

## Program Outcomes

### M.Sc. I & II Organic Chemistry

**Vision:** Engender Human Resource to Lead the Competitive Science World for Nation Building

**Mission:** Impart most advanced scientific knowledge and training to the students so that genuine researchers and skilled scientists of world standard will be made available for the advancement of national science and technology programs as well as to cater the needs of industrial and pharma sectors

#### **Program Outcomes**

**PO1:** Students will gain in-depth understanding of both basic and applied organic chemistry ideas.

**PO2:** Students will be able to solve a variety of problems by figuring out what the key components of a problem are, coming up with a plan for solving it, using the right methods to get there, checking the correctness and precision of the answer, and interpreting the outcomes.

**PO3:** Students will be equipped with the technical know-how and subject-specific information required for careers in industry, education, and research.

**PO4:** Students will be able to solve cross-cutting concerns including sustainable development by applying their foundational knowledge.

**PO5:** Students will gain a thorough understanding of the ethics of organic chemistry research to produce high-Caliber work.

**PO6:** Students will be able to communicate effectively, which includes understanding and producing reports, presentations, and documentation, and having the ability to convey ideas both orally and in technical writing.

<b>Program Specific Outcomes</b>		
<b>PSO-1:</b> Students will have access to high-quality competitive tests such as GATE, SET, and NET.		
<b>PSO-2:</b> Students will be able to work in a variety of agricultural, food, pharmaceutical, and chemical industries.		
<b>PSO-3:</b> Students enrolled in Ph.D. programs will have access to worldwide research possibilities.		
<b>PSO-4:</b> Work well with others in chemistry or related professions to complete team-oriented assignments.		
<b>PSO-5:</b> Students can launch their own businesses or industries related to chemicals (entrepreneurship).		
<b>PSO-6:</b> Learners will be able to decipher NMR, MS, and IR data to clarify structural elements.		
<b>Course Outcomes</b>		
<b>Part-I Semester-I</b>		
<b>CH-1.1</b>	<b>(Inorganic Chemistry – I)</b>	<p><b>CO-1:</b> Students will be able to describe the fundamentals of transition metal chemistry and its compounds, including their spectroscopic properties, nomenclature, reactions, and applications.</p> <p><b>CO-2:</b> Students will learn about the physical, chemical, and preparatory characteristics of metal carbonyls of transition metals.</p> <p><b>CO-3:</b> Pupils will be fully capable of comprehending the synthesis, bonding, structure, and reactivity of organometallic compounds as well as how homogeneous catalysis uses them.</p> <p><b>CO-4:</b> Students will be able to describe nuclear stability and reactions as well as determine the stability of the complexes.</p>
<b>CH-1.2</b>	<b>(Organic Chemistry – I)</b>	<p><b>CO-1:</b> Learners will be able to distinguish between several types of reactive organic compounds.</p> <p><b>CO-2:</b> Learners are able to identify, categorize, clarify, and apply basic organic reactions.</p> <p><b>CO-3:</b> Students will be able to differentiate between several isomeric forms.</p> <p><b>CO-4:</b> This course will pique students' curiosity about writing and discovering novel response mechanisms.</p>

<b>CH.1.3:</b>	<b>Analytical Chemistry-I</b>	<p><b>CO-1:</b> Students will learn the principles of analytical chemistry, such as sampling, sample pretreatment, fundamental methodologies, and data handling, processing, and statistical analysis.</p> <p><b>CO-2:</b> Students would learn about and comprehend the breadth of analytical chemistry, which encompasses many different domains. Using traditional methods, the students will master the foundations of qualitative analysis.</p> <p><b>CO-3:</b> Students will study electroanalytical techniques and computation chemistry, which will prepare them for alternative analytical strategies, which are a crucial part of analytical chemistry. They will also learn about chromatographic techniques, including how to choose and adjust them based on the samples they must work with.</p> <p><b>CO-4:</b> Students will gain knowledge about using standard reference books to find information and drawing conclusions from them. We would talk about analytical case study situations to get a feel for the breadth and benefits of analytical chemistry.</p>
<b>PCH-1.1</b>	<b>(Practical – I)</b>	<p><b>CO-1:</b> Ability in professional sampling and sample treatment before actual analysis</p> <p><b>CO-2:</b> Capacity to handle and assess analytical results</p> <p><b>CO-3:</b> Knowledge of and aptitude for carrying out fundamental chemical reactions in a chemical laboratory</p> <p><b>CO-4:</b> Able to conduct measurements using chromatographs, photometers, spectrometers, and ion-selective electrodes, among other basic analytical instruments.</p>

PCH-1.2	(Practical – II)	<p><b>CO-1:</b> Students are able to make a variety of concentration solutions, including ppm, normal, and molar ones.</p> <p><b>CO-2:</b> Find the different first- and second-order reactions' rate constants.</p> <p><b>CO-3:</b> Use a conductometer and potentiometer to measure the system's redox potential, the acid's relative strength, etc.</p> <p><b>CO-4:</b> Gain an understanding of the creation of alloys such as brass and bronze, as well as the phase diagrams for binary and ternary systems, including their composition and critical temperature.</p> <p><b>CO-5:</b> The efficacy of Freundlich adsorption isotherms in eliminating harmful substances including dyes, acetic acid, and various industrial wastewaters</p>
<b>Part-I Semester-II</b>		
CH-2.1	(Organic Chemistry – II)	<p><b>Course Outcomes (COs)</b></p> <p><b>CO-1:</b> An example of contemporary reagent applications and synthesis techniques.</p> <p><b>CO-2:</b> Explain numerous coupling reactions and organometallic compound types.</p> <p><b>CO-3:</b> Recognize the fundamentals and practical uses of protecting and removing different functional groupings.</p> <p><b>CO-4:</b> The concepts of chemo selectivity, regioselectivity, and enantioselectivity will be explained in detail.</p>
CH-2.2	(Physical Chemistry – II)	<p><b>CO-1:</b> Fundamentals of quantum mechanics will be taught to students.</p> <p><b>CO-2:</b> Completion of the course will serve as the foundation or a prerequisite for the "Advanced Quantum Chemistry" course.</p> <p><b>CO-3:</b> Capable of anticipating conjugated organic compounds' electronic spectra and comprehending selection principles.</p> <p><b>CO-4:</b> Capable of researching photophysical and photochemical processes</p> <p><b>CO-5:</b> Ability to perform both qualitative and quantitative analysis.</p>

		<p>of various ingredients from industrial, food and pharma samples using techniques of emission spectroscopy.</p> <p><b>CO-6:</b> Able to comprehend battery materials and characterizations, ionic processes, electrochemical sensors, and other electrochemical characteristics of materials.</p> <p><b>CO-7:</b> Capable of researching electrokinetic effects and how they apply to the separation, characterisation, and other fields of protein science.</p> <p><b>CO-8:</b> Kinetic investigations to comprehend molecular dynamics. Understanding the processes that regulate life will be aided by applications that investigate reaction routes, protein-ligand binding rates, etc.</p>
<b>CH-2.3:</b>	<b>Analytical Chemistry-II</b>	<p><b>CO-1:</b> Students will learn about the spectroscopic instruments and technologies that are utilized in chemical analysis and data interpretation. In order to provide the students an understanding of the kinds of samples that these instruments may evaluate, the breadth and bounds of the spectroscopic tools will be covered.</p> <p><b>CO-2:</b> Students will gain knowledge of both basic and sophisticated analytical tools, such as NMR, MS, AAS, ICP, and thermal analysis (TGA, DTA, DSC, etc.) methods applied to a broad range of samples.</p> <p><b>CO-3:</b> Instruction will cover instrumentation, sample handling and preparation, analysis and interpretation of data, and structural clarification.</p> <p><b>CO-4:</b> Learning about different instruments will give them idea about appropriate choice of the instrument</p>

<b>PCH-2.1</b>	<b>(Practical – III)</b>	<p><b>CO-1:</b> Before conducting the actual analysis, students learned how to precisely prepare sample solutions and handle samples.</p> <p><b>CO-2:</b> Students are capable of performing the computations and error analysis for CO<sub>2</sub>.</p> <p><b>CO-3:</b> Gain knowledge of fundamental chemical reactions and choose analytical techniques.</p> <p><b>CO-4:</b> The ability to conduct measurements using standard analytical tools, such as chromatographs, photometers, spectrometers, high-end thermometers, refractometers, pH meters, etc.</p>
<b>PCH-2.2</b>	<b>(Practical – IV)</b>	<p><b>CO-1:</b> Students are able to make a variety of concentration solutions, including ppm, normal, and molar ones.</p> <p><b>CO-2:</b> Use a conductometer to find the unknown concentration and thermodynamic characteristics.</p> <p><b>CO-3:</b> Students will investigate how to calculate the catalysis and reaction order.</p> <p><b>CO-4:</b> Students are able to calculate species' molecular weights and refractive indices.</p> <p><b>CO-5:</b> Students are able to estimate equilibrium properties such as phase diagrams and redox potentials.</p>

**Part-II**  
**Semester-III**

<b>OCH-3.1</b>	<b>(Organic Reaction Mechanism)</b>	<p><b>CO-1:</b> Apply principles of organic chemistry to gain proficiency in efficient written and/or voice communication.</p> <p><b>CO-2:</b> Provides a fundamental understanding of the effects of organic chemistry on the technological and natural surroundings.</p> <p><b>CO-3:</b> A thorough understanding of the mechanics of organic reactions is provided by this course.</p> <p><b>CO-4:</b> An understanding of pericyclic processes will be provided by this course.</p>
<b>OCH-3.2</b>	<b>(Advanced Spectroscopic Methods)</b>	<p><b>CO-1:</b> Students will be able to use their understanding of various stretching and bending vibrational modes in infrared spectroscopy to the interpretation of functional groups.</p> <p><b>CO-2:</b> Recognize the methods of mass spectral fragmentation in relation to determining the structure.</p> <p><b>CO-3:</b> Recognize how to deduce chemical shift values from nuclear magnetic resonance spectra interpretation.</p> <p><b>CO-4:</b> Pupils will comprehend Beer Lambert's law and its uses.</p>
<b>OCH- 3.3:</b>	<b>(Advanced Synthetic Methods)</b>	<p><b>CO-1:</b> Students are able to design multistep organic synthesis with the aid of the reagent applications.</p> <p><b>CO-2:</b> During their advanced research, they can make use of sophisticated methods like microwaves, ionic liquids, ultrasound, etc.</p> <p><b>CO-3:</b> Studying and designing a new reaction benefits from an understanding of retro-synthetic analysis.</p> <p><b>CO-4:</b> Students will be able to create environmentally sustainable processes for organic transformations.</p>
<b>OCH-3. 4</b>	<b>(A) (Drugs and Heterocycles)</b>	<p><b>CO-1:</b> Capable of associating the structure and activity of bioactive substances</p> <p><b>CO-2:</b> Provide an overview of several medication classes for certain ailments</p> <p><b>CO-3:</b> Apply their expertise to the synthesis of different bioactive heterocycles.</p> <p><b>CO-4:</b> Capable of identifying the reactivity and uses of heterocycles with three, four, five, six, and seven members.</p> <p><b>CO-5:</b> Students will have an idea regarding Chemical kinetics of polymers.</p>

<b>OCHP – V</b>	<b>Practical-V</b>	<p><b>CO-1:</b> Divide and examine the various component mixes of basic organic compounds.</p> <p><b>CO-2:</b> Using various methods, students will be able to purify organic substances.</p> <p><b>CO-3:</b> Conduct the synthesis of basic organic molecules on your own.</p> <p><b>CO-4:</b> Conduct simple organic chemical synthesis on your own</p>
<b>OCHP – VI</b>	<b>Practical-VI</b>	<p><b>CO-1:</b> Distinguish and examine the various component mixes of basic organic compounds.</p> <p><b>CO-2:</b> Using various methods, students will be able to purify organic substances.</p> <p><b>CO-3:</b> Pupils will be proficient in both qualitative and quantitative analysis through experimentation.</p> <p><b>CO-4:</b> Constructs simple organic molecules on its own.</p>
<b>Part-II semester-IV</b>		
<b>OCH</b>	<b>4.1 (Theoretical Organic Chemistry)</b>	<p><b>CO-1:</b> Students will use organic synthesis to apply green chemistry concepts.</p> <p><b>CO-2:</b> Pupils will be able to recognize chemicals that are aromatic.</p> <p><b>CO-3:</b> Students will get an understanding of how to calculate an organic compound's delocalization energy .</p> <p><b>CO-4:</b> Students will acquire knowledge of kinetic and thermodynamic controlled reactions</p>
<b>OCH-4.2</b>	<b>(Stereochemistry)</b>	<p><b>CO-1:</b> Analysing the stereochemical features of organic compounds provides a crucial tool for determining the characteristics of molecules that are bioactive.</p> <p><b>CO-2:</b> Pupils will possess a solid understanding of acyclic and cyclic compound conformations.</p> <p><b>CO-3:</b> Students will be proficient in creating novel bioactive compounds with particular stereochemical characteristics.</p> <p><b>CO-4:</b> Students will understand how chiral reagents are used in asymmetric synthesis.</p>
<b>OCH-4.3</b>	<b>Chemistry of Natural Products)</b>	<p><b>CO-1:</b> Learn about the stereochemistry and categorization of natural items.</p> <p><b>CO-2:</b> Explain the fundamentals of stereoselective transformations, green synthesis, biosynthesis, and its</p>



		<p>physiological function in the human body.</p> <p><b>CO-3:</b> Recognize the composition and production of several hormones.</p> <p><b>CO-4:</b> Capable of comprehending vitamin deficiencies and the significance of several vitamins for human health</p>
<b>OCH-4.4 (A)</b>	<b>(Applied Organic Chemistry)</b>	<p><b>CO-1:</b> This knowledge helps to get placement to the students in agrochemicals, cosmetic, pharmaceuticals, dyes, polymers industries.</p> <p><b>CO-2:</b> Students will have knowledge of cosmetics, perfumes and food flavors in day-to-day life.</p> <p><b>CO-3:</b> Knowledge of unit processing will be useful for automation industries.</p> <p><b>CO-4:</b> Students will get an idea of synthesis of pesticides and their applications in agriculture.</p>
<b>OCH-4.4</b>	<b>(B) (Bioorganic Chemistry)</b>	<p><b>CO-1:</b> Students will understand the concept building blocks of biomacromolecules.</p> <p><b>CO-2:</b> Students will have an idea regarding classification, structure and functions of different bioorganic molecules.</p> <p><b>CO-3:</b> Students will get idea regarding structure and functions of plant and animal cells.</p> <p><b>CO-4:</b> Students will understand the physiological role of RNA, DNA and enzymes</p>
<b>OCHP – VII</b>	<b>Practical-VII</b>	<p><b>CO-1:</b> To act with a highly responsible, moral, and professional demeanour in order to benefit society.</p> <p><b>CO-2:</b> Students will be familiar with MSDS papers, safety precautions while handling chemicals, and safety notices on chemical containers.</p> <p><b>CO-3:</b> Students will have ability to synthesize commercial products</p> <p><b>CO-4:</b> Based on the experience of project work, students will have ability to start their R &amp; D laboratory.</p>
<b>OCHP – VIII</b>	<b>Practical-VIII</b>	<p><b>CO-1:</b> To act with a highly responsible, moral, and professional demeanour in order to benefit society.</p> <p><b>CO-2:</b> Students will be familiar with MSDS papers, safety precautions while handling chemicals, and safety notices on chemical containers.</p> <p><b>CO-3:</b> Students will be able to create commercial goods through synthesis.</p> <p><b>CO-4:</b> Students will be able to launch own R&amp;D labs based on their project work experience.</p>