DEPARTMENT OF CHEMISTRY

# LAKHIMPUR GIRLS' COLLEGE

## PROGRAMMES OFFERED, PROGRAMME OUTCOMES, PROGRAMME SPECIFIC OUTCOMES AND COURSE OUTCOMES

### SEMESTER-WISE COURSE STRUCTURE FOR CHOICE BASED CREDIT SYSTEM IN

### B.Sc. Core (Honours) Course

| SEMSTER | CORE COURSE (14 papers) (6 credit per paper) | Ability Enhancement Compulsory Course (AECC) (2 papers) (2 credit per paper) | Ability Enhancement Elective Course(AEEC) (Skill Based) (2 papers) (2 credit per paper) | Elective: Discipline Specific DSE (4 papers) (6 credit per paper) | Elective: Generic(GE)4 papers *(To be taken from other discipline)* (6 credit per paper |
|---|---|---|---|---|---|
| I | CHEMISTRY-C-101 | Communicative English | | | GE-1 |
| | CHEMISTRY -C-102 | Alternative English/MIL | | | |
| II | CHEMISTRY -C-201 | Environmental Science | | | GE-2 |
| | CHEMISTRY -C-202 | | | | |
| III | CHEMISTRY -C-301 | | CHEMISTRY-SEC-301 | | GE-3 |
| | CHEMISTRY -C-302 | | | | |
| | CHEMISTRY -C-303 | | | | |
| IV | CHEMISTRY -C-401 | | CHEMISTRY-SEC-401 | | GE-4 |
| | CHEMISTRY -C-402 | | | | |
| | CHEMISTRY -C-403 | | | | |
| V | CHEMISTRY -C-501 | | CHEMISTRY-DSE-501 | | |
| | CHEMISTRY -C-502 | | CHEMISTRY-DSE-502 | | |
| VI | CHEMISTRY -C-601 | | | CHEMISTRY-DSE- 601 | |
| | CHEMISTRY -C-602 | | | CHEMISTRY-DSE-602 | |

## Core (Honours) Courses for Chemistry with Course Code and Course Name

| SEMESTER | Course No. | Course Name | Credit |
|---|---|---|---|
| I | **CHEMISTRY-C-101** | **Inorganic Chemistry –101**<br>*Atomic Structure and Chemical Bonding* | 4 |
| | **CHEMISTRY-C-101-PRACT.** | ***Practical*** | 2 |
| | **CHEMISTRY-C-102** | **Physical Chemistry ¯102**<br>*States of Matter and Ionic Equilibrium* | 4 |
| | **CHEMISTRY-C-102- PRACT.** | ***Practical*** | 2 |
| II | **CHEMISTRY-C-201** | **Organic Chemistry –201**<br>*Hydrocarbons and Stereochemistry* | 4 |
| | **CHEMISTRY-C-201- PRACT.** | ***Practical*** | 2 |
| | **CHEMISTRY-C-202** | **Physical Chemistry –202**<br>*Chemical Thermodynamics and its Applications* | 4 |
| | **CHEMISTRY-C-202- PRACT.** | ***Practical*** | 2 |
| III | **CHEMISTRY-C-301** | **Inorganic Chemistry –301**<br>*s- & p-block Elements and Metallurgy* | 4 |
| | **CHEMISTRY-C-301- PRACT.** | ***Practical*** | 2 |
| | **CHEMISTRY-C-302** | **Organic Chemistry –302**<br>*Halogen & Oxygen Containing Functional Groups* | 4 |
| | **CHEMISTRY-C-302-LAB** | ***Practical*** | 2 |
| | **CHEMISTRY-C-303** | **Physical Chemistry –303**<br>*Phase Equilibria and Chemical Kinetics* | 4 |
| | **CHEMISTRY-C-303- PRACT.** | ***Practical*** | 2 |
| IV | **CHEMISTRY-C-401** | **Inorganic Chemistry –401**<br>*Coordination Chemistry & its Applications* | 4 |
| | **CHEMISTRY-C-401- PRACT.** | ***Practical*** | 2 |
| | **CHEMISTRY-C-402** | **Organic Chemistry –402**<br>*Heterocyclic Chemistry* | 4 |
| | **CHEMISTRY-C-402- PRACT.** | ***Practical*** | 2 |
| | **CHEMISTRY-C-403** | **PhysicalChemistry–403**<br>*Electrochemistry* | 4 |
| | **CHEMISTRY-C-403- PRACT.** | ***Practical*** | 2 |
| V | **CHEMISTRY-C-501** | **Organic Chemistry –501**<br>*Biomolecules* | 4 |
| | **CHEMISTRY-C-501 -PRACT.** | ***Practical*** | 2 |
| | **CHEMISTRY-C-502** | **Physical Chemistry --502**<br>*Quantum Chemistry and Spectroscopy* | 4 |
| | **CHEMISTRY-C-502- PRACT.** | ***Practical*** | 2 |
| VI | **CHEMISTRY-C-601** | **Inorganic Chemistry –601**<br>*Organometallic Chemistry* | 4 |
| | **CHEMISTRY-C-601- PRACT.** | ***Practical*** | 2 |
| | **CHEMISTRY-C-602** | **Organic Chemistry –602**<br>*Spectroscopy, Dyes and Polymers* | 4 |
| | **CHEMISTRY-C-602- PRACT.** | ***Practical*** | 2 |

## Discipline Specific Elective (DSE) Courses for Chemistry Honours

| SEMESTER | COURSENo. | *CouseName* | Credit |
|---|---|---|---|
| **V** (Any Two Papers) | **CHEMISTRY-DSE-501** | *Analytical Methods in Chemistry* | 4 |
| | **CHEMISTRY-DSE-501-PRACT.** | *Practical* | 2 |
| | **CHEMISTRY-DSE-502** | *Green Chemistry* | 4 |
| | **CHEMISTRY-DSE-502-PRACT.** | *Practical* | 2 |
| | **CHEMISTRY-DSE-503** | *Research Methodology for Chemistry* | 6 |
| | **CHEMISTRY-DSE-504** | *Elementary Computational Chemistry* | 6 |
| **VI** (Any two Papers) | **CHEMISTRY-DSE-601** | *Inorganic Materials of Industrial Importance* | 4 |
| | **CHEMISTRY-DSE-601- PRACT.** | *Practical* | 2 |
| | **CHEMISTRY-DSE-602** | *Industrial Chemicals &Environment* | 4 |
| | **CHEMISTRY-DSE-602-PRACT.** | *Practical* | 2 |
| | **CHEMISTRY-DSE-603** | ***Dissertation* (*Project Work*)** | 6 |

## Skill Enhancement Courses (SEC) for Chemistry Core (Honours) Course

| | | | |
|---|---|---|---|
| **III** | **CHEMISTRY-SEC-301** | *Basic Analytical Chemistry* | 2 |
| **IV** | **CHEMISTRY–SEC-401** | *Fuel Chemistry* | 2 |

## Semester wise list of Chemistry Generic Elective papers for the students taking Honours in other disciplines

| SEMESTER | COURSE No.<br>*Course Name* | Credit |
|---|---|---|
| I | **CHEMISTRY-GE-101**<br>*Atomic Structure, Bonding, General Organic Chemistry and Aliphatic Hydrocarbons* | 4 |
| | **CHEMISTRY-GE-101-PRACT.**<br>*Practical* | 2 |
| II | **CHEMISTRY-GE-201**<br>*Chemical Energetics, Equilibria and Functional Group Organic Chemistry-I* | 4 |
| | **CHEMISTRY-GE-201- PRACT.**<br>*Practical* | 2 |
| III | **CHEMISTRY-GE-301**<br>*Solutions, Phase Equilibrium, Conductance, Electrochemistry and Functional Group Organic Chemistry-II* | 4 |
| | **CHEMISTRY-GE-301- PRACT.**<br>*Practical* | 2 |
| IV | **CHEMISTRY-GE-401**<br>*Transition metals, Coordination Chemistry, States of Matter and Chemical Kinetics* | 4 |
| | **CHEMISTRY-GE-401- PRACT.**<br>*Practical* | 2 |

**PROGRAMME: B.Sc. CHEMISTRY**

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|---|---|
| **Department of Chemistry** | After successful completion of three year degree program in Chemistry a student will be able - |
| **Programme Outcomes (PO)** | PO-1. To define the different terms, statements of different laws in all disciplines of chemistry. (**Knowledge**)<br>PO-2. To explain and demonstrate the major concepts in all disciplines of chemistry. (**Understanding**)<br>PO-3. To solve the problem and also think methodically, independently and draw a logical conclusion. (**Skill**)<br>PO-4. To employ critical thinking and the scientific knowledge to design, carry out, record and analyze the results of chemical reactions. (**Skill**)<br>PO-5. To create an awareness of the impact of chemistry on the environment, society, and development outside the scientific community. (**Application**)<br>PO-6. To find out the green route for chemical reaction for Sustainable development. (**Application**)<br>PO-7. To inculcate the scientific temperament in the students and outside the scientific community. (**Application**)<br>PO-8. To use modern techniques and decent equipments of Chemistry laboratory (**Application**) |
| **Programme Specific Outcomes (PSO)** | PSO-1. To acquire the knowledge of Chemistry through theory and practicals.<br>PSO-2. To explain nomenclature, stereochemistry, structures, reactivity, mechanism of the chemical reactions and other concepts in all disciplines of chemistry.<br>PSO-3. To solve numerical problems.<br>PSO-4. To understand good laboratory practices and safety.<br>PSO-5. To develop research oriented skills.<br>PSO-6. To make aware and handle the sophisticated laboratory instruments/equipments. |

| **Course Outcomes** | |
|---|---|
| **SEMESTER-I: Core (Honours) Course** | |
| **Course** | **Outcomes**<br>After completion of these course students will be able - |
| **CHEMISTRY-C-101: Inorganic Chemistry** | CO 1. To draw the wave function, counter boundary and probability diagrams etc.<br>CO 2. To understand the variations of orbital energy with atomic number.<br>CO 3. To understand the properties of elements, atomic radiation, ionic radiation, size effect of ionic bond, solvation energy, covalent character of ionic bond, redox equations, principle involved in volumetric analysis etc. |
| **CHEMISTRY-C-102: Physical Chemistry** | CO 1. To understand the kinetic molecular model of a gas, behaviour of real gases etc<br>CO 2. To understand the effect of addition of various solution surface Tension and viscosity. Cleansing action of detergents.<br>CO 3. To understand the nature of solid state, elementary idea of symmetry.<br>CO 4. To understand the idea of solubility and solubility product of sparingly soluble salts. |
| **SEMESTER-II: Core (Honours) Course** | |
| **Course** | **Outcomes**<br>After completion of these course students will be able - |
| **CHEMISTRY-C-201: Organic Chemistry** | CO 1. To understand the knowledge of basic organic chemistry, definition, classification of stereoisomerism, optical activity, absolute and relative configuration etc.<br>CO 2. To understand the knowledge of elimination reaction, electrophilic and nucleophilic addition reaction.<br>CO 3. To understand the relative stability of cyclic hydrocarbon, Bayer's strain theory etc. |
| **CHEMISTRY-C-202: Physical Chemistry** | CO 1. To understand the application of mathematical tools to calculate thermodynamic properties<br>CO 2. To understand the concept of free energy change and spontaneity.<br>CO 3. To understand the thermodynamics derivation of relation between Gibbs free energy of reaction and reaction quotient.<br>CO 4. To understand the derivation of relation between the four colligative properties using chemical potential (Thermodynamics derivation) |

| **SEMESTER-III: Core (Honours) Course** | |
|---|---|
| **Course** | **Outcomes**<br>After completion of these course students will be able - |
| **CHEMISTRY-C-301: Inorganic Chemistry** | CO 1. To predict the purification of metal, study of compounds with emphasis on structure, bonding, preparation and properties.<br>CO 2. To understand the real world applications, shapes etc of noble gas.<br>CO 3. To understand the structural aspects and applications of inorganic polymer. |
| **CHEMISTRY-C-302: Organic Chemistry** | CO 1. To predict the mechanism for organic reactions<br>CO 2. To understand how to design synthesis of organic molecule.<br>CO 3. To understand the reactivity and stability of organic molecule based on structure<br>CO 4. To understand an idea of alcohols, phenols, carbonyl compounds, acids and their derivatives etc |
| **CHEMISTRY-C-303: Physical Chemistry** | CO 1. To understand the types of catalysis, Michaelis–Menten mechanism, mechanism of catalysed reaction at solid state.<br>CO 2. To understand the steady - state approximation in reaction mechanism.<br>CO 3. To understand the concept of phases, phase diagrams for systems of solid-liquid equilibria involving eutectic, congruent and incongruent melting point, solid solution etc. |
| **SEMESTER-IV: Core (Honours) Course** | |
| **Course** | **Outcomes**<br>After completion of these course students will be able - |
| **CHEMISTRY-C-401: Inorganic Chemistry** | CO 1. To predict the metal ion present in biological systems<br>CO 2. To understand the use of chelating agents in medicine.<br>CO 3. To understand the quantitative aspect of ligand field and MO theory, stability of various oxidation states and electro motive force of transition elements |
| **CHEMISTRY-C-402: Organic Chemistry** | CO 1. To understand the reaction for preparation of heterocyclic compounds, polynuclear hydrocarbons.<br>CO 2. To understand the reaction and mechanism of substitution in heterocyclic compounds.<br>CO 3. To understand the methods of structure elucidation of terpenoids. |
| **CHEMISTRY-C-403: Physical Chemistry** | CO 1. To understand the quantitative aspects of Faraday's laws of electrolysis<br>CO 2. To understand the application of conductance measurement.<br>CO 3. To understand the electrical and magnetic properties of atoms and molecules. |

| **SEMESTER-V: Core (Honours) Course** | |
|---|---|
| **Course** | **Outcomes**<br>After completion of these course students will be able - |
| **CHEMISTRY-C-501: Organic Chemistry** | CO 1. To understand the chemical basis for biological phenomena and Cellular structure.<br>CO 2. To understand the chemical properties of amino acids co-factors and sugar.<br>CO 3. To understand the enzyme kinetics, chemical logic of metabolism<br>CO 4. To understand the health, disease and modern medicine are all rooted in biological chemistry. |
| **CHEMISTRY-C-502: Physical Chemistry** | CO 1. To understand the difference between classical and quantum mechanics<br>CO 2. To understand qualitative treatment of hydrogen atom and hydrogen like ions.<br>CO 3. To understand how to interpret spectra.<br>CO 4. To understand the role of photochemical reaction in biochemical processes |
| **SEMESTER-VI: Core (Honours) Course** | |
| **Course** | **Outcomes**<br>After completion of these course students will be able - |
| **CHEMISTRY-C-601: Inorganic Chemistry** | CO 1. To understand the basic principles involved in analysis of anions, cations solubility product, common ion effect etc<br>CO 2. To understand the inorganic reaction mechanism.<br>CO 3. To understand the use of Wilkinson's catalyst in industrial process of hydrozenation of alkene, gas synthesis by metal carbonyl<br>CO 4. To understand the hapacity of organic ligands, 18 electron rule, Zeise's salt etc |
| **CHEMISTRY-C-602: Organic Chemistry** | CO 1. To understand the application of UV, IR, NMR spectroscopy, mass spectra in organic molecules.<br>CO 2. To understand the biological importance of carbohydrates.<br>CO 3. To understand the biodegradable polymer, colour and constitution of dyes and applications of different dyes. |