

**Programme Outcomes**  
**DEPARTMENT OF CHEMISTRY**  
**M.Sc., Chemistry**  
**2019-20**

<b>Programme Outcomes</b>	After successful completion of two year Master Degree program in Chemistry, a student should be able to,
	PO – 1: Demonstrate and apply the fundamental knowledge of the basic principles in various fields of Chemistry
	PO – 2: Collaborate effectively on team -oriented projects in the field of Chemistry or other related fields. Communicate scientific information in a clear and concise manner both orally and in writing.
	PO – 3: Inculcate logical thinking to address problems and become result oriented with a positive attitude. Have developed their critical reasoning, judgment and communication skills.
	PO – 4: Augment the recent developments in the field Organic chemistry, Physical Chemistry, Pharmaceutical, Bioinorganic Chemistry and relevant fields of research and development.
	PO – 5: Enhance the scientific temper among the students so as to develop a research culture and implementation of the policies to tackle the burning issues at global and local level.
	PO – 6: Explain the environmental pollution issues and the remedies there of. Apply the knowledge to develop the sustainable and eco-friendly technology in Industrial Chemistry.
<b>Programme Specific Outcomes</b>	Apply advanced concepts of Organic, Analytical, Physical and Inorganic Chemistry to solve complex problems to improve human life.
	Design experiments, analyse, synthesize and interpret data to provide solutions to different industrial problems by working in the pure, inter and multi-disciplinary sciences.
	Able to independently carry out research/ investigation to solve practical problems and write / present a substantial technical report/document.
	Apply knowledge to build up small scale industry for developing endogenous product

	Apply various aspects of chemistry in natural product isolations, pharmaceutical, dyes, textiles, polymers, petroleum products, forensic etc., and also to develop interdisciplinary approach of the subject.
<b>COURSE OUTCOMES</b>	
<b>SEMESTER - 1</b>	
<b>Course</b>	<b>Outcomes</b>
After completion of these courses students should be able to;	
<b>Inorganic Chemistry – I (CH-401)</b>	CO – 1: Have a detailed study of the different theories proposed on covalent bonding, applications of V.B & M.O-structure of boranes.
	CO – 2 Understanding the nature of ionic bonding in crystals, solving the problems on energetics of ionic bonding.
	CO – 3 Understanding the different theories of solid-semiconductors -superconductivity.
	CO – 4 Evaluate the problems based on Solid State Chemistry
	CO – 5 To understand radioactive decay, types of nuclear reactions--radioactive techniques.
<b>Organic Chemistry – I (CH-421)</b>	CO-1 Understanding the nature of Chemical Bonding in Organic molecules. Evaluate the problems based on aromaticity and supramolecular chemistry.
	CO-2 Understanding the concept of configuration and confirmation of stereo chemistry. Apply their understanding about the organic reactions of industrial significance with respect to chemo selectivity, regio selectivity and enantioselectivity. Analyse the product distribution and the stereochemistry of various organic products.
	CO-3 Evaluate the organic reactions based on the influence of substituents on substrate molecules and nature of solvent
	CO-4 Analyse the product distribution and the stereochemistry of various organic products in addition and substitution products.
	CO-5 Design new organic reactions in order to achieve the required products
<b>Physical Chemistry – I (CH-441)</b>	CO – 1 Student should be able to calculate thermodynamic properties of ideal and real gases and also absolute entropy of a system.
	CO-2 To study the physical methods of surfaces -- Determination of surface area-- Kinetics of surface absorption
	CO – 3 Students should able to understand the concept of macromolecules

	CO – 4 Evaluate the problems based on Debye-Huckel Limiting Law. Apply theories in electrochemistry to analyse electrode kinetics and plot potential Vs current, surface coverage vs Potential, concentration profile vs distance from the electrode.
	CO – 5 Calculate the rate constants of parallel and Opposing reactions and derive the rate expressions of chain reactions for the formation of hydrogen halides by applying steady state approximation. Explain the kinetics of fast reactions using various instrumentation techniques.
<b>Practical - I Inorganic Chemistry-I (CH-400)</b>	CO-1 Prepare exact solutions for quantitative analysis
	CO-2 apply the knowledge of quantitative analysis for the determination of metals from ores/alloys.
	CO-3 Synthesize inorganic complexes and also find their purity.
	CO-4 Understand paper chromatography and Ion-Exchange chromatography.
<b>SEMESTER - 2</b>	
<b>Inorganic Chemistry – 2 (CH-402)</b>	CO – 1 To have a detailed understanding about crystal field theory, molecular orbital theory for coordination compounds.
	CO – 2 Evaluate the magnetic nature and spectral characteristic of coordination compounds based on Russell-Saunders coupling schemes--charge transfer spectra--
	CO – 3 To understand the stability and reactivity of organometallics like carbonyls, nitrosyls, metallocenes.
	CO - 4 Understanding reaction mechanism in transition metal complexes.
	CO – 5 understanding the oxidative, reductive elimination, insertion reactions, olefin hydrogenation, hydroformylation reactions of organometallic compounds & catalysis.
<b>Organic Chemistry – 2 (CH-422)</b>	CO – 1 A detailed study on elimination reactions in organic compounds and to identify the stereoselective formation of products in the reactions.
	CO – 2 To understand the oxidation and reduction reactions on organic molecules.
	CO – 3 To study theoretical aspects of concerted reactions--PMO approach--FMO--Sigma tropic rearrangements.
	CO – 4 To study the principles of photochemical reactions, evaluation of expected product formation in the reaction.
	CO – 5 A detailed and thorough study on Biomolecules like carbohydrates, lipids, monoacids, Nucleic acids.

<b>Physical Chemistry -2 (CH-442)</b>	CO – 1 To study different aspects in advanced Statistical thermodynamics
	CO – 2 A detail study on concepts of nonequilibrium thermodynamics
	CO – 3 To understand molecular reaction dynamics
	CO – 4 To understand Electrochemistry-II
	CO – 5 A detailed study on basic principles of quantum chemistry
<b>Practical - II Organic Chemistry –II (CH-420)</b>	CO – 1 Imparting training in synthesis of organic molecules and in analysis of chemical and instrumental methods.
	CO – 2 Understand the importance of different instrumental methods in chemical analysis of materials.
	CO – 3 Recall the importance of the analysis of organic molecules. Understand the qualitative analysis of mixtures, the functions of various reagents and reaction mechanisms.
	CO – 4 Evaluate the properties of synthesized organic products and their derivatives through spectroscopic and analytical data.
<b>SEMESTER - 3</b>	
<b>Inorganic Photo Chemistry &amp; Bio inorganics (CH-501)</b>	CO – 1 A detailed study of chemistry of essential and trace elements in biological processes.
	CO – 2 A detailed and thorough study on kinetics of inorganic photochemical reactions
	CO – 3 To understand advanced topics in inorganic photochemistry and redox reactions.
	CO – 4 To understand role of metalloenzymes like zinc, iron, copper in biological processes.
	CO-5 A detailed and thorough study on function of haemoglobin, myoglobin, haemocyanins, ferridoxin, Rubredoxins etc.
<b>Organic Spectroscopy (CH-521)</b>	CO – 1 To understand the basic principles of UV-VIS & NMR Spectroscopy, solve the problems on UV-VIS & NMR Spectroscopy
	CO – 2 To study the basic principles & theory of NMR spectroscopy
	CO – 3 A detailed and thorough study on Applications of <sup>1</sup> H NMR, <sup>13</sup> C NMR, 2D NMR.
	CO – 4 A detail study on principle and Applications of Mass Spectrometry.
	CO – 5 To know how to solve the problems based on UV, IR, Mass, NMR data
	CO – 1 To understand the symmetrical aspects in molecules and application of group theory in chemistry.

<b>Physical Chemistry -3 (CH-541)</b>	CO – 2 Recall the fundamental principles of Quantum chemistry--Applications of particle in 1D, 2D,3D boxes-Simple Harmonic oscillator
	CO – 3 A detailed and thorough study on Variation and Perturbation methods--Slater determinants and Hartree - Fock Self-Consistent field for atoms
	CO – 4 To understand the principles and applications of Vibrational, Rotational, Raman--Applications of molecular spectroscopy.
	CO-5 A detailed and thorough study on basic principles of NMR Spectroscopy--ESR spectroscopy and NQR spectroscopy.
<b>Practical - III Physical Chemistry (CH-540)</b>	CO – 1 To impart training in operating instruments used in the analysis of various chemical constituents.
	CO – 2 Design experiments in Physical Chemistry and Analytical Chemistry using potentiometry, Conductometry, Fluorimetry, colorimetry, chromatography.
	CO – 3 Apply concepts of Physical Chemistry and Analytical Chemistry through experimentation.
<b>SEMESTER - 4</b>	
<b>Advanced Topics in Chemistry (CH-572)</b>	<b>CO – 1</b> Recall the fundamental principles of organic reactions. Understand the concepts related to synthesis, mechanisms and the functions of various reagents or catalysts.
	<b>CO – 2</b> Apply their understanding about the synthetic methodologies of organic chemistry--Basic principles of Retrosynthetic approach--Protecting groups of alcohols, amines, carbonyl and carboxyl groups.
	<b>CO – 3</b> To apply retrosynthetic approaches for designing a synthetic route for synthesis of target molecule-one group C-C connections, two group C-C connections.
	<b>CO – 4</b> To understand the advanced topics in Solid State Chemistry
	<b>CO – 5</b> Application of quantum chemistry principles to Hybridization of orbitals, Hückel and SCF theory- Hellman & Feynman theorem.
<b>Natural Products Chemistry and Heterocycles (Elective) (CH-582B)</b>	<b>CO – 1</b> To study isolation and general methods of structural determination of Terpenoids and Carotenoids
	<b>CO – 2</b> To study isolation, Biosynthesis and general methods of structural determination of Alkaloids like Ephedrine, Nicotine, Atropine, Quinine.
	<b>CO – 3</b> A detail study on Steroids like Cholesterol, Bile acids, Testosterone, Progesterone etc.,
	<b>CO – 4</b> To study the chemistry of three membered, four membered heterocycles and their applications.

	<b>CO-5</b> To study the structure & synthesis of six membered hetero cycles with multiple hetero atoms.
<b>Project/Review Work (CH-570)</b>	<b>CO -1</b> Enhance the scientific temper among the students so as to develop a research culture and implementation of the policies to tackle the burning issues at global and local level.
	<b>CO -2</b> Collaborate effectively on team -oriented projects in the field of Chemistry or other related fields. Communicate scientific information in a clear and concise manner both orally and in writing.
<b>Lab Course (Elective) (CH-580)</b>	<b>CO -1</b> How to synthesize organic molecules
	<b>CO -2</b> How to maintain reaction conditions
	<b>CO -3</b> Arrangement of assembly
	<b>CO -4</b> How to follow reaction by using thin layer chromatography
	<b>CO -5</b> Methods of purification of sample