

**M.Sc. Chemistry
CO-PO Mapping**

SEMESTER-I															
Course Code	Course	Course Outcomes	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	
CHH501B	Physical Chemistry-I	CO1	Learn the experimental methods to determine mean activity coefficient	1	-	1	-	-	-	-	-	-	-	1	
		CO2	Comprehend the need for modification in the Debye-Hückel Theory	1	-	3	-	-	1	-	-	-	-	-	1
		CO3	Understand the basics of Quantum mechanics	1	-	-	-	1	-	-	-	-	1	-	1
		CO4	Identifies correctly the mathematical space that contains all possible states	1	-	2	-	1	1	-	-	-	1	-	1
CHH502B	Inorganic Chemistry-I	CO1	Understand the theories of bonding in coordination compounds and Identify the type of metal-ligand bonding/ distortions in transition metal complexes.	1	-	1	-	-	-	-	-	-	-	1	
		CO2	Understand the electronic spectra of transition metal complexes and interpret structural information from the electronic spectral data	1	-	3	-	-	1	-	-	-	-	-	1
		CO3	Understand the basics of Organometallic compounds and identify their role in catalysis	1	-	-	-	1	-	-	-	-	1	-	1
		CO4	Understand the basic of metal carbonyls and interpret the bonding and structure from its vibrational spectra.	1	-	2	-	1	1	-	-	-	1	-	1
CHH503B	Organic Chemistry-I	CO1	To understand and enhance the knowledge of the students towards reaction intermediates and its use in synthesis	3	-	-	3	3	-	-	-	2	2	3	
		CO2	Develop the ability to demonstrate the reaction mechanism of organic reaction towards nucleophilic substitution reaction	3	-	-	3	3	-	-	-	2	2	3	
		CO3	To develop the ability to synthesize different aromatic organic compounds and identify the mechanism and reasons of the formation of the desired product towards nucleophilic and electrophilic reactions	3	2	-	3	3	-	-	-	2	2	3	
		CO4	To develop the ability to identify the neighbouring group behavior of the molecules in nucleophilic reaction	3	2	-	3	3	-	-	-	2	2	3	
CHH504B	Analytical Chemistry	CO1	Understand the basics of analytical tools, data collection and design of analytical instruments	2	2	-	-	3	3	2	2	2	2	2	
		CO2	Analyze the working, instrumentation, principle, recording of the result obtained through latest analytical techniques	3	3	-	-	3	3	2	2	2	2	2	
		CO3	Able to evaluate data obtained from various techniques and apply them in chemical industries	3	2	-	-	2	3	2	2	2	2	2	
		CO4	Apply the concept of hyphenated instrumentation for molecular structural determination for various chemical industries	2	3	-	-	3	3	2	2	2	2	2	
SEMESTER-II															
Course Code	Course	Course Outcomes	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	
CHH505B	Laboratory-I	CO1	To be able to perform common laboratory techniques including reflux, distillation, recrystallization, vacuum filtration, and thin-layer chromatography	-	1	-	1	-	-	2	1	1	1	2	
		CO2	To be able to interpret detailed organic structure analysis	-	1	-	1	-	-	1	2	1	2	1	
		CO3	To be able to estimate the metals by gravimetrically or titrimetric ally	-	1	-	1	-	-	2	2	1	2	1	

CHH506B	Physical Chemistry-II	CO1	explain the connection between classical statistical mechanics and quantum statistical mechanics	1	-	1	-	-	-	-	-	-	-	1	
		CO2	define and discuss the Boltzmann distribution and the role of the partition function	1	-	2	-	-	1	-	-	-	-	-	1
		CO3	Identify and describe different diffraction methods	1	-	-	-	1	-	-	-	1	-	-	1
		CO4	To understand the different theories of chemical kinetics	1	-	2	-	1	1	-	-	1	-	-	1
CHH507B	Inorganic Chemistry-II	CO1	Identify the products formed while studying the reaction mechanism of coordination complexes	-	-	-	1	-	2	-	3	-	-	1	
		CO2	Understand the use of different precursors in industrial manufacturing of certain product with same molecular formula but different configuration	-	1	-	-	2	-	3	-	-	-	1	
		CO3	Understand the use of electron transfer reactions and shall demonstrate an ability to display reactant compounds, conditions like temp, pressure and concentrations carried out in chemical laboratory	-	1	-	-	-	-	2	-	3	-	-	-
		CO4	Understand the impact of chemical end product development in formulation of drug synthesis and in various chemical industries	1	2	-	-	-	3	-	-	-	-	-	1
		CO5	Develop the understanding of thermal and optical electron transfer reactions	-	-	1	-	-	2	-	3	-	-	-	-
CHH508-B	Organic Chemistry II	CO1	Distinguish between the mechanism of nucleophilic addition reactions, elimination reactions.	-	2	-	3	3	-	-	2	-	2	2	
		CO2	Apply the Huckel's rule to determine the concept of aromaticity	1	-	-	-	-	-	-	2	-	2	2	
		CO3	Understand the concept of linear free energy relationship, Hammett Equation	-	-	-	-	-	-	1	-	-	-	-	2
		CO4	Synthesis the advanced Heterocyclic compounds and understand its importance	-	2	2	3	-	-	-	3	-	3	3	
		CO5	Develop confidence for self-education and ability for life-long learning	-	-	-	-	-	-	-	3	-	3	-	-
CHH509B	Molecular Spectroscopy	CO1	To understand the UV-Visible, Molecular Luminescence & Vibrational Spectroscopy.	-	3	-	-	-	3	1	1	-	1	2	
		CO2	To demonstrate the principles of ¹ H-NMR & ¹³ C-NMR Spectroscopy.	-	3	-	-	-	3	1	2	-	2	3	
		CO3	To learn the interpretation of NMR spectra for identification of compounds.	-	3	-	-	-	3	1	2	-	1	1	
		CO4	To analyze the fragmentation pattern of the compound by mass spectroscopy.	-	3	-	-	-	3	1	2	-	1	2	
CHH510B	Laboratory-II	CO1	To define the qualitative and quantitative analysis of inorganic and organic compounds	-	1	-	1	-	-	2	1	1	1	2	
		CO2	To understand the methods of analysis of components of mixtures with high accuracy	-	1	-	1	-	-	1	2	1	2	1	
		CO3	To apply the theoretical concept of spectroscopy to identify structure of different molecules.	-	1	-	1	-	-	2	2	1	2	1	
		CO4	To study the reaction rate or kinetics of a reaction	-	1	-	1	-	-	2	1	1	1	2	
RDO503	Scientific Research-I	CO1	The student shall be able to describe research and its impact.	2	2	-	2	2	3	3	3	2	2	2	
		CO2	The student shall be able to identify broad area of research, analyze, the processes and procedures to carry out research.	2	2	-	2	2	2	2	2	2	2	2	2
		CO3	The student shall be able to use different tools for literature survey	-	-	-	-	-	2	3	2	-	-	-	-
		CO4	The student is able choose specific area of research and supervisor/mentor is finalized	-	-	-	-	-	3	2	2	-	-	-	-
		CO5	To understand and adopt the ethical practice that are to be followed in the research activities	-	-	-	-	-	2	3	3	-	-	-	-
		CO6	To work in groups with guidance	-	-	-	-	-	3	3	3	-	-	-	-

SEMESTER-III														
Course Code	Course	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	
CHH601B	Symmetry & Group Theory	CO1	Understand point group representation of various molecules	1	-	-	1	-	2	-	-	-	2	-
		CO2	Apply basics of group theory to identify the symmetry operations and symmetry elements in various molecules	1	2	-	-	2	-	2	-	-	1	-
		CO3	analyze reducible and irreducible representations	1	-	2	-	-	-	2	-	2	-	2
		CO4	analyze direct product of various reducible and irreducible representations	1	-	2	-	-	2	-	-	-	1	-
		CO5	create the co-relation diagram for terms splitting in different geometrical environment	1	-	2	2	-	2	-	-	-	-	2
		CO6	apply the basics of group theory for different applications in spectroscopy, hybridization and other vibrational modes of molecules	-	1	-	-	2	2	-	-	-	-	2
CHH602B	Physical Special I: Magneto-chemistry, Chemical Kinetics, Catalysis & ion transport	CO1	understand the knowledge of magnetochemistry and its application	1	-	1	-	-	-	-	-	-	-	1
		CO2	understand knowledge and applications of kinetics and electrochemistry	1	-	2	-	-	2	-	-	-	-	1
		CO3	understand knowledge and applications of Uncatalyzed and platinum group metals	1	-	-	-	1	-	-	-	1	-	1
		CO4	understand the concept of Ion Transport in solutions	1	-	1	-	3	1	-	-	1	-	1
CHH604B	Physical Elective-I Advanced Spectroscopy	CO1	understand the knowledge of Molecular Structure and Spectroscopy Spectroscopic methods	1	-	1	-	-	-	-	-	-	-	1
		CO2	understand knowledge and applications of Introduction to rotational spectroscopy	1	-	2	-	-	2	-	-	-	-	1
		CO3	understand knowledge of Vibrational spectroscopy:	1	-	-	-	1	-	-	-	1	-	1
		CO4	understand the concept of Electronic and NMR spectroscopy	1	-	1	-	3	1	-	-	1	-	1
CHH605B	Physical Elective-II: Advanced Chemical Kinetics (CHH605B)	CO1	Student will be able to understand the knowledge of advanced chemical kinetics	1	-	1	-	-	-	-	-	-	-	1
		CO2	Student will be able to understand the knowledge of Enzyme kinetics:	1	-	2	-	-	2	-	-	-	-	1
		CO3	understand knowledge Reaction Dynamics I:	1	-	-	-	1	-	-	-	1	-	1
		CO4	understand the concept of Reaction Dynamics II:	1	-	1	-	3	1	-	-	1	-	1
CHH603B	Physical Special II: Irreversible thermodynamics, Transport Phenomenon, Photochemistry & Fast Reaction	CO1	understand the knowledge of Irreversible thermodynamics	1	-	1	-	-	-	-	-	-	-	1
		CO2	understand knowledge of transport phenomenon	1	-	2	-	-	2	-	-	-	-	1
		CO3	understand knowledge of photochemistry & Fast reactions	1	-	-	-	1	-	-	-	1	-	1
		CO4	understand the concept of Photochemistry	1	-	1	-	3	1	-	-	1	-	1
CHH606B	Physical Laboratory	CO1	Student will be able to the exposure of practical aspects of kinetics of the reactions & different potentiometric titrations.	1	-	1	-	-	-	-	-	-	-	1
		CO2	Student will be able to understand the Kinetics of oxidation of alcohols/diols by aqueous alkaline	1	-	2	-	-	2	-	-	-	-	1
		CO3	Student will be able to understand the Kinetics of oxidation of aliphatic/cyclic alcohols/glycols by alkaline hexacyanoferrate(III) catalyzed by ruthenium (III) chloride	1	-	-	-	1	-	-	-	1	-	1
		CO4	Student will be able to understand the Kinetics of iridium (III) catalyzed oxidation of aromatic aldehydes/aromatic	1	-	1	-	3	1	-	-	1	-	1
CHH608B	Inorganic Special-I: Organometallic Chemistry of Transition Metals & Bio Inorganic Chemistry	CO1	Understand the concept of nomenclature in organometallic compounds and identify the specific characteristics of ligands	-	-	-	-	1	-	-	-	-	-	1
		CO2	Understand the various reaction types and their mechanisms in various catalysis reaction by organometallic compounds	1	-	-	-	1	-	-	-	-	-	1
		CO3	Analyze the impact of various inorganic compounds for different biological activities by understanding the fundamentals of bioinorganic chemistry.	-	-	-	-	1	-	-	-	-	-	1
		CO4	Understand the role of metal ions in organometallic compounds for various replication/ transcription processes for their applicability in biosensor and other applications.	1	-	-	-	1	-	-	-	-	-	1

CHH609B	Inorganic Special-II: Supramolecular Chemistry & Metal Clusters	CO1	Identify the importance of macrocyclic and supramolecular compound with understanding in template synthesis	2	-	-	-	1	-	-	-	-	-	1	
		CO2	Investigate on molecular recognition by various bonding parameters, chelation and macrocyclic effects	2	-	-	-	1	2	-	-	-	-	-	1
		CO3	Understand the chemical properties of inorganic rings, cages and metal clusters and various classifications properties and applications of silicates and aluminosilicates.	2	-	-	-	1	-	-	-	-	-	-	1
		CO4	Familiarize in synthesis and characterization techniques of metal cluster compounds and finding there appropriate applications in industry.	2	-	-	-	1	2	-	-	-	-	-	1
CHH610B	Inorganic Elective-II: Solid State Materials	CO1	Students shall be able to understand the electronic, electric and optical behaviour of inorganic materials	1	-	-	1	-	2	-	2	-	-	-	
		CO2	Gain knowledge of methods of synthesis of solid state materials	1	2	-	-	2	-	1	2	-	-	-	
		CO3	Understand the basics of inorganic polymers and solid state lasers	1	-	2	-	-	-	1	-	-	-	-	2
		CO4	Learn about the mesoporous compounds and their catalytic properties for industrial applications	1	-	2	-	-	3	1	2	-	-	-	-
CHH611B	Inorganic Elective: Inorganic and Biological Catalysis	CO1	Understand the different homogeneous catalysis reactions with mechanisms and identifying their selectivity for variety of chemical reactions	1	-	-	-	1	-	-	-	-	-	1	
		CO2	Understand the concept of heterogenous catalyst, its specification and functionality for various reactions	1	-	-	-	1	-	-	-	-	1	1	
		CO3	Identify the industrially important reactions involved with inorganic compounds as catalyst to categorize and scale up.	1	-	-	-	1	-	-	-	-	-	-	1
		CO4	Identify the problem of metal ions on their reactions with biological systems with basic fundamentals about toxification and detoxification.	1	-	-	-	1	-	-	-	-	1	1	-
CHH612B	Inorganic Chemistry Lab	CO1	Students will be able to hands on laboratory exposure to the synthesis of coordination complexes and quantitative analysis of the inorganic mixtures	1	-	-	-	-	2	-	3	-	3	-	
		CO2	Learn the analysis of inorganic ions present in a matrix	1	-	-	-	2	-	3	-	-	3	-	

CHH613B	Organic Special-I: STATISTICAL STEREOCHEMISTRY & ASYMMETRIC SYNTHESIS	CO1	To understand the nomenclature, conformation, configuration, representation and interconversion of cyclic and acyclic. Molecules and learn and assign about relative and absolute configuration.	3	-	2	-	2	-	-	-	3	-	3	
		CO2	To find and assign the relationship between the molecules: homologues, conformational, configurational, epimers, anomers, geometrical, optical, enantiomers, identical, diastereomers etc.	3	-	2	-	2	-	-	-	-	3	-	3
		CO3	To find the topicity of ligands, lone pairs and faces, their nomenclature along with the prochirality nomenclature i.e. Pro-R, Pro-S, Re and Si.	3	-	2	-	2	-	-	-	-	3	-	3
		CO4	To learn the application of various methodologies used in asymmetric synthesis.	3	-	2	-	2	-	-	-	-	3	-	3
CHH614B	Organic Special -II: Photochemistry & Pericyclic Reaction	CO1	Understand the Concepts of organic photochemical reactions in organic Synthesis	3	-	2	-	2	-	-	-	3	-	3	
		CO2	Develop the ability to demonstrate the mechanism of pericyclic reactions & Photochemical reactions of Alkenes & carbonyl Compounds	-	3	-	2	-	-	-	-	-	-	-	2
		CO3	Suggest the Mechanism of various types of cleavages in photochemical reactions of carbonyl compounds	-	3	-	-	-	-	-	-	-	2	-	2
		CO4	Explain the Pericyclic reactions with the support of various Theories	-	3	-	-	-	-	-	-	-	3	-	3
		CO5	Develop confidence for self-education and ability for life-long learning	-	-	-	-	-	-	-	2	-	-	3	-
CHH615B	Organic Elective: Modern Organic Synthetic Techniques	CO1	To understand the mechanisms for organic Name reactions.	3	-	-	2	3	-	1	3	3	1	2	
		CO2	To apply the understanding of organic mechanisms to predict the outcome of reactions	3	-	-	2	3	-	1	3	3	1	3	
		CO3	To evaluate the synthesis of organic molecules.	3	-	-	2	3	-	1	3	2	1	2	
		CO4	To analyze reactivity and stability of an organic molecule based on structure.	3	-	-	1	3	-	1	2	3	1	2	
		CO5	To create route of new synthetic reagents.	2	-	-	2	3	-	1	3	3	1	2	
		CO6	To evaluate the retro synthesis of Organic compounds	3	-	-	2	3	-	1	3	3	1	2	
CHH616B	Organic Special- Elective: Bioorganic Chemistry	CO1	Understand the concept of enzymes, different theories of catalytic activity and typical enzyme mechanisms	-	-	2	-	1	1	-	-	-	-	-	
		CO2	Understand the biomimetic chemical approach to biological systems, explore some host molecules and industrially important enzymes.	-	-	2	-	1	1	-	-	-	-	-	
		CO3	Identify the recombinant DNA and fermentation technology, apply genetic engineering concepts for diagnosis of diseases and learn the basics of Industrial fermentation.	-	-	1	-	1	1	-	-	-	-	-	
		CO4	Learn the concept of coenzymes, co-factors and its classifications and their functions reactions catalyzed by the above coenzymes.	-	-	1	-	1	1	-	-	-	-	-	
CHH617B	Organic Special- Elective: Chemistry of Natural Products	CO1	Investigate the type of the natural products, its biosynthesis and reactions involve in biosynthesis.	2	-	1	-	1	-	-	-	2	-	-	
		CO2	Understand the classification, structural determination, isolation of terpenoids and structural determination of carotenoids	2	-	1	-	1	-	-	-	2	-	-	
		CO3	Understand the definition, nomenclature, occurrence, isolation, general methods of structure elucidation of alkaloids and its synthesis	1	-	1	-	1	-	-	-	2	-	-	
		CO4	Learn about the skeleton of steroids, applications, plant pigment synthesis and its structural determinations	2	-	1	-	1	-	-	-	2	-	-	

CHH618B	Organic Laboratory	CO1	To understand the isolation of natural products.	3	2	2	-	2	-	-	-	3	-	1
		CO2	To familiarize with synthesis of organic compounds	3	2	2	-	2	-	-	-	3	-	1
		CO3	To familiarize with separation of organic compounds	3	2	2	-	2	-	-	-	3	-	1
		CO4	To understand the reaction mechanism involved during synthesis of organic compounds	3	2	2	-	2	-	-	-	3	-	1
RDO603	Scientific Research-II	CO1	The students will be able to critically evaluate the work done by various researchers relevant to the research topic	-	-	-	-	-	3	2	3	-	-	-
		CO2	To integrate the relevant theory and practices followed in a logical way and draw appropriate Conclusions	-	-	-	-	-	2	3	3	-	-	-
		CO3	To structure and organize the collected information or findings through an appropriate abstract, headings, reference citations and smooth transitions between sections	-	-	-	-	-	3	3	2	-	-	-
		CO4	To understand the research methodologies/approaches/techniques used in the literature	-	-	-	-	-	3	3	3	-	-	-
SEMESTER-IV														
Course Code	Course	Course Outcomes	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CHN619B	Major Project	CO1	To apply theoretical knowledge and practical skills to a research project and on the collection and analysis of scientific data	3	3	1	-	3	3	-	-	2	2	-
		CO2	Work independently and collaboratively with peers to bring the project to satisfactory completion	3	3	1	-	3	3	-	-	2	2	-
		CO3	Communicate a scientific argument convincingly at a level and style appropriate to the audience	3	3	2	-	3	3	-	-	2	2	-