

Government Girls' General Degree College

COURSE & PROGRAM OUTCOMES OF CHEMISTRY HONOURS (B.SC.)

UNDER CBCS

The CBCS Course curriculum of the discipline of Chemistry is well designed and very promising. The core course would help to enrich the subject knowledge of the students and increase their confidence level in the field of both academia and industry. Generic electives make integration among various interdisciplinary courses to fulfill the vision and mission of designing the course. The introduction of Skill Enhancement Courses (SEC) would help to gain more powerful knowledge not only in their core Chemistry subject but also in interrelated multidisciplinary subjects both theoretically and practically. The inclusion of Discipline Specific Courses (DSE) has brought an opportunity in front of students to gain knowledge on various naturally and industrially important useful materials and also helps them to familiar and expert in handling different chemistry based software after proper training. In brief the student graduated with this type of curriculum would be able to disseminate subject knowledge along with necessary skills to suffice their capabilities for academia, entrepreneurship and industry.

Course Outcomes:

Semester	Course Codes	Course Outcomes
SEM I	CC1-1-TH Inorganic Chemistry-1 & CC 1-1-P Inorganic Chemistry: I(1) LAB	CO 1. To learn about the extra nuclear structure of atom and get a basic idea about Quantum Chemistry and its Application. CO 2. Gives an idea about different types of acids, their definitions and also gives a clear concept about pH, buffer, and indicator. CO 3. To get an idea of redox reaction –Oxidation and reduction reaction, oxidation number, competitive electron transfer reaction, electrode process. CO 4. To study the estimation of ions or salts by acid-base titration method and oxidation-reduction titration method.
	CC 1-1-TH Organic Chemistry-1A &	CO 1. It gives the basic idea of structure, properties and reactivity of organic molecules and their relationship and an overview about Molecular Orbital Theory (MOT).

	CC 1-1-P Organic Chemistry: O(1A) LAB	CO 2. It informs the students about the different reaction mechanism in organic chemistry. CO 3. It helps to develop the hand-on skill to determine the nature of the organic compounds on the basis of solubility.
	CC1-2-TH Physical Chemistry-1 & CC1-2-P Physical Chemistry: P(1) LAB	CO 1. To get some fundamental understanding of the concept of pressure, temperature, average velocity, average energy etc. of gas molecules and able to derive the expressions of those properties using Kinetic Theory of gas. Students will learn the deviation of the properties of real gas from kinetic theory of gas behaviour and construct an equation of state that describes their properties. Students will also get information about the various intermolecular forces present in the system. CO 2. To get some ideas about various transport processes such as diffusion and viscosity and their measurements. CO 3. Help the students to understand the basic concepts regarding rates of various chemical reactions, measurements of the order and rate of the reactions, dependence of rate constants and hence the rate of the reaction on temperature, catalysts etc. and plausible mechanisms of the reactions. CO 4. The laboratory course enable students to determine the viscosity of unknown liquid with respect to water by using instrument like Viscometer, solubility of sparingly soluble salt in water and in presence of electrolyte with common ion and in presence of non electrolyte. They will also study the kinetics of various chemical reactions.
	CC 1-2-TH Organic Chemistry-1B & CC 1-2-P Organic Chemistry: O(1B) LAB	CO 1. Students will learn three-dimensional structure of organic molecule which is very much essential to visualize molecules. CO 2. To get an idea about the structure and nature of intermediates like carbocations, carboanions, radicals and carbenes. CO 3. The laboratory course helps students to develop laboratory training to use melting point and boiling apparatus.
SEM 2	CC2-3-TH Organic Chemistry-2 & CC2-3-P Organic Chemistry LAB	CO 1. It provides an advanced idea on axial chirality, topicity, etc. and the conformational analysis of organic molecules. CO 2. Students will learn thermodynamics of organic reactions and basic concept reaction mechanism CO 3. To get detail idea about the nucleophilic substitution reactions (SN1, SN2) along with NGP and SNi and stereochemical and regiochemical outcome of elimination reactions. CO 4. The laboratory course enable students to get basic skill of organic synthesis through the preparation methodology.

	CC2-4-TH Inorganic Chemistry-2 & CC2-4-P Inorganic Chemistry LAB	CO 1. To get an idea about Ionic bond and Covalent bond, laws, rules and equations for formation of chemical bonds, solubility, hybridization and dipole moment of molecules. CO 2. To develop a concept about MOT (Molecular orbital theory), LCAO (Linear combination of atomic orbitals), Metallic bond and Weak Chemical Forces etc. CO 3. To understand about the concept of radioactivity and radioactive compounds, nuclear reactions, artificial radioactivity, radio carbon dating, hazards of radiation and safety measures. CO 4: To know experimentally how to estimate the percentage of chlorine in bleaching powder; vitamin C; arsenic and antimony in a sample by iodimetric titration method. Students can also learn how to estimate Cu in brass, Cr and Mn in steel and Fe in cement.
SEM 3	CC3-5-TH Physical Chemistry-2 & CC 3-5- PPhysical Chemistry LAB	CO 1. To get a knowledge of basic concepts of thermodynamic properties, nature of changes and the first law of thermodynamics. They can also apply this law in various systems undergoing different thermodynamic process to evaluate various thermodynamic properties such as heat, mechanical work, change in enthalpy, change in internal energy etc. of the system and also able to explain the thermochemistry of the various chemical processes. CO 2. Will first learn the need and the various statements of the second law of thermodynamics and new thermodynamic functions such as entropy, Gibbs free energy, Gibbs-Helmholtz etc. are also introduced to them. From these thermodynamic properties they get knowledge regarding the random behaviour of the system and most importantly the criteria of spontaneity and equilibrium. They will also learn the various important thermodynamic relations, various partial molar quantities, dependence of thermodynamics parameters on composition etc. CO 3. To get idea about conductance and transport number of electrolytes and their measurements, the derivation of Debye-Huckel Theory, DebyeHuckel limiting law and Ostwald dilution law, knowledge of conductometric titration and it's application. Students will gain vast knowledge on chemical equilibrium and electrochemistry. CO 4. The laboratory course enable students to handle instruments like digital conductometer, digital potentiometer and able to perform various conductometric and potentiometric experiments to find out the ionisation constant of weak acid, rate constants of chemical reaction, K _{sp} values etc.
	CC3-6-TH Inorganic Chemistry-3 &	CO 1. To study in detail about the modern periodic table, physical and chemical properties of the elements along a group or period, factors influences those properties, relativistic effects

	CC 3-6- PInorganic Chemistry LAB	<p>and inert pair effect.</p> <p>CO 2. To study the chemistry of s and p block elements and to get an elementary idea about occurrence, use of Noble gases, Nature of bonding of Noble gas compounds and their preparations including noble gases and their compounds in detail.</p> <p>CO 3. To learn about inorganic polymers with types ,structural aspects and their applications in detail.</p> <p>CO 4. To get a basic idea about different types of coordination complexes, theory of coordination complexes and their nature of bonding. To learn about the Werner’s theory for complex formation, structural and stereoisomerism of coordination complexes.</p> <p>CO 5. To learn the complexometric and gravimetric estimation of different ions, chromatographic separation of (i) Ni (II) and Cu (II) ions, (ii) Fe (III) and Al (III) ions.</p>
	CC3-7-TH Organic Chemistry-3 & CC3-7-P Organic Chemistry LAB	<p>CO 1. To get detailed idea about the electrophilic addition reactions of organic molecules with stereochemistry.</p> <p>CO 2. It informs about the reparation of different aromatic compounds using the idea of substitution reaction.</p> <p>CO 3. To get detailed idea about nucleophilic addition to carbonyl carbon, 1,2- addition vs 1,4- addition by using of organometallics compounds.</p> <p>CO 4. The students learn the application of organic reaction and some tricks for qualitative and quantitative analysis of some organic compounds used in daily life.</p>
	SEC A	<p>SEC-1. Mathematics and statistics for chemists</p> <p>CO 1. To get a basic idea of mathematical functions, differential equations, probability, vectors, matrices and determinants.</p> <p>CO 2. To learn about qualitative and quantitative aspects of analysis and helps to understand how to present a data after analysis.</p> <p>SEC-2. Analytical clinical biochemistry</p> <p>CO 1. To learn about the preparation, structures, reactions and biological importance of carbohydrates, proteins, enzymes, lipids and lipoproteins.</p> <p>CO 2. To know the biochemistry of different diseases through a diagnostic approach by blood and urine analysis.</p> <p>CO 3. To learn how to isolate proteins and how to perform the qualitative estimation of carbohydrate, proteins and lipids.</p> <p>CO 4. To study the quantitative estimation of carbohydrate, cholesterol, nucleic acids, determination of the iodine number of oil and saponification number of oil.</p>

SEM 4	CC4-8-TH Organic Chemistry-4 & CC 4-8-POrganic Chemistry LAB	<p>CO 1. It provides detailed idea about preparations and applications of nitrogenous organic compounds.</p> <p>CO 2. Students will learn Rearrangements of organic compounds in presence different reagents and learn the mechanism of rearrangement.</p> <p>CO 3. To get get about synthesis strategy of the synthesis of organic compounds with the knowledge of organic reactions and mechanism.</p> <p>CO 4. Idea about analysis of different organic compounds using different spectroscopic methods.</p> <p>CO 5. The laboratory course enable students to get idea about detection of functional groups and preparation of derivatives using the knowledge of organic chemistry.</p>
	CC4-9-TH Physical Chemistry-3 & CC4-9- PPhysical Chemistry LAB	<p>CO 1. Will learn the thermodynamic basis of various colligative properties; its derivation, various applications and its abnormal behaviour. Students will also understand the background of phase transitions and the behaviour of binary solutions.</p> <p>CO 2. To develop a concept about the fundamental quantum theories which help the students to understand wave-particle duality of matter and uncertainty relationship. Students will become familiar with the techniques to solve the translational motion of quantum mechanical system by modelling particle in box problem with the help of fundamental postulates of quantum mechanics.</p> <p>CO 3. To understand about the various types of solids, lattices, laws of crystallography, representation of crystal planes and able to solve the dilemma of classical picture of calculation of specific heat of solid.</p> <p>CO 4: To know experimentally how to handle digital polarimeter and study the kinetics of inversion of cane sugar by using it. They will also learn to draw the phase diagram of binary solvents. They will also handle digital pH meter for pH metric titration of dibasic and tribasic acid against strong base.</p>
	CC4-10-TH Inorganic Chemistry-4 & CC 4-10-P Inorganic Chemistry LAB	<p>CO 1. To get an idea about elementary Crystal Field theory ,MO concept, Magnetism, Colour, Magnetic moment and Selection rules for electronic spectral transitions etc.</p> <p>CO 2. To get a basic idea about transition elements(3d,4d and 5d) like their electronic configuration ,oxidation states and properties etc and also get a clear idea about Lanthanoids and Actinoids.</p>

		<p>CO 3. To get idea about various types of substitution reaction and their mechanisms, Thermodynamic and Kinetic stability related problems.</p> <p>CO 4. The laboratory course enable students to learn study experimentally how to synthesize inorganic complexes and determine the λ_{max} values of inorganic complexes. To calculate the $10Dq$ value by spectrophotometric method.</p>
	SEC-B	<p>SEC-3. Pharmaceuticals Chemistry</p> <p>CO 1. To learn about the drug discovery, design and development of representative drugs of the following classes: Analgesics, Antipyretic, Anti-inflammatory, Anti-bacterial, Antifungal, Antiviral, Antibiotics, Anti-laprosy, Central Nervous System agents, HIV-AIDS related drugs.</p> <p>CO 2. To get idea about aerobic and anaerobic fermentation.</p> <p>CO 3. To learn experimentally the preparation of aspirin and its analysis.</p> <p>CO 4. To learn experimentally the preparation of magnesium bisilicate (Antacid).</p> <p>SEC-4. Pesticide Chemistry</p> <p>CO 1. To learn about the preparation, structures, properties, reactions, benefits and adverse effects of representative pesticide of the following classes: Organochlorines, Organophosphates, Carbamates, Quinones.</p> <p>CO 2. Learn to calculate acidity/ alkalinity in a given sample of pesticide formulations as per BIS specifications.</p> <p>CO 3. To learn experimentally the preparation of organophosphates, phosphonates and thiophosphates.</p>
SEM 5	CC5-11-TH Physical Chemistry-4 & CC 5-11-P Physical Chemistry LAB	<p>CO 1. Will learn to set up and solve the Schrödinger wave equations for vibrational motion of a system by modelling it as SHO, rotational motion of the system by modelling it as rigid rotor and the real system hydrogen atom and hydrogen like ions. This segment provides some quantum mechanical basis of chemical bonding with the help of VB theory and MO theory.</p> <p>CO 2. Will learn to set up some relations of various macroscopic properties with the properties of microscopic constituents of the system using statistical method and the concept of partition function.</p> <p>CO 3. Help students to derive numerical methods of various mathematical operations such as differentiation, integrations, the solutions of linear and nonlinear equations.</p> <p>CO 4. The laboratory course enable students to become</p>

		familiar with the computer program, FORTRAN and by using this program they can evaluate numerical differentiation, numerical integrations etc.
	CC5-12-TH Organic Chemistry-5 & CC 5-12-P Organic Chemistry LAB	CO 1. It provides knowledge about the detection and transformation of carbohydrates and their uses. CO 2. To get an idea about the preparation and different reactions of heterocyclic compounds. CO 3. To get general idea about pericyclic reactions, stereochemistry of cyclic organic compounds and their reactions. CO 4. Basic idea about preparations and applications of biomolecules. CO 5. The laboratory course helps students to learn about qualitative and quantitative separations and purifications of organic compounds. Helps to do qualitative analysis of organic compounds using IR and NMR spectroscopy.
	DSE	<p>DSE A-1. Molecular Modeling & Drug Design</p> <p>CO 1. It introduces to the students with the pharmaceutical aspect and importance of chemistry by molecular modeling and computer simulation. CO 2. Students will learn to optimized C – C bond lengths and compare the shapes in different Organic molecules. CO 3. Students will learn to visualise the electron density and electrostatic potential maps of some compounds. CO 4. Students will learn to build and minimize organic compounds and also to determine the heat of hydration and compute the resonance energy.</p> <p>DSE A-2. Applications Of Computers In Chemistry</p> <p>CO 1. It helps students to learn about different languages (FORTRAN) and softwares which are useful in the study and development of chemistry. CO 2. Helps to know about statistical data analysis. CO 3. To learn how to prepare graphs by using spreadsheet and introduction to spreadsheet software (MS Excel). CO 4. To study about the Acid-Base Titration Curve, Plotting of First and Second derivative Curve for pH metric and Potentiometric titrations, Calculation and Plotting of a Precipitation Titration Curve with MS Excel, Michaelis-Menten Kinetics for Enzyme Catalysis using Linear and Non - Linear Regression.</p>

		<p>DSE B-1. Inorganic Materials Of Industrial Importance</p> <p>CO 1. Students will learn the synthetic procedure and use of different commercially important materials like silicates, fertilizers, alloys, catalysts, surface coating materials and batteries.</p> <p>CO 2. To learn about the general principles, properties, classification, industrial use, deactivation and regeneration of catalysis.</p> <p>CO 3. To learn about the preparation and explosive properties of lead azide, PETN, RDX and the basic idea of rocket propellant.</p> <p>CO 4. The practical course helps to to learn how to analyze the composition of cement, composition of percentage of metals in alloy, electroless metallic coatings on ceramic and plastic.</p> <p>CO 5. To know how to determine free acidity in ammonium sulphate fertilizer, estimation of Calcium in Calcium ammonium nitrate fertilizer and phosphoric acid in superphosphate fertilizer.</p> <p>DSE B-2. Novel Inorganic Solids</p> <p>CO 1. Introduces students with advance fields of chemistry like synthetic modification of different industrially important Inorganic solids, synthesis of nano material, polymers etc.</p> <p>CO 2. To understand how to synthesize hydro-gel by co-precipitation method and silver and gold nanoparticles.</p> <p>CO 3. Determination of ions by cation exchange method and total difference of solids in a composite material.</p>
SEM 6	CC6-13-TH Inorganic Chemistry-5 & CC6-13-P Inorganic Chemistry LAB	<p>CO 1. Students get an idea about basic principles involved in qualitative analysis of cations and anions in various groups.</p> <p>CO 2. To study about the essential and beneficial elements of our life and various types of dioxygen management protein and their activity.</p> <p>CO 3. To learn about inorganic polymers with types ,structural aspects and their applications in detail.</p> <p>CO 4. To develop an idea about different types of organometallic compounds and their preparation and their applications as catalysis in various industrial process.</p> <p>CO 5. To study experimentally the qualitative detection of known and unknown radicals and insoluble materials in a mixture.</p>

	<p>CC6-14-TH Physical Chemistry-5 & CC6-14-P Physical Chemistry LAB</p>	<p>CO 1. To get a vast knowledge of the principles, experimental techniques and broad chemical application of Rotational, Vibrational, Electronic and Raman spectroscopy.</p> <p>CO 2. To learn about various photochemical and photophysical processes like fluorescence, phosphorescence etc., various laws of photochemistry and the concept of quantum yield. Students are also able to get knowledge regarding the detailed theoretical and mathematical treatment of reaction rate and the mechanism of unimolecular reactions.</p> <p>CO 3. To get information about the origin of various surface properties such as surface tension , adsorption etc., and molecular properties such as dipole moment and polarizability. They will also learn the various types of colloids, their stability, electro kinetic phenomena and the concept of micelle.</p> <p>CO 4. The students will learn to handle very sophisticated instrument like Spectrophotometer to perform various spectroscopy based experiments like verification of Lambert-Beer's law and measurement pH of unknown buffer solution, indicator constant of acid- base indicator, rate constants of chemical reaction. They will also able to handle instrument like Stalagmometer for the determination of surface tension of liquid and CMC of micelle.</p>
	<p>DSE</p>	<p>DSE A-3. Green Chemistry And Chemistry Of Natural Products</p> <p>CO 1. Students of undergraduate course are continuously being introduced and encouraged about the different possibilities in this field. It helps students to think and perform to design and develop environmentally benign methods for organic synthesis.</p> <p>CO 2. To know about the examples of green reactions and future trends in green reaction.</p> <p>CO 3. To learn how to perform green synthesis of a number of organic compounds in the laboratory.</p> <p>DSE A-4. Analytical Methods In Chemistry</p> <p>CO 1. Helps to learn about different analytical methods (Flame Atomic Absorption and Emission Spectrometry, Thermogravimetry, pH metric, Potentiometric and Conductometric Titrations) to identify and separate the products formed during different chemical transformations.</p> <p>CO 2. To study the fundamental laws of spectroscopy and</p>

		<p>selection rules.</p> <p>CO 3. To learn the methods of separation of stereoisomers by spectral, chemical and chromatographic data analysis (IC, GLC, GPC, TLC and HPLC).</p> <p>CO 4. To study experimentally how to separate and identify a mixture of monosaccharides by chromatography method.</p> <p>CO 5. To learn experimentally how to separate a mixture of ions by solvent extraction technique; determination of pH of soil and estimation of Ca, Mg and phosphate ion in soil.</p> <p>CO 6. To determine the pKa values of an indicator, COD and BOD using spectrophotometry.</p> <p>DSE B-3. Polymer Chemistry</p> <p>CO 1. To learn about the history, functionality and importance of polymeric materials.</p> <p>CO 2. To study the kinetics of polymerization, crystallization and crystallinity of polymers.</p> <p>CO 3. To understand the nature and structure of polymers, determination of molecular weight of polymers, and Tg.</p> <p>CO 4. To study the preparation, structure, properties and application of different types of addition and condensation polymers.</p> <p>CO 5. To learn experimentally the synthesis of polymers.</p> <p>CO-6: To learn experimentally how to characterize and analyze a polymeric compound or material.</p> <p>DSE B-4. Dissertation</p> <p>CO 1. Here students have immense opportunities to consult different national and international research papers. Thus they can enhance their knowledge and prepare useful review work in their desired topic with the help of faculty members.</p> <p>CO 2. To know how to handle the technical devices for presenting research works.</p>
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Course Outcomes of Chemistry Generic Elective

[For students having Honours in subjects other than Chemistry]

Semester	Course Code	Course Outcome
SEM I	CC1/GE-1	<p>CO-1: To know in detail about Kinetic Theory of Gases; Liquids and Chemical kinetics</p> <p>CO-2: To learn the basic concept, terms and equations of Atomic Structure; Chemical Periodicity and Acids and Bases</p> <p>CO-3: To learn about the Fundamentals of Organic Chemistry; Stereochemistry, Types, Mechanism and Examples of Nucleophilic Substitution Reaction and Elimination Reaction</p> <p>CO-4: To learn practically how to do the quantitative estimation of ions in a solution by using iodometric titration, permanganate titration and dichromate titration.</p> <p>CO-5: To learn how to estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture and how to estimate of water of crystallization in Mohr's salt by titrating with KMnO_4.</p> <p>CO-6: To study the estimation of oxalic acid by titrating it with KMnO_4.</p>
SEM II	CC1/GE-2	<p>CO-1: To understand detail about Chemical thermodynamics, Chemical equilibrium, Solutions, Phase Equilibrium and Solids.</p> <p>CO-2: To learn about synthesis, properties and reactions of Aliphatic Hydrocarbons</p> <p>CO-3: To understand about Error analysis and Computer Applications</p> <p>CO-4: To know the basic knowledge, types and applications Redox Reactions</p> <p>CO-5: To study the kinetics of acid-catalyzed hydrolysis of methyl acetate and decomposition of H_2O_2 (Clock Reaction)</p> <p>CO-6: To determine the viscosity of unknown liquid (glycerol, sugar) with respect to water surface tension of a liquid using Stalagmometer and the solubility of sparingly soluble salt in water</p> <p>CO-7: Preparation of buffer solutions and find the pH</p>

		of an unknown buffer solution by colour matching method.
SEM III	CC1/GE-3	<p>CO-1: To learn about Chemical bonding and Molecular structure, Comparative study of p-block elements, Transition Elements and Co-ordination Chemistry</p> <p>CO-2: To know the basic concept, terms, equations and applications of Electrochemistry</p> <p>CO-3: To understand about the synthesis, properties, chemical reactions and mechanisms of Aromatic Hydrocarbons, Organometallic Compounds and Aryl Halides</p> <p>CO-4: To study experimentally the qualitative detection of known and unknown radicals in a mixture.</p>
SEM IV	CC1/GE-4	<p>CO-1: To learn in detail about the preparation, properties, chemical reactions and mechanisms of Alcohol, Phenol, Ethers, Aldehydes, Ketones, Carboxylic acids, Esters, Amides, Amines, Diazonium salts, Amino-acids and Carbohydrates.</p> <p>CO-2: To know in detail about Crystal Field Theory.</p> <p>CO-3: To study the fundamental concepts of Quantum Chemistry and Spectroscopy.</p> <p>CO-4: To learn experimentally the qualitative analysis of single known and unknown solid organic compounds and also the identification of pure solid and liquid organic compounds.</p>

Program Outcomes

PO-1: Disciplinary knowledge and skill: A graduate student is expected to be capable of demonstrating comprehensive knowledge and understanding both theoretical and practical knowledge in all disciplines of Chemistry. Students can solve their subjective problems very methodically, independently and finally draw a logical conclusion. Further, the student will be capable of applying modern technologies, handling advanced instruments and Chemistry related soft-wares for chemical analysis, characterization of materials and in separation technology.

PO-2: Skilled communicator: The course curriculum incorporates basics and advanced training in order to make a graduate student capable of expressing the subject through technical writing as well as through oral presentation.

PO-3: Critical thinker and problem solver: The course curriculum also includes components that can be helpful to graduate students to develop critical thinking and to design, carry out, record and analyze the results of chemical reactions. Students will be able to think and apply evidence based comparative chemistry approach to explain chemical synthesis and analysis.

PO-4: Sense of inquiry: It is expected that the course curriculum will develop an inquisitive characteristics among the students through appropriate questions, planning and reporting experimental investigation.

PO-5: Team player: The course curriculum has been designed to provide opportunity to act as team player by contributing in laboratory, field based situation and industry.

PO-6: Skilled project manager: The course curriculum has been designed in such a manner as to enabling a graduate student to become a skilled project manager by acquiring knowledge about chemistry project management, writing, planning, study of ethical standards and rules and regulations pertaining to scientific project operation.

PO-7: Digitally literate: The course curriculum has been so designed to impart a good working knowledge in understanding and carrying out data analysis, use of library search tools, use of chemical simulation software and related computational work.

PO-8: Ethical awareness: A graduate student requires understanding and developing ethical awareness or reasoning which is adequately provided through the course curriculum. Students CO-2: To know how to handle the technical devices for presenting research works. can also create an awareness of the impact of chemistry on the environment, society, and also make development outside the scientific community.

PO-9: Environmental Awareness: As an inhabitant of this green planet a Chemistry graduate student should have many social responsibilities. The course curriculum is designed to teach a Chemistry graduate student to follow the green routes for the synthesis of chemical compounds and also find out new greener routes for sustainable development. The course also helps them to understand the causes of environmental pollution and thereby applying environmental friendly policies instead of environmentally hazard ones in every aspect.

PO-10: Lifelong learner: The course curriculum is designed to inculcate a habit of learning continuously through use of advanced ICT technique and other available e-techniques, e-books and e-journals for personal academic growth.

PO-11: Analytical skill development and job opportunity: The course curriculum is designed in such a way that Chemistry graduate students can handle many Chemistry based software, decent instruments and advanced technologies to synthesize, characterize and analyze the chemical compounds very skillfully. Such a wonderful practice in the graduate level will bring a

good opportunity to the students for getting job in industries besides academic and administrative works.

Program Specific Outcomes

PSO 1. Apply appropriate techniques for the qualitative and quantitative analysis of chemicals in laboratories and in industries.

PSO 2. Will become familiar with the different branches of chemistry like analytical, organic, inorganic, physical, environmental, polymer, medicinal and biochemistry

PSO 3. Acquires the ability to synthesise, separate and characterize compounds using laboratory and instrumentation techniques.

PSO 4. To develop leadership and managerial skills promoting the need for lifelong learning as required for a competent professional.

PSO 5. To explain nomenclature, stereochemistry, structures, reactivity, and mechanism of the chemical reactions.

PSO 6. Identify chemical formulae and solve numerical problems.

PSO 7. Achieve the skills required to succeed in graduate school, professional school and the chemical industry like Cement industries, Agro product, Paint industries, Rubber industries, Petrochemical industries, Food processing industries, Fertilizer industries etc.

PSO 8. Understand the importance of the elements in the periodic table including their physical and chemical nature and role in the daily life.