



PDEA's  
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Hadapsar Pune - 411028.



## 2.6.2 - Attainment of Programme outcomes and course outcomes are evaluated by the institution.

### Department of Chemistry COPO Attainment and Mapping M. Sc. Year 2021-22

M. Sc. Organic Chemistry	
<b>General</b>	
PO1	Students will be able to use the evidence based comparative chemistry approach to explain the chemical synthesis and analysis.
PO2	The students will be able to understand the characterization of materials.
PO3	Students will be able to understand the basic principle and handling of equipment's, instruments used in the chemistry laboratory and to demonstrate the experimental techniques and methods of their area of specialization in Chemistry.
PO4	Enable students acquire jobs in R and D, QC and QA in scientific laboratories, industries, teaching at college level, management, marketing and sales in public sector organizations and pursue research.
PO5	Disciplinary knowledge and skill: The student will be capable of using of advanced instruments and related soft-wares for in-depth characterization of materials/chemical analysis and separation technology.
<b>Subject specific</b>	
PO6	Analyze problem, formulate a hypothesis, evaluate the results and draw reasonable conclusions.
PO7	Interpretation and data analysis of UV, IR, NMR, CMR, Mass spectroscopic technique.
PO8	Able to set up industrial unit related to chemical science.
PO9	Synthesis of Natural products and drugs by using proper mechanisms and mole concept.
PO10	Literature survey and research methodology.
<b>Institutional</b>	
PO11	To inculcate moral and ethical values and create social awareness.

PO12	To train manpower in accordance with global perspectives.
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After successfully completing **M.Sc. Organic Chemistry**  
Programme students will be able to:  
**Course Outcome (CO)**

<b>M. Sc.-I Organic (Semester-I) 2019 Pattern</b>	
<b>CHP:- -110 Fundamentals of Physical Chemistry [Credit -4, 48 L]</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> To describe Kinetics of different orders of reaction and Kinetics of complex reaction.
CO2:	<b>Understanding:</b> To explain the basic Principles of classical and statistical thermodynamics.
CO3:	<b>Applying:</b> To determine the thermodynamics of mixtures and colligative properties.
CO4:	<b>Analyzing:</b> To categorize historical development of quantum mechanics and to find Schrodinger wave equation of particle in 1-d box.
CO5:	<b>Evaluating:</b> Predict the quantum mechanical based problems.
<b>CHI:- -130 Inorganic Chemistry [ Credit-4 , 48 L]</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> Student should identify the visualize/ imagine molecules in 3 dimensions.
CO2:	<b>Understanding:</b> To understand the elements of symmetry and should be able to apply symmetry elements and their operations on different molecules.
CO3:	<b>Applying:</b> They should be able to analyze and construct character table for a given point group.
CO4:	<b>Analyzing:</b> Students should know the concept of SALC.
CO5:	<b>Evaluating:</b> Predict the character table and SALC equation for different point groups.
<b>CHO:- -150 Basic Organic Chemistry (Credit-4, 48L)</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> To recall heterocyclic compound containing one and two hetero atoms with their structure, synthesis and reactions.
CO2:	<b>Understanding:</b> To understand some fundamental aspects of organic chemistry, to learn the concept aromaticity, to understand the various types of aromaticity.
CO3:	<b>Applying:</b> To determine 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.
CO4:	<b>Analyzing:</b> To discriminate structure, formation, stability and related name reaction of intermediates like Carbocation, Carbanion, Free Radical, Carbenes and nitrenes; Recognize neighboring group participation.

CO5:	<b>Evaluating:</b> Judge what type of reagent need for the organic Conversion
<b>CHG-190: Introduction to solid state of matter [Credit 2,24 L]</b>	

The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> Memorize the Bonding in solids – band theory.
CO2:	<b>Understanding:</b> To explain the Semiconductors, photoconductivity.
CO3:	<b>Applying:</b> To determine the Non-stoichiometry, defects and types of defects in solids.
CO4:	<b>Analyzing:</b> To analyze Ionic conductivity and their applications.
CO5:	<b>Evaluating:</b> Compare the different types of conductor
<b>CHP-107: Practical Course-I - Basic Practical Chemistry-I [Credit -4]</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> Describe the preparation of solution and calibration of the instrument according to respective practical's.
CO2:	<b>Understanding:</b> Differentiate the experiment of non-instrumental methods like chemical kinetics, viscosity, partial molar volume and steam distillation.
CO3:	<b>Applying:</b> Determine the concentration of sample by conductometry, potentiometry, pH-metry colorimetry and spectrophotometrically.
CO4:	<b>Analysing:</b> Calculate the concentration of solutions.
CO5:	<b>Evaluating:</b> Predict the needs of every experiment including instrumental and non-instrumental.
<b>CHG-190: Section-II: General Chemistry Practical Inorganic Chemistry-Material Analysis, Synthesis and Applications [Credit-2]</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> Examine the laboratory glassware's, hazardous chemicals, and safety in laboratory.
CO2:	<b>Understanding:</b> Students are generalize the aware of safety techniques and handling of chemicals. .
CO3:	<b>Applying:</b> To construct the assembling of different glass apparatus such as oxhlet apparatus. Distillation unit, column of chromatography, Rota evaporator.
CO4:	<b>Analyzing:</b> Students are categorize the different types of reactions and their workup methods
CO:5	<b>Evaluating:</b> Summarise inorganic material analysis, synthesis and applications.
<b>M.Sc. Chemistry Part I</b>	
<b>Introduction To Cyber Security</b>	
Pre-requisites in Information and Network Security SEM-I (Credit -1 )	
CO1:	<b>Remembering:</b> To describe computers, networks, and software program from cyber attacks

CO2:	<b>Understanding:</b> Understand the conceptual foundation of information security Awareness
CO3:	<b>Applying:</b> To develop the best practices in security concepts to maintain confidentiality, integrity and availability of computer systems
<b>M.Sc. Chemistry Part</b>	
<b>I Human Rights I</b>	
<b>Introduction to Human Rights and Duties SEM-I: (Credit -1)</b>	
CO1:	<b>Remembering:</b> Memorize the conceptual General Introduction Life and Works, Ruling through Virtue, Rituals and Filial Piety.
CO2:	<b>Understanding:</b> To understand the fares, Perspectives & Interrelationship of Rights and Duties.
CO3:	<b>Applying:</b> To judge the knowledge of the course to introduced to Nature
CO4:	<b>Analyzing:</b> To apply the principles of Study of Human Rights International & National Perspectives, Provision of the charters of United Nations, Universal Declaration of Human Rights.

<b>M. Sc.-I Organic Chemistry (Semester-II) 2019 Pattern</b>	
<b>CHP--210 Molecular spectroscopy and Nuclear and radiation Chemistry [Credit -4, 48 L]</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> To define basic principles of nuclear chemistry and radioactivity
CO2:	<b>Understand:</b> To understand basic principles behind nuclear reactions
CO3:	<b>Applying:</b> To apply core concepts related to different spectroscopic techniques and their applications
CO4:	<b>Analyzing:</b> To analyze the problems and elucidate the molecular structures from spectroscopic data
CO5:	<b>Evaluating:</b> Summarize Concepts of molecular spectroscopy and nuclear chemistry
<b>CHI-230 Inorganic Chemistry [ Credit-4 , 48 L]</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> Student should remember Hund's rules for arranging the terms according to energy
CO2:	<b>Understanding:</b> Student should understand inter electronic repulsion
CO3:	<b>Applying:</b> Student should able to able to find out splitting of the free ion terms in weak ligand field and strong ligand field
CO4:	<b>Analyzing:</b> Students should able to analyze the microstate table for various configuration
CO5:	<b>Evaluating:</b> Summarize magnetism, metalloproteins, DNA, RNA
<b>CHP--250 Organic spectroscopy and Photocyclic and Pericyclic Chemistry (Credit-4, 48L]</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> To remember core concepts related to different spectroscopic techniques and their applications
CO2:	<b>Understanding:</b> To classify the different molecular changes in different regions of electromagnetic Spectrum

CO3:	<b>Applying:</b> To solve spectroscopic problems and elucidate the molecular structures from spectroscopic data
CO4:	<b>Analyzing:</b> Students should be able to analyze different types of functional groups using spectroscopy data
CO:5	<b>Evaluating:</b> find the different functional groups in organic compounds.
<b>CHG-290: General Chemistry-II Material Characterization Technique [Credit-2, 24 L]</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> To remember basics of X-rays, Principle of XRF, types of XRF, instrumentation, qualitative and quantitative analysis, numerical. To remember different characterization technique of solids.
CO2:	<b>Understanding:</b> Students should understand the principle of XRD, instrumentation of powder XRD, Bragg's law,
CO3:	<b>Applying:</b> students should apply XRD for crystal structure determination
CO4:	<b>Analyzing:</b> Students should be able to calculate numerical problems.
CO5:	<b>Evaluating:</b> Estimate the result obtained from XRD.
<b>CHO-290: Section-II: General Chemistry, Practical Electrochemical Methods of Analysis [Credit-2]</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> Students memorize of carrying out different types of reactions and their workup methods.
CO2:	<b>Understanding:</b> Describe the methods of organic synthesis.
CO3:	<b>Applying:</b> Judge the reaction mechanism and synthesis process.
CO4:	<b>Analyzing:</b> Classifying the different instruments.
CO5:	<b>Evaluating:</b> Summarize Basics of X-rays, Principle of XRF, types of XRF, instrumentation, qualitative and quantitative analysis, numerical.
<b>CHI-227: Basic Practical Chemistry-II [Credit-4]</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> Define the principles in qualitative and quantitative determination of ore and alloy analysis.
CO2:	<b>Understanding:</b> Discuss the methods of extraction of the ore and alloy analysis.
CO3:	<b>Applying:</b> Apply the knowledge to synthesize co-ordination complexes, studied composition, structure, properties, and reactions and checked their Purity with respect to metal.
CO4:	<b>Analyzing:</b> Analyzed the data and interpret UV-visible spectra.
CO5:	<b>Evaluating:</b> Measure percentage composition of metal and minerals in alloy.
<b>M.Sc. Chemistry Part I</b>	
<b>Security Management SEM-II (Credit -1)</b>	
<b>) Introduction To Cyber Security II</b>	
CO1:	<b>Remembering:</b> To describe ability for security management and its application to protecting assets, infrastructure and people.
CO2:	<b>Understanding:</b> To understand and comprehend how to manage risks in the real world.

<b>Human Rights II</b>	
<b>Human rights of vulnerable and disadvantaged groups SEM-II (Credit -1 )</b>	
CO1:	<b>Remembering:</b> To define the Social status of women and children in International and national perspective.
CO2:	<b>Understanding:</b> To understand and comprehend the General Introduction of Vulnerable and Disadvantage, Groups, Customary, Socio-Economic and Cultural Problems, Vulnerable and Disadvantaged Groups.
CO3:	<b>Applying:</b> To apply the Status of Social and Economically Disadvantaged people.
CO4:	<b>Analyzing:</b> To analyze the enable the students to Introduce of Human rights of valuable groups-Stateless Persons, Sex Workers, Migrant Workers, HIV/AIDS Victims.

<b>M. Sc. Organic Chemistry (Semester-III) 2019 Pattern</b>	
<b>CHO-350 – Organic Reaction Mechanism and Biogenesis [Credit -4, 48 L]</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> Memorize the reaction mechanism by using kinetics and non-kinetics methods.
CO2:	<b>Understanding:</b> Describe the reaction mechanism by using hammet plot and its equation.
CO3:	<b>Applying:</b> Apply the knowledge of mechanism in biological chemistry.
CO4:	<b>Analyzing:</b> Classify the Biogenesis of natural products (Terpenoids, Alkaloids, The shikimate pathway).
CO5:	<b>Evaluating:</b> Predict reaction with intermediate, structure, stability and reactions of free radicals.
<b>CHO-351:- Structure Determination of organic compounds by Spectroscopic methods [Credit-4, 48 L]</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> Recall the Interpret 1D and 2D NMR.
CO2:	<b>Understanding:</b> To identify Molecular formula & Calculate J value and Integration.
CO3:	<b>Applying:</b> Predict possible 1D NMR (13C and 1H) spectrum.
CO4:	<b>Analyzing:</b> Analyze the progress of reaction using the spectroscopic data of the intermediates and Identify %, stereochemistry using the spectra provided.
CO5:	<b>Evaluating:</b> Summarize all spectroscopic UV,IR,NMR,Mass values.
<b>CHO-352:- Stereochemistry and Asymmetric Synthesis of organic compounds [Credit-4, 48 L]</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> Recall the mechanisms involved in the production of stereo chemically pure product.
CO2:	<b>Understanding:</b> Understand the principle and application of asymmetric synthesis.

CO3:	<b>Applying:</b> Illustrate the concept of resolution of racemic mixture with different techniques.
CO4:	<b>Analyzing:</b> Analyze the stereochemistry of fused and bridged ring system.
CO5:	<b>Evaluating:</b> Justify the three-dimensional structure of acyclic, homocyclic, heterocyclic compounds.
<b>CHO-353(B):- Designing organic syntheses &amp; Heterocyclic Chemistry [Credit -4, 48L]</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> Memorize the concept of design of organic synthesis.
CO2:	<b>Understanding:</b> Explain the nomenclature and structural effects, ring strains in heterocyclic molecules.
CO3:	<b>Applying:</b> Evaluate the reactivity and general methods of various size ring systems.
CO:4	<b>Analyzing:</b> Analyze the applications of carbohydrate molecules
CO:5	<b>Evaluating:</b> Select proper pathway for retro synthesis and Synthesis of carbohydrate molecule using Chiron based source.

<b>CHO-353 (A): Protection and Deprotection of functional group, Chiron approach and Carbohydrate Chemistry</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> Memorize the concept of protection and deprotection
CO:2	<b>Understanding:</b> nomenclature Carbohydrates and bio - molecules.
CO:3	<b>Applying:</b> Synthesis of di, tri and poly saccharides using glycosyl donar and acceptor
CO4:	<b>Analyzing:</b> Analyze the applications of heterocyclic molecules.
CO5:	<b>Evaluating:</b> Select proper pathway for retrosynthesis of organic molecules.

<b>CHO-354:- Solvent free Organic Synthesis [Credit -4]</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> Examine the solvent free approach to synthesis organic molecule.
CO2:	<b>Understanding:</b> Understand the mechanochemical and ball-mill process.
CO3:	<b>Applying:</b> Employ the chemical reaction involving collision between molecules.
CO4:	<b>Analyzing:</b> To analyze the applications of principles of green chemistry.
CO5:	<b>Evaluating:</b> Summarize principles of green chemistry

<b>M.Sc. Chemistry Part II</b>	
<b>Introduction To Cyber Security</b>	
<b>III</b>	
<b>Information and Network Security SEM-I (Credit -1)</b>	
CO1:	<b>Remembering:</b> To describe the issues of security management and its application to protecting assets, Infrastructure and people.
CO2:	<b>Understanding:</b> To understand basics of Cryptography and Network Security.

CO3:	<b>Applying:</b> To apply adapt risk management methods and skills to their current area of expertise in cyber security
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<b>M. Sc. Organic Chemistry (Semester-IV) 2019 Pattern</b>	
<b>CHO-450:- Chemistry of Natural Products [Credit -4, 48 L]</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> To remembering the mechanisms involved in the complex reactions.
CO2:	<b>Understanding:</b> Students able to classify the synthetic methods to design new synthetic strategies.
CO3:	<b>Applying:</b> Students apply the spectroscopic data to assign the absolute stereochemistry.
CO4:	<b>Analyzing:</b> Differentiate the retrosynthesis and synthesis of small natural products.
CO5:	<b>Evaluating:</b> Justify spectroscopic values in synthesis of natural products.
<b>CHO-451: - Organometallic reagents in organic synthesis [Credit-4, 48 L]</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> Define the term transition metal complex in organic synthesis.
CO2:	<b>Understanding:</b> Explain the mechanistic details of common modern synthetic organometallic reactions.
CO3:	<b>Applying:</b> Students discuss the chemistry and applications of a range of Boron, silicon, sulfur and selenium reagents in modern organic synthesis.
CO4:	<b>Analyzing:</b> Analyze the outcome of some simple transition metal catalyzed processes and comment on the strategies used.
CO5:	<b>Evaluating:</b> Summarize various palladium catalysed coupling reactions.
<b>CHO-452(A):- Concept and Application of Medicinal Chemistry [Credit-4, 48 L]</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> Identify the various stages and strategies used in drug discovery.
CO2:	<b>Understanding:</b> Discuss the principles of design and Development processes.

CO3:	<b>Applying:</b> Determine the different methods development of anti-infective agents.
CO4:	<b>Analyzing:</b> Predict the outcome of some simple transition metal catalyzed processes and conclude on the strategies used.
CO5:	<b>Evaluating:</b> Summarize SAR, mode of action, limitations and adverse effect of Anti-infective Agents, Beta lactam antibacterial agents.
<b>CHO-453:- a) Ternary mixture separation b) carbohydrates synthesis and isolations of natural products c)Project/Industrial Training/Summer training/ Internships [Credit-4]</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> Record the physical constants.
CO2:	<b>Understanding:</b> Understand and employ concept of type determination and separation.
CO3:	<b>Applying:</b> Examine the micro scale chemical elemental analysis.
CO4:	<b>Analyzing:</b> Estimate the qualitative analysis of functional groups.
CO5:	<b>Evaluating:</b> Test Functional group from isolated essential oils from the natural products.
<b>CHO-454:- Convergent and Divergent Organic Syntheses Credit-4]</b>	



The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> Describe the Three stage synthesis of organic molecules.
CO2:	<b>Understanding:</b> Classify the five stage synthesis of organic molecules.
CO3:	<b>Applying:</b> Apply the knowledge for convergent synthesis of organic molecules.
CO4:	<b>Analyzing:</b> Plan for divergent synthesis of organic molecules.
CO5:	<b>Evaluating:</b> Summarize name reactions involved in Convergent and Divergent Organic Syntheses

<b>M.Sc. Chemistry Part II Introduction To Cyber Security IV System and Application Security SEM-II (Credit -1 )</b>	
CO1:	<b>Remembering:</b> To describe about how to maintain the Confidentiality, Integrity and availability of data.
CO2:	<b>Understanding:</b> To understand and learn various methods for securing a message over internet.
CO3:	<b>Applying:</b> To apply the various protocols for network security to protect against the threats in the networks.
<b>M.Sc. Chemistry Part II (30095) Introduction to Constitution SEM-II (Credit -2 )</b>	
CO1:	<b>Remembering:</b> Explain the historical background of the Indian Constitution. They will get the knowledge of the Preamble of India.
CO2:	<b>Understanding:</b> Discuss of all fundamental rights which are given by the constitution to all Indians.
CO3:	<b>Applying:</b> Apply Directive Principles of the state policy.
CO4:	<b>Analyzing:</b> Plan of their fundamental duties for the nation.
<b>M.Sc. Chemistry Part II Skill Development SEM-II (Credit -2 )</b>	
CO1:	<b>Remembering:</b> To recall the knowledge of different chromatography techniques.
CO2:	<b>Understanding:</b> Understand various terms in mass spectroscopy.
CO3:	<b>Applying:</b> Apply the knowledge regarding GC-HPLC-MS detectors.
CO4:	<b>Analyzing:</b> To correlated GC and HPLC chromatogram.

## CO-PO MAPPING

Course	CO /PO	1	2	3	4	5	6	7	8	9	10	11	12
<b>M.Sc Sem-I</b>													
CHP-110	CO1	1	1	2			2						1
	CO2	1		2			2						1
	CO3	1	1	2			2						1
	CO4	1	1				2						1
	Average	1.0	1.0	2.0			2.0						
CHI-130	CO1	1	1	2			2						1
	CO2	2		2			2						1
	CO3	1	1	2			2						1
	CO4	1		2			2						1
	Average	1.3	1.0	2.0			2.0						
CHO-150	CO1	1	1	2			3						1
	CO2	1	1	3			2						1
	CO3		1	2			2						1
	CO4	2	1	2			2						1
	Average	1.3	1.0	2.3			2.3						
CH-190 Section I	CO1	1	1	2			2						1
	CO2		2	2			2						1
	CO3	1	1	3			2						1
	CO4	2	1	3									1
	Average	1.3	1.3	2.5			2.0						
CH-190 Section II	CO1					2					2		2
	CO2	1									1		2
	CO3	1				2					1		2
	CO4	1				2					2		2
	Average	1.0				2.0					1.5		2.0
CHP-107	CO1	1				1	2				1		2
	CO2	1	1			2	3				2		2
	CO3	1	1				2				1		2
	CO4					2					2		2
	Average	1.0	1.0			1.7	2.3				1.5		2.0
Human Rights	CO1											3	3
	CO2											3	3
	CO3											3	3
	CO4											3	3
	Average											3.0	3.0



Security IV	CO2											3	3
	Average											3.0	3.0
<b>M Sc II -Organic Sem III</b>													
CHO-350	CO1	2		2		2	3			1			1
	CO2	1		2		1	2			1			1
	CO3			2		1	1			1			1
	CO4	1		2		1	1			1			1
	Average	1.3		2.0		1.3	1.8			1.0			1.0
CHO-351	CO1	2	2	2	2			3					1
	CO2	2	2	2	1			3					1
	CO3	1	2	2	1			3					1
	CO4		3	2	1			3					1
	Average	1.7	2.3	2.0	1.3			3.0					1.0
CHO-352	CO1	2		2		3				3			
	CO2	1		1		3			2	3			
	CO3	1				3			2	3			
	CO4	1		1		2			2	2			
	Average	1.3		1.3		2.8			2.0	2.8			
CHO-353 B	CO1	2	2	2	2		3	2	2	3			1
	CO2		2						2	1			1
	CO3	1	2	2		2				1			1
	CO4	2	2	2		2			2	2			1
	Average	1.7	2.0	2.0	2.0	2.0	3.0	2.0	2.0	1.8			1.0
CHO-354	CO1	2	2	1		3				3			1
	CO2	1	2	2		3				2			1
	CO3	1		2		2				2			1
	CO4	2	2	2		2				2			1
	Average	1.5	2.0	1.8						2.3			1.0
	CO 1				3	3	3	3			2	2	3
	CO 2				3	3	3	3			2	2	3

Skill Development	CO 3				3	2	3	3		2	2	2	2
	CO 4				3	3	3	3		2	1	3	3
	Average				3.0	2.8	3.0	3.0		2.0	1.8	2.3	2.8
<b>M Sc II -Organic Sem IV</b>													
CHO-450	CO 1	2	1	1	1		1		2	1	1		2
	CO 2	1	1	1	1	1	2		1	1	3		1
	CO 3		1		3	1	1		1			1	1
	CO 4	1	1		1	3	1		1	1		1	1
	Average	1.3	1.0	1.0	1.5	1.7	1.3		1.3	1.0	2.0	1.0	1.3
CHO-451	CO 1	3	1	1	1	1	1	1		1	1	1	1
	CO 2	1	2	1	1	1	3	1		1	2	1	3
	CO 3	1		1	1		1	1			1	1	1
	CO 4	1		1	1		1	3		1			
	Average	1.5	1.5	1.0	1.0	1.0	1.5	1.5		1.0	1.3	1.0	1.7
CHO-452	CO 1	3	1	1		1	1	1		1	1	1	1
	CO 2	1	2	1		1	3	1		1	2	1	3
	CO 3			1			1	1	2		1	2	1
	CO 4	1		1		1	1	3		1			
	Average	1.7	1.5	1.0		1.0	1.5	1.5	2.0	1.0	1.3	1.3	1.7
Constitution	CO 1											3	3
	CO 2											3	3
	CO 3											3	3
	CO 4											3	3
	Average											3.0	3.0

Average PO Mapping of Principal Subject - Organic Chemistry	1.3	1.4	1.7	1.6	1.9	1.9	1.8	1.5	1.5	1.4	2.0	1.6
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<b>M.Sc. Analytical Chemistry</b>	
<b>General</b>	
PO1	Students will be able to use the evidence based comparative chemistry approach to explain the chemical synthesis and analysis.
PO2	The students will be able to understand the characterization of materials.
PO3	Students will be able to understand the basic principle and handling of equipment's, instruments used in the chemistry laboratory and to demonstrate the experimental techniques and methods of their area of specialization in Chemistry.
PO4	Enable students acquire jobs in R and D, QC and QA in scientific laboratories, industries, teaching at college level, management, marketing and sales in public sector organizations and pursue research.
PO5	Disciplinary knowledge and skill: The student will be capable of using of advanced instruments and related soft-wares for in-depth characterization of materials/chemical analysis and separation technology.
<b>Subject specific</b>	
PO6	Develop the knowledge and understanding of essential facts, concepts, principles and theories of the analytical chemistry.
PO7	Select and apply appropriate method of chemical analysis and understand the limitations of methods.
PO8	Use research-based knowledge and research methods including design of experiment, analysis, interpretation of data and make conclusions.
PO9	Explain the impact of chemical pollutants on environment and ecosystem.
PO10	Apply scientific knowledge to perform laboratory experiments and its documentation, able to write effective report, make and give its effective presentation.
PO11	To inculcate moral and ethical values and create social awareness
PO12	To train manpower in accordance with global perspectives.

### Course Outcome (CO)

<b>M. Sc.-I Organic (Semester-I) 2019 Pattern</b>
<b>CHP-: -110 Fundamentals of Physical Chemistry [Credit -4, 48 L]</b>
The student who successfully completes this course students will be able to:

CO1:	<b>Remembering:</b> To describe Kinetics of different orders of reaction and Kinetics of complex reaction.
CO2:	<b>Understanding:</b> To explain the basic Principles of classical and statistical thermodynamics.
CO3:	<b>Applying:</b> To determine the thermodynamics of mixtures and colligative properties.
CO4:	<b>Analyzing:</b> To categorize historical development of quantum mechanics and to find Schrodinger wave equation of particle in 1-d box.
CO5:	<b>Evaluating:</b> Predict the quantum mechanical based problems.

#### **CHI:- -130 Inorganic Chemistry [ Credit-4 , 48 L]**

The student who successfully completes this course students will be able to:

CO1:	<b>Remembering:</b> Student should identify the visualize/ imagine molecules in 3 dimensions.
CO2:	<b>Understanding:</b> To understand the elements of symmetry and should be able to apply symmetry elements and their operations on different molecules.
CO3:	<b>Applying:</b> They should be able to analyze and construct character table for a given point group.
CO4:	<b>Analyzing:</b> Students should know the concept of SALC.
CO5:	<b>Evaluating:</b> Predict the character table and SALC equation for different point groups

#### **CHO:- -150 Basic Organic Chemistry (Credit-4, 48L)**

The student who successfully completes this course students will be able to:

CO1:	<b>Remembering:</b> To recall heterocyclic compound containing one and two hetero atoms with their structure, synthesis and reactions.
CO2:	<b>Understanding:</b> To understand some fundamental aspects of organic chemistry, to learn the concept aromaticity, to understand the various types of aromaticity.
CO3:	<b>Applying:</b> To determine 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.
CO4:	<b>Analyzing:</b> To discriminate structure, formation, stability and related name reaction of intermediates like Carbocation, Carbanion, Free Radical, Carbenes and nitrenes; Recognize neighboring group participation.
CO5:	<b>Evaluating:</b> Judge what type of reagent need for the organic Conversion

#### **CHG-190: Introduction to solid state of matter [Credit 2,24 L]**

The student who successfully completes this course students will be able to:

CO1:	<b>Remembering:</b> Memorize the Bonding in solids – band theory.	
CO2:	<b>Understanding:</b> To explain the Semiconductors, photoconductivity.	
CO3:	<b>Applying:</b> To determine the Non-stoichiometry, defects and types of defects in solids.	
CO4:	<b>Analyzing:</b> To analyze Ionic conductivity and their applications.	

CO5:	<b>Evaluating:</b> Compare the different types of conductor	
<b>CHP-107: Practical Course-I - Basic Practical Chemistry-I [Credit -4]</b>		
The student who successfully completes this course students will be able to:		
CO1:	<b>Remembering:</b> Describe the preparation of solution and calibration of the instrument according to respective practical's.	
CO2:	<b>Understanding:</b> Differentiate the experiment of non-instrumental methods like chemical kinetics, viscosity, partial molar volume and steam distillation.	
CO3:	<b>Applying:</b> Determine the concentration of sample by conductometry, potentiometry, pHmetry colorimetry and spectrophotometrically.	
CO4:	<b>Analyzing:</b> Calculate the concentration of solutions.	
CO5:	<b>Evaluating:</b> Predict the needs of every experiment including instrumental and non-instrumental.	
<b>CHG-190: Section-II: General Chemistry Practical Inorganic Chemistry-Material Analysis, Synthesis and Applications [Credit-2]</b>		
The student who successfully completes this course students will be able to:		
CO1:	<b>Remembering:</b> Examine the laboratory glassware's, hazardous chemicals, and safety in laboratory.	
CO2:	<b>Understanding:</b> Students are generalize the aware of safety techniques and handling of chemicals. .	
CO3:	<b>Applying:</b> To construct the assembling of different glass apparatus such as soxhlet apparatus. Distillation unit, column of chromatography, Rota evaporator.	
CO4:	<b>Analyzing:</b> Students are categorize the different types of reactions and their workup methods.	
CO5:	<b>Evaluating:</b> Summarise inorganic material analysis, synthesis and applications.	
<b>M.Sc. Chemistry Part I Introduction To Cyber Security</b>		
Pre-requisites in Information and Network Security SEM-I (Credit -1 )		
CO1:	<b>Remembering:</b> To describe computers, networks, and software program from cyber attacks	
CO2:	<b>Understanding:</b> Understand the conceptual foundation of information security Awareness	
CO3:	<b>Applying:</b> To develop the best practices in security concepts to maintain confidentiality,integrity and availability of computer systems	
<b>M.Sc. Chemistry Part I Human Rights I</b>		
<b>Introduction to Human Rights and Duties SEM-I: (Credit -1)</b>		
CO1:	<b>Remembering:</b> Memorize the conceptual General Introduction Life and Works, Ruling through Virtue, Rituals and Filial Piety.	
CO2:	<b>Understanding:</b> To understand the fares, Perspectives & Interrelationship of Rights and Duties.	



CO3:	<b>Applying:</b> To judge the knowledge of the course to introduced to Nature	
CO4:	<b>Analyzing:</b> To apply the principles of Study of Human Rights International & National Perspectives, Provision of the charters of United Nations, Universal Declaration of Human Rights.	

### Course Outcome (CO)

<b>M. Sc.-I Organic and Analytical Chemistry (Semester-II) 2019 Pattern</b>		
<b>CHP--210 Molecular spectroscopy and Nuclear and radiation Chemistry [Credit -4, 48 L]</b>		
The student who successfully completes this course students will be able to:		
CO1:	<b>Remembering:</b> To define basic principles of nuclear chemistry and radioactivity	
CO2:	<b>Understand:</b> To understand basic principles behind nuclear reactions	
CO3:	<b>Applying:</b> To apply core concepts related to different spectroscopic techniques and their applications	
CO4:	<b>Analyzing:</b> To analyze the problems and elucidate the molecular structures from spectroscopic data	
CO5:	<b>Evaluating:</b> Summarize Concepts of molecular spectroscopy and nuclear chemistry	
<b>CHI-230 Inorganic Chemistry [ Credit-4 , 48 L]</b>		
The student who successfully completes this course students will be able to:		
CO1:	<b>Remembering:</b> Student should remember Hund's rules for arranging the terms according to energy	
CO2:	<b>Understanding:</b> Student should understand inter electronic repulsion	
CO3:	<b>Applying:</b> Student should able to able to find out splitting of the free ion terms in weak ligand field and strong ligand field	
CO4:	<b>Analyzing:</b> Students should able to analyze the microstate table for various configuration	
CO5:	<b>Evaluating:</b> Summarize magnetism, metalloproteins, DNA, RNA	
<b>CHP--250 Organic spectroscopy and Photocyclic and Pericyclic Chemistry (Credit-4, 48L)</b>		
The student who successfully completes this course students will be able to:		
CO1:	<b>Remembering:</b> To remember core concepts related to different spectroscopic techniques and their applications To understand different molecular changes in different regions of electromagnetic spectrum.	

CO2:	<b>Understanding:</b> To classify the different molecular changes in different regions of electromagnetic Spectrum
CO3:	<b>Applying:</b> To solve spectroscopic problems and elucidate the molecular structures from spectroscopic data
CO4:	<b>Analyzing:</b> Students should able to analyze different types of functional groups using spectroscopy data
CO5:	<b>Evaluating:</b> find the different functional groups in organic compounds.

<b>CHG-290: General Chemistry-II Material Characterization Technique [Credit-2, 24 L]</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> To remember basics of X-rays, Principle of XRF, types of XRF, instrumentation, qualitative and quantitative analysis, numerical. To remember different characterization technique of solids.
CO2:	<b>Understanding:</b> Students should understand the principle of XRD, instrumentation of powder XRD, Bragg's law,
CO3:	<b>Applying:</b> students should apply XRD data for crystal structure determination
CO4:	<b>Analyzing:</b> Students should be able to calculate numerical problems.
CO5:	<b>Evaluating:</b> Estimate the result obtained from XRD.
<b>CHG-290: Section-II: General Chemistry, Practical Electrochemical Methods of Analysis [Credit-2]</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> Students memorize of carrying out different types of reactions and their workup methods.
CO2:	<b>Understanding:</b> Describe the methods of organic synthesis.
CO3:	<b>Applying:</b> Judge the reaction mechanism and synthesis process.
CO4:	<b>Analyzing:</b> Classifying the different instruments.
CO5:	<b>Evaluating:</b> Summarize Basics of X-rays, Principle of XRF, types of XRF, instrumentation, qualitative and quantitative analysis, numerical.
<b>CHI-227: Basic Practical Chemistry-II [Credit-4]</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> Define the principles in qualitative and quantitative determination of ore and alloy analysis.
CO2:	<b>Understanding:</b> Discuss the methods of extraction of the ore and alloy analysis.
CO3:	<b>Applying:</b> Apply the knowledge to synthesize co-ordination complexes, studied composition, structure, properties, and reactions and checked their Purity with respect to metal.
CO4:	<b>Analyzing:</b> Analyzed the data and interpret UV-visible spectra.
CO5:	<b>Evaluating:</b> Measure percentage composition of metal and minerals in alloy.
<b>M.Sc. Chemistry Part I Security Management SEM-II (Credit -1 ) Introduction To Cyber Security II</b>	
CO1:	<b>Remembering:</b> To describe ability for security management and its application to protecting assets, infrastructure and people.
CO2:	<b>Understanding:</b> To understand and comprehend how to manage risks in the real world.
<b>Human Rights II Human rights of vulnerable and disadvantaged groups SEM-II (Credit -1 )</b>	
CO1:	<b>Remembering:</b> To define the Social status of women and children in International and national perspective.

CO2:	<b>Understanding:</b> To understand and comprehend the General Introduction of Vulnerable and Disadvantage, Groups, Customary, Socio-Economic and Cultural Problems, Vulnerable and Disadvantaged Groups.
CO3:	<b>Applying:</b> To apply the Status of Social and Economically Disadvantaged people.
CO4:	<b>Analyzing:</b> To analyze the enable the students to Introduce of Human rights of valuable groups-Stateless Persons, Sex Workers, Migrant Workers, HIV/AIDS Victims.

## M Sc Part II

<b>M. Sc. Analytical Chemistry (Semester-III) 2019 Pattern</b>	
<b>CHA-390 Electrochemical and Thermogravimetric Methods of Chemical Analysis [Credit -4, 48L]</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> To describe the trace analysis technique such as polarography and voltammetry.
CO2:	<b>Understanding:</b> Explain instrumentation in electrochemistry and thermogravimetry.
CO3:	<b>Applying:</b> Apply the knowledge of basic principles of electrochemistry and thermogravimetry.
CO4:	<b>Analyzing:</b> Analyze the applications of electrochemistry and thermogravimetry in industry and in analytical laboratory.
CO5:	<b>Evaluating:</b> Predit polarogram, cyclic voltammogram, pulse polarogram, thermogram, differential thermogram and DSC thermogram.
<b>CHA-391 Analytical Method Development and Extraction Techniques [Credit -4, 48L]</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> Define various terms in analytical extraction and method development and validation.
CO2:	<b>Understanding:</b> Explain instrumentations and methodology in analytical extraction.
CO3:	<b>Applying:</b> Apply the basic principles of analytical extraction method development and validation.
CO4:	<b>Analyzing:</b> Analyze the different applications of analytical extraction and method development and validation in industry and in analytical laboratory.
CO5:	<b>Evaluating:</b> Compare among the methods of analytical extraction.
<b>CHA-392 Advanced Chromatographic Methods of Analysis [Credit -4, 48L]</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> Define various terms in chromatography (GC and HPLC) and mass spectroscopy.
CO2:	<b>Understanding:</b> Explain instrumentations in chromatography (GC and HPLC) and mass spectroscopy.

CO3:	<b>Applying:</b> Apply the i) basic principles of chromatography (GC and HPLC) and mass spectroscopy. ii) Separation in GC / HPLC column. iii) Functioning and construction of GC / HPLC/ MS detectors.
CO4:	<b>Analyzing:</b> Analyze the applications chromatography (GC and HPLC) in industry and in analytical laboratory.
CO5:	<b>Evaluating:</b> . Summarize GC and HPLC chromatogram, Mass spectrum
<b>CHA-393 Analysis of Food and Controlled Substances Analysis [Credit -4, 48L]</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> Define various terms in food analysis techniques and methods, forensic science and drug substances.
CO2:	<b>Understanding:</b> Explain methods and principles of analysis of i) Food - carbohydrates, proteins, preservatives, ii) drug substances.
CO3:	<b>Applying:</b> Choose the appropriate methods of food analysis for its quality.
CO4:	<b>Analyzing:</b> Classify the appropriate methods for identification of drug and analysis of drug from sample.
CO5:	<b>Evaluating:</b> Distinguish among the different methods of analysis of food and drug substances.
<b>CHA-387: Practical I: Basics of Instrumental Methods of Chemical Analysis SEM III [Credit -4]</b>	
The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> Describe basic principles of chromatography different instrumental methods of analysis. Able to handle particular instrument according to SOP.
CO2:	<b>Understanding:</b> Generalize the personal safety in laboratory and able handle all chemicals, instruments, etc. safely in laboratory.
CO3:	<b>Applying:</b> Collect the data obtained from instrumentations of colorimeter, spectrophotometer, photofluorometer, TGA, HPLC, GC, Flame-photometer, CV, AAS, etc.
CO4:	<b>Analyzing:</b> To analyze the various equations involved practical methods of quantitative analysis.
CO5:	<b>Evaluating:</b> Justify theoretical principle practically or apply theory to explain practical observations.

<b>M.Sc. Chemistry Part II Introduction To Cyber Security III Information and Network Security SEM-I (Credit -1)</b>	
CO1:	<b>Remembering:</b> To describe the issues of security management and its application to protecting assets, Infrastructure and people.
CO2:	<b>Understanding:</b> To understand basics of Cryptography and Network Security.
CO3:	<b>Applying:</b> To apply the adapt risk management methods and skills to their current area of expertise in cyber security

<b>M. Sc. Analytical Chemistry (Semester-IV) 2019 Pattern</b>	
<b>CHA-490 Advanced Analytical Spectroscopic Techniques [Credit -4, 48L]</b>	
The student who successfully completes this course students will be able to:	

CO1:	<b>Remembering:</b> Recall the instrumentation of atomic absorption, atomic emission, ICPAES, ICPAES-MS, fluorescence, ESR and electron spectroscopy and its analysis.
CO2:	<b>Understanding:</b> To describe basic principles of atomic absorption, atomic emission, ICPAES, ICPAESMS, fluorescence, ESR and electron spectroscopy.
CO3:	<b>Applying:</b> To employ appropriate methods for sample treatment in AAS / AES, ICPAES, ICPAES-MS.
CO4:	<b>Analyzing:</b> Categorize the different advantages of ICPAES-MS over AES spectroscopy, fluorescence spectroscopy.
CO5:	<b>Evaluating:</b> . Deeside ESR spectra, super hyperfine splitting and g value in ESR, and parameters affecting it.

#### **CHA-491 Chemical Methods of Pharmaceuticals Analysis [Credit -4, 48L]**

The student who successfully completes this course students will be able to:

CO1:	<b>Remembering:</b> Define various terms in pharmaceutical raw material and finished product analysis.
CO2:	<b>Understanding:</b> Explain various pharmaceutical dosage forms and types of raw materials used.
CO3:	<b>Applying:</b> To apply principles of methods of pharmaceutical analysis according to IP.
CO4:	<b>Analyzing:</b> Explain importance particular test in pharmaceutical raw material and finished product analysis.
CO5:	<b>Evaluating:</b> Compare IR spectra, HPLC chromatogram, UV-Visible spectra of pharmaceutical materials.

#### **CHA-492 Analytical Chemistry of agriculture, Polymer and Detergents [Credit -4, 48L]**

The student who successfully completes this course students will be able to:

CO1:	<b>Remembering:</b> Define various terms in soil analysis, pesticide residue analysis, detergent analysis and polymer analysis.
CO2:	<b>Understanding:</b> Explain techniques / methods of soil analysis, pesticide residue analysis, detergent analysis and polymer analysis.
CO3:	<b>Applying:</b> To determine importance of soil analysis, pesticide residue analysis, detergent analysis and polymer analysis.
CO4:	<b>Analyzing:</b> To analyze results of analysis soil, pesticide residue, detergent and polymer.
CO5:	<b>Evaluating:</b> Decide conclusion regarding water and air quality from analytical results.

#### **CHA-493-A: Optional Analytical Chemistry Practical OR CHA-493-B: Project [Credit -4]**

The student who successfully completes this course students will be able to:

CO1:	<b>Remembering:</b> list the proper record of analytical data in notebook. Observer personal safety in laboratory and able handle all chemicals, instruments, etc safely in laboratory.
CO2:	<b>Understanding:</b> Understand various terms involved practical methods of quantitative analysis.
CO3:	<b>Applying:</b> Apply / select particular method / instrumental parameters for analysis of given sample
CO4:	<b>Analyzing:</b> To deduce basic principles of chemical / instrumental methods used for analysis.
CO5:	<b>Evaluating:</b> To conclude the results able to take the decision regarding quality of sample.

#### **CHA-494: Practical II: Applied Analytical Chemistry [Credit -4]**

The student who successfully completes this course students will be able to:	
CO1:	<b>Remembering:</b> Identify the sample with described procedure.
CO2:	<b>Understanding:</b> Determine appropriate reaction conditions as described in procedures
CO3:	<b>Applying:</b> Apply / select particular method / instrumental parameters for analysis of given sample..
CO4:	<b>Analyzing:</b> To plan i) selective analysis of particular component from sample. ii) Analysis at trace level from sample.
CO5:	<b>Evaluating:</b> To conclude the results able to take the decision regarding quality of sample.

**M.Sc. Chemistry Part II**  
**Introduction To Cyber Security**  
**IV**

**System and Application Security SEM-II (Credit -1 )**

CO1:	<b>Remembering:</b> To describe about how to maintain the Confidentiality, Integrity and availability of data.
CO2:	<b>Understanding:</b> To understand and learn various methods for securing a message over internet.
CO3:	<b>Applying:</b> To apply the various protocols for network security to protect against the threats in the networks.

**M.Sc. Chemistry Part II**

**(30095) Introduction to Constitution SEM-II (Credit -2 )**

CO1:	<b>Remembering:</b> Explain the historical background of the Indian Constitution. They will get the knowledge of the Preamble of India.
CO2:	<b>Understanding:</b> Discuss of all fundamental rights which are given by the constitution to all Indians.
CO3:	<b>Applying:</b> Apply Directive Principles of the state policy.
CO4:	<b>Analyzing:</b> Plan of their fundamental duties for the nation.

**M.Sc. Chemistry Part II**

**Skill Development SEM-II (Credit -2 )**

CO1:	<b>Remembering:</b> To recall the knowledge of different chromatography techniques.
CO2:	<b>Understanding:</b> Understand various terms in mass spectroscopy.
CO3:	<b>Applying:</b> Apply the knowledge regarding GC-HPLC-MS detectors.
CO4:	<b>Analyzing:</b> To correlated GC and HPLC chromatogram.
CO5:	<b>Evaluating:</b> Distinguish among the chromatography (GC and HPLC) methods of analysis

### CO-PO MAPPING

Course	CO /PO	1	2	3	4	5	6	7	8	9	10	11	12
<b>M Sc I -Sem I</b>													
CHP-110	CO1	1	1	2			2						1
	CO2	1		2			2						1
	CO3	1	1	2			2						1
	CO4	1	1				2						1
	Average	1.0	1.0	2.0			2.0						1.0
CHI-130	CO1	1	1	2			2						1
	CO2	2		2			2						1
	CO3	1	1	2			2						1
	CO4	1		2			2						1
	Average	1.3	1.0	2.0			2.0						1.0
CHO-150	CO1	1	1	2			3						1
	CO2	1	1	3			2						1
	CO3		1	2			2						1
	CO4	2	1	2			2						1
	Average	1.3	1.0	2.3			2.3						1.0
CH-190 Section I	CO1	1	1	2			2						1
	CO2		2	2			2						1
	CO3	1	1	3			2						1
	CO4	2	1	3									1
	Average	1.3	1.3	2.5			2.0						1.0
CH-190 Section II	CO1					2					2		2
	CO2	1									1		2
	CO3	1				2					1		2
	CO4	1				2					2		2
	Average	1.0				2.0					1.5		2.0
CHP-107	CO1	1				1	2				1		2
	CO2	1	1			2	3				2		2
	CO3	1	1				2				1		2
	CO4					2					2		2
	Average	1.0	1.0			1.7	2.3				1.5		2.0
	CO1											3	3
Hum an Rig hts	CO2											3	3
	CO3											3	3
	CO4											3	3
	Average											3.0	3.0





Cyber Security I V	CO2											3	3
	Average											3 · 0	3 · 0
<b>M Sc II -Analytical Sem III</b>													
CH-390	CO 1	2	2	3		3	3	3			1		1
	CO 2	2	2	3		3	3	3			1		1
	CO 3	2	2	3		3	3	2			1		1
	CO 4	2	2	3		3	3	2			1		1
	Average		2 · 0	3 · 0		3 · 0	3 · 0	2. 5			1. 0		1 · 0
CH-391	CO 1	2	2	3		3	3	2			1		1
	CO 2	2	2	3		3	3	2			1		1
	CO 3	2	2	3		3	3	3			1		1
	CO 4	2	2	3		3	3	3			1		
	Average		2 · 0	3 · 0		3 · 0	3 · 0	2. 5			1. 0		1 · 0
CH-392	CO 1	2	2	3		3	3	2			1		1
	CO 2	2	2	3		3	3	2			1		1
	CO 3	2	2	3		3	3	3			1		1
	CO 4	2	2	3		3	3	3			1		
	Average		2 · 0	3 · 0		3 · 0	3 · 0	2. 5			1. 0		1 · 0
CH-393	CO 1	2	2	3		3	3	2			1		1
	CO 2	2	2	3		3	3	2			1		1
	CO 3	2	2	3		3	3	3			1		1
	CO 4	2	2	3		3	3	3			1		
	Average		2 · 0	3 · 0		3 · 0	3 · 0	2. 5			1. 0		1 · 0
CH-387	CO 1	2	2	3	2	3	3	3	2	3	3		
	CO 2	3	3	2	1	3	2	2	2	2	2		
	CO 3	2	2	2	1	3	3	3	2	3	3		
	CO 4	2	3	2	2	2	2	3	2	1	2		
	Average		2 · 5	2 · 3	1 · 5	2 · 8	2 · 5	2. 8	2 · 0	2 · 3	2. 5		
	CO 1				3	3	3	3			2	2	3
	CO 2				3	3	3	3			2	2	3

Skill Development	CO 3				3	2	3	3		2	2	2	2
	CO 4				3	3	3	3		2	1	3	3
	Average				3.0	2.8	3.0	3.0		2.0	1.8	2.3	2.8
<b>M Sc Analytical Sem IV</b>													
CHA-490	CO 1	1	2	3	1		3	2		1	1	1	
	CO 2		1	1	3			1	1			1	1
	CO 3	1	2	1	1		1		3				
	CO 4		1	1	1		1	1	1	1	3		
	Average	1.0	1.5	1.5	1.5		1.7	1.3	1.7	1.0	2.0	1.0	1.0
CHA-491	CO 1	1	1	1	1	1		1	1	1	1	1	1
	CO 2	1	1	1	3	1		1	2	1	1		1
	CO 3		2	1	1	2		1	1	3		1	
	CO 4	1		1	1	1		2	1	1	1	1	
	Average	1.0	1.3	1.0	1.5	1.3		1.3	1.3	1.5	1.0	1.0	1.0
CHA-492	CO 1	2	1	1		1	1	2	1	1	1	1	1
	CO 2	1	2	1	1		1	1	1	1	1		1
	CO 3		1	1	1		2	1	3	1		1	
	CO 4	1	1	3	1	1	1	1	1	1			1
	Average	1.3	1.3	1.5	1.0	1.0	1.3	1.3	1.5	1.0	1.0	1.0	1.0
CHA-494	CO 1	2	2	3	2	2	3			3			
	CO 2	2	2	3	3	2	2			3			
	CO 3	2	2	3	3	2	3			3			
	CO 4	2	2	3	2	2	3			3			
	Average	2.0	2.0	3.0	2.5	2.0	2.8			3.0			
Constitution	CO 1											3	3
	CO 2											3	3
	CO 3											3	3
	CO 4											3	3
	Average											3.0	3.0

<b>Average PO Mapping of Principal Subject - Analytical Chem.</b>	<b>1.4</b>	<b>1.6</b>	<b>2.1</b>	<b>1.7</b>	<b>2.3</b>	<b>2.3</b>	<b>1.9</b>	<b>1.5</b>	<b>1.6</b>	<b>1.4</b>	<b>2.0</b>	<b>1.6</b>
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