Department of Chemistry, Analytical Chemistry and Agrochemicals and Fertilizers

Programme Outcomes: B. Sc Chemistry

B.Sc Ist year	
Programme Outcomes	
	• Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Analytical, Inorganic, Organic and Physical Chemistries. Majors to be certified by the American Chemical Society will have extensive laboratory work and knowledge of Biological Chemistry. • Students will be able to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments. • Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems. • Students will be able to clearly communicate the results of scientific work in oral, written and electronic formats to both scientists and the public at large. • Students will be able to explore new areas of research in both chemistry and allied fields of science and technology. • Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behavior in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine. • Students will be able to explain why chemistry is an integral activity for addressing social, economic, and environmental problems. • Students will be able to function as a member of an interdisciplinary problem solving team.
Course Outcome	a. chemical reactions and strategies to balance them b. the relative quantities of reactants and products c. the fundamental properties of atoms, molecules, and the various states of matter

	d. the electronic structure of atoms and its influence on chemical properties e. molecular geometries of selected molecular species f. the fundamentals of acid/base chemistry, including pH calculations, buffer behavior, and acid/base titrations g. the energy and speed of chemical reactions h. unit conversions and their importance in clinical medicine i. molecular interactions and chemical reactions in the body j. the scientific method of collecting and analyzing information k. proper laboratory safety and techniques
B.Sc IInd year	
Programme Outcomes	
	• Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Analytical, Inorganic, Organic and Physical Chemistries. Majors to be certified by the American Chemical Society will have extensive laboratory work and knowledge of Biological Chemistry. • Students will be able to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments. • Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems. • Students will be able to clearly communicate the results of scientific work in oral, written and electronic formats to both scientists and the public at large. • Students will be able to explore new areas of research in both chemistry and allied fields of science and technology. • Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behavior in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine. • Students will be able to explain why chemistry is an integral activity for addressing social, economic, and environmental problems. • Students will be able to function as a member of an

	interdisciplinary problem solving team.
Course Outcome	l. chemical reactions and strategies to balance them m. the relative quantities of reactants and products n. the fundamental properties of atoms, molecules, and the various states of matter o. the electronic structure of atoms and its influence on chemical properties p. molecular geometries of selected molecular species q. the fundamentals of acid/base chemistry, including pH calculations, buffer behavior, and acid/base titrations r. the energy and speed of chemical reactions s. unit conversions and their importance in clinical medicine t. molecular interactions and chemical reactions in the body u. the scientific method of collecting and analyzing information v. proper laboratory safety and techniques
Chemistry -I	students will gain an understanding of: a. the use of an analytical balance for mass measurement b. the use of graduated cylinders, graduated pipettes, and volumetric pipettes for volumetric measurement c. the use of thermometers and temperature probes d. titrations e. the calibration and use simple spectrophotometers, pH meters, centrifuges, and vortexers f. The analysis of data using a spreadsheet program such as Excel g. how to design and perform experiments to determine the rate, order, and activation energy of chemical reactions by varying concentrations and/or temperature h. methods to measure equilibrium concentrations and equilibrium constants for acid-base, solubility, and complexation reactions given initial concentrations of reactant i. the preparation of buffer solutions at a required pH, given a choice of solutions of acid/conjugate base pairs j. the identification of the absence or presence of a number of cations or anions in solution, using tests based on acid-base, solubility, and complexation equilibria k. the acquisition of solubility vs. temperature data and the

	calculation of ΔH, ΔS, and ΔG for dissolving a salt at a given temperature. l. how to set up and use an electrolysis cell to determine the equivalent mass of an unknown metal m. the determination of the molar mass of an unknown nonelectrolyte and an unknown electrolyte from a freezing point depression experiment n. ligand strengths by the stability of the complexes and precipitates formed by the ligands with a given metal ion
Inorganic Chemistry	Students will gain an understanding of: a. the bonding fundamentals for both ionic and covalent compounds, including electronegativities, bond distances and bond energies using MO diagrams and thermodynamic data b. predicting geometries of simple molecules c. the fundamentals of the chemistry of the main group elements, and important real world applications of many of these species d. the use of group theory to recognize and assign symmetry characteristics to molecules and objects, and to predict the appearance of a molecule's vibrational spectra as a function of symmetry e. the bonding models, structures, reactivities, and applications of coordination complexes, boron hydrides, metal carbonyls, and organometallics
Inorganic Chemistry Lab course	Students will gain an understanding of: a. key concepts of inorganic and organometallic chemistry including those related to synthesis, reaction chemistry, and structure and bonding b. basic and advanced laboratory procedures used in inorganic synthesis including spectroscopic and analytical techniques for identification and characterization of small molecules c. laboratory safety d. The communication of the results of scientific experiments in oral reports, technical graphics, and written reports e. the chemical literature and to read and understand technical literature related to the discipline f. how to contribute to solutions of problems encountered in an experiment g. making informed choices among post-graduate opportunities for work or further education h. how to maintain high standards of professional and scientific ethics
Organic Chemistry	Students will gain an understanding of: a. the hybridization and geometry of atoms and the three-dimensional structure of organic molecules b. the reactivity and stability of an organic molecule based on

	structure, including conformation and stereochemistry c. an understanding of nucleophiles, electrophiles, electronegativity, and resonance d. the prediction of mechanisms for organic reactions e. how to use their understanding of organic mechanisms to predict the outcome of reactions f. how to design syntheses of organic molecules g. how to determine the structure of organic molecules using IR and NMR spectroscopic techniques
Organic Chemistry Lab course	
	Students will gain an understanding of: a. how to calculate a limiting reagent, yield, and percent yield b. how to maintain a detailed scientific notebook c. how to critically evaluate data collected to determine the identity, purity, and yield of products d. how to summarize findings in writing in a clear and concise manner e. how to use the scientific method to create, test, and evaluate a hypothesis f. how to engage in safe laboratory practices handling laboratory glassware, equipment, and chemical reagents g. how to characterize organic molecules by physical and spectroscopic means, including mp, bp, IR, NMR, GC h. how to perform common laboratory techniques, including reflux, distillation, steam distillation, recrystallization, vacuum filtration, aqueous extraction, thin layer chromatography, column chromatography i. how to predict the outcome and mechanism of some simple organic reactions, using a basic understanding of the relative reactivity of functional groups
Physical Chemistry	
	Students will gain an understanding of: a. concepts in thermodynamics, different thermodynamic quantities such as heat and work and how they are measured, related or transformed from one to the other b. states of matter and how they depend on temperature and pressure as well as how they co-exist in phase equilibria c. chemical equilibrium and its relationship with themodynamic quantities d. the transport of ions and thermodynamic functions with applications to electron transfer in biological systems e. chemical kinetics; how reaction rates are measured and represented in rate laws, and applications of chemical kinetics

	in studying enzyme mechanisms f. basic quantum chemistry and atomic structures of atoms g. chemical bonding from the valence bond model and molecular orbital theory h. computational methods for studying biochemical processes i. methods for determining size, shape, and 3D structure of bio-molecules j. spectroscopic methods that are used to study biochemical processes
Physical Chemistry Lab course	
	Students will gain an understanding of: a. the preparation for each experiment by studying lab handouts and links therein b. safety requirements and lab skills to perform physico-chemical experiments c. how to keep records of instruments, parameters, and experimental observations d. reporting of experimental results (including error analysis) in a publication-style (journal paper) e. an appreciation for modern problems and scientific controversies in physical chemistry f. key spectroscopic techniques including FTIR, UV-vis absorption, luminescence, laser methods g. the use of chemistry software programs to model energy potentials and vibrational levels of molecules h. the use of standard vacuum and cryogenic techniques used in physic-chemical experiments

B.Sc.Chemistry (Semester-III)

	After successful completion of three year degree program in Chemistry a student should be able to;
Programme Outcomes	PO-1. Demonstrate, solve and an understanding of major concepts in all disciplines of chemistry. PO-2. Solve the problem and also think methodically, independently and draw a logical conclusion. PO-3. Employ critical thinking and the scientific knowledge to design, carry out, record and analyze the results of chemical reactions. PO-4. Create an awareness of the impact of chemistry on the environment, society, and development outside the scientific community. PO-5. Find out the green route for chemical reaction for sustainable development. PO-6. To inculcate the scientific temperament in the students and outside the scientific community. PO-7. Use modern techniques, decent equipments and Chemistry software□s

Programme Specific Outcomes	PSO-1. Gain the knowledge of Chemistry through theory and practical's. PSO-2. To explain nomenclature, stereochemistry, structures, reactivity, and mechanism of the chemical reactions. PSO-3. Identify chemical formulae and solve numerical problems. PSO-4. Use modern chemical tools, Models, Chem-draw, Charts and Equipments. PSO-5. Know structure-activity relationship. PSO-6. Understand good laboratory practices and safety. PSO-7. Develop research oriented skills. PSO-8.make aware and handle the sophisticated instruments/equipments.

Course Outcomes B. Sc Chemistry

Semester-III

Course	**Outcomes** After completion of these courses students should be able to;
Physical Chemistry	CO-1. Write an expression for rate constant K for third order reaction CO-2. Solve the numerical problems based on Rate constant CO-3.Understand the term specific volume, molar volume and molar refraction CO-4. Know the meaning of phase, component and degree of freedom CO-5. Derive the expression for rotational spectra for the transition from J to J+1
Inorganic Chemistry	CO-1. Know the meaning of various terms involved in co-ordination chemistry CO-2. To understand Werner□s formulation of complexes and identify the types of valences

	CO-3. Know the limitations of VBT CO-4. Know the shapes of d-orbitals and degeneracy of d-orbitals CO-5. Draw the geometrical and optical isomerism of complexes
Organic Chemistry	CO-1. Define organic acids and bases. CO-2. Distinguish between geometrical and optical isomerism. CO-3. Discuss kinetics, mechanism and stereochemistry of SN^1 and SN^2 reactions. CO-4. Compare between E_1 and E_2 reactions. CO-5. Understand the evidences, reactivity and mechanism of various elimination and substitution reactions.
Analytical Chemistry	CO-1. Know the principles of common ion effect and solubility product. CO-2. Study the methods of thermo-gravimetric analysis. CO-3. Understand the principles of Spectro-photometric analysis and properties of electromagnetic radiations. CO-4. Study the Voltammetry and Polarography as an analytical tool. CO-5. Measure the absorbance of atoms by AAS.
Agrochemical and Fertilizers	CO-1. Know the role of Agrochemical and Fertilizers and its potential CO-2. Understand the basic concept of soil, properties of soil & its classification on the basis of pH. CO-3. Know the different plant nutrients, their functions and deficiency symptoms. CO-4. Identify the problematic soil and recommend a method for their reclamation. CO-5. Have the knowledge of various pesticides, insecticides, fungicides and herbicides.

Course Outcomes B. Sc Chemistry Semester-IV	
Physical Chemistry	CO-1.Understand Mechanics of system of particles. CO-2.Know the Redox reaction. CO-3 Study the Crystal Field Theory. CO-4.Solve the cell reaction and calculate EMF. CO-5. Calculate interplanar distance.CO-6.Understand De-Broglie hypothesis and Uncertainty principle CO-7. Derive Schrodinger□s time dependent and independent equations
Inorganic Chemistry	CO-1 Study the electronic configuration of lanthanides and actinides. CO-2. Get knowledge of Crystalline solid. CO-3. Understand different operation in stoichiometric molecule. CO-4. Study the Bio-inorganic chemistry. CO-5. Understand the p-type semiconductor and n-type semiconductor.
Organic Chemistry	CO-1.To study UV, IR and NMR spectroscopy. CO-2. Discuss different types of rearrangement reactions. CO-3. Determine structure of compound by spectroscopic methods. CO-4. Understand the difference between carbocation and carbanion. CO-5.To study alkaloids, Ephedrine, citral molecule with their properties and application.
Analytical Chemistry	CO-1. Know the different analytical techniques. CO-2. To understand different types of separation techniques. CO-3. To study principle, construction and working of GC and HPLC. CO-4. To give an extended knowledge about chromatographic techniques used for separation of amino acids. CO-5. Discuss the problem based on distribution coefficient and extraction techniques.
Physical chemistry practical's	CO-1. Calculate molar and normal solution of various concentrations. CO-2. Determine specific rotations and percentage of to optically active substances by polorimetrically. CO-3. Study the energy of activation and second order reaction. CO-4. Study the stability of complex ion and stranded free energy change and equilibrium constant by potentiometry. CO-5. Find out the acidity, Basicity and PKa Value on pH meter.

Inorganic Chemistry Practical's	CO-1. Study the gravimetric and volumetric analysis of ores and alloy. CO-2. Prepare a various inorganic complexes and determine its % purity. CO-3. To study binary mixture with removal of borate and phosphate. CO-4. To understand the chromatographic techniques
Organic Chemistry Practical's	CO-1. Perform the Binary mixtures. CO-2. Preparation of organic compounds, their purifications and run TLC. CO-3. Determination of physical constant: Melting point, Boiling point. CO-4. Different separation techniques.

Programme Outcomes: M. Sc Organic Chemistry

Department of Chemistry	After successful completion of two year degree program in chemistry a student should be able to;
Programme Outcomes	PO-1. Determine molecular structure by using UV, IR and NMR. PO-2. Study of medicinal chemistry for lead compound. PO-3. Improve the Skill of student in organic research area. PO-4. Synthesis of Natural products and drugs by using proper mechanisms. PO-5. Study of Asymmetric synthesis. PO-6. Determine the aromaticity of different compounds. PO-7. Solve the reaction mechanisms and assign the final product.
Programme Specific Outcomes	PSO-1. Know the structure and bonding in molecules/ ions and predict the Structure of molecule/ions. PSO-2. Understand the various type of aliphatic, aromatic, nucleophilic substitution reaction. PSO-3. Understand and apply principles of Organic Chemistry for understanding the scientific phenomenon in Reaction mechanisms. PSO-4. Learn the Familiar name reactions and their reaction mechanisms. PSO-5. Understand good laboratory practices and safety. PSO-6. Study of organometallic reactions. PSO-7. Study of free radical,bycyclic compound, conjugate addition of Enolates and pericyclic reactions. PSO-8. Study of biological mechanisms using amino acids.
Course Outcomes M. Sc Organic Chemistry **<u>Semester-I</u>**	
Course	**Outcomes** After completion of these courses students should be able to;

Physical Chemistry	CO-1. Realize the terms ionic strength, activity coefficient, DHO equation. CO-2. Know the Eigen function, Eigen value, operator and postulates of quantum mechanics. CO-3. Learn two and three dimensional box, mechanics of particle. CO-4. Understand the adsorption of gases by solid type of isotherms CO-5. Recognized the Fricke and cerric sulphate Dosimeter. CO-6. Learn parent-daughter relationship, application of radioactivity, NAA, IDA. Effect of radiation and units of radiation.
Inorganic Chemistry	CO-1 Determine and Learn about Dipole moment and bond order of The inorganic molecule. CO-2. Learn about geometry and shape of the molecule. CO-3. Known the preparation and properties of transition metal carbonyls CO-4. To understand the 18 electron rule and its application. CO-5. Find out the point group of inorganic molecules. CO-6. Learn molecular orbital and its orientation. CO-7. Learn concept of symmetry elements in molecules.
Organic Chemistry	CO-1. Learn SN1, SN2 and SNi Mechanism and stereochemistry. CO-2. Learn classical and non-classical carbocation, NGP by pi and sigma bonds. CO-3. Solve the elimination problems. CO-4. Distinguish between type of addition, elimination and substitution reaction. CO-5. Learn E and Z nomenclature inC,N,S,P containing compound ,Stereo chemical principal, enantiomeric relationship R and S.

Semester-II	
Physical Chemistry	CO-1. Learn the thermodynamic description of exact, inexact differential and state function. CO-2. Know the qualitative properties of solution, the depression in freezing point, elevation in boiling point and osmotic pressure. CO-3. Know the statistical thermodynamics and various partition functions. CO-4. Study the steady state approximation michaelis- menten mechanism, lindemann-hinshelwood mechanism, chain reaction, Rate determining stapes and consecutive elementary reactions. CO-5. Learn the molecular spectroscopy, R.Raman, Electronic and Mossbauer and its application.
Inorganic Chemistry	CO-1. Understand the mechanism in transition metal complexes, Born Haber cycle to calculate lattices energy. CO-2. Learn the use of catalyst, radius ratio rule of coordination number 3, 4. CO-3. Study the structure of atom, Hunds rule, term symbol, calculation of microstate and selection rule. CO-4. Understand the metal complexes in biological system.
Name reaction ,synthetic Organic Chemistry and spectroscopy	CO-1`. Study the various name reaction with examples. CO-2. Learn the mechanism of rearrangement reaction, use synthetic reagent of oxidation and reduction for solving the problems. CO-3. Understand the factors affecting UV-absorption spectra, Interpret IR- spectra on basic values of IR-frequencies. CO-4. Discuss the problem of UV, IR and NMR.

Physical chemistry practical's	CO-1. Calculate molar and normal solution of various concentrations. CO-2. Determine specific rotations and percentage of to optically active substances by polorimetrically. CO-3. Study the energy of activation and second order reaction. CO-4. Study the stability of complex ion and stranded free energy change and equilibrium constant by potentiometry. CO-5. Find out the acidity, Basicity and PKa Value on pH meter.
Inorganic chemistry practical's	CO-1. Study the gravimetric and volumetric analysis of ores and alloy. CO-2. Prepare a various inorganic complexes and determine its % purity. CO-3. Preparation of nonmaterial. CO-4. To understand the chromatographic techniques.
Organic chemistry practical's	CO-1. Perform the ternary mixtures. CO-2. Preparation of organic compounds, their purifications and run TLC. CO-3. Determination of physical constant: Melting point, Boiling point. CO-4. Different separation techniques.
Semester-III	
Organic reaction mechanism	CO-1. Study of carbanion-formation, stability and related name reaction, enemies and its applications. CO-2. Understand the NGP. CO-3. Learn the carbines and nitrenes. CO-4. Study of free radicals: generation of radicals, Nucleophilic electrophilic radicals, inter and intra molecular C-C bond formation via mercuric hydride. CO-5. Study of oxidative coupling and SNAr reaction.
Spectroscopic methods in structure determination.	CO-1. Study ^{1}H NMR Spectroscopy: Chemical Shift, deshielding, correlation for protons bonded to carbon and other nuclei. CO-2. Study of ^{13}C NMR spectroscopy: FT- NMR, type of ^{13}C NMR spectra, proton decoupled , off resonance, APT, INEPT, DEPT, Chemical

	shift, nuclear and hetero nuclear coupling constant CO-3. 2D NMR techniques: COSY, homo and hetero nuclear 2D resorts spectroscopy, NOESY and the applications CO-4. Study of mass spectrometry: Instrumentation, various methods of ionization, SIMS, FAB, MALDI. Different detectors rules of fragmentations of different functional groups.
Organic stereochemistry	CO-1. Study of stereochemistry of six member ring. CO-2. Learn the stereochemistry of rings other than six members. CO-3. Understand fused bridge and Caged rings. CO-4. Learn resolution of racemic modification, stereochemistry of organic compound using NMR. CO-5. Determine geometrical isomerism and stereochemistry of olefins.
Photochemistry, Pericyclic reaction and heterocyclic chemistry.	CO-1. Study of photochemistry: Carbonyl compounds, alkenes, dienes, polyenes and aromatic compounds. CO-2. Study photo rearrangement Barton reaction, application of photochemical reaction. CO-3. Learn Pericyclic reaction: Electro cyclic, Cycloaddition, and Ene Reaction, analysis by correlation diagram, FMO approach and ATS concept. CO-4. Study of heterocyclic chemistry: Five and six member heterocyclic with one or two hetero atoms. CO-5. Understand condensed five and six member□s heterocyclic. CO-6. Study the synthesis, reactivity, aromatic character and importance of heterocyclic compounds.
Semester-IV	
Chemistry of natural product	CO-1. Study structure and stereochemistry of hardwickiic acid, camptothecin and podothyllotoxin. CO-2. Study the synthesis of taxol, estorne and mefepristone, fredericamycin A. CO-3. Learn biogenesis terpenoides, alkaloids and shikimmte pathway.

Advance synthetic organic chemistry.	CO-1.Study of transition metal complexes in organic synthesis. CO-2. Learn C=C formation reaction, multi compound reaction, ring formation reaction. CO-3. Study of sharpless azides Cycloaddition, use of boron and silicon in organic synthesis.
Carbohydrate and chiral approach, chiral drugs and medicinal chemistry.	CO-1. Study of carbohydrates: Introduction of sugar, structure of triose tetrosa, panctose, hexoes, stereochemistry of glucose. CO-2. Understand the chiral approach, concept of chiral templates, and utilization of the basic concept for reterosynthetic strategy. CO-3. Study of chiral drug. CO-4. Learn medicinal chemistry, the action and discovery. CO-5. Study the structure activity and drug targets. CO-6. Study of antimicrobial drugs, antibacterial, antifungal, antiviral, antimalerial etc.
Designing organic synthesis and asymmetric synthesis.	CO-1. Study the design of organic synthesis, protection deprotation of hydroxyl, amino carboxyl, ketones and aldehyde. CO-2. Learn retrosynthesis. CO-3. Understand the principle and application of asymmetric synthesis. CO-4. Study of cram□s rule, felkin-Anh rule, Cram□s chelate model asymmetric synthesis using chiral reagent.
Single stage preparations	CO-1. Spectral analysis best on instrumental techniques. CO-2. Preparation of organic compounds, their purifications and run TLC. CO-3. Determination of physical constant: Melting point, Boiling point. CO-4. Different separation techniques.
Two stage preparation	CO-1. Spectral analysis best on instrumental techniques CO-2. Preparation of organic compounds, their purifications and run TLC. CO-3. Determination of physical constant: Melting point, Boiling point. CO-4. Different separation techniques.
Single stage preparations by	CO-1. Spectral analysis best on instrumental techniques. CO-2. Preparation of organic compounds, their purifications and run TLC. CO-3. Determination of physical constant: Melting point, Boiling point.
Green synthesis.	CO-4. Different separation techniques.

Programme Outcomes: M. Sc Analytical Chemistry

Department of Chemistry	After successful completion of two year degree programme in chemistry a student should be able to;
Programme Outcomes	.PO-1.Demonstrate, solve and an understanding of major concepts in all disciplines of Chemistry. PO-2. Solve the problem and also think methodically, independently and draw a logical conclusion. PO-3. Create an awareness of the impact of chemistry on the society, and development outside the scientific community. PO-4. Become professionally trained in the area of Industry, material science, lasers and Nano-Technology. PO-5. Employ critical thinking and the scientific knowledge to design, carry out, record and analyze the results of Chemistry experiments. PO-6. To inculcate the scientific temperament in the students and outside the scientific community. PO-7. Apply modern methods of analysis to chemical systems in a laboratory setting.
Programme Specific Outcomes	PSO-1. Learn about the potential uses of analytical industrial chemistry. PSO-2. Carry out experiments in the area of organic analysis, estimation, separation, derivation process, conduct metric and potentiometric analysis. PSO-3. Learn the classical status of thermodynamics. PSO-4. Gathers attention about the physical aspects of atomic structure, various energy transformation, molecular assembly in nanolevel and significance of electrochemistry. PSO-5. Understand good laboratory practices and safety. PSO-6. Introduce advanced techniques and ideas required in developing area of Chemistry. PSO-7. Make aware and handle the sophisticated instruments/equipments. PSO-8. Enhance students ability to develop mathematical models for physical systems.

Course Outcomes M. Sc Analytical Chemistry **Semester-I**	
Course	**Outcomes** After completion of these courses students should be able to;
Physical Chemistry	CO-1. Realize the terms ionic strength, activity coefficient, DHO equation. CO-2. Know the Eigen function, Eigen value, operator and postulates of quantum mechanics. CO-3. Learn two and three dimensional box, mechanics of particle. CO-4. Understand the adsorption of gases by solid type of isotherms CO-5. Recognized the Fricke and cerric sulphate Dosimeter. CO-6. Learn parent-daughter relationship, application of radioactivity, NAA, IDA. Effect of radiation and units of radiation.
Inorganic Chemistry	CO-1 Determine and Learn about Dipole moment and bond order of the inorganic molecule. CO-2. Learn about geometry and shape of the molecule. CO-3. Known the preparation and properties of transition metal carbonyls CO-4. To understand the 18 electron rule and its application. CO-5. Find out the point group of inorganic molecules. CO-6. Learn molecular orbital and its orientation. CO-7. Learn concept of symmetry elements in molecules.
Organic Chemistry	CO-1. Learn SN1, SN2 and SNi Mechanism and stereochemistry. CO-2. Learn classical and non-classical carbocation, NGP by pi and sigma bonds. CO-3. Solve the elimination problems. CO-4. Distinguish between type of addition, elimination and substitution reaction. CO-5. Learn E and Z nomenclature inC,N,S,P containing compound ,Stereo chemical principal, enantiomeric relationship R and S.

Semester-II	
Physical Chemistry	CO-1. Learn the thermodynamic description of exact, inexact differential and state function. CO-2. Know the qualitative properties of solution, the depression in freezing point, elevation in boiling point and osmotic pressure. CO-3. Know the statistical thermodynamics and various partition functions. CO-4. Study the steady state approximation michaelis- menten mechanism, lindemann-hinshelwood mechanism, chain reaction, Rate determining stapes and consecutive elementary reactions. CO-5. Learn the molecular spectroscopy, R.Raman, Electronic and Mossbauer and its application.
Inorganic Chemistry	CO-1. Understand the mechanism in transition metal complexes, Born Haber cycle to calculate lattices energy. CO-2. Learn the use of catalyst, radius ratio rule of coordination number 3, 4. CO-3. Study the structure of atom, Hunds rule, term symbol, calculation of microstate and selection rule. CO-4. Understand the metal complexes in biological system.
Name reaction ,synthetic Organic Chemistry and spectroscopy	CO-1`. Study the various name reaction with examples. CO-2. Learn the mechanism of rearrangement reaction, use synthetic reagent of oxidation and reduction for solving the problems. CO-3. Understand the factors affecting UV-absorption spectra, Interpret IR-spectra on basic values of IR-frequencies. CO-4. Discuss the problem of UV, IR and NMR.

General Chemistry	CO-1**.** Study the instrumentation, sample injection system, columns for HPLC and GC, Solvent treatment system and choice of mobile phase. CO-2. Learn instrumentation of mass spectrometry, fragmentation, structure determination. CO-3. Solve mean and standard deviation problems. CO-4. Understand the accuracy and precision and classification error. CO-5. Learn distillation, solvent extraction, crystallization, and other separation techniques.
Physical chemistry practical's	CO-1. Calculate molar and normal solution of various concentrations. CO-2. Determine specific rotations and percentage of to optically active substances by polorimetrically. CO-3. Study the energy of activation and second order reaction. CO-4. Study the stability of complex ion and stranded free energy change and equilibrium constant by potentiometry. CO-5. Find out the acidity, Basicity and PKa Value on pH meter.
Inorganic chemistry practical's	CO-1. Study the gravimetric and volumetric analysis of ores and alloy. CO-2. Prepare a various inorganic complexes and determine its % purity. CO-3. Preparation of nonmaterial. CO-4. To understand the chromatographic techniques.
Organic chemistry practical's	CO-1. Perform the ternary mixtures. CO-2. Preparation of organic compounds, their purifications and run TLC. CO-3. Determination of physical constant: Melting point, Boiling point. CO-4. Different separation techniques.
Semester-III	
Electro analytical and radio analytical methods of analysis.	CO-1. Study of colorimeter, Faraday 1st law, Faraday 2nd law. CO-2. Study of voltametry and paleographic method of analysis, heterodynamic voltametry, plus paleography and cyclic voltametry. CO-3. Study of ampherometry and their applications. CO-4. Learn radio analytical methods of analysis, activation analysis, isotope dilution analysis, radio metric titration.

	CO-5. Understand thermal methods of analysis TGA, DTA, DSC.
Pharmaceutical analysis.	CO-1. Study of apparatus for test and assay, cleaning of glassware, role of FDA in pharmaceutical industry. CO-2. Learn biological test and assay, microbiological test and assay, physical test, determination, limit test sterilization. CO-3. Analysis of vegetable drug, sources of impurities in pharmaceutical row materials and finished products. CO-4. Learn standardization and quality control of different row materials.
Advanced analytical techniques.	CO-1. Study the classical approach for aqueous extraction, solid phase extraction, micro extraction and SFE. CO-2. Learn: AAS, FES, ICPAES, and DCP. CO-3. Study atomic fluorescence, resonant ionization and LASER based enhanced ionization. CO-4. Study of different detectors and their applications.
Semester-IV	
Analytical spectroscopy	CO-1. Study of ESCA, Detectors and their applications. CO-2. Learn X-ray method of analysis, numerical problems. CO-3. Understand an introduction to microscopy, its applications. CO-4. Study of chemiluminescences, Fluorescence and phosphorescence. CO-5. Study of NMR spectroscopy.
Analysis of materials	CO-1. Study the gravimetric and volumetric analysis of ores and alloy. CO-2. Prepare a various inorganic complexes and determine its % purity. CO-3. Preparation of nonmaterial. CO-4. To understand the chromatographic techniques. CO-5. Estimation of Iron By Various methods.
Instrumental Analysis.	CO-1. Spectral analysis best on instrumental techniques CO-2. Photometric determination. CO-3. Study of Conductometer, FES, Polarography. CO-4. Analysis of riboflavin by photoflurometry. CO-5. To Study the spectroscopic techniques. CO-6. To study the terbidometry and Neflometry.