

**DEPARTMENT OF CHEMISTRY**  
**PROGRAMME OUTCOMES AND COURSE OUTCOMES OF UNDER**  
**GRADUATE & POST GRADUATE PROGRAMME (2024 ONWARDS)**

<b>NAME OF THE PROGRAMME: BACHELOR OF CHEMISTRY– PROGRAMME OUTCOME</b>	
<b>PO1</b>	<b>Disciplinary knowledge:</b> Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study.
<b>PO2</b>	<b>Communication Skills:</b> Ability to express thought effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write an analytically, and present complex information in a clear and concise manner to different groups.
<b>PO3</b>	<b>Critical thinking:</b> Capability to apply analytic thought to a body of knowledge; analyses and evaluate evidence, arguments, claims, belief basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.
<b>PO4</b>	<b>Problem solving:</b> Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.
<b>PO5</b>	<b>Analytical reasoning:</b> Ability to evaluate the liability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples and addressing opposing view points.
<b>PO6</b>	<b>Research-related skills:</b> As sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesizing and articulating; Ability to recognize cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyze, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation.
<b>PO7</b>	<b>Cooperation/Teamwork:</b> Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group of a common cause and work efficiently as a member of a team.
<b>PO8</b>	<b>Scientific reasoning:</b> Ability to analyze, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence, and experiences from an open-minded and reasoned perspective.
<b>PO9</b>	<b>Reflective thinking:</b> Critical sensibility to lived experiences, with self-awareness and reflexivity of both self and society.
<b>PO10</b>	<b>Information/digital literacy:</b> Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.
<b>PO11</b>	<b>Self-directed learning:</b> Ability to work independently, identify appropriate resources

	required for a project, and manage a project through to completion.
<b>PO12</b>	<b>Multicultural competence:</b> Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.
<b>PO13</b>	<b>Moral and ethical awareness/reasoning:</b> Ability to embrace moral/ethical values in conducting one's life, formulate apposition/argument about ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstrating the ability to identify ethical issues related to one's work, avoid unethical behavior such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.
<b>PO14</b>	<b>Leadership readiness/qualities:</b> Capability form aping out that asks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in as efficient way.
<b>PO15</b>	<b>Lifelong learning:</b> Ability to acquire knowledge and skills, including learning how to learn, that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of workplace through knowledge/skill development/reskilling.

NAME OF THE PROGRAMME: B.Sc CHEMISTRY – COURSE OUTCOMES	
SEMESTER I	
<b>GENERAL CHEMISTRY-I</b>	<ol style="list-style-type: none"> <li>1. Explain the atomic structure, wave particle duality of matter, periodic properties bonding, and properties of compounds.</li> <li>2. Classify the elements in the periodic table, types of bonds, reaction intermediates electronic effects in organic compounds, types of reagents.</li> <li>3. Apply the theories of atomic structure, bonding, to calculate energy of a spectral transition, <math>\Delta x</math>, <math>\Delta p</math> electronegativity, percentage ionic character and bond order</li> <li>4. Evaluate the relationship existing between electronic configuration, bonding, geometry of molecules and reactions; structure reactivity and electronic effects</li> <li>5. Construct MO diagrams, predict trends in periodic properties, assess the properties of elements, and explain hybridization in molecules and organic reaction mechanisms.</li> </ol>
<b>Quantitative Inorganic Estimation (titrimetry)</b>	<ol style="list-style-type: none"> <li>1. Explain the basic principles involved in titrimetric analysis and inorganic preparations.</li> <li>2. Compare the methodologies of different titrimetric analysis.</li> <li>3. Estimate the amount of a substance present in a given solution.</li> </ol>

	<ol style="list-style-type: none"> <li>4. Assess the yield of different inorganic preparations and identify the end point of various titrations.</li> <li>5. Describe the measurable skills, abilities, knowledge in qualitative analysis.</li> </ol>
Allied Biochemistry-I	<ol style="list-style-type: none"> <li>1. Able to explain the structure, biological importance of carbohydrates, from monosaccharides to polysaccharides.</li> <li>2. Get an awareness about food poisons like natural poisons (alkaloids - nephrotoxin) pesticides, DDT, BHC, Malathion</li> <li>3. Able to classify proteins and explain their properties.</li> <li>4. To classify lipids and describe the structure and biological functions of phospholipids, glycolipids and sterols.</li> <li>5. To illustrate the structure of nucleotides, distinguish DNA and RNA and describe the structure of DNA, types of RNA and their biological functions matching.</li> </ol>
<b>Skill Elective Course - 2</b> <b>Allied Biochemistry</b> <b>Practical - I</b>	<ol style="list-style-type: none"> <li>1. Quantify glycine by Sorenson's formol titration method</li> <li>2. Quantify ascorbic acid in lemon by Dichlorophenol indo phenol dye method</li> <li>3. Quantify glucose by benedicts method</li> <li>4. Qualitatively analyze the carbohydrates report the type of carbohydrate based on specific tests</li> <li>5. Determine lipid properties of unsaturation and fatty acid content by SAP number and acid number</li> </ol>
<b>SEC - 1 (NM)</b> <b>Foundation Course in</b> <b>Chemistry</b>	<ol style="list-style-type: none"> <li>1. Students at the end of the course will have acquired a good knowledge of the concepts of atoms and chemical bonds.</li> <li>2. They will be able to understand and use the fundamental principles which characterize the properties of matter and how it reacts.</li> <li>3. Students will gain an understanding of chemical reactions and strategies to balance them.</li> <li>4. The relative quantities of reactants and products.</li> <li>5. The fundamental properties of atoms, molecules, and the various states of matter.</li> </ol>
<b>Foundation Course -</b> <b>Food Chemistry</b>	<ol style="list-style-type: none"> <li>1. Learn about Food adulteration - Contamination of Wheat, Rice, Milk, Butter.</li> <li>2. Get an awareness about food poisons like natural poisons (alkaloids -nephrotoxin) Pesticides, DDT, BHC and Malathion.</li> <li>3. Get an exposure on food additives, artificial sweeteners, Saccharin, Cyclamate and Aspartate in the food industries.</li> <li>4. Acquire knowledge on beverages, soft drinks, soda, fruit juices and alcoholic beverages examples.</li> <li>5. Study about fats and oils - Sources of oils - production of refined vegetable oils - preservation. Saturated and unsaturated fats – MUFA and PUFA.</li> </ol>

<b>Allied Chemistry - I</b>	<ol style="list-style-type: none"> <li>1. Gain in-depth knowledge about the theories of chemical bonding, nuclear reactions and its applications.</li> <li>2. Evaluate the efficiencies and uses of various fuels and fertilizers.</li> <li>3. Explain the type of hybridization, electronic effect and mechanism involved in the organic reactions.</li> <li>4. Apply various thermodynamic principles, systems and phase rule.</li> <li>5. Explain various methods to identify an appropriate method for the separation of chemical components.</li> </ol>
<b>Chemistry Practical for Physical and Biological Sciences - I</b>	<ol style="list-style-type: none"> <li>1. Demonstrate advanced skills in using laboratory equipment specific to volumetric analysis, such as burettes, pipettes, and volumetric flasks.</li> <li>2. Explain and perform different types of titrations, including acid-base, redox, complexometric, and precipitation titrations, and understand their applications.</li> <li>3. Prepare standard solutions and accurately perform standardization procedures to ensure precise concentration measurements.</li> <li>4. Accurately determine the concentration of unknown solutions through titration and interpret the results using appropriate mathematical and chemical principles.</li> <li>5. Understand and apply the principles of chemical equilibria and reaction stoichiometry in the context of volumetric analysis.</li> </ol>

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<b>NAME OF THE PROGRAMME: MASTERS IN CHEMISTRY – COURSE OUTCOMES</b>	
<b>SEMESTER –I</b>	
<b>ORGANIC REACTION MECHANISM - I</b>	<ol style="list-style-type: none"> <li>1.To recall the basic principles of organic chemistry.</li> <li>2. To understand the formation and detection of reaction intermediates of organic reactions.</li> <li>3. To predict the reaction mechanism of organic reactions and stereochemistry of organic compounds.</li> <li>4. To apply the principles of kinetic and non-kinetic methods to determine the mechanism of reactions.</li> <li>5. To design and synthesize new organic compounds by correlating the stereochemistry of organic compounds.</li> </ol>
<b>STRUCTURE AND BONDING IN INORGANIC COMPOUNDS</b>	<ol style="list-style-type: none"> <li>1. Predict the geometry of main group compounds and clusters.</li> <li>2.. Explain about the packing of ions in crystals and apply the radius ratio rule to predict the coordination number of cations.</li> <li>3. Understand the various types of ionic crystal systems and analyze their structural features.</li> <li>4. Explain the crystal growth methods.</li> <li>5. To understand the principles of diffraction techniques and</li> </ol>

	microscopic techniques.
<b>ORGANIC CHEMISTRY PRACTICAL</b>	<ol style="list-style-type: none"> <li>1. To recall the basic principles of organic separation, qualitative analysis and preparation.</li> <li>2. To explain the method of separation and analysis of separated organic mixtures and convert them as derivatives by suitable preparation method.</li> <li>3. To determine the characteristics of separation of organic compounds by various chemical reactions.</li> <li>4. To develop strategies to separate, analyze and prepare organic compounds.</li> <li>5. To formulate a method of separation, analysis of organic mixtures and design suitable procedure for organic preparations.</li> </ol>
<b>Elective Course 1 - Nanomaterials and Nanotechnology</b>	<ol style="list-style-type: none"> <li>1.To explain methods of fabricating nanostructures.</li> <li>2. To relate the unique properties of nanomaterials to reduce dimensionality of the material.</li> <li>3.To describe tools for properties of nanostructures.</li> <li>4. To discuss applications of nanomaterials.</li> <li>5.To understand the health and safety related to nanomaterial.</li> </ol>
<b>Elective Course – 2 Molecular Spectroscopy</b>	<ol style="list-style-type: none"> <li>1.To understand the importance of rotational and Raman spectroscopy.</li> <li>2. To apply the vibrational spectroscopic techniques to diatomic and polyatomic molecules.</li> <li>3. To evaluate different electronic spectra of simple molecules using electronic spectroscopy.</li> <li>4. To outline the NMR, <math>^{13}\text{C}</math> NMR, 2D NMR – COSY, NOESY, Introduction to <math>^{31}\text{P}</math>, <math>^{19}\text{F}</math>NMR and ESR spectroscopic techniques.</li> <li>5.To develop the knowledge on principle, instrumentation and structural elucidation of simple molecules using Mass Spectrometry, EPR and Mossbauer Spectroscopy techniques.</li> </ol>

<b>Ability Enhancement Compulsory Course 1 - Chemistry in Consumer Products</b>	<ol style="list-style-type: none"> <li>1. To learn about various soap making techniques.</li> <li>2. To understand the structure-property relationships of surfactants in detergents.</li> <li>3. To apply the knowledge to develop cosmetic products with desired properties.</li> <li>4. To understand the cosmetic formulation principles, including the selection of active ingredients, excipients, and additives to achieve desired skincare effects for both skin and hair products.</li> <li>5. To explore the adverse health effects associated with harmful chemicals found in skincare and toiletries products.</li> </ol>
<b>Value Education - 1 Human Rights</b>	<ol style="list-style-type: none"> <li>1. The student will be able to know the nature of human rights its origin, the theories, the movements in the march of human rights and the facets of future of human rights.</li> <li>2. The student will be able to know the international dimension of human rights, the role of UN and the global effort in formulating conventions and declarations.</li> <li>3. The student will be able to Perceive the regional developments of human rights in Europe , Africa and Asia and the enforceable value of human rights in international arena.</li> <li>4. The student will be able to have knowledge on the human rights perspectives in India, more developed by its constitution and special legislations.</li> <li>5. The student will be able to know the redressal mechanism made available in case of human rights violation confined to India.</li> </ol>