



Sai College[®]

COURSE OUTCOMES

OF

MASTERS OF SCIENCE

(M.Sc. CHEMISTRY)

VISION

The Vision of the college is to generate and disseminate knowledge through a harmonious blend of ancient and modern wisdom, and to serve the society by developing in students heightened intellectual, cultural, ethical, and humane sensitivities; to foster a scientific temper, and to promote professional and technological expertise. Central to this vision is a commitment to regional and national development in consonance with our culture, heritage, and environment.

MISSION

- To impart updated technical education and knowledge.
- To promote, inspire and nurture the fundamental of chemistry through UG and PG courses offered for the basic sciences students.

COURSE OBJECTIVES

This course aims at acquainting students to concept of Crystal field and Ligand field theory. The symmetry, magnetic properties and spatial arrangements of molecules are studied in good detail. This course also aims at to accustom the students the basic concepts of thermodynamics along with the Non-ideal systems including the basic Debye Huckel theory. Modern theoretical and experimental methods used to study problems of molecular structure and bonding; emphasis on spectroscopic techniques.

SYLLABUS**M.Sc. Ist Semester**

Paper	Name of Paper
Paper I	Group theory and Chemistry of Metal Complexes
Paper II	Concept in Organic Chemistry
Paper III	Quantum Chemistry, Thermodynamics and Chemical Dynamics-I
Paper IV	Theory and Applications of Spectroscopy-I

Course Outcome

At the end of this course, a student will have developed ability to:

Paper Name	Course	Outcomes
Paper I	Group theory and Chemistry of Metal Complexes	<p>CO-1. Get the knowledge of actual structure of elements.</p> <p>CO-2. To understand the metal-ligand bonding in metal complexes.</p> <p>CO-3. Study the metal-ligand equilibria in solution.</p> <p>CO-4. Understand the structure and properties of metal clusters.</p>

Paper II	Concept in Organic Chemistry	<p>CO-1. To understand the nature of bonding in organic molecules and the concept of aromaticity.</p> <p>CO-2. Understand the Conformational analysis and stereochemistry of organic molecules.</p> <p>CO-3. Study the reaction intermediates and elimination reactions of organic molecules.</p> <p>CO-4. Get the knowledge of the pericyclic reactions of organic compounds.</p>
Paper III	Quantum Chemistry, Thermodynamics and Chemical Dynamics-I	<p>CO-1. Understand the basic mathematical concept used in quantum chemistry.</p> <p>CO-2. Understand the basic concepts of thermodynamics.</p> <p>CO-3. Study the basics of electrochemistry.</p> <p>CO-4. Understand the rate of reaction and theories of reaction rate.</p>
Paper IV	Theory and Applications of Spectroscopy-I	<p>CO-1. To gain insight into the basic principle of molecular spectra, types of spectra and its origin.</p> <p>CO-2. To know about rigid rotor, energy levels, origin of rotational spectra and its applications.</p> <p>CO-3 To get the knowledge of electron diffraction, augur spectroscopy, turbidity, nephelometry, fluorometry,</p> <p>CO-4. To understand the theories/principles, predict the functional groups and differentiate between IR and Raman spectra.</p>
Lab course I	Inorganic chemistry	To get the knowledge of cation, anion, rare earth elements including interfering radicals, volumetric estimation and gravimetric estimation
Lab course II	Physical chemistry	To get the knowledge of adsorption, surface, phase equilibrium, chemical kinetics, conduct metric, pH,

		potentiometer titration
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SYLLABUS**M.Sc.-IInd Semester**

Paper	Name of Paper
Paper I	Transition metal complexes
Paper II	Reaction Mechanism
Paper III	Quantum chemistry, Thermodynamics and Chemical Dynamics-II
Paper IV	Theory and Applications of Spectroscopy-II

Course Outcomes

At the end of this course, a student will have developed ability to:

Paper	Paper Name	Course Outcome
Paper I	Transition metal complexes	<p>CO-1. To understand the reaction mechanism of transition metal complexes</p> <p>CO-2. To understand how to interpret electronic spectra of complexes and know magnetic properties of complexes of different geometry.</p> <p>CO-3. To understand transition metal complexes with unsaturated organic molecules.</p> <p>CO-4. To study the alkyl and aryl of transition metals.</p>
Paper II	Reaction Mechanism	<p>CO-1. To have a thorough idea about the basic concepts and reaction mechanism of various types of organic reactions.</p> <p>CO-2. To get an idea about the mechanism and stereochemical aspects of elimination reactions.</p> <p>CO-3. To understand the mechanism and stereochemistry of nucleophilic substitution reactions.</p> <p>CO-4. To acquire the knowledge of mechanism of electrophilic substitution in aliphatic as well as aromatic compounds.</p>
		<p>CO-1. To have basic knowledge of mathematics – vector, matrix algebra, probability, calculus and its application in chemistry which adds value to the programme.</p> <p>CO-2. To illustrate the concepts in statistical thermodynamics – distribution, thermodynamic probability, partition function and its application and to compare Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac Statistics.</p> <p>CO-3. To explain and derive equations related to</p>

Paper III	Quantum chemistry, Thermodynamics and Chemical Dynamics-II	<p>the theory of strong electrolytes – structure/models and thermodynamics of electrified interfaces, polarography and its applications.</p> <p>CO-4. To describe different theories of reaction rates, fast reactions and its methods, kinetics and mechanism of photochemical and unimolecular reactions.</p>
Paper IV	Theory and Applications of Spectroscopy-II	<p>CO-1 To get the knowledge of electronic spectra, frank condon principal, rotational and transitional of organic molecule</p> <p>CO-2. To gain detailed insight into the instrumentation and sample handling in IR spectroscopy, characteristic vibrational frequencies and factors effecting.</p> <p>CO-3. To acquaint with the principle and interpretation of Mass spectra and to elucidate structure of molecule on the basis of various spectral spectroscopic data.</p> <p>CO-4. To get to know in detail about the various effects, mechanism, correlations and advanced techniques related to proton and C-13 NMR spectroscopy.</p>
Lab course III	Organic chemistry	Understand the process of solvent extraction, distillation technique, binary mixture, synthesis of binary compound
Lab course IV	Analytical chemistry	Understand the computer programmes, linear regression, MS office, Excel, flame photometer, nephelometer, electrophoresis, Lambert beers law

SYLLABUS**M.Sc.-IIIrd Semester**

Paper	Name of Paper
Paper I	Resonance spectroscopy, Photochemistry and Organocatalysis
Paper II	Chemistry of Biomolecules
Paper III	Catalysis, solid state and surface chemistry
Paper IV	Analytical chemistry

Course Outcome

At the end of this course, a student will have developed ability to:

Paper	Paper Name	Course Outcome
Paper I	Resonance spectroscopy, Photochemistry and Organocatalysis	<p>CO-1. Explain relevant terms of ESR, NQR, PE and PAS spectroscopy.</p> <p>CO-2. Explain basic and working principle of ESR, NQR, PE and PAS spectroscopy.</p> <p>CO-3. Taking resonance spectra and their interpretation.</p> <p>CO-4. Explain mechanism of photochemical reactions and organocatalysis.</p>

Paper II	Chemistry of Biomolecules	<p>CO-1. The basic properties of enzymes, components of metabolic pathway and kinetics of enzyme action.</p> <p>CO-2. Mechanisms of enzyme action and different kinds of enzyme catalyzed reactions.</p> <p>CO-3. Different models of enzymes and co-enzymes, their structures and biological functions.</p> <p>CO-4. Biotechnological applications of enzymes and constituents of biological cell.</p>
Paper III	Catalysis, solid state and surface chemistry	<p>CO-1. Gives an introduction to solid state chemistry and crystal defects.</p> <p>CO-2. Explain types and electrical properties of semiconductors.</p> <p>CO-3. Explain the mechanism of homogenous and heterogeneous catalysis.</p> <p>CO-4. Explain adsorption process and its mechanism on the surface.</p>
Paper IV	Analytical chemistry	<p>CO-1. Explain the fundamentals of analytical chemistry and steps of a characteristic analysis.</p> <p>CO-2. Express the role of analytical chemistry in science.</p> <p>CO-3. Explain the quantitative analytical methods and compare qualitative and quantitative analytical methods.</p> <p>CO-4. Elucidate the solvent extraction techniques and their classification.</p>
Lab course V	Physical chemistry	Understand the process of solvent extraction volumetric conduct metric determination and reactions kinetics of different types of reactions
Lab course VI	Analytical chemistry	To get the knowledge of qualitative and quantitative determination of metal ions by spectrophotometer, polarometer, pH meter, NMR, GC-MS, AAS,

SYLLABIS**M.Sc.-IVth Semester**

Paper	Name of Paper
Paper I	Instrumental methods of analysis
Paper II	Natural products and medicinal chemistry
Paper III	Nuclear chemistry
Paper IV	Environmental chemistry

Course Outcomes

At the end of this course, a student will have developed ability to:

Paper	Paper Name	Course Outcome
Paper I	Instrumental methods of analysis	CO-1. Evaluate electromagnetic radiation properties. CO-2. Explain the interaction of electromagnetic radiation with matter. CO-3. Classify basic principles of spectroscopic methods. CO-4. Interpretation of all spectrums.
		CO-1. Knowledge of chemistry and significance of

Paper II	Natural products and medicinal chemistry	<p>Terpenes.</p> <p>CO-2.Structure and biosynthesis of Steroids.</p> <p>CO-3.To know about the basics of drugs, drug design and important pharmacokinetic parameters.</p> <p>CO-4.To understand biosynthesis/synthesis, structure and applications of antibiotics.</p>
Paper III	Nuclear chemistry	<p>CO-1.Identify and define various types of nuclear transmutation including fission, fusion and decay reactions.</p> <p>CO-2.State and compare the differences and similarities between a nuclear change and a chemical change.</p> <p>CO-3.Understand and explain the concept of isotopic stability including the band of stability.</p> <p>CO-4.Explain the concept of rate of change of half life in the context of nuclear decay.</p>
Paper IV	Environmental chemistry	<p>CO-1.Appreciate concepts and methods from ecological science and solving environmental problems.</p> <p>CO-2.Explain the ethical, cross-cultural and historical context of environmental issues.</p> <p>CO-3.Discuss the link between human and natural systems.</p> <p>CO-4.Able to recognise the physical, chemical and biological components of the earth's systems and show how they function.</p>
Lab course VII	Organic chemistry	Understand the multi step synthesis, qualitative synthesis, estimation of functional group
Lab course VIII	Analytical chemistry	Understand the process of spectrophotometer determination, flow injector analysis, AAS, titrimetric and gravimetric analysis and chromatographic separation of metal ions

SYLLABUS**M.Sc.-4th Semester**

Paper	Name of Paper
Paper I	Instrumental methods of analysis
Paper II	Natural products and medicinal chemistry
Paper III	Nuclear chemistry
Paper IV	Environmental chemistry

Course Outcomes

At the end of this course, a student will have developed ability to:

Paper	Paper Name	Course Outcome
Paper I	Instrumental methods of analysis	CO-1. Evaluate electromagnetic radiation properties. CO-2. Explain the interaction of electromagnetic radiation with matter. CO-3. Classify basic principles of spectroscopic methods. CO-4. Interpretation of all spectrums.
		CO-1. Knowledge of chemistry and significance of

Paper II	Natural products and medicinal chemistry	<p>Terpenes.</p> <p>CO-2.Structure and biosynthesis of Steroids.</p> <p>CO-3.To know about the basics of drugs, drug design and important pharmacokinetic parameters.</p> <p>CO-4.To understand biosynthesis/synthesis, structure and applications of antibiotics.</p>
Paper III	Nuclear chemistry	<p>CO-1.Identify and define various types of nuclear transmutation including fission, fusion and decay reactions.</p> <p>CO-2.State and compare the differences and similarities between a nuclear change and a chemical change.</p> <p>CO-3.Understand and explain the concept of isotopic stability including the band of stability.</p> <p>CO-4.Explain the concept of rate of change of half life in the context of nuclear decay.</p>
Paper IV	Environmental chemistry	<p>CO-1.Appreciate concepts and methods from ecological science and solving environmental problems.</p> <p>CO-2.Explain the ethical, cross-cultural and historical context of environmental issues.</p> <p>CO-3.Discuss the link between human and natural systems.</p> <p>CO-4.Able to recognise the physical, chemical and biological components of the earth's systems and show how they function.</p>
Lab course VII	Organic chemistry	Understand the multi step synthesis, qualitative synthesis, estimation of functional group
Lab course VIII	Analytical chemistry	Understand the process of spectrophotometer determination, flow injector analysis, AAS, titrimetric and gravimetric analysis and chromatographic separation of metal ions

