COURSE & PROGRAM OUTCOMES OF CHEMISTRY HONOURS (B.SC.) UNDER NEP 2020 GOVT. WOMEN'S COLLEGE, BALANGIR

The NEP 2020 framework for undergraduate Chemistry programs includes a range of course and programme outcomes designed to equip students with the necessary skills and knowledge for their future careers. These outcomes are aligned with the National Education Policy (NEP) 2020 and are structured to ensure a holistic and multidisciplinary education. The outcomes focus on developing students' critical thinking, problem-solving skills, and practical laboratory skills, preparing them for various fields such as academia, industry, and research.

The undergraduate program in Chemistry, aligned with NEP 2020 guidelines, offers a robust foundation in chemical sciences, blending core subjects, electives, and hands-on laboratory experiences. This program prepares students for careers in academia, industry, research, environmental science, pharmaceuticals, and entrepreneurship. Graduates will be equipped with critical thinking, problem-solving skills, and a deep understanding of chemical principles, ready to contribute to sustainable development and innovation. The program emphasizes a comprehensive understanding of various chemistry disciplines, practical application of knowledge, and the development of advanced laboratory techniques. After completing this program, students will develop expertise in instrumentation and laboratory techniques, enabling them to conduct independent experiments and interpret data accurately. They will demonstrate strong theoretical and practical knowledge, applying it effectively in professional settings. Students will enhance their analytical and problem-solving skills, understand the societal and environmental

impact of chemical solutions and advocate for sustainable practices. Additionally, they will engage in lifelong learning, integrate interdisciplinary knowledge, and demonstrate effective communication and teamwork skills, preparing them for a dynamic and evolving job market.

After completing this program, the learner will be able to,

1. Apply principles of chemistry and creative thinking to solve diverse problems in chemistry

2. Critically analyze chemical data, evaluate scientific literature, and construct coherent scientific arguments.

3. Design experiments and use appropriate methodologies for data collection and analysis.

4. Effectively communicate chemical concepts and research findings clearly in writing and orally.

5. Work effectively in diverse teams and exhibit leadership skills in guiding projects and research initiatives.

6. Utilize ICT tools for data analysis and research.

7. Apply ethical principles, promote sustainability, and engage in community outreach to advance public understanding of chemistry

After careful analysis of the course, the department of Chemistry has pointed out the following outcomes of the course.

Course Objectives and Course Outcomes

Department of Chemistry, Govt. Women's College, BALANGIR

Course Code	Course Name	Course Objective	Course Outcomes
CORE I	Atomic Structure, Periodicity of Elements and Chemical Bonding	1. To enable students with the detail knowledge of structure of atom, properties of elements and types of chemical bonds in various compounds 2. To provide the practical knowledge about different kinds of titrations	The students will learn…. 1.atomic structure 2.types of elements and their properties 3.practical experience of titration
CORE II	Fundamental Organic Chemistry	1. To introduce the basic concept of organic chemistry 2. To aware about the different phenomena such as Isomerism, effects and types of organic reactions 3. To discuss the various methods of preparation and properties of simple organic molecules: alkane, alkene, alkyne and aromatic hydrocarbon	The students will acquire knowledge about……. 1.fundamental concepts in Organic Chemistry 2.Preparations, properties and applications of alkane, alkene, alkyne and aromatic hydrocarbon.

CORE- III	State of matter and Ionic equilibrium	1.To apply gas laws in various real-life situations and explain the behavior of real and ideal gas. 2.To differentiate between gaseous state and Vapour. 3.To explain the kinetic theory of gases. 4.To explain the properties of liquids. and condition required for liquefaction of gases.	The students will gain knowledge regarding…… 1.different gas laws and their practical applications. 2.Effect of pressure, temperature on the behavior of gases 3.the liquefaction parameters of different gases
CORE- IV	Chemical thermodynamics, Equilibrium and Colligative property	1.To discuss the application of mathematical tools to calculate thermodynamic properties 2.To explain the relationship between microscopic properties of molecules with macroscopic thermodynamic observables the derivation of rate equations from mechanistic data. 3.To know the various properties of solution as well as colligative properties.	The students will learn…. 1.thermodynamic properties of matter 2.relation among various parameters 3.thorough knowledge regarding properties of solutions

CORE- V	Acid and Bases, Metallurgy, Chemistry of main group elements	1.To know the processes and Principles involved in extraction of different metals. 2.To get knowledge about acid and base including various theory and their applications 3.To discuss about various inorganic polymers, properties and applications	The students will gain knowledge regarding…. 1.Metallurgy by which the metals are extracted from different ores. 2.various theories of acid and base as well as importance of the acid and base in real life 3. different kinds of inorganic polymers and their applications in real world

CORE-VI	Chemistry of halogen, oxygen and Sulphur containing organic compound	1.To study the synthesis, Properties and applications of haloalkane, haloarene, alcohol, ether and phenol. 2.To know the synthesis, chemical Properties of carbonyl compounds, carboxylic acid and their derivatives	The students will acquire knowledge about……. 1.Synthesis, Properties and Applications of haloalkane, haloarene, alcohol, ether and phenol 2.Preparations, properties and applications of carbonyl compounds, carboxylic acid and their derivatives.
CORE-VII	Phase equilibrium, Chemical dynamics, catalysis and surface chemistry	1. To acquire knowledge regarding phase equilibrium and its importance.	The students will learn…. 1.phase equilibrium and its importance

		2. To gain the strategic knowledge regarding distribution of solute in binary mixture of two immiscible liquids	2.distribution of solute in binary mixture of two immiscible liquids.
CORE-VIII	Coordination Chemistry, Chemistry of d- and f- block elements, Inorganic Reaction Mechanism and electron transfer reactions	1.To know about the coordinate compounds and their applications 2.To acquire knowledge regarding CFT and its significance	The students will gain knowledge regarding…... 1.coordinate compounds and their practical applications 2. CFT and its significance
CORE-IX	Natural Products, Heterocyclic Compounds, Nitrogen containing compounds and Polynuclear Hydrocarbons	1.To increase the knowledge of students about the preparation and properties of nitrogen containing organic compounds 2.To introduce the students with natural products such as alkaloids and terpenes	The students will acquire knowledge about……. 1.preparation and properties of nitrogen containing organic compounds 2.Properties and applications of natural products such as alkaloids and terpenes.
CORE-X	Conductance, Electrochemistry, Electrical properties of atom and molecules,	1.To gain knowledge regarding conductance, motilities of ions and applications of conductance measurements 2.To enhance the knowledge of students regarding various EMF	The students will learn…. 1. conductance, motilities of ions and applications of conductance measurements 2. various EMF measurements and titrations.

		measurements and titrations.	
CORE-XI	Organic Spectroscopy Organic Chemistry-IV Lab	1.To discuss theory and application of modern spectroscopic techniques including UV-Vis, IR and NMR spectroscopy etc. 2.To enhance the knowledge about the occurrence and biological importance of carbohydrate.	The students will gain knowledge regarding…. 1. The use of UV-Vis, IR and NMR spectroscopy for organic structure elucidation 2. The fundamentals of electronic structure and bonding in conjugated and aromatic systems
CORE-XII	Basic quantum chemistry, molecular and electronic spectroscopy and photochemistry Physical Chemistry-V Lab	1. To know the Eigen function, Eigen value, operator and postulates of Quantum mechanics. 2. . To learn about the characteristics of electromagnetic radiations and various photochemical reactions.	The students will acquire knowledge about……. 1. Eigen function, Eigen value, 2. operator and postulates of Quantum mechanics. 3. 2. Characteristics of electromagnetic radiations and various photochemical reactions.

CORE-XIII	Chemistry of organometallic compounds Inorganic chemistry Lab	1. understanding the syntheses, structure, and properties of organometallic compounds, including their applications in catalysis. 2. Learning about the reactivity and mechanisms of organometallic compounds, such as substitution, oxidative addition, and reductive elimination. 3. Analyzing the structure and bonding aspects of organometallic compounds and their relevance to catalytic processes.	1. Applying electron counting rules to predict the shape and geometry of metal carbonyl clusters. 2. Identifying different types of organometallic reactions and applying these concepts to explain catalytic reactions. 3. Learning about the reactivity of organometallic compounds and their applications in synthesis.
CORE-XIV	Analytical methods of chemistry	1. The course objectives of analytical chemistry are designed to equip students with a comprehensive understanding of the essential concepts and applications of mathematical, physical, and chemical sciences. 2. These objectives include developing critical thinking,	1. Understanding of Analytical Methods: Students will gain knowledge of various analytical methods, including titrations, spectrophotometry, and chromatography, and their applications in quantitative analysis. 2. Error Minimization: The course emphasizes

		3. solving, and analytical skills, enabling students to apply scientific principles to real-world	the importance of minimizing errors in analytical results, which is crucial for accurate measurements
C-XV	Solid and porous material and magnetochemistry and power cell	1. Understanding the physical properties of solids, including electrical, magnetic, optical, thermal, and mechanical properties. 2. Exploring the magnetic properties of materials, including dia-, para-, and ferromagnetism, and their applications in power cells.	1. Understanding atomic and crystal structure: Students will learn about lattice structures, unit cells, Miller indices, and Brillouin zones, allowing analysis of physical properties of solids . 2. Electronic, thermal, and mechanical properties: They will relate electron behavior, band formation, conductivity, and thermoelectric effects to solid materials
C-XVI	CHEMISTRY OF BIOMOLECULES	1.To acquire knowledge regarding biomolecules such as amino acids, peptides and proteins	The students will learn….

		2.To study the importance and application of pharmaceutical compounds.	1.various biomolecules such as amino acids, peptides and proteins 2.the importance and application of pharmaceutical compounds.

Programme Specific Outcomes

- **PSO-1: Core competency:** The chemistry graduates are expected to gain knowledge of the fundamental concepts of chemistry and applied chemistry through theory and practical. These fundamental concepts would be reflected in the latest understanding of the field to keep continues its progression.

- **PSO-2: Communication skills:** Chemistry graduates are expected to possess minimum standards of communication skills to read and understand documents so that they can solve their problems very methodically, independently and with logical argument. Graduates are expected to build good communication skill so that they can easily share their idea/finding/concepts to others.

- **PSO-3: Critical thinking:** Chemistry graduates are expected to achieve critical thinking ability to design, carry out, record and analyze the results of chemical reactions. They can have that much potential and confidence that they can overcome many difficulties with the help of their sharp scientific knowledge and logical approaches.

- **PSO-4: Psychological skills:** Chemistry graduates are expected to possess basic psychological skills so that they can deal with individuals and students

of various socio-cultural, economic and educational levels. Psychological skills are very important for proper mind setting during performing, observing and giving conclusion of a particular reaction. It is also important for self-compassion, self-reflection, interpersonal relationships, and emotional management.

- **PSO-5: Problem-solving:** Graduates are expected to be well trained with problem-solving philosophical approaches that are pertinent across the disciplines.

- **PSO-6: Analytical skill development and job opportunity:** Chemistry graduates are expected to possess sufficient knowledge how to synthesize a chemical compound and perform necessary characterization and analysis in support of the formation of the product by using modern analytical tools and advanced technologies. Because of this course curriculum chemistry graduates have lot of opportunity to get job not only in academic and administrative field but also in industry.

- **PSO-7: Research motivation:** Chemistry graduates are expected to be technically well trained with modern devices and Chemistry based software and has powerful knowledge in different disciplines of Chemistry so they can easily involve themselves in theory and laboratory-based research activities.

- **PSO-8: Teamwork:** Graduates are expected to be team players, with productive co-operations involving members from diverse socio-cultural backgrounds.

- **PSO-9: Digital Literacy:** Graduates are expected to be digitally literate for them to enroll and increase their core competency via e-learning resources such as MOOC and other digital tools for lifelong learning.

- **PSO-10: Social Awareness:** As an inhabitant of this green world, it is our duty to make our planet clean and suitable for living to all. In this context Chemistry graduates are expected to be more aware about finding green

chemical reaction routes for sustainable development. They are expected to maintain good laboratory practices and safety.