POSTGRADUATE PROGRAMME: COURSE OUTCOME

Name of the Programme: M.Sc. Chemistry

Name of the Class	Course Code	Course Title	Course Outcomes	
SEMESTER I				
M.Sc. I	CCTP-1 CHP-110	Physical Chemistry-I (Fundamentals of Physical Chemistry)	CO1	After successfully completing this course, students will be able: to learn Thermodynamics parameters at different conditions.
			CO2	Explain the applications of colligative properties.
			CO3	Applications of quantum chemistry.
			CO4	Types of hybridization, idea of Valence bond theory and Molecular orbital theory.
			CO5	Huckel theory, applications to simple π-systems.
			CO6	basic concept in rate law equation.order of reactions.
			CO7	. Collision theory of bimolecules.
			CO8	Eyrings equation concept.
			CO9	Michaelis mechanism in enzyme catalyzed reactions.
			CO10	enzyme action and inhibition with examples.
			CO11	Maxwell- Boltzmann relationship
			CO12	Fermi-Dirac and Bose-Einstein statistics.
M.Sc. I	CCTP-2: CHI-130	Inorganic Chemistry-I	CO1	After successfully completing this course, students will be able to: Student should visualize/ imagine molecules in 3 dimensions.
			CO2	To understand the concept of symmetry and able to pass various symmetry elements through the molecule.
			CO3	Understand the concept and point group and apply it to molecules.
			CO4	To apply the concept of point group for determining optical activity and dipole

				moment.
			CO5	To understand product of symmetry operations.
			CO6	Student able to find out character for reducible representation.
			CO7	To know about projection operator.
			CO8	Apply projection operator to find out the normalized wave function for atomic orbital
			CO9	Student should correlate the application of symmetry to spectroscopy.
			CO10	From the previous knowledge of symmetry student must able to find out which mode are IR active.
			CO11	Student should understand the detail chemistry of S and P block elements w.r.t. their compounds, their reactions and applications.
			CO12	To learn the advance chemistry of boranes, fullerene, zeolites, polymers etc.
			CO13 CO14 CO15 CO16	Organometallic chemistry of some important elements from the main groups and their applications
M.Sc. I	CCTP-3:CHO-150	Organic Chemistry-I	CO1	At the end of the course the students will know and recall the fundamental principles of organic chemistry that include chemical bonding, nomenclature, structural isomerism, stereochemistry, chemical reactions and mechanism.
			CO2	They will understand the **c**riteria for aromaticity in nonbenzenoid molecules and other advanced polycyclic aromatics
			CO3	Understand the chemistry of monocyclic heterocycles, nomenclature and reactions
			CO4	Learn the concept stereochemistry and its importance; their rules and the concept of chirality.
			CO5	Understand the role of various reaction intermediates like carbocation, carbanion, carbenes, radicals, and nitrenes in organic reactions; concept of NGP.
			CO6	Able to describe mechanism of different rearrangement reactions. Appreciates the

				various steps involved in the molecular rearrangements.
			CO7	Understand the chemistry of Ylides.
			CO8	Use synthetic reagent of oxidation and reduction for solving the problems
			CO9	To understand some fundamental aspects of organic chemistry, to learn the concept aromaticity, to understand the various types of aromaticity.
			CO10	To study heterocyclic compound containing one and two hetero atoms with their structure, synthesis and reactions.
			CO11	To know stereochemistry of organic compounds; able to do interconversion of Fischer to Newmann, Newmann to Sawhorse and vice versa, Able to assign R and S to given molecules; understand stereoselective and stereospecific reactions; acquire knowledge on topicity.
			CO12	To study structure, formation, stability and related name reaction of intermediates like Carbocation, Carbanion, Free Radical, Carbenes and nitrenes; Recognize neighboring group participation.
			CO13	To study rearrangement reaction with specific mechanism and migratory aptitude of different groups.
			CO14	To study Ylides and their reaction.
			CO15	To understands the basis of redox reaction; acquire knowledge about the reagents which causes selective oxidation
			CO16	reduction in various compounds; learn the basic mechanism of oxidation / reduction in organic compounds.
M.Sc. I	CBOP-1: CHG – 190	General Chemistry-I	CO1	The goal of this course is to introduce students to fundamental concepts in Chemical Biology and methods of chemistry used to solve problems in molecular and cell biology. After completion of this course, successful students will .
			CO2	Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.

			CO3	Students will be able to function as a member of an interdisciplinary problem solving team.
			CO4	To impart the students thorough idea in the chemistry of carbohydrates, amino acids, proteins and nucleic acids etc.
			CO5	Be able to describe the chemical basis for replication, transcription, translation and how each of these central processes can be expanded to include new chemical matter.
			CO6	Develop skills to critically read the literature and effectively communicate research in a peer setting.
M.Sc. I	CCPP-1: CHP-107	Practical Course – I	CO1	At the end of the course the students will know and recall the fundamental principles of organic chemistry that include research and development , further
			CO2	Determination of an order of a reaction.
			CO3	Application of Colorimetry and spectrophotometry.
			CO4	Study of Radioactivity.
			CO5	Green Chemistry principles and application in organic transformations.
			CO6	Application of few efficient catalyst in the organic reaction.
SEMESTER II				
M.Sc. I	CCTP-4: CHP-210	Physical Chemistry-II	CO1	At the end of the course the students will know and recall the fundamental principles of physical chemistry and inorganic chemistry oriented reactions and effects of parameters, in addition to

				this student would be skilled in understanding
			CO2	Types of molecule on the basis of moment of inertia and rotational spectra.
			CO3	Spectroscopic technique such as Infra-red Spectroscopy, breakdown of the Born-Oppenheimer approximation,
			CO4	carbon dioxide laser and Applications.
			CO5	Quantum and classical theory of Raman effect.
			CO6	Electronic Spectroscopy of molecules
			CO7	radioactive decay and its characteristics
			CO8	Process of nuclear fission and fission.
M.Sc. I	CCTP-5: CHI-230	Inorganic Chemistry, Semester – II	CO1	Student should able to find out the no of microstates and meaningful term symbols, Construction of microstate table for various configuration.
			CO2	Hund's rules for arranging the terms according to energy.
			CO3	Student should know the concept of weak and strong ligand field.
			CO4	Student should know basic d-d transition, d-p mixing, charge transfer spectra.
			CO5	Interpretation of electronic spectra for spin allowed oh and td complexes using Orgel diagram.
			CO6	Understand the concept of spectro chemical series and Nephelauxetic series.
			CO7	Various phenomenons of magnetism and their temperature dependence.
			CO8	Various experimental methods to find out magnetic moment.
			CO9	Understand the various Quenching of orbital angular momentum.
			CO10	Understand the various terms involved in magnetochemistry.
			CO11	Should able to solve numerical based on crystal field parameters.
			CO12	Interpretation of electronic spectra for spin allowed oh and td complexes using Orgel diagram
			CO13	Role of metals in Metalloprotein and metalloenzymes.

			CO14	Importance and transport of metal ions
			CO15	Nerve impulse generation in rod cell of retina.
			CO16	Importance and function of Ca, Fe and Mg in metalloprotein.
M.Sc. I	CCTP-6:CHO – 250	Organic Chemistry-II	CO1	Students should able to understand free radicals' formation, stability and reactivity and should also be able to use the basic understanding in writing probable reaction mechanisms.
			CO2	Students should able to write MO diagram for various olefinic compounds and should able to predict the products, the stereochemistry as well as should able to understand the preferred reaction pathways.
			CO3	Students should able to calculate □max of organic compounds containing more than one and less than four conjugated systems. Students should able to correlate IR bands with functional groups using numerical data as well as spectral data.
			CO4	Students should able to solve 1H-NMR problems and should also able to draw the 1H-NMR spectrum for simple organic compounds mentioning multiplicity pattern and coupling constant with the help of "Tree Diagram" Should able to predict and analyze the multiplicity patterns with more than one coupling constants.
			CO5	Students should able to use 13C-NMR data to interpret the structure NMR problems and should also able to draw the 1H-NMR spectrum for simple organic compounds mentioning multiplicity pattern and coupling constant with the help of "Tree Diagram" Should be able to predict and analyze the multiplicity patterns with more than one coupling constants.
			CO6	Students should know various key factors responsible for the spectroscopic data acquisition and should able to solve Problems based on UV, IR, MS, 1H-NMR,13CNMR.

			CO7	MOT and will be able to extend this in predicting reaction mechanism and Stereochemistry of electrocyclic reactions.
			CO8	The concepts in free radical reactions, mechanism and the stereo chemical outcomes
			CO9	The basic principle of spectroscopic methods and their applications in structure elucidation of organic compounds using given spectroscopic data or spectra.
M.Sc. I	CBOP-2: CHG – 290	General Chemistry -II	CO1	The goal of this course is to introduce students to fundamental concepts in Chemical Biology and methods of chemistry used to solve problems in molecular and cell biology. After completion of this course, successful students will:.
			CO2	Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.
			CO3	Students will be able to function as a member of an interdisciplinary problem solving team.
			CO4	To impart the students thorough idea in the chemistry of carbohydrates, amino acids, proteins and nucleic acids etc
			CO5	Be able to describe the chemical basis for replication, transcription, translation and how each of these central processes can be expanded to include new chemical matter.
			CO6	Develop skills to critically read the literature and effectively communicate research in a peer setting.
			CO7	Describe the importance of chemical biology research and interdisciplinary work.
	CCPP-2: CHP-227	Practical Course-II	CO1	This course is designed to make students aware of how to perform organic compounds in laboratory.

			CO2	The course includes synthesis of some derivatives and organic compounds, which will help them while working in research laboratory in future.
			CO3	Making derivatives of organic compounds will help them in industry or while doing research in medicinal chemistry for Drug development.
			CO4	This practical course is also designed to make student aware of green chemistry and role of green chemistry in pollution reduction.
			CO5	The students learn how to avoid solvents and do solvent free reaction.
			CO6	Also the work-up procedure in many experiments is made more eco-friendly to environment.
SEMESTER III				
M.Sc. II	CCTP-7, CHO-350	Organic Reaction Mechanism and Biogenesis	CO1	After successfully completing this course, students will be able to: Explain the Reaction Mechanisms.
			CO2	Free radical generation , stability and their application.
			CO3	Cleavage of C-Heteoatom and formation of free radicals.
			CO4	Linear Free Energy Relationships with Hammet equation, deviation and effects of substituents on the ring.
			CO5	.Insight of alkaloids, Terpenoids and The Shikimate pathway.
			CO6	Alkaloids isolated from the Roots of Piper nigrum.
M.Sc. II	CCTP-8, CHO-351	Structure Determination of Organic Compounds by Spectroscopic Methods	CO1	After successfully completing this course, students will be able to: Explain principles of NMR techniques.
			CO2	NOE and its application.
			CO3	APT, DEPT and INEPT techniques.
			CO4	Elucidation of organic compounds, catalysts and biomolecules
			CO5	COSY and TOCSY techniques of NMR.
			CO6	2D-INADEQUATE, 2D- ADEQUATE,

				NOESY, ROESY (b) Heteronuclear: HSQC, HMQC and HMBC techniques.
			CO7	Principles of Mass Spectrometry
			CO8	ionization methods like EI, CI, ES, MALDI and FAB-Fragmentation.
			CO9	Isotopic Abundance in structure establishment.
			CO10	Analysis of Biomolecules.
			CO11	Structure elucidation using UV using different techniques.
M.Sc. II	CCTP-9, CHO-352	Stereochemistry and Asymmetric Synthesis of Organic Compounds	CO1	After successfully completing this course, students will be able to: Stereochemistry of polysubstituted cyclohexane, six membered rings with SP2 carbon, heterocycles with N and O.
			CO2	stereochemical principles involved in reactions of six membered rings and other than six membered rings.
			CO3	Stereochemistry of fused and bridged ring systems.
			CO4	Nomenclature, synthesis; stereochemical aspects of Perhydrophenanthrene.
			CO5	Perhydroanthracene, hydrindane, Steroids; Bridged system.
			CO6	Conformations of substituted cyclohexanes.
			CO7	Determination of configuration,
			CO8	Resolution and analysis of stereomers - formation of racemization and methods of resolution.
			CO9	Asymmetric Synthesis, Chirol pool and Chiral auxillaries.
			CO10	Transition Metal-Catalyzed Homogeneous Asymmetric Hydrogenation.
			CO11	Transition Metal-Catalyzed Homogeneous Asymmetric Hydroxylation and Epoxidation
M.Sc. II	CHO-353(B)	Designing Organic Syntheses and Heterocyclic Chemistr	CO1	After successfully completing this course, students will be able to explain: Concepts of Retrosynthes**is**
			CO2	Retrosynthetic analysis.
			CO3	disconnection approach, Synthons, multiple step synthesis.

			CO4	Retrosynthesis and synthesis of following Molecules: Strychnine, Reserpine, Thienamycin, Asteltoxin, Indolizomycin, Erythronolide B.
			CO5	Systematic nomenclature monocyclic, fused and bridged heterocycles.
			CO6	General chemical behaviour of heterocyclic compounds and their applications.
			CO7	Common Methods in Ring Synthesis of Aromatic Heterocyclic Systems.
	CCPP-3, CHO-354	Practical-I Solvent Free Organic Synthesis	CO1	After successfully completing this course, students will be able to: Explain Solvent Free Carbon–Carbon Bond Formation.
			CO2	Solvent-Free C–N Bond Formation
			CO3	Solvent-Free C–S Bond Formation
			CO4	Solvent-Free C–X Bond Formation
			CO5	Solvent-Free N–N Bond Formation
			CO6	Solvent free supramolecular assembly formation
SEMESTER IV				
M.Sc. II	CCTP-10, CHO-450	Chemistry of Natural Products	CO1	After successfully completing this course, students will be able to learn: Understanding and planning of total synthesis while maintaining the stereochemistry.
			CO2	Explain total Synthesis Hirsutellone.
			CO3	Explain total Synthesis Ribisins.
M.Sc. II	CCTP-11, CHO-451	Organometallic Reagents in Organic Synthesis	CO1	After successfully completing this course, students will be able to: Explain use of transition metal complexes in organic synthesis.
			CO2	Explain C=C formation reactions.
			CO3	Illustration of Ring formation reactions.

			CO4	Idea behind the Click chemistry: criterion for click reaction.
			CO5	Explain concept of Metathesis.
			CO6	Explain the use of Boron and Silicon reagents in organic synthesis
			CO7	
			CO8	
			CO9	
			CO10	
			CO11	Illustrate the preparation and management of fish culture ponds.
			CO12	Demonstrate the methods of packaging and transport of fish and brood fish.
			CO13	Illustrate techniques of fish harvesting, preservation & processing.
			CO14	Compare the techniques used in fishery development.
M.Sc. II	CBOP-4, CHO-452(A)	Concepts and Applications of Medicinal Chemistry	CO1	After successfully completing this course, students will be able to: Explain Proteins as biological catalyst Nucleic acids.
			CO2	Explain Principle of drug design, Chemistry of diseases and Drug development.
			CO3	Explain Peptides, sequencing and applications in therapeutics.
			CO4	Explain Design of Oxamniquine.
			CO5	Explain Pharmacokinetics and Pharmacodynamics.
			CO6	Explain Structure and activity Relationship: QSAR And application.
M.Sc. II	CBOP-5, CHO-453	Practical-III Section-I: Ternary Mixture Separation Section-II: Carbohydrates Synthesis and Isolation Natural Products	CO1	After successfully completing this course, students will be able to: Understand and employ concept of type determination and separation
			CO2	Perform qualitative estimation of functional groups
			CO3	Recrystallize /distill the separated compounds.
			CO4	Carbohydrate Synthesis.
			CO5	Isolation of pigments from the natural products.
			CO6	Isolation of essential oils from the natural products.

			CO7	Isolation of medicinally important component from the natural products
			CO8	Students should carry out a small research project.
			CO9	Becomes familiar with i. Literature survey, research methodologies, Column and TLC chromatographic techniques
M.Sc. II	CCPP-04, CHO-454: Practical-II:	Convergent and Divergent Organic Syntheses	CO1	After successfully completing this course, students will be able to: Learn convergent Synthesis involving acylation, reduction.
			CO2	Divergent Synthesis involving acylation, nitration, One pot synthesis,
			CO3	Resolution technique)
			CO4	Sulfonation reaction
			CO5	Three Stage Syntheses.