
P- I General Chemistry	CO1: Learn and understand the selection rules and criteria for molecules to exhibit rotational and IR spectroscopy.
	CO2: Understand the Classical and quantum mechanical theories of Raman spectroscopy and basic concepts of electronic spectroscopy.
	CO3: Learn spectroscopic methods based on magnetic resonance principles.
	CO4: Learn basics of group theory and its application in chemistry.
	CO5: Understand the basic concepts of FORTRAN programming and its applications
P-II, Inorganic Chemistry	CO 1: Acquire the knowledge on applications of VSEPR, Valence Bond and Molecular orbital theories in explaining the structures of simple molecules and role of p and d orbitals in pi bonding.
	CO 2: Understand the concept of MO theory to square planar (PtCl4 2-) and Octahedral complexes (CoF6 3- , Co (NH3)6 3+). And Walsh diagram for H2O molecule
	CO 3: Apply the knowledge and understanding of Understand the Orgel and Tanabe-Sugano diagrams for d1 –d 9 octahedral and tetrahedral transition metal complexes of 3d series to newly prepared metal complexes
	CO 4: Develop interest in the areas of magnetic properties of transition and inner transition metal complexes – spin and orbital moments – quenching of orbital momentum by crystal fields in complexes.
	CO5: To understand the concept of Term symbols and electronic spectra and Magnetic properties of complexes
P-III, Organic Chemistry	CO1: Acquire the knowledge of aliphatic nucleophilic, aliphatic electrophilic, stereochemistry and conformational analysis, chemistry of heterocyclic compounds and chemistry of natural products
	CO2: Understand aliphatic nucleophilic, aliphatic electrophilic, stereochemistry and conformational analysis, chemistry of heterocyclic compounds and chemistry of natural products
	CO3: Apply the knowledge and understanding of aliphatic nucleophilic, aliphatic electrophilic, stereochemistry and conformational analysis.
	CO4: Develop interest in the areas of aliphatic nucleophilic, aliphatic electrophilic, stereochemistry and conformational analysis, chemistry of heterocyclic compounds and chemistry of natural products
	CO-5 Applying chemistry of heterocyclic compounds and chemistry of natural products to new situations
P-IV, Physical Chemistry	CO1: Explain the basic concepts of Thermodynamics and its applications
	CO2: Understand the concepts of thermodynamics of solutions.
	CO3: To understand the principle of micellisation.
	CO4: Understand the various kinetic theories, measurements of reaction rates.
	CO5: Learn experimental techniques for measuring the kinetics of fast reactions and homogenous catalyzed reactions

SEMESTER – II

Course	Outcomes After completion of these courses a student will gain knowledge in
P- I General Chemistry	CO 1: Students will have the idea of wave function and understand the uncertainty relations
	CO2: Students will learn how to solve the Schrödinger Eq. rigorously for model systems
	CO 3: Students will be able to understand and be able to explain the origin of quantized energy levels
	CO 4: Students will learn to apply concepts from physics and methods from mathematics to derive and understand the properties of chemical systems that arise from quantum mechanical models for the structure of atoms and molecules.
	CO 5: They will be able to understand and explain the differences between classical and quantum mechanics
P-II, Inorganic Chemistry	CO1: To give a basic and updated knowledge for the students on metal clusters, Organometallic chemistry of transition metals
	CO 2: To discuss the preparation and structures of and functional aspects of metal clusters
	CO3: Design new coordination compounds based on a fundamental understanding of their electronic properties
	CO4: To discuss basics principles of reaction mechanism in metal complexes
	CO5: To understand the concept of Term symbols and Electronic spectra and Magnetic properties of complexes
P-III, Organic Chemistry	CO1: Acquire the knowledge of aromaticity, aromatic nucleophilic substitution, reactive intermediates and name reactions, molecular rearrangements, spectroscopy, alkaloids, peptides, proteins and nucleic acids
	CO2: Understand aromaticity, aromatic nucleophilic substitution, reactive intermediates and name reactions, molecular rearrangements, spectroscopy, alkaloids, peptides, proteins and nucleic acids
	CO3: Apply the knowledge and understanding of aromaticity, aromatic nucleophilic substitution, reactive intermediates and name reactions, molecular rearrangements, spectroscopy, alkaloids, peptides, proteins and nucleic acids to new situations
	CO4: Develop interest in the areas of aromaticity, aromatic nucleophilic substitution, reactive intermediates
	CO-5 Applying name reactions, molecular rearrangements, spectroscopy, alkaloids, peptides, proteins and nucleic acids in synthetic methods.
P-IV, Physical Chemistry	CO1: Explain the basic concepts of Crystallography.
	CO2: Understand the types of polymers and analyze various physical properties of polymers.
	CO3: understand the concepts of electrochemistry and theories like Debye Huckel theory
	CO4: Understand the basic concept and theories of electrode-electrolyte interface.
	CO5: Learn Principles of photochemistry and various photochemical reactions.

SEMESTER – III

Course	Outcomes After completion of these courses a student will gain knowledge in
P- I, Separation methods-I	CO-1 Introduction to Chromatography and classification of different Chromatographic techniques.
	CO-2 Study of dynamics of chromatography, principle and different methods of paper chromatography.
	CO- 3 Principle and Instrumentation of TLC, HPTLCand column chromatography. Chromatography.
	CO-4 Principles, instrumentations and applications of GEC, capillary electrophoresis, inorganic molecular sieves.
	CO-5 Theory, Instrumentations and applications of GC and GC-MS and counter current chromatography
P-II, Quality control and traditional methods of analysis- 1	CO-1 Quality control in Analytical chemistry
	CO-2 Statistical analysis and need implementation and organization of good laboratory practices and decomposition and dissolution of inorganic compounds
	CO-3 Decomposition techniques and principle and application of solubility of organic compounds
	CO-4 Oxidant systems , principles and applications in analysis
	CO-5 Classification and determinations of Organic functional groups
P-III, Applied analysis -1	CO-1 Analysis of Ores- Iron ore and manganese ore.
	CO -2 Analysis of ores- chromite, phosphaterock ,aluminium ore.
	CO-3 Analysis of Steel ,Refractory materials and fluxes
	CO-4 Analysis of cement,oils,soaps,paints
	CO-5 . Assessment of Water quality.
P-IV, Instrumentational method of analysis- 1	CO-1 Theory and instrumentation of UV Visible spectroscopy
	CO-2 Theory and instrumentation of Spectrofluorimetry, Raman spectroscopy.
	CO-3 Theory and instrumentation of IR Spectroscopy
	CO-4 Theory and instrumentation of NMR and ESR Spectroscopy
	CO-5 Theory and instrumentation of Mass Spectroscopy and X Ray spectroscopy

SEMESTER – IV

Course	Outcomes After completion of these courses a student will gain knowledge in
P- I, Separation methods-II	CO-1 Principles and applications of Ion exchange Chromatography and ion Chromatography.
	CO-2 Principles and instrumentation of HPLC and LCMS.
	CO- 3 Principle and Instrumentation of liquid-liquid partition chromatography, Introduction to sampling.
	CO-4 Samplimg of solids, liquids and gases.
	CO-5 Importance of analytical chemistry in Research and development. Principles of solvent extraction methods.
P-II, Quality control and traditional methods of analysis	CO-1 Precipiation, coprecipitation, post precipitation methods
	CO-2 Precipitatipn titrations and PFHS.
	CO-3 Gravimetric determinations of inorganic and organic precipitants and electrogravimetric analysis.
	CO-4 Principles and applications in the analysis of reductant systems.
	CO-5 Basic Classification of drugs and their determinations.
P-III, Applied analysis	CO-1 Analysis of raw materials like non ferrous alloys and ferrous alloys.
	CO -2 Analysis of raw materials like ferrous alloys.
	CO-3 Analysis of soils, fertilizers and fuels.
	CO-4 Assessment of air quality.
	CO-5 Kinetic methods of analysis and non-aqueous titrations.
P-IV, Instrumentational method of analysis	CO-1 Theory and instrumentation of atomic absorption spectroscopy, flame photometry, ICPAES and ICPMS.
	CO-2 Theory and instrumentation of flame photometry, ICPAES and ICPMS.
	CO-3 Thermal methods of analysis like, TG, DTA, and DSC.
	CO-4 Analysis of voltametry, polarography, anode stripping voltametry and colorometric analysis.
	CO-5 Ion selective electrodes and radiochemical methods of analysis..