PROGRAMME SPECIFIC OUTCOMES, PROGRAMME OUTCOMES AND COURSE OUTCOMES

PG DEPARTMENT OF CHEMISTRY

PART – III CHEMISTRY, B.SC., (CHE), EXTRA-CREDIT COURSES & VALUE-ADDED COURSES

PSO, PO & CO STATEMENTS / 2023 – 2024 Onwards (Tansche)

PSOs	**PROGRAMME SPECIFIC OUTCOMES**
PSO1	**Disciplinary Knowledge:** Understand the fundamental principles, concepts, and theories related to physics and computer science. Also, exhibit proficiency in performing experiments in the laboratory.
PSO2	**Critical Thinking:** Analyse complex problems, evaluate information, synthesize information, apply theoretical concepts to practical situations, identify assumptions and biases, make informed decisions and communicate effectively
PSO3	**Problem Solving:** Employ theoretical concepts and critical reasoning ability with physical, mathematical and technical skills to solve problems, acquire data, analyze their physical significance and explore new design possibilities.
PSO4	**Analytical & Scientific Reasoning:** Apply scientific methods, collect and analyse data, test hypotheses, evaluate evidence, apply statistical techniques and use computational models.
PSO5	**Research related skills:** Formulate research questions, conduct literature reviews, design and execute research studies, communicate research findings and collaborate in research projects.
PSO6	**Self-directed & Lifelong Learning:** Set learning goals, manage their own learning, reflect on their learning, adapt to new contexts, seek out new knowledge, collaborate with others and to continuously improve their skills and knowledge, through ongoing learning and professional development, and contribute to the growth and development of their field.
PART – III CHEMISTRY	
B.SC., CHEMISTRY	
Part – III B.SC., CHEMISTRY / PROGRAMMES OUTCOMES	
POs	**Description of POs**
PO1	**Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study
PO2	**Communication Skills:** Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.

PO3	**Critical thinking:** Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.
PO4	**Problem solving: Capacity** to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.
PO5	**Analytical reasoning**: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.
PO6	**Research-related skills**: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation
PO7	**Cooperation/Team work:** Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team
PO8	**Scientific reasoning**: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.
PO9	**Reflective thinking**: Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society.
PO10	**Information/digital literacy:** Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.
PO11	**Self-directed learning**: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.
PO12	**Multicultural competence:** Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.
PO13	**Moral and ethical awareness/reasoning**: Ability toembrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstratingthe ability to identify ethical issues related to one‟s work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.
PO14	**Leadership readiness/qualities:** Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way.
PO15	**Lifelong learning:** Ability to acquire knowledge and skills, including „learning how to learn‟, that are necessary for participating in

	learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.	
Part – III B.SC., CHEMISTRY / COURSE OUTCOMES		
	Description of COs	**Bloom's Taxonomy / Cognitive Domain**
General Chemistry-I		
CO1.	Explain the atomic structure, waveparticle duality of matter, periodic properties bonding, and properties of compounds.	Analyze(K4)
CO2.	Classify the elements in the periodic table, types of bonds, reaction intermediates electronic effects inorganic compounds, types of reagents.	Understand(K2)
CO3.	Apply the theories of atomic structure, Bonding, To calculate energy of aspectral transition, Δx, Δp electronegativity, Percentage ionic character and bondorder.	Application (K3)
CO4.	Evaluate the relationship existing between electronic configuration, bonding, geometry of molecules and reactions; structurere activity and electronic effects	Analyze(K4)
CO5.	Construct MO diagrams, predict trends in periodic properties, assess the properties ofelements, and explain hybridization in molecules, nature of H – bonding and organicreactionmechanisms.	Analyze(K4)
Food Chemistry		
CO1.	Learn aboutFoodadulteration-contaminationofWheat,Rice,Milk,Butter	Recall (K1)
CO2.	Get an awareness about food poisons like natural poisons (alkaloids-nephrotoxin) pesticides, DDT, BHC, Malathion.	Understand(K2)
CO3.	Get an exposure on food additives, artificial sweeteners, Saccharin, Cyclomate and Aspartate in the food industries.	Understand(K2)
CO4.	Acquire knowledge on beverages, soft drinks, soda, fruit juices and alcoholic beverages examples.	Recall (K1)
CO5.	Study about fats and oils- Sources of oils- production of refined vegetable oils-preservation. Saturated and unsaturated fats– MUFA and PUFA	Application (K3)
Role Of Chemistry In Daily Life		
CO1.	Learn about the chemicals used in everyday life as well as air pollution and water pollution.	Recall (K1)
CO2.	Get knowledge on building materials cement, ceramics, glass and plastics, polythene, PVC Bakelite, polyesters	Understand(K2)
CO3.	Acquire information about Food and Nutrition .Carbohydrates, Proteins, Fats Also have an awareness	Understand(K2)

	about Cosmetics Toothpastes,facepowder,soaps anddetergents.	
CO4.	Discuss about the fertilizers like urea, NPKfertilizers and superphosphate. Fuel classification solid,liquid and gaseous;nuclear fuel-examples and uses.	Understand(K2)
CO5.	Have idea about the pharmaceutical drugs analgesics and antipyretics like paracetamol and aspirin and also about pigments anddyes and it sapplications.	Application (K3)
General Chemistry-II		
CO1.	Explain the concept of acids, bases and ionic equilibria; periodic properties of s and p blockelements,preparation and properties of aliphatic and aromatic hydrocarbons	Evaluate(K5)
CO2.	Discuss the periodic properties of s and p-block elements, reactions of aliphatic and aromatic hydrocarbons and strength of acids	Analyze(K4)
CO3.	Classify hydrocarbons,types of reactions,acids and bases,examine the properties s and p-block elements,reaction mechanisms of aliphatic and aromatic hydrocarbons	Understand(K2)
CO4.	Explain theories of acids,bases and indicators,buffer action and important compounds of s-block elements	Evaluate(K5)
CO5.	Assess the application of hard and soft acids indicators,buffers,compounds of s and p-block elements and hydrocarbons	Application (K3)
Dairy Chemistry		
CO1.	Understand about general composition of milk–constituents and its physical properties.	Understand(K2)
CO2.	Acquire knowledge about pasteurization of Milk and various types of pasteurization-Bottle, Batch and HTST Ultra High Temperature Pasteurization.	Recall (K1)
CO3.	Learn aboutCream and Butter their composition and how to estimate fat in cream and Ghee	Understand(K2)
CO4.	Explain about Homogenized milk, flavoured milk, vitaminised milk and toned milk.	Analyze(K4)
CO5.	Have an idea about how to make milk powder and its drying process- types of drying process	Application (K3)
Cosmetics and Personal Grooming		
CO1.	Know about the composition of various cosmetic products	Recall (K1)
CO2.	Understand chemical aspects and applications of hair care and dental care and skin care products.	Understand(K2)
CO3.	Understand chemical aspects and applications of perfumes and skin care products.	Understand(K2)
CO4.	To understand the methods of beauty treatments their advantages and disadvantage	Understand(K2)
CO5.	Understand the hazards of cosmetic products.	Understand(K2)

General Chemistry-III		
CO1.	Explain the kinetic properties of gases by using mathematical concepts.	Analyze(K4)
CO2.	Describe the physical properties of liquid and solids; identify various types of crystals with respect to its packing and apply the XRD method for crystal structure determinations.	Analyze(K4)
CO3.	Investing ate the radioactivity, nuclear energy and it's production, also the nuclear waste management.	Application (K3)
CO4.	Write the nomenclature, physical & chemical properties and basic mechanisms of haloorganic compounds and alcohols.	Recall (K1)
CO5.	Investigate the named organic reactions related to phenol; explain the preparation and properties of aromatic alcohol including thiol.	Analyze(K4)
Chemistry For Physical Sciences I		
CO1.	Gainin-depthknowledgeaboutthetheoriesofchemicalbonding,nuclearreactionsanditsapplications.	Recall (K1)
CO2.	Evaluate the efficiencies and uses of various fuels and fertilizers.	Analyze(K4)
CO3.	Explainthetypeofhybridization,electroniceffectandmechanisminvolvedintheorganicreactions	Understand(K2)
CO4.	Apply various thermodynamic principles, systems and phaserule.	Application (K3)
CO5.	Explain various methods to identify an appropriate method for the separation of chemical components	Analyze(K4)
Chemistry For Biological Sciences I		
CO1.	State the theories of chemical bonding ,nuclear reactions and its applications.	Understand(K2)
CO2.	Evaluate the efficiencies and uses of various fuels and fertilizers.	Application (K3)
CO3.	Explain the type of hybridization, electronic effect and mechanism involved in the organic reactions.	Understand(K2)
CO4.	Demonstrate the structure and uses of antibiotics, anaesthetics, antipyretics and artificial sugars.	Application (K3)
CO5.	Analyse various methods to identify an appropriate method for the separation ofChemical components.	Analyze(K4)
Entrepreneurial Skills in Chemistry		
CO1.	Identify adulterated food items by doing simple chemical tests.	Recall (K1)
CO2.	prepare cleaning products and become entrepreneurs	Application (K3)
CO3.	Educate others about adulteration and motivate them to become entrepreneurs.	Analyze(K4)
Pesticide Chemistry		
CO1.	Teach about the pesticides and their toxicity with respect to structure and category.	Recall (K1)
CO2.	Explain the preparation and property of pesticides	Analyze(K4)
CO3.	Investigate the pesticide residues, prevention and care	Application (K3)
CO4.	Demonstrate the extraction and analytical methods of pesticide residues	Analyze(K4)

CO5.	Make awareness to the public on bio-pesticides	Understand(K2)
General Chemistry-IV		
CO1.	Explain the terms and processes in thermodynamics;discuss the various laws of thermodynamics and thermochemical calculations.	Understand(K2)
CO2.	Discuss the second law of thermodynamics and its application to heat engine;discuss third law and its application on heat capacity measurement.	Application (K3)
CO3.	Investigate the chemistry of transition elements with respect to various periodic properties and group wise discussions.	Recall (K1)
CO4.	Discuss the fundamental organic chemistry of ethers, epoxides and carbonyl compounds including named organic reactions.	Understand(K2)
CO5.	Discuss the chemistry and named reactions related to carboxylic acids and their derivatives; discuss chemistry of active methylene compounds, halogen substituted acids and hydroxyl acids.	Understand(K2)
Chemistry For Physical Sciences II		
CO1.	Write the IUPAC name for complex, different theories to explain the bonding in coordination compounds and water technology	Recall (K1)
CO2.	Explain the preparation and property of carbohydrate, aminoacids and nucleicacids.	Understand(K2)
CO3.	Apply/demonstrate the electro chemistry principles in corrosion, electroplating and fuel cells	Application (K3)
CO4.	Identify the reaction rate, order for chemical reaction and explain the purpose of a catalyst.	Application (K3)
CO5.	Outline the various type of photochemical process.	Understand(K2)
Chemistry For Biological Sciences II		
CO1.	Write the IUPAC name for complex, different theories to explain the bonding in coordination compounds and water technology.	Recall (K1)
CO2.	Explain the preparation and property of carbohydrate.	Understand(K2)
CO3.	Enlighten the biological role of transition metals, aminoacids and nucleicacids.	Application (K3)
CO4.	Apply/demonstrate the electrochemistry principles incorrosion, electroplating and fuelcells.	Application (K3)
CO5.	Outline the various type of photochemical process.	Understand(K2)
Instrumental Methods Of Chemical Analysis		
CO1.	Apply error analysis in the calibration and use of analytical instruments, explaintheory, instrumentation and application of flame photometry and Atomic Absorption spectrometry	Application (K3)
CO2.	Explain theory, instrumentation and application of UV visible and Infrared spectroscopy.	Analyze(K4)
CO3.	Able to discuss instrumentation, theory and applications of thermal and electrochemical techniques	Application (K3)

CO4.	Explain the use of chromatographic techniques in the separation and identification of mixture.	Analyze(K4)
CO5.	Explain preparation of solutions, stoichiometric calculations	Analyze(K4)
	Forensic Science	
CO1.	Learn about the Poisons-types and classification of poisons in the living and the dead organisms and also get information about Postmortem.	Recall (K1)
CO2.	Get awareness on Human bombs,possible explosives(gelatinsticksandRDX)and metal defector devices and othe rsecurity measures for VVIP-composition of bullets and detecting powder burns	Understand(K2)
CO3.	Detect thef orgery documents,differen ttypes of forged signatures.	Analyze(K4)
CO4.	Have an idea abou thow to tracks and trace using police dogs,foot prints identification and gain the knowledge in analyzing biological substances-blood,semen,saliva,urine and hair-DNAFingerprinting for tissue eidentification in dismembered bodies	Application (K3)
CO5.	Get the awareness on Aids-causes and prevention and also have ane exposure on handling fire explodes.	Analyze(K4)
	Organic Chemistry-I	
CO1.	Assign RS notations to chirals and EZ notations to olefins and explain conformations of ethane and butane.	Recall (K1)
CO2.	Explain preparation and properties of aromatic and aliphatic nitro compounds and amines	Understand(K2)
CO3.	Explaincolour and constitution of dyes and food additives	Analyze(K4)
CO4.	Discuss preparation and properties of five membered heterocycles like pyrrole,furan and thiophene	Analyze(K4)
CO5.	Discuss preparation and properties of six membered heterocycles like pyridine,quinoline and isoquinoline	Analyze(K4)
	Inorganic Chemistry-I	
CO1.	Explain isomerism, Werner's Theory and stability of chelate complexes	Analyze(K4)
CO2.	Discuss crystal field theory, magnetic properties and spectral properties of complexes.	Application (K3)
CO3.	Explain preparation and properties of metal carbonyls	Understand(K2)
CO4.	Give a comparative account of the characteristics of lanthanoids and actinoids	Understand(K2)
CO5.	Explain properties and uses of inorganic polymers of silicon, sulphur, boron and phosphorous	Analyze(K4)
	Physical Chemistry-I	
CO1.	Explain Gibbs and Helmholtz free energy functions,partial molar quantities and Ellinghams	Understand(K2)
CO2.	Apply the concepts of chemical kinetics to predict the rate of the reaction and order of the reaction, demonstrate the effect of temperature on reaction rate, and the significance of f ree energy and entropy of activation.	Application (K3)
CO3.	**C**ompare chemical and physical adsorption, Freundlich and Langmuir adsorption isotherms, and differentiate between homogenous and heterogeneous catalysis.	Understand(K2)

CO4.	Demonstrate the types and characteristics of colloids, preparation of sols and emulsions,and determine the molecular weights of macromolecules.	Analyze(K4)
CO5.	Utilize the concepts of photochemistry in fluorescence, phosphorescence, chemiluminescence and color perception of vision.	Application (K3)
	Bio Chemistry	
CO1.	Explain molecular logic of living organisms, composition of blood and blood coagulation	Analyze(K4)
CO2.	Explain synthesis and properties of aminoacids, determination of structure of peptides and proteins	Analyze(K4)
CO3.	Explain factors influencing enzyme activity and vitamins as coenzymes	Understand(K2)
CO4.	Explain RNA and DNA structure and functions	Understand(K2)
CO5.	Explain biological significance of simple and compound lipids	Recall (K1)
	Water Treatment and Analysis	
CO1.	To understand the Quantitative information on the physical, chemical and biological characteristics of water via statistical sampling.	Understand(K2)
CO2.	To explain the importance of ground water, surface water pollution & its harmful effects.	Recall (K1)
CO3.	Know t6he types of water treatment methods.	Understand(K2)
CO4.	To acquire knowledge about the different steps involved in primary, secondary and tertiary treatment of waste water.	Understand(K2)
CO5.	To Understand how water resources management are developed.	Understand(K2)
	Industrial Chemistry	
CO1.	Summarize the properties of fuels which include petroleum, watergas, naturalgas and propellents.	Understand(K2)
CO2.	Evaluate cosmetic products, soaps, detergents.	Recall (K1)
CO3.	Explain manufacture of sugar, food spoilages and food additives.	Understand(K2)
CO4.	Explain properties of abrasives, manufacture of leather and paper	Application (K3)
CO5.	Explain properties and manufacture of lubricants and cement, and intellectual property rights	Analyze(K4)
	Petro Chemistry	
CO1.	To understand the occurrence ,composition, uses of petrochemicals and also to know the preparation of synthetic petroleum	Recall (K1), Evaluate(K5)
CO2.	To acquire knowledge on extraction of hydrocarbons and classification of petroleum products	Recall (K1), Application (K3)
CO3.	To sketch the fuel oils and classification of lubricants	Understand(K2), Application (K3)
CO4.	To understand chemistry of petroleum products and Inter – relationship of precursors from natural gas,	Understand(K2),

	Petroleum cuts & Coal.	Application (K3)
CO5.	To outline the purification processes of petroleum products	Recall (K1), Analyze(K4)
Organic Chemistry-II		
CO1.	Explain isolation and properties of alkaloids and terpenes	Understand(K2)
CO2.	Explain preparation and reactions of mono and disachharides	Recall (K1)
CO3.	Classify biomolecules and natural products based on their structure,properties,reactions and uses.	Understand(K2)
CO4.	Explain molecular rearrangements like benzidine,Hoffmannetc.,	Recall (K1)
CO5.	Preparation and properties of organolithiumcompounds	Understand(K2)
Inorganic Chemistry–II		
CO1.	Ability to explain the importance of tracer elements on biological system.	Recall (K1)
CO2.	Explain the metal ion transport, Bohr effect,Na,K,Capump.	Understand(K2)
CO3.	Explain the function of Vitamin B_{12},Zn- Cu enzyme, ferredoxin,cluster enzymes.	Application (K3)
CO4.	Classification and structure of silicates.	Understand(K2)
CO5.	Explainthemanufactureofrefractories,explosives,paintsandpigments	Application (K3)
Physical Chemistry-II		
CO1.	Construct the phase diagram for one component and two component systems, explain the properties of freezing mixture,component with congruent melting points and solid solutions. principle,van'tHoff reaction isotherm andClausius-Clayperon equation.	Application (K3)
CO2.	apply the concepts of chemical equilibriumin dissociation of PCl_5,N_2O_4andformationofHI,NH_3,$SO_3$and decomposition of calcium carbonate.Demonstrate important principles such asLechatelier	Application (K3)
CO3.	Identify anappropriate distillation method for thes eparation of binary liquid mixtures such as azeotropic mixtures,partially miscible mixtures and immiscible liquids.	Understand(K2)
CO4.	Explain the significance of Arrhenius theory,Debye-Huckel theory,Onsager equation andKohlrausch's law in conductance.	Recall (K1)
CO5.	Construct electrochemical cell with the help of electrochemical series and calculatecell EMF.Demonstrate the applications of EMF and significance of potentiometrictitrations.	Application (K3)
Fundamentals of Spectroscopy		
CO1.	Explain electrical and magnetic properties of materials and microwave spectroscopy	Understand(K2)
CO2.	Explain theory, instrumentation and applications of Infrared and Raman spectroscopy	Application (K3)
CO3.	Apply selection rules to underst and spectral transitions, explain Woodward–Fieser's rule for the	Application (K3)

	calculation of wavelength maximum of conjugated dienes	
CO4.	Explain theory, instrumentation and applications of NMR spectroscopy	Application (K3)
CO5.	Explain theory, instrumentation and applications of Mass spectrometry	Application (K3)
Polymer Science		
CO1.	Explain classification of polymers,elastomers, fibres and liquidresins	Recall (K1)
CO2.	Explain addition and condensation polymerization, mechanical properties of polymers	Understand(K2)
CO3.	Determine the molecular weight of polymers, and explain the thermal properties of polymers	Analyze(K4)
CO4.	Explain reactions of polymers and polymer processing	Understand(K2)
CO5.	Discuss speciality polymers like PVC, PMMA, rubbers,biodegradable polymers	Understand(K2)
Pharmaceutical Chemistry		
CO1.	Define the pharmaceutical terminologies;describe the principles in pharmacological activity,drug development,clinical chemistry,hematology,therapeutic drugs and treatment of diseases;list the types of IPR and trademarks.	Application (K3)
CO2.	Discuss the development of drugs, structural activity,disease types, physio-Chemical properties of therapeutic agents, significance of medicinal plants,clinical tests and factors for patentability.	Understand(K2)
CO3.	Apply the rinciples involved in structural activity and drug designing,functions of haematological agents; estimation of clinical parameters and therapeutic application of drugs for major diseases.	Application (K3)
CO4.	Explain classification of analgesics and anasthetics, and physiological functions of plasma protiens	Recall (K1)
CO5.	Explain the significance of clinical tests like blood urea, serum proteins and coronary risk index	Application (K3)
Nano Science		
CO1.	Explain the general concepts and physical phenomena of relevance with in the field of nanoscience.	Recall (K1)
CO2.	Describe the properties, synthesis, characteristics of nanomaterials, special nanomaterials and applications.	Application (K3)
CO3.	Examine the structure, properties, applicability and characterization of nanomaterials.	Understand(K2)
CO4.	Analyze various synthesis procedures, characterizations and uses of carbon nanotubes, fullerene and graphene	Recall (K1)
CO5.	Discuss applications of nanomaterials of sensors and in optics and electronics	Application (K3)

M.SC., CHEMISTRY

M.SC., CHEMISTRY / PROGRAMMES OUTCOMES

POs	Description of POs

PO1	**problem Solving Skill:** Apply knowledge of Management theories and Human Resource practices to solve business problems through research in Global context. Explain the scientific principles in various fields.
PO2	**Decision Making Skill:** Foster analytical and critical thinking abilities for data-based decision-making. splay practical skills in their career, intellectual analysis of problems and lead a team, apply entrepreneurial skills and develop a leadership quality.
PO3	**Ethical Value:** Ability to incorporate quality, ethical and legal value-based perspectives to all organizational activities. enrich the academic career by doing higher education and have a successful attitude to do research.
PO4	**Communication Skill:** Ability to develop communication, managerial and interpersonal skills. Candle standard equipments and to analyze the data.
PO5	**Individual and Team Leadership Skill** Capability to lead themselves and the team to achieve Organizational goals.
PO6	**Employability Skill** Inculcate contemporary business practices to enhance employability skills in the competitive environment.
PO7	**Entrepreneurial Skill** Equip with skills and competencies to become an entrepreneur.
PO8	**Contribution to Society** Succeed in career endeavors and contribute significantly to society.
PO9	**Multicultural competence** Possess knowledge of the values and beliefs of multiple cultures and a global perspective.
PO10	**Moral and ethical awareness/reasoning** Ability to embrace moral/ethical values in conducting one's life.

MSC., CHEMISTRY / COURSE LEARNING OUTCOMES

	Description of COs	**Bloom's Taxonomy / Cognitive Domain**
	Organic Reaction Mechanism - I	
CO1.	To recall the basic principles of organic chemistry.	Recall (K1)
CO2.	To understand the formation and detection of reaction intermediates of Organic reactions.	Recall (K1)
CO3.	To predict the reaction mechanism of organic reactions and stereochemistry of Organic compounds.	Understand(K2)
CO4.	To apply the principles of kinetic and non-kinetic methods to determine the mechanism of reactions.	Application (K3)
CO5.	To design and synthesize new organic compounds by correlating the Stereochemistry of organic compounds.	Analyze(K4)
	Structure And Bonding In Inorganic Compounds	
CO1.	Predict the geometry of main group compounds and clusters.	Understand(K2)

CO2.	Explain about the packing of ions in crystals and apply the radius ratio rule to predict the coordination number of cations.	Analyze(K4)
CO3.	Understand the various types of ionic crystal systems and analyze their structural features	Recall (K1)
CO4.	Explain the crystal growth methods.	Analyze(K4)
CO5.	To understand the principles of diffraction techniques and microscopic techniques.	Analyze(K4)
Pharmaceutical Chemistry		
CO1.	To identify the suitable drugs for various diseases.	Recall (K1)
CO2.	To apply the principles of various drug action and drug design.	Application (K3)
CO3.	To acquire the knowledge on product development based on SAR.	Understand(K2)
CO4.	To apply the knowledge on applications of computers in chemistry.	Application (K3)
CO5.	To synthesize new drugs after understanding the concepts SAR.	Analyze(K4)
Nano Materials and Nano Technology		
CO1.	To explain methods of fabricating nanostructures.	Analyze(K4)
CO2.	To relate the unique properties of nanomaterials to reduce dimensionality of the material.	Application (K3)
CO3.	To describe tools for properties of nanostructures.	Analyze(K4)
CO4.	To discuss applications of nanomaterials.	Application (K3)
CO5.	To understand the health and safety related to nanomaterial.	Recall (K1)
Electro Chemistry		
CO1.	To understand the behaviour of electrolytes in solution and compare the structures of electrical double layer of different models.	Recall (K1)
CO2.	To predict the kinetics of electrode reactions applying Butler-Volmer and Tafel Equations.	Understand(K2)
CO3.	To study different thermodynamic mechanism of corrosion.	Application (K3)
CO4.	To discuss the theories of electrolytes, electrical double layer, electrodics and activity coefficient of electrolytes	Analyze(K4)
CO5.	To have knowledge on storage devices and electrochemical reaction mechanism.	Understand(K2)
Molecular Spectroscopy		
CO1.	To understand the importance of rotational and Raman spectroscopy.	Recall (K1)
CO2.	To apply the vibrational spectroscopic techniques to diatomic and polyatomic molecules.	Application (K3)
CO3.	To evaluate different electronic spectra of simple molecules using electronic spectroscopy.	Analyze(K4)

CO4.	To outline the NMR, ^{13}C NMR, 2D NMR – COSY, NOESY, Introduction to ^{31}P, ^{19}FNMR and ESR spectroscopic techniques.	Understand(K2)
CO5.	To develop the knowledge on principle, instrumentation and structural elucidation of simple molecules using Mass Spectrometry, EPR and Mossbauer Spectroscopy techniques.	Analyze(K4)
Organic Reaction Mechanism - II		
CO1.	To recall the basic principles of aromaticity of organic and heterocyclic compounds.	Recall (K1)
CO2.	To understand the mechanism of various types of organic reactions.	Recall (K1)
CO3.	To predict the suitable reagents for the conversion of selective organic compounds.	Understand(K2)
CO4.	To correlate the principles of substitution, elimination, and addition reactions.	Application (K3)
CO5.	To design new routes to synthesis organic compounds.	Analyze(K4)
Physical Chemistry - I		
CO1.	To Explain the classical and statistical concepts of thermodynamics.	Analyze(K4)
CO2.	To Compare and correlate the thermodynamic concepts to study the kinetics of chemical reactions.	Application (K3)
CO3.	To Discuss the various thermodynamic and kinetic determination.	Analyze(K4)
CO4.	To Evaluate the thermodynamic methods for real gases ad mixtures.	Analyze(K4)
CO5.	To Compare the theories of reactions rates and fast reactions.	Understand(K2)
Medicinal Chemistry		
CO1.	Predict a drugs properties based on its structure.	Understand(K2)
CO2.	Describe the factors that affect its absorption, distribution, metabolism, and excretion,and hence the considerations to be made in drug design.	Analyze(K4)
CO3.	Explain the relationship between drug's chemical structure and its therapeutic properties.	Application (K3)
CO4.	Designed to give the knowledge of different theories of drug actions at molecular level.	Knowledge (Level K1)
CO5.	To identify different targets for the development of new drugs for the treatment of infectious and GIT.	Analysis (Level K4)
Green Chemistry		
CO1.	To recall the basic chemical techniques used in conventional industrial preparations and in green innovations.	Recall (K1)
CO2.	To understand the various techniques used in chemical industries and in laboratory.	Understand(K2)
CO3.	To compare the advantages of organic reactions assisted by renewable energy sources and non-renewable energy sources.	Understand(K2)

CO4.	To apply the principles of PTC, ionic liquid, microwave and ultrasonic assisted Organicsynthesis.	Application (K3)
CO5.	To design and synthesize new organic compounds by green methods.	Analyze(K4)
Bio - Inorganic Chemistry		
CO1.	The students will be able to analyses trace elements.	Analyze(K4)
CO2.	Students will be able to explain the biological redox systems.	Analyze(K4)
CO3.	Students will gain skill in analyzing the toxicity in metals.	Application (K3)
CO4.	Students will have experience in diagnosis.	Application (K3)
CO5.	Learn about the nitrogen fixation and photosynthetic mechanism.	Recall (K1)
Material Science		
CO1.	To understand and recall the synthesis and characteristics of crystal structures,semiconductors, magnets, nanomaterials and renewable energy materials.	Understand(K2)
CO2.	To integrate and assess the structure of different materials and their properties.	Recall (K1)
CO3.	To analyse and identify new materials for energy applications.	Application (K3)
CO4.	To explain the importance of crystal structures, piezoelectric and pyroelectricmaterials, nanomaterials, hard and soft magnets, superconductors, solar cells, electrodes, LEDuses, structures and synthesis.	Analyze(K4)
CO5.	To design and develop new materials with improved property for energy applications.	Application (K3)
Industrial Chemistry		
CO1.	To describe the students well – grounded in the principles and through knowledge of Scientific techniques of industrial chemistry	Recall (K1)
CO2.	To Explain the properties of Paints and varnishes.	Understand(K2)
CO3.	To understand the applications of soaps and detergents	Understand(K2)
CO4.	To Describe the physical characteristics of Portland cement	Understand(K2)
CO5.	To explain the various types of batteries.	Understand(K2)
Organic Synthesis and Photo Chemistry		
CO1.	To recall the basic principles of organic chemistry and to understand the various reactions of organic compounds with reaction mechanisms.	Recall (K1)
CO2.	To understand the versatility of various special reagents and to correlate their reactivity with various reaction conditions.	Understand(K2)
CO3.	To implement the synthetic strategies in the preparation of various organic compounds.	Application (K3)
CO4.	To predict the suitability of reaction conditions in the preparation of tailor-made organic compounds.	Application (K3)
CO5.	To design and synthesize novel organic compounds with the methodologies learnt during the course.	Analyze(K4)

Coordination Chemistry - I		
CO1.	Understand and comprehend various theories of coordination compounds.	Understand(K2)
CO2.	Understand the spectroscopic and magnetic properties of coordination complexes.	Understand(K2)
CO3.	Explain the stability of complexes and various experimental methods to determine the stability of complexes	Analyze(K4)
CO4.	Predict the electronic transitions in a complex based on correlation diagrams and UV- visible spectral details.	Application (K3)
CO5.	Comprehend the kinetics and mechanism of substitution reactions in octahedral and square planar complexes.	Analyze(K4)
Pharmocognosy and Phytochemistry		
CO1.	To recall the sources of natural medicines and analysis of crude drugs.	Recall (K1)
CO2.	To understand the methods of evaluation based on various parameters.	Understand(K2)
CO3.	To analyze the isolated drugs	Analyze(K4)
CO4.	To apply various techniques to discover new alternative medicines.	Application (K3)
CO5.	To evaluate the isolated drugs for various pharmacological activities.	Analyze(K4)
Biomolecules and Heterocyclic Compounds		
CO1.	To understand the basic concepts of biomoleculesand natural products.	Understand(K2)
CO2.	To integrate and assess the different methods of preparation of structurally different biomolecules and natural products.	Application (K3)
CO3.	To illustrate the applications of biomolecules and their functions in the metabolism of living organisms.	Application (K3)
CO4.	To analyse and rationalise the structure and synthesis of heterocyclic compounds.	Analyze(K4)
CO5.	To develop the structure of biologically important heterocyclic compounds by different methods.	Analyze(K4)
Coordination Chemistry - II		
CO1.	Understand and apply 18 and 16 electron rule for organometallic compounds.	Analyze(K4)
CO2.	Understand the structure and bonding in olefin, allyl, cyclopentadienyl and carbonyl containing organometallic compounds.	Application (K3)
CO3.	Understand the reactions of organometallic compounds and apply them in CO4: understanding the catalytic cycles.	Analyze(K4)
CO4.	Identify / predict the structure of coordination complexes using spectroscopic tools such as IR, NMR, ESR, Mossbauer and optical rotatory dispersion studies to interpret the structure of molecules by various spectral techniques.	Understand(K2)

Physical chemistry - II		
CO1.	To discuss the characteristics of wave functions and symmetry functions.	Analyze(K4)
CO2.	To classify the symmetry operation and wave equations.	Understand(K2)
CO3.	To apply the concept of quantum mechanics and group theory to predict the electronic structure.	Application (K3)
CO4.	To specify the appropriate irreducible representations for theoretical applications.	Analyze(K4)
CO5.	To develop skills in evaluating the energies of molecular spectra.	Analyze(K4)
Chemistry of Natural Products		
CO1.	To Understand the biological importance of chemistry of natural products.	Understand(K2)
CO2.	To Scientifically plan and perform the isolation and characterization of synthesized natural products.	Application (K3)
CO3.	To Elucidate the structure of alkaloids, terpenoids, carotenoids, falvanoids and anthocyanins.	Analyze(K4)
CO4.	To Determine the structure of phytochemical constituents by chemical and physical methods.	Analyze(K4)
CO5.	To Interpret the experimental data scientifically to improve biological activity of active components.	Analyze(K4)
Polymer Chemistry		
CO1.	To understand the bonding in polymer.	Understand(K2)
CO2.	To scientifically plan and perform the various polymerization reactions.	Application (K3)
CO3.	To observe and record the processing of polymers.	Recall (K1)
CO4.	To calculate the molecular weight by physical and chemical methods.	Understand(K2)
CO5.	To interpret the experimental data scientifically to improve the quality of synthetic polymers.	Analyze(K4)
EXTRA-CERDIT COURSES		
Food Chemistry		
CO1.	To understand the chemistry of food adulteration and adulterants	Comprehension (K2)
CO2.	To know the chemistry of food poisoning	Comprehension (K2)
CO3.	To acquire knowledge about food additives	Comprehension (K2)
CO4.	To understand the chemistry of beverages and soft drinks and to know the methods of preparing the soft drinks by field visits.	Comprehension (K2)
CO5.	To acquire knowledge about various edible oils and the processing techniques related to oils.	Comprehension (K2)
Chemistry In Day Today Life		
CO1.	To learn the types of fabrics, fading, starching process.	Comprehension (K2)
CO2.	To acquire knowledge about types of soaps whiteners, stiffeners, flavouring agents	Comprehension (K2)

CO3.	To understand soft and hard utensil cleaning liquid soaps	Comprehension (K2)
CO4.	To acquire a comprehensive knowledge about Floor cleaning agents and Anti mosquito repellant machines	Comprehension (K2)
CO5.	To understand the Chemicals used in water purifiers and germicidal effect of uv radiation	Comprehension (K2)
Forensic Science & Crime Investigation		
CO1.	To learn crime investigation through diagnosis of poisoning and postmortem	Comprehension (K2)
CO2.	To acquire knowledge about explosions, the causes (gelatin sticks, TDX etc) and the security measures.	Comprehension (K2)
CO3.	To understand the methods of detecting Forgery in bank and educational records.	Comprehension (K2)
CO4.	To acquire a comprehensive knowledge about tracks and traces.	Comprehension (K2)
CO5.	To understand the chemical methods used in crime investigation (Medical aspects).	Comprehension (K2)
VALUE-ADDED COURSES		
Soil Chemistry		
CO1.	Gaining theoretical Knowledge in soil chemistry	Knowledge (K1)
CO2.	Gaining in depth Knowledge of soli bio chemistry and anomalous soils	Knowledge(K1)
CO3.	Comprehending the values of soil chemistry in agriculture	Comprehension(K2)
CO4.	Analyzing different methods for soil enrichment	Analysis (K4)
CO5.	Creating new strategies to minimize soil pollution and detoxification	Synthesis (K6)
Clinical Chemistry And Toxicology		
CO1.	To understand the carbohydrate metabolism	Understand (K2)
CO2.	Gaining knowledge on Renal function	Knowledge (K1)
CO3.	To Knowledge on Liver Function	Knowledge (K1)
CO4.	Applying gained Practical Knowledge of Blood analysis	Application (K3)
CO5.	Analysis the introduction of Toxicology	Analysis (K3)
Pharmaceutical Quality & Quality Assurance		
CO1.	To Understand the concept of quality control and quality assurance	Knowledge (K1)
CO2.	To comprehend the guidelines of Pharmacology	Comprehension (K2)
CO3.	To know the organization and personal responsibilities of Pharmaceutical industries	Knowledge (K1)
CO4.	To analyze various materials used in Pharmaceutical industries	Analysis (K4)
CO5.	To acquire in-depth knowledge in documentation	Analysis (K4)