(University of Delhi)
Shyam Lal College

Programme Specific Outcomes and Course Outcomes

B.Sc. (H) Chemistry

Programme Outcomes

Programme	Programme Outcomes
B.Sc. (H) Chemistry	**PO-1:** The students acquire in-depth knowledge of the various concepts and theoretical principles and are aware of their manifestations. **PO-2:** The students are expected to be thoroughly conversant with all basic analytical, qualitative and quantitative laboratory techniques and demonstrate meticulousness in operation. **PO-3:** Students are aware of the importance of working with safety and consciousness in laboratory and actively seeks information about health and environmental safety of chemicals that are used in the laboratories and follows protocols for their safe disposal. **PO-4:** Students assimilate technical information about chemistry from various sources and convey it to intended audience, both orally and in writing in an intelligible manner. **PO-5:** Critical thinking as an attribute enables a student to analyze a problem, assess it, reconstruct it and solve it. **PO-6:** An integral part of chemistry curriculum is problem solving. The student will be equipped to solve problems of numerical, synthetic and analytical nature that are best approached with critical thinking. **PO-7:** The student will be able to draw logical conclusions based on a group of observations, facts and rules. **PO-8:** The student is inquisitive about processes and phenomena happening during experiments in laboratories and seeks answers through the research path.

Course Outcomes

Core Subjects (Semester 1)

Course Name	Course Outcomes	Methodology to Achieve the Specific Outcomes
Atomic Structure & Chemical Bonding	**CO-1**: Solve the conceptual questions using the knowledge gained by studying the quantum mechanical model of the atom, quantum numbers, electronic configuration, radial and angular distribution curves, shapes of s, p, and d orbitals, and periodicity in atomic radii, ionic radii, ionization enthalpy and electron affinity of elements. **CO-2**: Draw the plausible structures and geometries of molecules using radius ratio rules, VSEPR theory and MO diagrams (homo- & hetero- nuclear diatomic molecules). **CO-3**: Understand the concept of lattice energy using Born-Lande and Kapustinskii equation. **CO-4**: Calibrate the apparatus used in titrimetric analysis and prepare standard solutions for titration. **CO-5**: Understand the theory and application of various acid-base and redox titrations. **CO-6**: Comprehend the theory of acid-base indicators.	**1.** Use of 3D models to visualize the organic molecules in a three dimensional space. **2.** Hands on methods in laboratory to learn quantitative techniques so that students can join the industrial labs. **3.** Video lectures from SWAYAM and NPTEL. **4.** Use of Virtual Labs. **5.** Correlation of concepts with demonstration and experiments in Laboratory. **6.** Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test. **7.** In Practical, assessment will be done based on continuous evaluation, performance in the experiment on the date of examination and viva voce.
Gaseous and Liquid State	**CO-1:** Derive mathematical expressions for different properties of gas and liquid andunderstand their physicalsignificance. **CO-2:** Apply the concepts of gas equations and liquids while studying other chemistry courses and every-day life.	1. Students will learn the skills to handle the viscometer and Stalagmometer and measure the viscosity and surface tension of different liquids.

	CO-3: Handle stalagmometer and Ostwald viscometer properly. **CO-4:** Determine the density of aqueous solutions. **CO-5:** Dilute the given solutions as per required concentrations. **CO-6:** Data reduction using numerical and graphical methods.	**2.** Blended mode of teaching with flip classroom approach along with traditional chalk and blackboard method. **3.** Video lectures from SWAYAM and NPTEL. **4.** Use of Virtual Labs. **5.** Training to handling basic chemical laboratory instruments and their use in analytical and biochemical determinations. **6.** Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test. In Practical, assessment will be done based on continuous evaluation, performance in the experiment on the date of examination and viva voce.
Basic Concepts and Aliphatic Hydrocarbons	**CO-1:** Understand and explain the electronic displacements and reactive intermediates and their applications in basic concepts. **CO-2:** Formulate the mechanistic route of organic reactions by recalling and correlating the fundamental concepts. **CO-3:** Identify and comprehend mechanism for free radical substitution, electrophilic addition, nucleophilic substitution and elimination reactions.	**1.** Use of 3D models to visualize the organic molecules in a three dimensional space. **2.** Hands on methods in laboratory to learn quantitative techniques so that students can join the industrial labs. **3.** Video lectures from SWAYAM and NPTEL

	CO-4: Understand the fundamental concepts of stereochemistry. **CO-5:** Understand and suitably use the chemistry of hydrocarbons.	**4.** Use of Virtual Labs **5.** Correlation of concepts with demonstration and experiments in Laboratory **6.** Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test. **7.** In Practical, assessment will be done based on continuous evaluation, performance in the experiment on the date of examination and viva voce.

Core Subjects (Semester 2)

Course Name	Course Outcomes	Methodology to Achieve the Specific Outcomes
Haloalkanes, Arenes, Haloarenes, Alcohols, Phenols, Ethers and Epoxides	**CO-1:** Understand reactions of arenes, haloarenes and some oxygen containing functional groups. **CO-2:** Understand the concept of protection and deprotection**.** **CO3:** Use the synthetic chemistrylearnt in this course to do functional group transformations. **CO4:** Propose plausible mechanisms for the reactions under study.	**1.** Use of 3D models to visualize the organic molecules in a three dimensional space. **2.** The students will learn the techniques to synthesize the new chemical molecules in the lab. **3.** Video lectures from SWAYAM and NPTEL. **4.** Use of Virtual Labs **5.** Correlation of concepts with demonstration and experiments in Laboratory **6.** Demonstration of chromatography techniques in lab. **7.** In Practical, assessment will be done based on continuous evaluation, performance in the experiment on the date of examination and viva voce.

Chemical Thermodynamics and its Applications	**CO-1:** Understand the three laws of thermodynamics, concept of State and Path functions, extensive and intensive properties. **CO-2:** Derive the expressions of ΔU, ΔH, ΔS, ΔG, ΔA for ideal gases under different conditions. **CO-3:** Explain the concept of partial molar properties.	**1.** Use of 3D models to visualize the organic molecules in a three dimensional space. **2.** Blended mode of teaching with flip classroom approach along with traditional chalk and blackboard method. **3.** Video lectures from SWAYAM and NPTEL. **4.** Use of Virtual Labs. **5.** Correlation of concepts with demonstration and experiments in Laboratory. **6.** Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test. **7.** In Practical, assessment will be done based on continuous evaluation, performance in the experiment on the date of examination and viva voce.

Chemistry of s and p-Block Elements	**CO-1:** Learn the fundamental principles of metallurgy and understand the importance of recovery of by-products during extraction. **CO-2:** Applications of thermodynamic concepts like that of Gibbs energy and entropy to the principles of extraction of metals. **CO-3:** Learn about the characteristics of s- and p- block elements as well as the synthesis, structure, bonding and uses of their compounds. **CO-4:** Understand the concept and use of internal and external redox indicators **CO-5:** Comprehend the theory and application of iodometric and iodimetric titrimetric analysis.	**1.** Use of 3D models to visualize the organic molecules in a three dimensional space. **2.** Hands on methods in laboratory to learn quantitative techniques so that students can join the industrial labs. **3.** Video lectures from SWAYAM and NPTEL. **4.** Use of Virtual Labs. **5.** Correlation of concepts with demonstration and experiments in Laboratory. **6.** Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test. **7.** In Practical, assessment will be done based on continuous evaluation, performance in the experiment on the date of examination and viva voce.

Core Subjects (Semester 3)

Course Name	Course Outcomes	Methodology to Achieve the Specific Outcomes
Chemistry of d- and f Elements & quantitative Inorganic Analysis	**CO-1:** Provide thorough knowledge about the d- and f-block elements with respect to the general group trends, physical and chemical properties of these elements. **CO-2:** Familiarize the students with the d- and f-block elements and get an idea about horizontal similarity in a period in addition to vertical similarity in a group. **CO-3:** Impart the knowledge about inorganic polymer. **CO-4:** Give an idea about the principles of gravimetric analysis. **CO-5:** List the important properties of transition metals, lanthanoids, and actinoids, Use Latimer diagrams to predict and identify species which are reducing, oxidizing and tend to disproportionate and calculate skip step potentials. **CO-6:** Describe the classification, structure and applications of Inorganic Polymers, List and use the principles of gravimetric analysis for quantitative analysis.	**1.** Use of 3D models to visualize the organic molecules in a three dimensional space. **2.** Blended mode of teaching with flip classroom approach along with traditional chalk and blackboard method. **3.** Video lectures from SWAYAM and NPTEL. **4.** Use of Virtual Labs. **5.** Correlation of concepts with demonstration and experiments in Laboratory. **6.** Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test. **7.** In Practical, assessment will be done based on continuous evaluation, performance in the experiment on the date of examination and viva voce.

Carbonyls, Carboxylic Acids, Amines, Nitro Compounds, Nitriles, Isonitriles and Diazonium Salts	**CO-1:** Infuse students with the details of the chemistry of aldehydes, ketones, carboxylic acids and their derivatives, nitro, amines and diazonium salts. **CO-2:** Make students aware of the chemical synthesis, properties, reactions and key applications of the listed classes of compounds and develop understanding of detailed mechanistic pathways for each functional group to unravel the spectrum of organic chemistry and the extent of organic transformations. **CO-3:** Aid in the paramount learning of the concepts and their applications. **CO-4:** Explain the chemistry of oxygen and nitrogen containing compounds. **CO-5:** Use the synthetic chemistry learnt in this course to do functional group transformations. **CO-6:** Propose plausible mechanisms for the reactions under study.	**1.** Use of 3D models to visualize the organic molecules in a three dimensional space. **2.** Blended mode of teaching with flip classroom approach along with traditional chalk and blackboard method. **3.** Video lectures from SWAYAM and NPTEL. **4.** Use of Virtual Labs. **5.** Correlation of concepts with demonstration and experiments in Laboratory. **6.** Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test. **7.** In Practical, assessment will be done based on continuous evaluation, performance in the experiment on the date of examination and viva voce.

Chemical equilibrium, Ionic equilibrium, conductance and solid state	**CO-1:** Make students understand the concept of chemical equilibrium and ionic equilibrium. **CO-2:** Introduce the concept of electrolytes, ionization of various electrolytes, pH. **CO-3:** Explain the applications of ionization in buffer, hydrolysis, acid-base titrations and indicators. **CO-4:** Introduce the concept of electrolytic conductance with respect to strong and weak electrolytes and then extend it to understand concepts like ionic mobility, transference and related properties. **CO-5:** Develop the advance concept of solid state with emphasis on crystal structures in general and cubic crystals in details. **CO-6:** Apply the concept of equilibrium to various physical and chemical processes. **CO-7:** Derive and express the equilibrium constant for various reactions at equilibrium. **CO-8:** Use Le Chatelier's principle to predict the thermodynamic conditions required to get maximum yield of a reaction. **CO-9:** Apply the concept of equilibrium to various ionic reactions. **CO-10:** List different types of electrolytes and their properties related to conductance in aqueous solutions **CO-11:** Use conductance measurements for calculating many properties of the	**1.** Demonstration of working of Electrochemical cells in the lab. **2.** Handling skills for potentiometer. **3.** Video lectures from SWAYAM and NPTEL. **4.** Use of Virtual Labs. **5.** Correlation of concepts with demonstration and experiments in Laboratory. **6.** Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test. **7.** In Practical, assessment will be done based on continuous evaluation, performance in the experiment on the date of examination and viva voce.

	electrolytes, Prepare buffer solutions of appropriate pH. **CO-12:** Explain the crystal properties and predict the crystal structures of cubic systems form the XRD, Use the instruments like pH-meter and conductivity meters.	

Core Subjects (Semester 4)

Course Name	Course Outcomes	Methodology to Achieve the Specific Outcomes
Coordination Chemistry and Reaction Mechanism	**CO-1:** Familiarize the students with coordination compounds which find manifold applications in diverse areas. **CO-2:** Acquaint the student with the concept of Inorganic reaction mechanism. **CO-3:** Explain the terms- ligand, denticity of ligands, chelate, coordination number and use standard rules to name coordination compounds. **CO-4:** Discuss the various types of isomerism possible in such compounds. **CO-5:** Use Valence Bond Theory to predict the structure and magnetic behaviour of metal complexes and understand the terms inner and outer orbital complexes. **CO-6:** Explain the meaning of the terms Δo, Δt, pairing energy, CFSE, high spin and low spin complexes and how CFSE affects thermodynamic properties like lattice enthalpy and hydration enthalpy. **CO-7:** Explain magnetic properties and colour of complexes on the basis of Crystal Field Theory. **CO-8:** Explain the reaction mechanism of coordination compounds and differentiate between kinetic and thermodynamic	**1.** Demonstration of UV-Vis spectrophotometer working. **2.** Blended mode of teaching with flip classroom approach along with traditional chalk and blackboard method. **3.** Demonstration and performing the experiments to synthesize the new inorganic molecules in the lab. **4.** Use of Virtual Labs. **5.** Correlation of concepts with demonstration and experiments in Laboratory. **6.** Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test. **7.** In Practical, assessment will be done based on

	stability.	continuous evaluation, performance in the experiment on the date of examination and viva voce.
Carbohydrates, Lipids and Heterocyclic Compounds	**CO-1:** Familiarize students with the chemistry of carbohydrates, lipids, and heterocyclic compounds. **CO-2:** Enable students to develop novel, efficient, convenient, selective and environmentally benign synthetic methods for synthesis of heterocyclic compounds. **CO-3:** Describe uses and applications carbohydrates, lipids and heterocycles. **CO-4:** Use the knowledge gained from study of carbohydrates, lipids and heterocycles to propose greener and better synthetic routes. **CO-5:** Use the chemistry and biology of carbohydrates, lipids and heterocycles to better serve the mankind.	**1.** Practicals related to structural elucidation of organic compounds with specific examples of terpenes and alkaloids. **2.** Blended mode of teaching with flip classroom approach along with traditional chalk and blackboard method. **3.** Video lectures from SWAYAM and NPTEL. **4.** Use of Virtual Labs. **5.** Correlation of concepts with demonstration and experiments in Laboratory. **6.** Experiment to predict the carbon skeleton of amines and heterocyclic compounds via use of Hoffmann's exhaustive methylation and Emde's modification methods. **7.** Experiment to isolate caffeine from tea leaves
Electrochemical Cells, Chemical Kinetics and Catalysis	**CO-1:** Explain the working of electrochemical cells and different types of galvanic cell. **CO-2:** Devise a spontaneous galvanic cell using various combinations of half-cells, Understand the concept of concentration cell.	**1.** Use of 3D models to visualize the organic molecules in a three dimensional space. **2.** Blended mode of teaching with flip classroom approach

	CO-3: Use the appropriate galvanic cell to measure pH, calculate thermodynamic parameters and perform potentiometric titrations. **CO-4:** Write rate law and derive rate equations for simple and complex reactions and understanding of theories of reaction rates. **CO-5:** Understand different types of catalysts and mechanism of enzyme catalysis. **CO-6:** Perform potentiometric titrations using appropriate electrodes for quantitative analysis. **CO-7:** Set up experiments to study the kinetics of simple reactions.	along with traditional chalk and blackboard method. **3.** Video lectures from SWAYAM and NPTEL. **4.** Use of Virtual Labs. **5.** Correlation of concepts with demonstration and experiments in Laboratory. **6.** Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test. **7.** In Practical, assessment will be done based on continuous evaluation, performance in the experiment on the date of examination and viva voce.

Core Subjects (Semester 5)

Course Name	Course outcomes	Methodology to Achieve the Specific Outcomes
Nucleic Acids, Amino Acids, Proteins and Enzymes	**CO-1:** Demonstrate how structure of biomolecules determines their reactivity and biological role. **CO-2:** Gain insight into concepts of heredity through the study of genetic code, replication, transcription, and translation. **CO-3:** Demonstrate basic understanding of enzyme action and role of inhibitors. **CO-4:** Use knowledge gained to solve real world problems.	**1.** Techniques for Isolation and estimation of DNA usingcauliflower/onion. **2.** Blended mode of teaching with flip classroom approach along with traditional chalk and blackboard method. **3.** Video lectures from SWAYAM and NPTEL. **4.** Use of Virtual Labs. **5.** Correlation of concepts with demonstration and experiments in Laboratory. **6.** Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test. **7.** In Practical, assessment will be done based on continuous evaluation, performance in the experiment on the date of examination and viva voce.

Quantum Chemistry & Spectroscopy	**CO-1:** Learn about limitations of classical mechanics and solution in terms of quantum mechanics for atomic/molecular systems. **CO-2:** Develop an understanding of quantum mechanical operators, quantization, probability distribution, uncertainty principle and application of quantization to spectroscopy. **CO-3:** Interpret various types of spectra and know about their application in structure elucidation.	**1.** Use of 3D models to visualize the organic molecules in a three dimensional space. **2.** Blended mode of teaching with flip classroom approach along with traditional chalk and blackboard method. **3.** Video lectures from SWAYAM and NPTEL. **4.** Use of Virtual Labs. **5.** Students will learn the techniques to handle colorimeter and spectrophotometer by hands on experience in the lab. **6.** Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test. **7.** In Practical, assessment will be done based on continuous evaluation, performance in the experiment on the date ofexamination.

Core Subjects (Semester 6)

Course Name	Course Outcomes	Methodology to Achieve the Specific Outcomes
Spectroscopy and Applied Organic Chemistry	**CO-1:** Gain insight into the basic principles of UV, IR and NMR spectroscopic techniques. **CO-2:** Use spectroscopic techniques to determine structure and stereochemistry of known and unknown compounds. **CO-3:** Develop a sound understanding of the structure of Pharmaceutical Compounds. They will also understand the importance of different classes of drugs and their applications for treatment of various diseases. **CO-4:** Learn about the chemistry of natural and synthetic polymers including fabrics and rubbers. **CO-5:** Understand the chemistry of biodegradable and conducting polymers and appreciate the need of biodegradable polymers with emphasis on basic principles. **CO-6:** Learn about the theory of colour and constitution as well asthe chemistry of dyeing. **CO-7:** Know applications of various types of dyes including those in foods and textiles.	**1.** Techniques to Identify simple organic compounds by IR and NMR spectroscopy. **2.** Blended mode of teaching with flip classroom approach along with traditional chalk and blackboard method. **3.** Video lectures from SWAYAM and NPTEL. **4.** Use of Virtual Labs. **5.** Correlation of concepts with demonstration and experiments in Laboratory. **6.** Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test. **7.** In Practical, assessment will be done based on continuous evaluation, performance in the experiment on the date of examination and viva voce.

Organometallic Chemistry & Bio-inorganic Chemistry	**CO-1:** Understand and explain the basic principles of qualitative inorganic analysis. **CO-2:** Apply 18-electron rule to rationalize the stability of metal carbonyls and related species **CO-3:** Understand the nature of Zeise's salt and compare its synergic effect with that of carbonyls. **CO-4:** Identify important structural features of the metal alkyls tetrameric methyl lithium and dimeric trialkyl aluminium and explain the concept of multicenter bonding in these compounds **CO-5:** Diagrammatically explain the working of the sodium-potassium pump in organisms and the factors affecting it and understand and describe the active sites and action cycles of the metalloenzymes carbonic anhydrase and carboxypeptidase **CO-6:** Explain the sources and consequences of excess and deficiency of trace metals and learn about the toxicity of certain metal ions, the reasons for toxicityand antidotes **CO-7:** Explain the use of chelating agents in medicine and, specifically, the role of cisplatin in cancer therapy and explain the applications of iron in biological systems with particular reference to hemoglobin, myoglobin, ferritin	**1.** Use of 3D models to visualize the organic molecules in a three dimensional space. **2.** Blended mode of teaching with flip classroom approach along with traditional chalk and blackboard method. **3.** Video lectures from SWAYAM and NPTEL. **4.** Use of Virtual Labs. **5.** Correlation of concepts with demonstration and experiments in Laboratory. **6.** Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test. **7.** In practicals, assessment will be done based on continuous evaluation, performance in the experiment on the date of examination and viva voce.

	and transferring **CO-8:** Get a general idea of catalysis and describe in detail the mechanism of Wilkinson's catalyst, Zeigler- Natta catalyst and synthetic gasoline manufacture by Fischer-Tropsch process.	

DSE Semester 4/5/6

Course Name	Course Outcomes	Methodology to Achieve the Specific Outcomes
Nuclear and Environmental Chemistry	**CO-1:** Gain knowledge about Nuclear chemistry, radioactive decay, nuclear disasters, and nuclear waste and their disposal. **CO-2:** Describe the composition of air, various air pollutants, effects and control measures of air pollutants. **CO-3:** List different sources of water, water quality parameters, impacts of water pollution, water treatment. **CO-4:** Identify different industrial effluents and their treatment methods. **CO-5:** Make students know more about nuclear chemistry. **CO-6:** Familiarize the students about environmental chemistry, especially with respect to air and water.	**1.** Use of 3D models to visualize the organic molecules in a three dimensional space. **2.** Blended mode of teaching with flip classroom approach along with traditional chalk and blackboard method. **3.** Video lectures from SWAYAM and NPTEL. **4.** Use of Virtual Labs. **5.** Correlation of concepts with demonstration and experiments in Laboratory. **6.** Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test. **7.** In Practical, assessment will be done based on continuous evaluation, performance in the experiment on the date of examination and viva voce.

Inorganic Materials of Industrial Importance	**CO-1:** Learn the composition and applications of the different kinds of glass. **CO-2:** Understand glazing of ceramics and the factors affecting their porosity. **CO-3:** Give the composition of cement and discuss the mechanism of setting of cement. **CO-4:** Explain the suitability of fertilizers for different kinds of crops and soil. **CO-5:** Explain the process of formulation of paints and the basic principle behind the protection offered by the surface coatings. **CO-6:** Explain the principle, working and applications of different batteries. **CO-7:** List and explain the properties of engineering materials for mechanical construction used in day to day life. **CO-8:** Explain the synthesis and properties of Nano-dimensional materials, various semiconductor and superconductor oxides.	**1.** Use of 3D models to visualize the organic molecules in a three dimensional space. **2.** Blended mode of teaching with flipclassroom approach along with traditionalchalk and blackboardmethod. **3.** Video lectures from SWAYAM and NPTEL. **4.** Use of Virtual Labs. **5.** Correlation of concepts with demonstration and experiments in Laboratory. **6.** Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test. **7.** In Practical, assessmentwill be done based on continuous evaluation, performance in the experiment on the date of examination and viva voce.
Industrial Chemicals and Environment	**CO-1:** The different toxic gases and their toxicity hazards. **CO-2:** Safe design systems for large scale production of industrial gases. **CO-3:** Manufacturing processes, handling and storage of inorganic chemicals. **CO-4:** Hazardous effects of the inorganic chemicals on human beings and vegetation. **CO-5:** The requirement of ultra-pure metals for the semiconducting technologies, Composition of air, various air	**1.** Use of 3D models to visualize the organic molecules in a three dimensional space. **2.** Blended mode of teaching with flip classroom approach along with traditional chalk and blackboard method. **3.** Video lectures from SWAYAM and NPTEL. **4.** Use of Virtual Labs. **5.** Correlation of concepts with demonstration and

	pollutants, effects and control measures of air pollutants. **CO-6:** Different sources of water, water quality parameters, impacts of water pollution, water treatment, Different industrial effluents and their treatment methods, Different sources of energy. **CO-7:** Generation of nuclear waste and its disposal. **CO-8:** Use of biocatalyst in chemical industries.	experiments inLaboratory. **6.** Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test. **7.** In Practical, assessment will be done based on continuous evaluation, performance in the experiment on the date of examination and viva voce.

Skill Enhancement Course

Course Name	Course Outcomes	Methodology to Achieve the Specific Outcomes
Green Methods in Chemistry	**CO-1:** Get idea of toxicology, environmental law, energy and the environment. **CO-2:** Think to design and develop materials and processes that reduce the use and generation of hazardous substances in industry. **CO-3:** Think of chemical methods for recovering metals from used electronics materials. **CO-4:** Get ideas of innovative approaches to environmental and societal challenges. **CO-5:** Know how chemicals can have an adverse/potentially damaging effect on human and vegetation. **CO-6:** Critically analyze theexisting traditional chemical pathways and processes and creatively think about bringing environmentally benign reformations in these protocols. **CO-7:** Convert biomass into valuable chemicals through green technologies.	**1.** Some motivating short movies in green chemistry especially in bio mimicry. **2.** Blended mode of teaching with flip classroom approach along with traditional chalk and black board method. **3.** Video lectures from SWAYAM and NPTEL. **4.** Use of Virtual Labs. **5.** Correlation of concepts with demonstration and experiments inLaboratory. **6.** Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test. **7.** In Practical, assessment will be done based on continuous evaluation, performance in the experiment on the date of examination and viva voce. **8.** Visits to a green chemistry lab.

Chemistry Lab Operations and Safety Measures	**CO-1:** Cultivate efficient working skills among the students to work in a chemistry laboratory. **CO-2:** Create a trained workforce which can responsibly learn imbibe and explore verticals on structured knowledge safely. **CO-3:** Make students aware of different chemicals and their properties being used in the chemistry laboratory. **CO-4:** Able to design and implement safe working practices in chemistry laboratory. **CO-5:** Able to safely handle different glass apparatus. **CO-6:** Able to handle the chemicals and equipment safely and properly. **CO-7:** Able to design working protocols related to various methods and instruments in chemistry laboratory.	**1.** Some motivating short movies in green chemistry especially in bio mimicry. **2.** Blended mode of teaching with flip classroom approach along with traditional chalk and black board method. **3.** Video lectures from SWAYAM and NPTEL. **4.** Use of Virtual Labs. **5.** Correlation of concepts with demonstration and experiments in Laboratory. **6.** Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test. **7.** In Practical, assessment will be done based on continuous evaluation, performance in the experiment on the date of Examination and viva voce.