Key Indicator - 1.1 Curriculum Design and Development

1.1.1 Curricula developed and implemented have relevance to the local, regional, national and global developmental needs, which is reflected in the Programme outcomes (POs) and Course Outcomes (COs) of the Programmes offered by the institution

Programme Outcomes (POs) and Course Outcomes (COs) – (2019-2020 Onwards)

DEPARTMENT OF CHEMISTRY

B. Sc- Chemistry

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	STATEMENTS
PEO1	Impart functional knowledge of all basic areas of chemistry which continue to develop throughout the life time.
PEO2	Profitable Employment in Private/Government/professional sectors\ appropriate to their interest, education and become a dynamic individual.
PEO3	Interdisciplinary approach helps in creating innovative ideas for the sustainable development.
PEO4	Develop leadership qualities in multi disciplinary setting through ethical manner.
PEO5	Ability to identify and find the solutions to socio-economic environmental problems for the development of the country.

PROGRAMME OUTCOMES (POs)

POs	STATEMENTS
PO1	Curriculum enhances the basic concepts, skills in problem solving, critical thinking and analytical reasoning in chemistry.
PO2	Explore the new area of research with innovative ideas in novel chemistry and other scientific fields.
PO3	Specific placement in R &D, chemical, pharmaceuticals, food products and life Oriented material industries.
PO4	Crop up all the competitive group examinations.
PO5	Imbibed ethical, moral and social values in personal life leading to highly cultured and civilized personality.

COURSE OUTCOMES (COs)

Course Title: General Chemistry -I Course Code: 19UCH1CC1		
CO Number	**CO Statement On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Plan to learn atomic orbitals, Classification of s, p, d & f block elements	**K2**
CO2	Explain the chemical boding	**K2**
CO3	Interpret the IUPAC nomenclature of compounds and cleavage of bonds	**K2**
CO4	Explain the Gaseous State of chemical sample	**K2**
CO5	Outline about the analytical experiments	**K2**

Course Title: Volumetric Analysis Course Code: 19UCH1CC1P		
CO Number	**CO Statement On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the basic principles of volumetric analysis	**K1**
CO2	Demonstrate the experimental methods of volumetric analysis	**K2**
CO3	Compare the hardness present drinking water	**K2**

Course Title: General Chemistry -II Course Code: 19UCH2CC2		
CO Number	**CO Statement On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Define the basics of bonding	**K1**
CO2	Recall the concepts of reaction mechanism	**K1**
CO3	Relate the knowledge of cycloalkanes	**K2**
CO4	Explain the basics of liquid and solid states.	**K2**
CO5	Outline about the analytical experiments.	**K2**

Course Title: Organic Chemistry Practical - I Course Code: 19UCH2CC2P		
CO Number	**CO Statement On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Find the physical constants of the organic compounds	**K1**
CO2	Demonstrate the estimation of organic compounds	**K2**
CO3	Prepare organic compounds using various reactions.	**K3**

Key Indicator - 1.1 Curriculum Design and Development

1.1.1 Curricula developed and implemented have relevance to the local, regional, national and global developmental needs, which is reflected in the Programme outcomes (POs) and Course Outcomes (COs) of the Programmes offered by the institution

Programme Outcomes (POs) and Course Outcomes (COs)) – (2020-2021 Onwards)

DEPARTMENT OF CHEMISTRY

B. Sc- Chemistry

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	STATEMENTS
PEO1	Impart functional knowledge of all basic areas of chemistry which continue to develop throughout the life time.
PEO2	Profitable Employment in Private/Government/professional sectors\ appropriate to their interest, education and become a dynamic individual.
PEO3	Interdisciplinary approach helps in creating innovative ideas for the sustainable development.
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PEO5	Ability to identify and find the solutions to socio-economic environmental problems for the development of the country.

PROGRAMME OUTCOMES

POs	STATEMENTS
PO1	Curriculum enhances the basic concepts, skills in problem solving, critical thinking and analytical reasoning in chemistry.
PO2	Explore the new area of research with innovative ideas in novel chemistry and other scientific fields.
PO3	Specific placement in R &D, chemical, pharmaceuticals, food products and life Oriented material industries.
PO4	Crop up all the competitive group examinations.
PO5	Imbibed ethical, moral and social values in personal life leading to highly cultured and civilized personality.

COURSE OUTCOMES (COs)

Course Title: General Chemistry -I **Course Code: 19UCH1CC1**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Plan to learn atomic orbitals, Classification of s, p, d & f block elements	**K2**
CO2	Explain the chemical boding	**K2**
CO3	Interpret the IUPAC nomenclature of compounds and cleavage of bonds	**K2**
CO4	Explain the Gaseous State of chemical sample	**K2**
CO5	Outline about the analytical experiments	**K2**

Course Title: Volumetric Analysis **Course Code: 19UCH1CC1P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the basic principles of volumetric analysis	**K1**
CO2	Demonstrate the experimental methods of volumetric analysis	**K2**
CO3	Compare the hardness present drinking water	**K2**

Course Title: General Chemistry -II **Course Code: 19UCH2CC2**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Define the basics of bonding	**K1**
CO2	Recall the concepts of reaction mechanism	**K1**
CO3	Relate the knowledge of cycloalkanes	**K2**
CO4	Explain the basics of liquid and solid states.	**K2**
CO5	Outline about the analytical experiments.	**K2**

Course Title: Organic Chemistry Practical - I **Course Code: 20UCH2CC2P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Find the physical constants of the organic compounds	**K1**
CO2	Demonstrate the estimation of organic compounds	**K2**
CO3	Prepare organic compounds using various reactions.	**K3**

Course Title: General Chemistry -III Course Code: 19UCH3CC3		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the basic concepts of s and p-block elements	**K1**
CO2	Demonstrate the preparation and properties of organo metallic compounds.	**K2**
CO3	Analyze the concepts of thermodynamics	**K2**
CO4	Outline the basics of qualitative and quantitative analysis.	**K2**
CO5	Identify the stereochemistry of organic molecules	**K3**

Course Title: Volumetric Analysis Course Code: 19UCH3CC3P		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the acidic and basic radicals	**K1**
CO2	Identify the cations and anions present in the mixture	**K1**
CO3	Demonstrate the experimental methods of group separation	**K2**

Course Title: Chemistry -I Course Code: 19UPH3AC4		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the types of crystal structure and terms involved in kinetics and chemical equilibrium.	**K1**
CO2	Compare the theories of bonding with metal atoms.	**K2**
CO3	Discuss the properties of benzene, naphthalene and halogen compounds.	**K2**
CO4	Apply the concepts of electron displacement effect in organic compounds.	**K3**

Course Title: Chemistry Practical -I Course Code: 19UPH3AC1P		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the basic principles of volumetric analysis.	**K1**
CO2	Demonstrate the experimental methods of volumetric analysis.	**K2**
CO3	Compare the hardness present drinking water.	**K2**

Course Title: Chemistry in Every Day Life **Course Code: 19UCH3NME1**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Indentify various water treatment processes	**K2**
CO2	Describe the types of fertilizers and their uses	**K2**
CO3	Explain the characteristics of paint and propellants	**K2**
CO4	Illustrate various cosmetics, soaps and detergents	**K3**
CO5	Apply the concept of polymer, fibre and dyes in everyday life	**K3**

Course Title: General Chemistry - IV **Course Code: 19UCH4CC4**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Compare the different characteristics of d- and f- block elements	**K2**
CO2	Classification of acids and bases	**K2**
CO3	Understand preparation, properties and reactions of hydroxyl derivatives.	**K2**
CO4	Apply the first and second law of thermodynamics	**K3**
CO5	Analyze the terms of chemical kinetics	**K4**

Course Title: Organic Qualitative Analysis **Course Code: 19UCH4CC4P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Differentiate the aromatic and aliphatic nature of organic sample	**K4**
CO2	Identification of special element in organic compound	**K2**
CO3	Analyze the functional group of organic compounds	**K4**
CO4	Demonstrate the derivative for functional group	**K3**

Course Title: Chemistry -II **Course Code: 19UPH4AC5**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the properties and applications of carbohydrates, amino acids and proteins	**K1**
CO2	Understand the basics of nuclear chemistry	**K2**
CO3	Apply the basic concepts of photochemistry	**K3**
CO4	Analyze the concepts of electrochemistry and material science	**K4**

Course Title: Food Adulterants and Health Care Course Code: 19UCH4NME2		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Understand food and nutrition	**K2**
CO2	Identify various food additives, antioxidants and preservatives	**K2**
CO3	Learn about food adulterants and contaminations.	**K2**
CO4	Illustrate role of Health care	**K3**
CO5	Classify the common drugs	**K3**

Course Title: Forensic Chemistry Course Code: 19UCH4SBE1A		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Identify the fundamental principles and functions of forensic science	**K3**
CO2	Explain the characteristic features of Indian currency notes, passports	**K3**
CO3	Analyze the techniques involved in the field of forensics	**K4**
CO4	Appraise the role of chemistry and other branches in forensics	**K5**
CO5	Describe the study of Chromatographic techniques	**K6**

Course Title: Food Chemistry Course Code: 19UCH4SBE1B		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Classify components of food by chemical structure.	**K4**
CO2	Describe the function of lipids, protein, cellulose in daily food intake	**K3**
CO3	Understand how the chemical components of a food impact the functionality of the overall food product	**K2**
CO4	Explain the major reactions that occur in foods.	**K4**
CO5	Apply the fundamental structure/function relationships to how they impact the overall food product quality, safety, and shelf life	**K3**

Key Indicator - 1.1 Curriculum Design and Development

1.1.1 Curricula developed and implemented have relevance to the local, regional, national and global developmental needs, which is reflected in the Programme outcomes (POs) and Course Outcomes (COs) of the Programmes offered by the institution

Programme Outcomes (POs) and Course Outcomes (COs)) – (2021-2022 Onwards)

DEPARTMENT OF CHEMISTRY

B. Sc- Chemistry

ROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	STATEMENTS
PEO1	Impart functional knowledge of all basic areas of chemistry which continue to develop throughout the life time.
PEO2	Profitable Employment in Private/Government/professional sectors\ appropriate to their interest, education and become a dynamic individual.
PEO3	Interdisciplinary approach helps in creating innovative ideas for the sustainable development.
PEO4	Develop leadership qualities in multi disciplinary setting through ethical manner.
PEO5	Ability to identify and find the solutions to socio-economic environmental problems for the development of the country.

PROGRAMME OUTCOMES (POs)

POs	STATEMENTS
PO1	Curriculum enhances the basic concepts, skills in problem solving, critical thinking and analytical reasoning in chemistry.
PO2	Explore the new area of research with innovative ideas in novel chemistry and other scientific fields.
PO3	Specific placement in R &D, chemical, pharmaceuticals, food products and life Oriented material industries.
PO4	Crop up all the competitive group examinations.
PO5	Imbibed ethical, moral and social values in personal life leading to highly cultured and civilized personality.

COURSE OUTCOMES (COs)

Course Title: General Chemistry -I Course Code: 19UCH1CC1		
CO Number	**CO Statement On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Plan to learn atomic orbitals, Classification of s, p, d & f block elements	**K2**
CO2	Explain the chemical boding	**K2**
CO3	Interpret the IUPAC nomenclature of compounds and cleavage of bonds	**K2**
CO4	Explain the Gaseous State of chemical sample	**K2**
CO5	Outline about the analytical experiments	**K2**

Course Title: Volumetric Analysis Course Code: 19UCH1CC1P		
CO Number	**CO Statement On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the basic principles of volumetric analysis	**K1**
CO2	Demonstrate the experimental methods of volumetric analysis	**K2**
CO3	Compare the hardness present drinking water	**K2**

Course Title: General Chemistry -II Course Code: 19UCH2CC2		
CO Number	**CO Statement On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Define the basics of bonding	**K1**
CO2	Recall the concepts of reaction mechanism	**K1**
CO3	Relate the knowledge of cycloalkanes	**K2**
CO4	Explain the basics of liquid and solid states.	**K2**
CO5	Outline about the analytical experiments.	**K2**

Course Title: Organic Chemistry Practical - I Course Code: 20UCH2CC2P		
CO Number	**CO Statement On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Find the physical constants of the organic compounds	**K1**
CO2	Demonstrate the estimation of organic compounds	**K2**
CO3	Prepare organic compounds using various reactions.	**K3**

Course Title: General Chemistry -III Course Code: 19UCH3CC3		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the basic concepts of s and p-block elements	**K1**
CO2	Demonstrate the preparation and properties of organo metallic compounds.	**K2**
CO3	Analyze the concepts of thermodynamics	**K2**
CO4	Outline the basics of qualitative and quantitative analysis.	**K2**
CO5	Identify the stereochemistry of organic molecules	**K3**

Course Title: Volumetric Analysis Course Code: 19UCH3CC3P		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the acidic and basic radicals	**K1**
CO2	Identify the cations and anions present in the mixture	**K1**
CO3	Demonstrate the experimental methods of group separation	**K2**

Course Title: Chemistry -I Course Code: 19UPH3AC4		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the types of crystal structure and terms involved in kinetics and chemical equilibrium.	**K1**
CO2	Compare the theories of bonding with metal atoms.	**K2**
CO3	Discuss the properties of benzene, naphthalene and halogen compounds.	**K2**
CO4	Apply the concepts of electron displacement effect in organic compounds.	**K3**

Course Title: Chemistry Practical -I Course Code: 19UPH3AC1P		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the basic principles of volumetric analysis.	**K1**
CO2	Demonstrate the experimental methods of volumetric analysis.	**K2**
CO3	Compare the hardness present drinking water.	**K2**

CRITERION I **POs and COs**

Course Title: Chemistry in Every Day Life **Course Code: 19UCH3NME1**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Indentify various water treatment processes	**K2**
CO2	Describe the types of fertilizers and their uses	**K2**
CO3	Explain the characteristics of paint and propellants	**K2**
CO4	Illustrate various cosmetics, soaps and detergents	**K3**
CO5	Apply the concept of polymer, fibre and dyes in everyday life	**K3**

Course Title: General Chemistry - IV **Course Code: 19UCH4CC4**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Compare the different characteristics of d- and f- block elements	**K2**
CO2	Classification of acids and bases	**K2**
CO3	Understand preparation, properties and reactions of hydroxyl derivatives.	**K2**
CO4	Apply the first and second law of thermodynamics	**K3**
CO5	Analyze the terms of chemical kinetics	**K4**

Course Title: Organic Qualitative Analysis **Course Code: 19UCH4CC4P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Differentiate the aromatic and aliphatic nature of organic sample	**K4**
CO2	Identification of special element in organic compound	**K2**
CO3	Analyze the functional group of organic compounds	**K4**
CO4	Demonstrate the derivative for functional group	**K3**

Course Title: Chemistry -II **Course Code: 19UPH4AC5**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the properties and applications of carbohydrates, amino acids and proteins	**K1**
CO2	Understand the basics of nuclear chemistry	**K2**
CO3	Apply the basic concepts of photochemistry	**K3**
CO4	Analyze the concepts of electrochemistry and material science	**K4**

Course Title: Food Adulterants and Health Care **Course Code: 19UCH4NME2**

CRITERION I **POs and COs**

CO Number	CO Statement On the successful completion of the course, students will be able to	Knowledge Level
CO1	Understand food and nutrition	**K2**
CO2	Identify various food additives, antioxidants and preservatives	**K2**
CO3	Learn about food adulterants and contaminations.	**K2**
CO4	Illustrate role of Health care	**K3**
CO5	Classify the common drugs	**K3**

Course Title: Forensic Chemistry
Course Code: 19UCH4SBE1A

CO Number	CO Statement On the successful completion of the course, students will be able to	Knowledge Level
CO1	Identify the fundamental principles and functions of forensic science	**K3**
CO2	Explain the characteristic features of Indian currency notes, passports	**K3**
CO3	Analyze the techniques involved in the field of forensics	**K4**
CO4	Appraise the role of chemistry and other branches in forensics	**K5**
CO5	Describe the study of Chromatographic techniques	**K6**

Course Title: Food Chemistry
Course Code: 19UCH4SBE1B

CO Number	CO Statement On the successful completion of the course, students will be able to	Knowledge Level
CO1	Classify components of food by chemical structure.	**K4**
CO2	Describe the function of lipids, protein, cellulose in daily food intake	**K3**
CO3	Understand how the chemical components of a food impact the functionality of the overall food product	**K2**
CO4	Explain the major reactions that occur in foods.	**K4**
CO5	Apply the fundamental structure/function relationships to how they impact the overall food product quality, safety, and shelf life	**K3**

Course Title: Inorganic Chemistry-I
Course Code: 19UCH5CC5

CO Number	CO Statement On the successful completion of the course, students will be able to	Knowledge Level
CO1	Explain the process of metallurgy.	**K1**
CO2	Recognize the basic concepts of co-ordination chemistry.	**K1**
CO3	Compare the theories of bonding in coordination compounds.	**K2**
CO4	Relate the stability of metal complexes.	**K3**
CO5	Interpret the biological importance of coordination complexes.	**K3**

CRITERION I **POs and COs**

Course Title: Organic Chemistry-I **Course Code: 19UCH5CC6**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Identify different types of carboxylic acids and to compare their relative strength	**K1**
CO2	Discuss about reactions of carbonyl compounds	**K2**
CO3	Explain various heterocyclic compounds and dyes	**K2**
CO4	Utilization appropriate reagents for oxidization and reduction	**K3**
CO5	Analyze the basicity and stability of aliphatic and aromatic amines	**K4**

Course Title: Physical Chemistry-I **Course Code: 19UCH5CC7**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Evaluate quantum yield and Identify types of electronic transition in organic molecules.	**K4**
CO2	Find equilibrium constant and enthalpy of equilibrium reaction at different temperature,	**K1**
CO3	Analyze thermodynamic conditions favoring chemical equilibrium.	**K2**
CO4	Discuss physical and chemical adsorption phenomenon	**K2**
CO5	Explain phase rule and law of dilute solution to predict composition, molecular weight	**K2**

Course Title: Physical Chemistry (P) **Course Code: 19UCH5CC5P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Construct the phase diagram	**K3**
CO2	Relate the effect of impurity on phenol water System	**K2**
CO3	Identify the molecular weight of unknown compound	**K3**
CO4	Examine the concentration of ions using Potentiometer	**K4**
CO5	Inspect the concentration of ions using Conductometer	**K4**

CRITERION I **POs and COs**

Course Title: Analytical Chemistry **Course Code: 19UCH5MBE1A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Acquire the knowledge of the qualitative and quantitative analysis	**K2**
CO2	To know the storage and handling of various chemicals and first aid procedures	**K3**
CO3	Examine about SI units	**K3**
CO4	Interpret the fundamental concepts and role in separation of different types of chromatography.	**K3**
CO5	Predict the applications of data analysis	**K3**

Course Title: Chemistry of Biomolecules **Course Code: 19UCH5MBE1B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Gain the knowledge of the carbohydrates	**K2**
CO2	Acquires the information's about amino acids and proteins	**K2**
CO3	To know the components of lipids and its function	**K3**
CO4	Procures the knowledge of nucleic acids	**K3**
CO5	Predict the applications of vitamins and enzymes	**K3**

Course Title: Chemistry of Consumer Products **Course Code: 19UCH5SBE2AP**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Know about Chemistry and modern trends in the industry.	**K1**
CO2	Identify the cations and anions present in the mixture	**K1**
CO3	Demonstrate the experimental methods of group separation	**K2**

Course Title: Dye Chemistry **Course Code: 19UCH5SBE2BP**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Identify the usages of dyes in industries	**K1**
CO2	Quantify the presence of dyes in the samples	**K1**
CO3	Demonstrate the experimental methods of preparation of dyes.	**K2**

CRITERION I **POs and COs**

Course Title: Water Treatment Technology **Course Code: 19UCH5SBE3AP**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Design the treatment unit for water treatment	**K1**
CO2	Identify the outflow level of impurities from water	**K1**

Course Title: Bio Fuels **Course Code: 19UCH5SBE3BP**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Know about the techniques to extract oil from plant	**K1**
CO2	Evaluate fuel viscosity	**K1**
CO3	Calculate the yield of sugar and types	**K2**

Course Title: Organic Chemistry – II **Course Code: 19UCH6CC8**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the basic concepts of carbohydrates, proteins and vitamins.	**K1**
CO2	Demonstrate the preparation and properties of amino acids, alkaloids and terpenoids	**K2**
CO3	Illustrate the structure of proteins and vitamins.	**K3**
CO4	Analyze the nucleophilic and electrophilic rearrangements.	**K4**
CO5	Deduce the structure of organic molecules using spectroscopic techniques.	**K4**

Course Title: Physical Chemistry – II **Course Code: 19UCH6CC9**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Apply various theories of weak and strong electrolyte to predict solubility and ionic products.	**K2**
CO2	Predict reduction potential of a metal and EMF the cell.	**K3**
CO3	Evaluate internuclear distance and bond strength using IR and rotational spectral data.	**K3**
CO4	Relate NMR and ESR concept to analyze structure of the molecules.	**K2**
CO5	Analyze symmetry of the molecule.	**K2**

CRITERION I **POs and COs**

Course Title: Gravimetric Analysis and Analytical Techniques (P) **Course Code: 19UCH6CC6P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Know about the accuracy in Gravimetric estimations and its significance	**K1**
CO2	Identify the compounds using Coloumn Chromatography	**K2**
CO3	Demonstrate the experimental method of Thin layer chromatography in the separation of amino acids and dyes	**K2**

Course Title: Nuclear and Industrial Chemistry **Course Code: 19UCH6MBE2A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Discuss about nuclear chemistry	**K1**
CO2	Discuss about Fundamentals of Radio chemistry	**K2**
CO3	Explore about leather techniques	**K2**
CO4	Discussing about various processes in sugar industries	**K3**
CO5	Explore about the essentials of Paints, Varnishes & Cleansing Agents	**K3**

Course Title: Basics of Nanoscience and Nanotechnology **Course Code: 19UCH6MBE2B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the basic concepts macro, micro and nanoscale materials	**K1**
CO2	Explain the synthesis of nanomaterials	**K1**
CO3	Analyze the characterization techniques of nanomaterials	**K2**
CO4	Understand the nano catalyst and carbon based nanomaterials.	**K2**
CO5	Illustrate the applications of nanomaterials.	**K3**

CRITERION I **POs and COs**

Course Title: Polymer Chemistry **Course Code: 19UCH6MBE3A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Classify polymers and explain the configuration of polymers and properties like glass transition temperature and melting point of polymers	**K2**
CO2	Illustrate the preparation, properties and applications of polymers	**K2**
CO3	Outline the recent advances in polymer chemistry.	**K3**
CO4	Acquaint various polymer processing technologies and moulding techniques.	**K4**
CO5	Interpret the mechanism of polymerization	**K5**

Course Title: Pharmaceutical Chemistry **Course Code: 19UCH6MBE3B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Explain the terminologies used in pharmacology	**K2**
CO2	Classify and compare different types of drug	**K4**
CO3	Describe the functions and mode of actions of drugs	**K3**
CO4	Explain the cause and symptom of common diseases	**K2**
CO5	Demonstrate the functions of medicine for common diseases	**K2**

Key Indicator - 1.1 Curriculum Design and Development

1.1.1 Curricula developed and implemented have relevance to the local, regional, national and global developmental needs, which is reflected in the Programme outcomes (POs) and Course Outcomes (COs) of the Programmes offered by the institution

Programme Outcomes (POs) and Course Outcomes (COs) – (2022-2023 Onwards)

DEPARTMENT OF CHEMISTRY

B. Sc- Chemistry

ROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	STATEMENTS
PEO1	**LEARNING ENVIRONMENT** To facilitate value-based holistic and comprehensive learning by integrating innovative learning practices to match the highest quality standards and train the students to be effective leaders in their chosen fields.
PEO2	**ACADEMIC EXCELLENCE** To provide a conducive environment to unleash their hidden talents and to nurture the spirit of critical thinking and encourage them to achieve their goal.
PEO3	**EMPLOYABILITY** To equip students with the required skills in order to adapt to the changing global scenario and gain access to versatile career opportunities in multidisciplinary domains.
PEO4	**PROFESSIONAL ETHICS AND SOCIAL RESPONSIBILITY** To develop a sense of social responsibility by formulating ethics and equity to transform students into committed professionals with a strong attitude towards the development of the nation.
PEO5	**GREEN SUSTAINABILITY** To understand the impact of professional solutions in societal and environmental contexts and demonstrate the knowledge for an overall sustainable development.

PROGRAMME OUTCOMES (POs)

PO No.	Programme Outcome On completion of B.Sc., Mathematics, B.Sc., Physics, B.Sc. Chemistry Programme, the students will be able to
PO1	**Domain knowledge:** Analyze, design and develop solutions by applying firm fundamental concepts of basic sciences and expertise in discipline.
PO2	**Problem solving:** Ability to think rationally, analyse and solve problems adequately with practical knowledge to assess the environmental issues
PO3	**Creative thinking and Team Work:** Develop prudent decision-making skills and mobility to work in teams to solve multifaceted problems.
PO4	**Employability:** Self-study acclimatize them to observe effective interactive practices for practical learning enabling them to be a successful science graduate.
PO5	**Life Long Learning:** Assure consistent improvement in the performance and arouse interest to pursue higher studies in premium institutions.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO NO	Programme Specific Outcomes Students of B.Sc., Chemistry will be able to	POs Addressed
PSO1	Afford a firm foundation in Chemistry that stresses scientific reasoning, analytical problem solving with a molecular perspective	PO1 PO2
PSO2	Acquire knowledge in theoretical and practical tools to exemplify entirely in the working environment.	PO4 PO5
PSO3	Inculcate scientific temperament and create an awareness of the impact of chemistry on the environment, society, and development outside the scientific community.	PO3 PO4
PSO4	Scale up of chemical process after designing, optimization and analysis for developing products required for society.	PO4
PSO5	Expand the knowledge available opportunities related to chemistry in the government services through public service commission particularly in the field of food safety, health inspector, pharmacist etc.	PO4 PO5

COURSE OUTCOMES (COs)

Course Title: General Chemistry **Course Code: 22UCH1CC1**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recognize and report the fundamental principles of various field of chemistry	**K1&K2**
CO2	Illustrate the knowledge on atomic structure, bonding, isomerism, reaction intermediates, solid state and analytical techniques.	**K3**
CO3	Examine the reaction intermediates, solid state and analytical techniques.	**K3**
CO4	Categorize the quantum numbers, elements, hybridization, stability of intermediates, crystal structure, titrations and acid radicals.	**K4**
CO5	Interpret the periodic properties, geometry of molecules and electronic displacement Effects	**K5**

Course Title: General Chemistry (P) **Course Code: 22UCH1CC1P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the basic principles of volumetric analysis and estimation	**K1**
CO2	Demonstrate the experimental methods of volumetric analysis	**K2**
CO3	Estimate the chlorine content in bleaching powder and copper in brass	**K3**
CO4	Determine the hardness of water	**K3**
CO5	Determine saponification value of oil	**K3**

Course Title: Biochemistry -I **Course Code: 22UCH1AC1B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the basic concepts and understand the structure, functions of the biomolecules in living organisms	**K1&K2**
CO2	Describe the functions of the biomolecules in living organisms	**K2**
CO3	Apply the concepts to illustrate the role of biomolecules in various metabolic pathways	**K3**
CO4	Analyze the results of routine biochemical analysis using theoretical Concepts	**K4**
CO5	Evaluate the dimensions of diseases associated with the metabolic Disorders	**K5**

Course Title: Biochemistry (P) Course Code: 22UCH1AC2BP		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Identify and classify the given compounds of carbohydrates, amino acids and lipids based on the characteristic reactions	**K1&K2**
CO2	Analysis of the compounds	**K2**
CO3	Prepare and isolate the biomolecules present in food products	**K3**
CO4	Estimate the amount of carbohydrate and protein present in the given solution	**K4**
CO5	Assess the quality and quantity of biomolecules by analytical methods	**K5**

Course Title: Inorganic and Physical Chemistry Course Code: 22UCH2CC2		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recognize and account the fundamental ideas of bonding, s, p block elements, thermochemistry, metallurgy and colloidal state	**K1 & K2**
CO2	Exemplify the knowledge on bonding, periodic elements, liquids, colloids, enthalpies and refining process	**K3**
CO3	Categorize the types of bonding, s block elements, liquid and colloidal state of compounds and their properties.	**K4**
CO4	Interpret the percent ionic character, dipole moment	**K4**
CO5	Interpret Hess's law and techniques used in metallurgy.	**K5**

Course Title: Preparation and Analysis of Industrial Importance (P) Course Code: 22UCH2CC2P		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Provide graduates with the skills, information and learning tools required to carry out professional research, and development and production activities in the field of chemistry.	**K1**
CO2	Explain the suitability of fertilizers for different kinds of crops and soil.	**K2**
CO3	Prepare students for professional participation in Chemical industries so as to adapt themselves to jobs which are problem solving	**K3**
CO4	Infer the students to be result-oriented in the chemical, biochemical and applied technological fields.	**K4**
CO5	Apply the concept of volumetric analysis in industrial analysis	**K5**

Course Title: Material Science **Course Code: 22UCH2CC3**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the basic concepts of magnetic, conductors and understand the energy storage materials.	**K1&K2**
CO2	Apply the concepts to illustrate the role of energy in various materials.	**K3**
CO3	Analyze the results of different materials using theoretical concepts.	**K4**
CO4	Evaluate the applications of magnetic, semiconductors,	**K4**
CO5	Evaluate the applications LED, batteries and fuel cell power plant.	**K5**

Course Title: Biochemistry - II **Course Code: 22UCH2AC3B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall and understand the basic tools in biochemistry	**K1**
CO2	Recollect the techniques involved in the analysis of biomolecules	**K2**
CO3	Describe the metabolic abnormalities and importance of nutrients in diet.	**K3**
CO4	Apply various methodologies to analyze biomolecules.	**K3**
CO5	Investigate the biomolecules using various bio-analytical techniques.	**K4**

Course Title: General Chemistry -III **Course Code: 19UCH3CC3**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the basic concepts of s and p-block elements	**K1**
CO2	Demonstrate the preparation and properties of organo metallic compounds.	**K2**
CO3	Analyze the concepts of thermodynamics	**K2**
CO4	Outline the basics of qualitative and quantitative analysis.	**K2**
CO5	Identify the stereochemistry of organic molecules	**K3**

Course Title: Chemistry -I Course Code: 19UPH3AC4		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the types of crystal structure and terms involved in kinetics and chemical equilibrium.	**K1**
CO2	Compare the theories of bonding with metal atoms.	**K2**
CO3	Discuss the properties of benzene, naphthalene and halogen compounds.	**K2**
CO4	Apply the concepts of electron displacement effect in organic compounds.	**K3**

Course Title: Chemistry Practical -I Course Code: 19UPH3AC1P		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the basic principles of volumetric analysis.	**K1**
CO2	Demonstrate the experimental methods of volumetric analysis.	**K2**
CO3	Compare the hardness present drinking water.	**K2**

Course Title: Chemistry in Every Day Life Course Code: 19UCH3NME1		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Indentify various water treatment processes	**K2**
CO2	Describe the types of fertilizers and their uses	**K2**
CO3	Explain the characteristics of paint and propellants	**K2**
CO4	Illustrate various cosmetics, soaps and detergents	**K3**
CO5	Apply the concept of polymer, fibre and dyes in everyday life	**K3**

Course Title: General Chemistry - IV Course Code: 19UCH4CC4		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Compare the different characteristics of d- and f- block elements	**K2**
CO2	Classification of acids and bases	**K2**
CO3	Understand preparation, properties and reactions of hydroxyl derivatives.	**K2**
CO4	Apply the first and second law of thermodynamics	**K3**
CO5	Analyze the terms of chemical kinetics	**K4**

Course Title: Organic Qualitative Analysis **Course Code: 19UCH4CC4P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Differentiate the aromatic and aliphatic nature of organic sample	**K4**
CO2	Identification of special element in organic compound	**K2**
CO3	Analyze the functional group of organic compounds	**K4**
CO4	Demonstrate the derivative for functional group	**K3**

Course Title: Chemistry -II **Course Code: 19UPH4AC5**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the properties and applications of carbohydrates, amino acids and proteins	**K1**
CO2	Understand the basics of nuclear chemistry	**K2**
CO3	Apply the basic concepts of photochemistry	**K3**
CO4	Analyze the concepts of electrochemistry and material science	**K4**

Course Title: Food Adulterants and Health Care **Course Code: 19UCH4NME2**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Understand food and nutrition	**K2**
CO2	Identify various food additives, antioxidants and preservatives	**K2**
CO3	Learn about food adulterants and contaminations.	**K2**
CO4	Illustrate role of Health care	**K3**
CO5	Classify the common drugs	**K3**

Course Title: Forensic Chemistry **Course Code: 19UCH4SBE1A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Identify the fundamental principles and functions of forensic science	**K3**
CO2	Explain the characteristic features of Indian currency notes, passports	**K3**
CO3	Analyze the techniques involved in the field of forensics	**K4**
CO4	Appraise the role of chemistry and other branches in forensics	**K5**
CO5	Describe the study of Chromatographic techniques	**K6**

Course Title: Food Chemistry **Course Code: 19UCH4SBE1B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Classify components of food by chemical structure.	**K4**
CO2	Describe the function of lipids, protein, cellulose in daily food intake	**K3**
CO3	Understand how the chemical components of a food impact the functionality of the overall food product	**K2**
CO4	Explain the major reactions that occur in foods.	**K4**
CO5	Apply the fundamental structure/function relationships to how they impact the overall food product quality, safety, and shelf life	**K3**

Course Title: Inorganic Chemistry-I **Course Code: 19UCH5CC5**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Explain the process of metallurgy.	**K1**
CO2	Recognize the basic concepts of co-ordination chemistry.	**K1**
CO3	Compare the theories of bonding in coordination compounds.	**K2**
CO4	Relate the stability of metal complexes.	**K3**
CO5	Interpret the biological importance of coordination complexes.	**K3**

Course Title: Organic Chemistry-I **Course Code: 19UCH5CC6**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Identify different types of carboxylic acids and to compare their relative strength	**K1**
CO2	Discuss about reactions of carbonyl compounds	**K2**
CO3	Explain various heterocyclic compounds and dyes	**K2**
CO4	Utilization appropriate reagents for oxidization and reduction	**K3**
CO5	Analyze the basicity and stability of aliphatic and aromatic amines	**K4**

Course Title: Physical Chemistry-I **Course Code: 19UCH5CC7**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Evaluate quantum yield and Identify types of electronic transition in organic molecules.	**K4**
CO2	Find equilibrium constant and enthalpy of equilibrium reaction at different temperature,	**K1**
CO3	Analyze thermodynamic conditions favoring chemical equilibrium.	**K2**
CO4	Discuss physical and chemical adsorption phenomenon	**K2**
CO5	Explain phase rule and law of dilute solution to predict composition, molecular weight	**K2**

Course Title: Physical Chemistry (P) **Course Code: 19UCH5CC5P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Construct the phase diagram	**K3**
CO2	Relate the effect of impurity on phenol water system	**K2**
CO3	Identify the molecular weight of unknown compound	**K3**
CO4	Examine the concentration of ions using Potentiometer	**K4**
CO5	Inspect the concentration of ions using Conductometer	**K4**

Course Title: Nuclear and Industrial Chemistry **Course Code: 20UCH5MBE1A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Discuss about nuclear chemistry	**K1**
CO2	Explore about Fundamentals of Radio chemistry.	**K2**
CO3	Explore about leather techniques.	**K2**
CO4	Discussing about various chemical process in industries.	**K3**
CO5	Explore about essential cosmetics and cleansing agents.	**K3**

Course Title: Basics of Nanoscience and Nanotechnology Course Code: 20UCH5MBE1B		
CO Number	**CO Statement On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the basic concepts macro, micro and nanoscale materials.	**K1**
CO2	Explain the synthesis of nanomaterials	**K1**
CO3	Analyze the characterization techniques of nanomaterials.	**K2**
CO4	Understand the nano catalyst and carbon-based nanomaterials.	**K2**
CO5	Illustrate the applications of nanomaterials.	**K3**

Course Title: Chemistry of Consumer Products (P) Course Code: 19UCH5SBE2AP		
CO Number	**CO Statement On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Know about Chemistry and modern trends in the industry.	**K1**
CO2	Identify the cations and anions present in the mixture	**K1**
CO3	Demonstrate the experimental methods of group separation	**K2**

Course Title: Dye Chemistry (P) Course Code: 19UCH5SBE2BP		
CO Number	**CO Statement On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Identify the usages of dyes in industries	**K1**
CO2	Quantify the presence of dyes in the samples	**K1**
CO3	Demonstrate the experimental methods of preparation of dyes.	**K2**

Course Title: Water Analysis (P) Course Code: 19UCH5SBE3AP		
CO Number	**CO Statement On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Design the treatment unit for water treatment	**K1**
CO2	Identify the outflow level of impurities from water	**K1**

Course Title: Bio Fuels (P) **Course Code: 19UCH5SBE3BP**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Know about the techniques to extract oil from plant	**K1**
CO2	Evaluate fuel viscosity	**K1**
CO3	Calculate the yield of sugar and types	**K2**

Course Title: Organic Chemistry – II **Course Code: 19UCH6CC8**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the basic concepts of carbohydrates, proteins and vitamins.	**K1**
CO2	Demonstrate the preparation and properties of amino acids, alkaloids and terpenoids	**K2**
CO3	Illustrate the structure of proteins and vitamins.	**K3**
CO4	Analyze the nucleophilic and electrophilic rearrangements.	**K4**
CO5	Deduce the structure of organic molecules using spectroscopic techniques.	**K4**

Course Title: Physical Chemistry – II **Course Code: 19UCH6CC9**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Apply various theories of weak and strong electrolyte to predict solubility and ionic products.	**K2**
CO2	Predict reduction potential of a metal and EMF the cell.	**K3**
CO3	Evaluate internuclear distance and bond strength using IR and rotational spectral data.	**K3**
CO4	Relate NMR and ESR concept to analyze structure of the molecules.	**K2**
CO5	Analyze symmetry of the molecule.	**K2**

Course Title: Gravimetric Analysis and Physical Parameter (P) **Course Code: 20UCH6CC6P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Know about the accuracy in Gravimetric estimations and its significance.	**K1**
CO2	Identify the compounds using thin layer Chromatography.	**K2**
CO3	Demonstrate the experimental method of Paper chromatography in the separation of amino acids and dyes	**K2**
CO4	Analyze the physical constants of the organic compounds.	**K3**

Course Title: Analytical Chemistry Techniques (P) **Course Code: 20UCH6MBE2AP**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Identify and separate the given compounds using various analytical methods.	**K1 & K2**
CO2	Apply the theoretical concepts to perform experiments.	**K3**
CO3	Analyse the quality and quantity of the given compounds using methods such as chromatography, titrations and pH measurements.	**K4**

Course Title: Analysis of Herbal Medicine (P) **Course Code: 20UCH6MBE2BP**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Understand the principle and testing methods of Excipients of natural origins	**K1, K2**
CO2	Isolate, identify and estimate alkaloids, phenol content, aldehydes present in medicinal plant.	**K3, K4**
CO3	Prepare and analyses herbal churna, tablet, lotion and shampoo.	**K4, K5**

Course Title: Polymer Chemistry **Course Code: 19UCH6MBE3A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Classify polymers and explain the configuration of polymers and properties like glass transition temperature and melting point of polymers	**K2**
CO2	Illustrate the preparation, properties and applications of polymers	**K2**
CO3	Outline the recent advances in polymer chemistry.	**K3**
CO4	Acquaint various polymer processing technologies and moulding techniques.	**K4**
CO5	Interpret the mechanism of polymerization	**K5**

Course Title: Pharmaceutical Chemistry **Course Code: 19UCH6MBE3B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Explain the terminologies used in pharmacology	**K2**
CO2	Classify and compare different types of drug	**K4**
CO3	Describe the functions and mode of actions of drugs	**K3**
CO4	Explain the cause and symptom of common diseases	**K2**
CO5	Demonstrate the functions of medicine for common diseases	**K2**

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Programme Outcomes (POs) and Course Outcomes (COs) – (2023-2024 Onwards)

DEPARTMENT OF CHEMISTRY

B. Sc- Chemistry

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	STATEMENTS
PEO1	**LEARNING ENVIRONMENT** To facilitate value-based holistic and comprehensive learning by integrating innovative learning practices to match the highest quality standards and train the students to be effective leaders in their chosen fields.
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PO5	**Life Long Learning:** Assure consistent improvement in the performance and arouse interest to pursue higher studies in premium institutions.

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO NO	Programme Specific Outcomes Students of B.Sc., Chemistry will be able to	POs Addressed
PSO1	Afford a firm foundation in Chemistry that stresses scientific reasoning, analytical problem solving with a molecular perspective	PO1 PO2
PSO2	Acquire knowledge in theoretical and practical tools to exemplify entirely in the working environment.	PO4 PO5
PSO3	Inculcate scientific temperament and create an awareness of the impact of chemistry on the environment, society, and development outside the scientific community.	PO3 PO4
PSO4	Scale up of chemical process after designing, optimization and analysis for developing products required for society.	PO4
PSO5	Expand the knowledge available opportunities related to chemistry in the government services through public service commission particularly in the field of food safety, health inspector, pharmacist etc.	PO4 PO5

COURSE OUTCOMES (COs)

Course Title: General Chemistry - I **Course Code: 23UCH1CC1**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recognize and report the fundamental principles of various field of chemistry.	**K1**
CO2	Explain the concepts of atomic structure, chemical bonding, reactive intermediates and different types of titrations.	**K2**
CO3	Illustrate the knowledge on atomic structure, bonding, MO theory, isomerism, reaction intermediates, solid state and analytical techniques.	**K3**
CO4	Categorize the quantum numbers, elements, hybridization, stability of intermediates, titrations and acid radicals.	**K4**
CO5	Interpret the periodic properties, geometry of molecules, bond order and electronic displacement effects.	**K5**

Course Title: Quantitative Inorganic Estimation (Titrimetry) and Inorganic Preparations (P) **Course Code: 23UCH1CC1P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Describe the basic principles involved in volumetric analysis and inorganic preparations.	**K1**
CO2	Demonstrate the experimental methods of volumetric analysis and estimate the chlorine content in bleaching powder and copper in brass.	**K2**
CO3	Determine the hardness of water and saponification value of oil.	**K3**
CO4	Apply volumetric analysis for the estimation of compounds.	**K4**
CO5	Predict the amount of chemical compounds in a given sample.	**K5**

Course Title: Inorganic and Physical Chemistry Course Code: 23UCH2CC2		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recognize the fundamental ideas of metallurgy, s &p block elements, solid, colloidal and gaseous state.	**K1**
CO2	Summarize the knowledge on symmetry operations, metals, colloids, molecular velocities and refining process.	**K2**
CO3	Demonstrate the purification process, structure and applications of compounds.	**K3**
CO4	Categorize the crystals, periodic elements, colloidal state of compounds	**K4**
CO5	Interpret the metallurgy techniques, properties of periodic elements and colloids, crystal planes and laws of gaseous state.	**K5**

Course Title: Inorganic materials of Industrial Importance (P) Course Code: 23UCH2CC2P		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the skills required to carry out professional research and production activities in the field of chemistry.	**K1**
CO2	Define the various terms such as normality, molality, molarity, equivalent weight and molecular weight.	**K1**
CO3	Select the specific titric method to estimate the amount of analyte present in the given solution.	**K1**
CO4	Describe the principles and procedures of various titrimetric methods.	**K2**
CO5	Prepare solutions of desired concentrations.	**K3**

Course Title: Material Science Course Code: 23UCH2CC3		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall conductors, magnetic, polymer, LCD and composite materials.	**K1**
CO2	Describe the classification of different materials.	**K2**
CO3	Illustrate the role of energy in various materials.	**K3**
CO4	Analyze the materials using theoretical concepts.	**K4**
CO5	Evaluate semiconductors, hysteresis curve, perovskite structure, reinforced composites.	**K5**

Course Title: Organic and Analytical Chemistry **Course Code: 22UCH3CC4**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall and understand the fundamental concepts of organic compounds and analytical techniques.	**K1**
CO2	Describe the nature of hydrocarbons, errors and different thermo analytical methods.	**K2**
CO3	Interpret the chemical reactions of hydrocarbons and thermogram.	**K3**
CO4	Analysis different reactions of organic molecules and analytical data.	**K4**
CO5	Explain the stability of organic molecules and application of thermograms.	**K5**

Course Title: Analysis and Preparation of Organic Compounds (P) **Course Code: 22UCH3CC3P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Observe the physical state, odour, colour and solubility of the given organic compounds.	**K1**
CO2	Detect the presence of special elements in an unknown organic compound performing a systematic analysis.	**K2**
CO3	Identify the presence of various functional groups in the given organic compounds.	**K3**
CO4	Exhibit the solid derivative with respect to the identified functional group.	**K4**
CO5	Prepare organic compounds and exhibit their crude and recrystallized sample.	**K5**

Course Title: Chemistry - I Course Code: 22UPH3AC4		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Define the terms involved in nuclear, analytical and industrial chemistry, organic reaction, thermodynamics and phase equilibria.	**K1**
CO2	Understand the magnetic properties, compounds used in industries, organic, thermal reactions and principle of analytical techniques.	**K2**
CO3	Illustrates the bonding nature, mechanisms, phase diagram, instrumentation of analytical techniques.	**K3**
CO4	Describe the molecular orbital diagrams, fuel gases, fertilizers, hybridization and applications of analytical techniques.	**K4**
CO5	Predict bond order, mechanism, phase rule, separation of compounds and its uses in industries.	**K5**

Course Title: Chemistry (P) Course Code: 22UPH3AC5P		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Remember the basic principles involved in quantitative and qualitative analyses.	**K1**
CO2	Outline the preparation of solutions and basic organic reactions involved in organic functional group analyses.	**K2**
CO3	Apply tests for the identification of functional groups and titration for quantitative analysis.	**K3**
CO4	Analyze compounds by qualitative and quantitative methods.	**K4**
CO5	Predict a suitable way to analysis compounds through qualitative and quantitative methods.	**K5**

Course Title: Chemistry in Every Day Life Course Code: 22UCH3GEC1		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recognize and account the importance of role of chemistry in industry and pollution control.	**K1 & K2**
CO2	Exemplify the chemistry of materials used in everyday life.	**K3**
CO3	Categorize the chemistry of materials used in everyday life.	**K4**
CO4	Interpret the uses of chemicals in day today life and its impact.	**K5**
CO5	Illustrate and classify the importance of chemistry used in commercial and daily life.	**K6**

Course Title: Inorganic and Organic Chemistry **Course Code: 22UCH4CC5**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Outline the synthesis of organometallics and oxygen containing functional groups and symmetry elements.	**K1, K2**
CO2	Describe the general characteristics of d and f block elements, organic compounds and stereoisomers.	**K3**
CO3	Analyze the trends of the periodic properties, reactions and types of stereoisomers.	**K4**
CO4	Distinguish between 3d, 4d and 5d elements, functional isomers and	**K5**
CO5	Predict the properties of transition, inner tansition elements and configuration of organic compounds	**K6**

Course Title: Inorganic Qualitative Analysis (P) **Course Code: 22UCH4CC4P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the nature of acidic and basic radicals	**K1**
CO2	Identify the cations and anions present in the mixture	**K2**
CO3	Analyze th e principles of inorganic qualitative analysis.	**K3**
CO4	Demonstrate the experimental methods of group separation	**K4**
CO5	Plan, execute and record all the experimental results.	**K5**

Course Title: Chemistry – II **Course Code: 22UPH4AC6**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the fundamental ideas in material science and biomolecules.	**K1**
CO2	Understand the characteristics of polymers, biomolecules, alloys, photochemical and electrochemical reactions	**K2**
CO3	Identify the types of polymerization, biomolecules, photolytic process, magnetic and nanomaterials	**K3**
CO4	Calculate the molecular weight, quantum yield and emf of a cell.	**K3**
CO5	Analyze the applications of industrial and bio materials	**K4**

Course Title: Food Adulterants and Health Care Course Code: 22UCH4GEC2		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Know the outline about the importance of health, sources of food, hazards of food additives and food poisoning.	**K1& K2**
CO2	Classify and identify common adulterants in different foods, food poisoning and impacts on health.	**K3**
CO3	Understand the common Food additives in food products, its prevention laws and importance of water balance in health care.	**K4**
CO4	Recognize the significance of nutrients, balanced diet and types of health care.	**K5**
CO5	Predict the nutrient, functions, sources of non-adulterants food and water for health care.	**K6**

Course Title: Chemistry of Consumer Products (P) Course Code: 22UCH4SEC1P		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Outline the various adulterants in food products.	**K1**
CO2	Explain the procedures for detecting the adulterants.	**K2**
CO3	Identify the nature of adulterants added to consumer products.	**K2**
CO4	Differentiate the pure and impure food samples.	**K2**
CO5	Calculate the percentage composition of food colorant in food and beverages.	**K3**

Course Title: Inorganic Chemistry-I Course Code: 19UCH5CC5		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Explain the process of metallurgy.	**K1**
CO2	Recognize the basic concepts of co-ordination chemistry.	**K1**
CO3	Compare the theories of bonding in coordination compounds.	**K2**
CO4	Relate the stability of metal complexes.	**K3**
CO5	Interpret the biological importance of coordination complexes.	**K3**

Course Title: Organic Chemistry-I **Course Code: 19UCH5CC6**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Identify different types of carboxylic acids and to compare their relative strength	**K1**
CO2	Discuss about reactions of carbonyl compounds	**K2**
CO3	Explain various heterocyclic compounds and dyes	**K2**
CO4	Utilization appropriate reagents for oxidization and reduction	**K3**
CO5	Analyze the basicity and stability of aliphatic and aromatic amines	**K4**

Course Title: Physical Chemistry-I **Course Code: 19UCH5CC7**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Evaluate quantum yield and Identify types of electronic transition in organic molecules.	**K4**
CO2	Find equilibrium constant and enthalpy of equilibrium reaction at different temperature,	**K1**
CO3	Analyze thermodynamic conditions favoring chemical equilibrium.	**K2**
CO4	Discuss physical and chemical adsorption phenomenon	**K2**
CO5	Explain phase rule and law of dilute solution to predict composition, molecular weight	**K2**

Course Title: Physical Chemistry (P) **Course Code: 19UCH5CC5P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Construct the phase diagram	**K3**
CO2	Relate the effect of impurity on phenol water System	**K2**
CO3	Identify the molecular weight of unknown compound	**K3**
CO4	Examine the concentration of ions using Potentiometer	**K4**
CO5	Inspect the concentration of ions using Conductometer	**K4**

Course Title: Nuclear and Industrial Chemistry Course Code: 20UCH5MBE1A		
CO Number	**CO Statement On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Discuss about nuclear chemistry	**K1**
CO2	Explore about Fundamentals of Radio chemistry.	**K2**
CO3	Explore about leather techniques.	**K2**
CO4	Discussing about various chemical process in industries.	**K3**
CO5	Explore about essential cosmetics and cleansing agents.	**K3**

Course Title: Basics of Nanoscience and Nanotechnology Course Code: 20UCH5MBE1B		
CO Number	**CO Statement On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the basic concepts macro, micro and nanoscale materials.	**K1**
CO2	Explain the synthesis of nanomaterials	**K1**
CO3	Analyze the characterization techniques of nanomaterials.	**K2**
CO4	Understand the nano catalyst and carbon-based nanomaterials.	**K2**
CO5	Illustrate the applications of nanomaterials.	**K3**

Course Title: Chemistry of Consumer Products (P) Course Code: 19UCH5SBE2AP		
CO Number	**CO Statement On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Know about Chemistry and modern trends in the industry.	**K1**
CO2	Identify the cations and anions present in the mixture	**K1**
CO3	Demonstrate the experimental methods of group separation	**K2**

Course Title: Dye Chemistry (P) Course Code: 19UCH5SBE2BP		
CO Number	**CO Statement On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Identify the usages of dyes in industries	**K1**
CO2	Quantify the presence of dyes in the samples	**K1**
CO3	Demonstrate the experimental methods of preparation of dyes.	**K2**

Course Title: Water Analysis (P) Course Code: 19UCH5SBE3AP		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Design the treatment unit for water treatment	**K1**
CO2	Identify the outflow level of impurities from water	**K1**

Course Title: Bio Fuels (P) Course Code: 19UCH5SBE3BP		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Know about the techniques to extract oil from plant	**K1**
CO2	Evaluate fuel viscosity	**K1**
CO3	Calculate the yield of sugar and types	**K2**

Course Title: Organic Chemistry – II Course Code: 19UCH6CC8		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the basic concepts of carbohydrates, proteins and vitamins.	**K1**
CO2	Demonstrate the preparation and properties of amino acids, alkaloids and terpenoids	**K2**
CO3	Illustrate the structure of proteins and vitamins.	**K3**
CO4	Analyze the nucleophilic and electrophilic rearrangements.	**K4**
CO5	Deduce the structure of organic molecules using spectroscopic techniques.	**K4**

Course Title: Physical Chemistry – II Course Code: 19UCH6CC9		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Apply various theories of weak and strong electrolyte to predict solubility and ionic products.	**K2**
CO2	Predict reduction potential of a metal and EMF the cell.	**K3**
CO3	Evaluate internuclear distance and bond strength using IR and rotational spectral data.	**K3**
CO4	Relate NMR and ESR concept to analyze structure of the molecules.	**K2**
CO5	Analyze symmetry of the molecule.	**K2**

Course Title: Gravimetric Analysis and Physical Parameter (P) **Course Code: 20UCH6CC6P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Know about the accuracy in Gravimetric estimations and its significance.	**K1**
CO2	Identify the compounds using thin layer Chromatography.	**K2**
CO3	Demonstrate the experimental method of Paper chromatography in the separation of amino acids and dyes	**K2**
CO4	Analyze the physical constants of the organic compounds.	**K3**

Course Title: Analytical Chemistry Techniques (P) **Course Code: 20UCH6MBE2AP**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Identify and separate the given compounds using various analytical methods.	**K1 & K2**
CO2	Apply the theoretical concepts to perform experiments.	**K3**
CO3	Analyse the quality and quantity of the given compounds using methods such as chromatography, titrations and pH measurements.	**K4**

Course Title: Analysis of Herbal Medicine (P) **Course Code: 20UCH6MBE2BP**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Understand the principle and testing methods of Excipients of natural origins	**K1, K2**
CO2	Isolate, identify and estimate alkaloids, phenol content, aldehydes present in medicinal plant.	**K3, K4**
CO3	Prepare and analyses herbal churna, tablet, lotion and shampoo.	**K4, K5**

Course Title: Polymer Chemistry Course Code: 19UCH6MBE3A		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Classify polymers and explain the configuration of polymers and properties like glass transition temperature and melting point of polymers	**K2**
CO2	Illustrate the preparation, properties and applications of polymers	**K2**
CO3	Outline the recent advances in polymer chemistry.	**K3**
CO4	Acquaint various polymer processing technologies and moulding techniques.	**K4**
CO5	Interpret the mechanism of polymerization	**K5**

Course Title: Pharmaceutical Chemistry Course Code: 19UCH6MBE3B		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Explain the terminologies used in pharmacology	**K2**
CO2	Classify and compare different types of drug	**K4**
CO3	Describe the functions and mode of actions of drugs	**K3**
CO4	Explain the cause and symptom of common diseases	**K2**
CO5	Demonstrate the functions of medicine for common diseases	**K2**

Key Indicator - 1.1 Curriculum Design and Development

1.1.1 Curricula developed and implemented have relevance to the local, regional, national and global developmental needs, which is reflected in the Programme outcomes (POs) and Course Outcomes (COs) of the Programmes offered by the institution

Programme Outcomes (POs) and Course Outcomes (COs) – (2019-2020 Onwards)

DEPARTMENT OF CHEMISTRY

M. Sc- Chemistry

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	STATEMENTS
PEO1	Develop firm foundation in distinct area of Chemistry.
PEO2	Impart quality education to make the students globally competite chemist by nurturing the needs.
PEO3	Inspire to pursue their doctoral research programme in reputed institutions.
PEO4	Interdisciplinary approach helps in creating innovative ideas for the sustainable development.
PEO5	Develop leadership qualities in multi-disciplinary setting through ethical manner.
PEO6	Ability to identify and find the solutions to socio-economic environmental problems for the development of the country.

PROGRAMME OUTCOMES (POs)

POs	STATEMENTS
PO1	Curriculum imparts firm foundation in all areas of Chemistry and enhances the skills in problem solving and analytical reasoning.
PO2	Inculcate research interest in emerging areas of chemical sciences and transform it to the benefit of society.
PO3	Ability to use technologies and instrumentation to collect and analyse the data.
PO4	Capable to nurture the needs of R &D laboratories and industries and make them to cope with all the competitive examinations.
PO5	Imbibed ethical, moral and social values in personal life leading to highly cultured and civilized personality.

COURSE OUTCOMES (COs)

Course Title: Organic Chemistry -I Course Code: 19PCH1CC1		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Classify different types of concerted reactions inorganic chemistry and orbital correlation approaches	**K2**
CO2	Identify the stereo centres in a molecule and assign the configuration as R or S	**K3**
CO3	Distinguish between aromatic, anti aromatic and non aromatic compounds by their structure.	**K4**
CO4	Discuss the relative stability of conformational isomers of cyclohexanes, decalins and norboranes	**K6**
CO5	Predict the mechanism for nucleophile substitution reaction, oxidation and reduction reactions	**K6**

Course Title: Inorganic Chemistry-I Course Code: 19PCH1CC2		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Identify the chemistry of p-block Clusters	**K3**
CO2	Apply the basic concepts co-ordination compounds.	**K3**
CO3	Analyse the mechanism of coordination reactions.	**K4**
CO4	Compare the standards of supramolecular chemistry and cationic hosts.	**K5**
CO5	Explain the chemistry of photochemical reactions	**K5**

Course Title: Physical Chemistry -I Course Code: 19PCH1CC3		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Explain the kinetics of reactions in solution and fast reaction techniques.	**K2**
CO2	Apply the fundamental concepts of quantum chemistry to describe different electron correlation models.	**K3**
CO3	Examine the symmetry elements and symmetry operation.	**K4**
CO4	Differentiate the ionic and electrodic part of electrochemical reactions and their applications.	**K4**
CO5	Evaluate thermodynamic probability and partition functions using statistical thermodynamics.	**K5**

Course Title: Organic Chemistry Practical -I Course Code: 19PCH1CC1P		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Apply the principles of separation in organic mixtures.	**K3**
CO2	Prepare the organic compounds by single stage method.	**K3**
CO3	Analyze the physical constant containing two components.	**K4**

Course Title: Inorganic Chemistry Practical -I Course Code: 19PCH1CC2P		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Identify the common and less common cations present in the mixture.	**K1**
CO2	Classify the group elements present in the mixture.	**K2**
CO3	Estimation of metal ions quantitative by photoelectric colorimeter.	**K3**

Course Title: Physical Methods in Chemistry -I Course Code: 19PCH2CC4		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Identify the fingerprint region of molecules in gas and solution phases using microwave and vibration spectroscopy.	**K3**
CO2	Examine the proton and 13C NMR spectra of molecules	**K4**
CO3	Deduce the structure of molecules using UV and IR absorption pattern	**K5**
CO4	Evaluate the absolute configuration of organic compound using ORD and CD.	**K5**
CO5	Formulate the structure of compound from molecular spectral data.	**K6**

Course Title: Organic Chemistry -I Course Code: 19PCH2CC5		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Outline the synthesis and reactivity of aromatic and non aromatic heterocycles	**K2**
CO2	Classify the different types of photochemical reactions	**K4**
CO3	Distinguish between addition and elimination reactions.	**K4**
CO4	Importance of Hmmette and Taft equation in structure reactivity	**K5**
CO5	Perceive the mechanism involved in aromatic nucleophilic, electrophilic and photolytic reactions	**K5**

Course Title: Organic Chemistry Practical -II Course Code: 19PCH2CC3P		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Explain the estimation and preparation of organic compounds.	**K2**
CO2	Apply the methods to analyze data, and interpret results, while observing responsible and ethical scientific conduct.	**K3**
CO3	Analyze quantitatively organic components in the environment by hands-on experience with modern instrumentation	**K4**

Course Title: Organic Chemistry Practical -II Course Code: 19PCH2CC3P		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Apply the principles for the separation of cations.	**K3**
CO2	Prepare the inorganic complexes.	**K3**
CO3	Estimation of metal ions by volumetric and gravimetric methods.	**K5**

Course Title: Green Chemistry Course Code: 19PCH2EC1A		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Explain the basic principles of green chemistry and planning a green synthesis of the reactions	**K2**
CO2	Apply the green technology in organic synthesis.	**K3**
CO3	Categorize the organic synthesis in solid state reactions.	**K4**
CO4	Importance of various types of green solvents in organic synthesis.	**K5**
CO5	Plan the method of preparation of phase transfer catalyst conditions	**K6**

Course Title: Forensic Chemistry Course Code: 19PCH2EC1B		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Identify the fundamental principles and functions of forensic science.	**K3**
CO2	Apply the principles of Spectroscopy in forensic science	**K3**
CO3	Analyse the techniques involved in the field of forensics	**K4**
CO4	Appraise the role of chemistry and other branches in forensics.	**K5**
CO5	Describe the role of DNA typing	**K6**

Signature Not Verified
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Signed by: Sujatha.V
Designation: Principal
Reason: NAAC
Location: Tiruchirappalli, Tamil Nadu, India
Date: 30-Sep-2024 12:00:03

Key Indicator - 1.1 Curriculum Design and Development

1.1.1 Curricula developed and implemented have relevance to the local, regional, national and global developmental needs, which is reflected in the Programme outcomes (POs) and Course Outcomes (COs) of the Programmes offered by the institution

Programme Outcomes (POs) and Course Outcomes (COs) – (2020-2021 Onwards)

DEPARTMENT OF CHEMISTRY

M. Sc- Chemistry

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	STATEMENTS
PEO1	Develop firm foundation in distinct area of Chemistry.
PEO2	Impart quality education to make the students globally competite chemist by nurturing the needs.
PEO3	Inspire to pursue their doctoral research programme in reputed institutions.
PEO4	Interdisciplinary approach helps in creating innovative ideas for the sustainable development.
PEO5	Develop leadership qualities in multi-disciplinary setting through ethical manner.
PEO6	Ability to identify and find the solutions to socio-economic environmental problems for the development of the country.

PROGRAMME OUTCOMES (POs)

POs	STATEMENTS
PO1	Curriculum imparts firm foundation in all areas of Chemistry and enhances the skills in problem solving and analytical reasoning.
PO2	Inculcate research interest in emerging areas of chemical sciences and transform it to the benefit of society.
PO3	Ability to use technologies and instrumentation to collect and analyse the data.
PO4	Capable to nurture the needs of R &D laboratories and industries and make them to cope with all the competitive examinations.
PO5	Imbibed ethical, moral and social values in personal life leading to highly cultured and civilized personality.

COURSE OUTCOMES (COs)

Course Title: Organic Chemistry -I **Course Code: 19PCH1CC1**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Classify different types of concerted reactions inorganic chemistry and orbital correlation approaches	**K2**
CO2	Identify the stereo centres in a molecule and assign the configuration as R or S	**K3**
CO3	Distinguish between aromatic, anti aromatic and non aromatic compounds by their structure.	**K4**
CO4	Discuss the relative stability of conformational isomers of cyclohexanes, decalins and norboranes	**K6**
CO5	Predict the mechanism for nucleophile substitution reaction, oxidation and reduction reactions	**K6**

Course Title: Inorganic Chemistry-I **Course Code: 19PCH1CC2**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Identify the chemistry of p-block Clusters	**K3**
CO2	Apply the basic concepts co-ordination compounds.	**K3**
CO3	Analyse the mechanism of coordination reactions.	**K4**
CO4	Compare the standards of supramolecular chemistry and cationic hosts.	**K5**
CO5	Explain the chemistry of photochemical reactions	**K5**

Course Title: Physical Chemistry -I **Course Code: 19PCH1CC3**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Explain the kinetics of reactions in solution and fast reaction techniques.	**K2**
CO2	Apply the fundamental concepts of quantum chemistry to describe different electron correlation models.	**K3**
CO3	Examine the symmetry elements and symmetry operation.	**K4**
CO4	Differentiate the ionic and electrodic part of electrochemical reactions and their applications.	**K4**
CO5	Evaluate thermodynamic probability and partition functions using statistical thermodynamics.	**K5**

Course Title: Organic Chemistry Practical -I Course Code: 19PCH1CC1P		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Apply the principles of separation in organic mixtures.	**K3**
CO2	Prepare the organic compounds by single stage method.	**K3**
CO3	Analyze the physical constant containing two components.	**K4**

Course Title: Inorganic Chemistry Practical -I Course Code: 19PCH1CC2P		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Identify the common and less common cations present in the mixture.	**K1**
CO2	Classify the group elements present in the mixture.	**K2**
CO3	Estimation of metal ions quantitative by photoelectric colorimeter.	**K3**

Course Title: Physical Methods in Chemistry -I Course Code: 19PCH2CC4		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Identify the fingerprint region of molecules in gas and solution phases using microwave and vibration spectroscopy.	**K3**
CO2	Examine the proton and 13C NMR spectra of molecules	**K4**
CO3	Deduce the structure of molecules using UV and IR absorption pattern	**K5**
CO4	Evaluate the absolute configuration of organic compound using ORD and CD.	**K5**
CO5	Formulate the structure of compound from molecular spectral data.	**K6**

CRITERION I **POs and COs**

Course Title: Organic Chemistry -I **Course Code: 19PCH2CC5**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Outline the synthesis and reactivity of aromatic and non aromatic heterocycles	**K2**
CO2	Classify the different types of photochemical reactions	**K4**
CO3	Distinguish between addition and elimination reactions.	**K4**
CO4	Importance of Hmmette and Taft equation in structure reactivity	**K5**
CO5	Perceive the mechanism involved in aromatic nucleophilic, electrophilic and photolytic reactions	**K5**

Course Title: Organic Chemistry Practical -II **Course Code: 19PCH2CC3P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Explain the estimation and preparation of organic compounds.	**K2**
CO2	Apply the methods to analyze data, and interpret results, while observing responsible and ethical scientific conduct.	**K3**
CO3	Analyze quantitatively organic components in the environment by hands-on experience with modern instrumentation	**K4**

Course Title: Organic Chemistry Practical -II **Course Code: 19PCH2CC3P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Apply the principles for the separation of cations.	**K3**
CO2	Prepare the inorganic complexes.	**K3**
CO3	Estimation of metal ions by volumetric and gravimetric methods.	**K5**

CRITERION I **POs and COs**

Course Title: Green Chemistry **Course Code: 19PCH2EC1A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Explain the basic principles of green chemistry and planning a green synthesis of the reactions	**K2**
CO2	Apply the green technology in organic synthesis.	**K3**
CO3	Categorize the organic synthesis in solid state reactions.	**K4**
CO4	Importance of various types of green solvents in organic synthesis.	**K5**
CO5	Plan the method of preparation of phase transfer catalyst conditions	**K6**

Course Title: Forensic Chemistry **Course Code: 19PCH2EC1B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Identify the fundamental principles and functions of forensic science.	**K3**
CO2	Apply the principles of Spectroscopy in forensic science	**K3**
CO3	Analyse the techniques involved in the field of forensics	**K4**
CO4	Appraise the role of chemistry and other branches in forensics.	**K5**
CO5	Describe the role of DNA typing	**K6**

Signature Not Verified
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Signed by: Sujatha.V
Designation: Principal
Reason: NAAC
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Key Indicator - 1.1 Curriculum Design and Development

1.1.1 Curricula developed and implemented have relevance to the local, regional, national and global developmental needs, which is reflected in the Programme outcomes (POs) and Course Outcomes (COs) of the Programmes offered by the institution

Programme Outcomes (POs) and Course Outcomes (COs) – (2021-2022 Onwards)

DEPARTMENT OF CHEMISTRY

M. Sc- Chemistry

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	STATEMENTS
PEO1	Develop firm foundation in distinct area of Chemistry.
PEO2	Impart quality education to make the students globally competite chemist by nurturing the needs.
PEO3	Inspire to pursue their doctoral research programme in reputed institutions.
PEO4	Interdisciplinary approach helps in creating innovative ideas for the sustainable development.
PEO5	Develop leadership qualities in multi-disciplinary setting through ethical manner.
PEO6	Ability to identify and find the solutions to socio-economic environmental problems for the development of the country.

PROGRAMME OUTCOMES

POs	STATEMENTS
PO1	Curriculum imparts firm foundation in all areas of Chemistry and enhances the skills in problem solving and analytical reasoning.
PO2	Inculcate research interest in emerging areas of chemical sciences and transform it to the benefit of society.
PO3	Ability to use technologies and instrumentation to collect and analyse the data.
PO4	Capable to nurture the needs of R &D laboratories and industries and make them to cope with all the competitive examinations.
PO5	Imbibed ethical, moral and social values in personal life leading to highly cultured and civilized personality.

COURSE OUTCOMES (COs)

Course Title: Organic Chemistry -I Course Code: 19PCH1CC1		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Classify different types of concerted reactions inorganic chemistry and orbital correlation approaches	**K2**
CO2	Identify the stereo centres in a molecule and assign the configuration as R or S	**K3**
CO3	Distinguish between aromatic, anti aromatic and non aromatic compounds by their structure.	**K4**
CO4	Discuss the relative stability of conformational isomers of cyclohexanes, decalins and norboranes	**K6**
CO5	Predict the mechanism for nucleophile substitution reaction, oxidation and reduction reactions	**K6**

Course Title: Inorganic Chemistry-I Course Code: 19PCH1CC2		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Identify the chemistry of p-block Clusters	**K3**
CO2	Apply the basic concepts co-ordination compounds.	**K3**
CO3	Analyse the mechanism of coordination reactions.	**K4**
CO4	Compare the standards of supramolecular chemistry and cationic hosts.	**K5**
CO5	Explain the chemistry of photochemical reactions	**K5**

Course Title: Physical Chemistry -I Course Code: 19PCH1CC3		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Explain the kinetics of reactions in solution and fast reaction techniques.	**K2**
CO2	Apply the fundamental concepts of quantum chemistry to describe different electron correlation models.	**K3**
CO3	Examine the symmetry elements and symmetry operation.	**K4**
CO4	Differentiate the ionic and electrodic part of electrochemical reactions and their applications.	**K4**
CO5	Evaluate thermodynamic probability and partition functions using statistical thermodynamics.	**K5**

Course Title: Organic Chemistry Practical -I Course Code: 19PCH1CC1P		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Apply the principles of separation in organic mixtures.	**K3**
CO2	Prepare the organic compounds by single stage method.	**K3**
CO3	Analyze the physical constant containing two components.	**K4**

Course Title: Inorganic Chemistry Practical -I Course Code: 19PCH1CC2P		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Identify the common and less common cations present in the mixture.	**K1**
CO2	Classify the group elements present in the mixture.	**K2**
CO3	Estimation of metal ions quantitative by photoelectric colorimeter.	**K3**

Course Title: Physical Methods in Chemistry -I Course Code: 19PCH2CC4		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Identify the fingerprint region of molecules in gas and solution phases using microwave and vibration spectroscopy.	**K3**
CO2	Examine the proton and 13C NMR spectra of molecules	**K4**
CO3	Deduce the structure of molecules using UV and IR absorption pattern	**K5**
CO4	Evaluate the absolute configuration of organic compound using ORD and CD.	**K5**
CO5	Formulate the structure of compound from molecular spectral data.	**K6**

Course Title: Organic Chemistry -I Course Code: 19PCH2CC5		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Outline the synthesis and reactivity of aromatic and non aromatic heterocycles	**K2**
CO2	Classify the different types of photochemical reactions	**K4**
CO3	Distinguish between addition and elimination reactions.	**K4**
CO4	Importance of Hmmette and Taft equation in structure reactivity	**K5**
CO5	Perceive the mechanism involved in aromatic nucleophilic, electrophilic and photolytic reactions	**K5**

Course Title: Organic Chemistry Practical -II Course Code: 19PCH2CC3P		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Explain the estimation and preparation of organic compounds.	**K2**
CO2	Apply the methods to analyze data, and interpret results, while observing responsible and ethical scientific conduct.	**K3**
CO3	Analyze quantitatively organic components in the environment by hands-on experience with modern instrumentation	**K4**

Course Title: Organic Chemistry Practical -II Course Code: 19PCH2CC3P		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Apply the principles for the separation of cations.	**K3**
CO2	Prepare the inorganic complexes.	**K3**
CO3	Estimation of metal ions by volumetric and gravimetric methods.	**K5**

Course Title: Green Chemistry Course Code: 19PCH2EC1A		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Explain the basic principles of green chemistry and planning a green synthesis of the reactions	**K2**
CO2	Apply the green technology in organic synthesis.	**K3**
CO3	Categorize the organic synthesis in solid state reactions.	**K4**
CO4	Importance of various types of green solvents in organic synthesis.	**K5**
CO5	Plan the method of preparation of phase transfer catalyst conditions	**K6**

Course Title: Forensic Chemistry Course Code: 19PCH2EC1B		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Identify the fundamental principles and functions of forensic science.	**K3**
CO2	Apply the principles of Spectroscopy in forensic science	**K3**
CO3	Analyse the techniques involved in the field of forensics	**K4**
CO4	Appraise the role of chemistry and other branches in forensics.	**K5**
CO5	Describe the role of DNA typing	**K6**

Course Title: Physical Chemistry -II Course Code: 19PCH3CC6		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Discuss the chemistry of macromolecules	**K2**
CO2	Solve the application of spectroscopy	**K3**
CO3	Examine the applications of wave mechanics to simple system.	**K4**
CO4	Compare the different techniques of surface chemistry	**K4**
CO5	Differentiate the ionic and electronic part of electrochemical reactions and their applications.	**K4**

Course Title: Chemistry for Competitive Examinations Course Code: 19PCH3CC7		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Describe the medicinal value of bio- inorganic compounds	**K2**
CO2	Interpret the spectrum of the molecules and calculate the point group.	**K3**
CO3	Explain the types of bonds and shapes of the molecules	**K4**
CO4	Compare the properties of f-block elements and analyze the catalytic behavior of organometallic compound.	**K4**
CO5	Choose the reagent and predict the mechanism of the reaction.	**K5**

Course Title: Physical Chemistry Practical – I Course Code: 19PCH3CC5P		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Explain the techniques to carry out operation of physical chemistry.	**K2**
CO2	Evaluate activation energy of a reaction, CST of immiscible liquids, colligative property to determine molecular weight, Association factor.	**K3**
CO3	Construct phase diagram of two and three component system.	**K4**

Course Title: Pharmaceutical Chemistry Course Code: 19PCH3EC2A		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Prediction of malarial, infectious, autoimmune and celiac diseases	**K3**
CO2	Relate the usage of drugs for asthma and allergic	**K3**
CO3	Diagnosis the prevention and treatment of all diseases	**K4**
CO4	Assessment of antibiotics and antiseptics	**K5**
CO5	Critique the usage of drugs in day today life	**K5**

Course Title: Bioorganic Chemistry Course Code: 19PCH3EC2B		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Describe the preparation, properties of amino acids, proteins and lipids.	**K2**
CO2	Outline the mechanism of enzymes and cofactors.	**K2**
CO3	Apply the concept of Bioenergetics.	**K3**
CO4	Analyze the principles of disconnection approach of organic synthesis.	**K4**
CO5	Distinguish between stereoselective and stereospecific reactions.	**K4**

Course Title: Instrumentation Techniques Course Code: 19PCH3EC3A		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Interpret the data analysis with different samples	**K2**
CO2	Predict the quality of different water samples.	**K2**
CO3	Identify the instruments and methods used to separate, identify, and quantify matter.	**K2**
CO4	construct the Instrumental methods used to separate samples using chromatography	**K3**
CO5	Point out the Classical quantitative analysis uses mass or volume changes to quantify amount.	**K4**

Course Title: Intellectual Property Rights Course Code: 19PCH3EC3B		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Indentify the basic property rights in development and management of innovative projects	**K2**
CO2	Interpret the knowledge on patents, patent regime in India and abroad	**K3**
CO3	Discriminate the system with its patent, copyright and trademark	**K4**
CO4	Evaluation of design on trademarks and registration aspects	**K5**

Course Title: Physical Methods in Chemistry -II **Course Code: 19PCH4CC8**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Explain the principles of NMR, IR, Raman, Mossbauer and electronic spectroscopy.	**K2**
CO2	Identify the applications of electronic spectroscopy to study the structure of molecules.	**K3**
CO3	Solve $\Delta 0$ and β for metal complexes.	**K3**
CO4	Analyze the spectrum of certain chemical compounds in qualitative.	**K4**
CO5	Assess the structure of a compound by various spectral data.	**K5**

Course Title: Physical Chemistry – II (P) **Course Code: 19PCH4CC6P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Analyze the electrical data	**K4**
CO2	Estimate the concentration of ions using Potentiometer	**K5**
CO3	Estimate the concentration of ions using Conductometer	**K5**

Course Title: Industrial Chemistry **Course Code: 19PCH4EC4A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Classify the fuels as saturated hydrocarbon, unsaturated hydrocarbons and aromatic hydrocarbons	**K2**
CO2	Outline the steps involved in the manufacturing of pulp, paper, glass and ceramics.	**K2**
CO3	Illumination the structure and properties of the materials used in the cosmetics and perfumes	**K3**
CO4	Analyze the milk products, composition and processing of milk	**K4**

Course Title: Selected Topics in Chemistry Course Code: 19PCH4EC4B		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Discussing about chemistry of pesticides	**K2**
CO2	Discussing about the various Naming Reactions in Organic Synthesis	**K3**
CO3	Appraise the essentials of clinical chemistry	**K4**
CO4	Explain the different steps in leather processing and analyze the effluent problems in tanneries	**K6**
CO5	Discuss about Fundamentals of Radio chemistry	**K6**

Course Title: Chemistry of Nanoscience Course Code: 19PCH4EC5A		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Classify different types of concerted methods of synthesis of nanomaterials.	**K2**
CO2	Identify the nanoparticles by characterization.	**K3**
CO3	Distinguish between clusters and nanostructures.	**K4**
CO4	Discuss the applications in electrochemical field.	**K6**
CO5	Predict the applications of nanoscience in the agricultural and food processing field.	**K6**

Course Title: Bio Fuels Course Code: 19PCH4EC5B		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Implentation of technologies for the production of biofuels by developing innovative ideas.	**K2**
CO2	Stabilize the knowledge on digestion and fermentation process for gaseous fuels from organic substrates of different origin	**K3**
CO3	Diagnose global impacts of biofuels on food and energy supplies	**K4**
CO4	Compile the regulations limits with Indian Standards	**K5**

Key Indicator - 1.1 Curriculum Design and Development

1.1.1 Curricula developed and implemented have relevance to the local, regional, national and global developmental needs, which is reflected in the Programme outcomes (POs) and Course Outcomes (COs) of the Programmes offered by the institution

Programme Outcomes (POs) and Course Outcomes (COs) – (2022-2023 Onwards)

DEPARTMENT OF CHEMISTRY

M. Sc- Chemistry

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	STATEMENTS
PEO1	**LEARNING ENVIRONMENT** To facilitate value-based holistic and comprehensive learning by integrating innovative learning practices to match the highest quality standards and train the students to be effective leaders in their chosen fields.
PEO2	**ACADEMIC EXCELLENCE** To provide a conducive environment to unleash their hidden talents and to nurture the spirit of critical thinking and encourage them to achieve their goal.
PEO3	**EMPLOYABILITY** To equip students with the required skills in order to adapt to the changing global scenario and gain access to versatile career opportunities in multidisciplinary domains.
PEO4	**PROFESSIONAL ETHICS AND SOCIAL RESPONSIBILITY** To develop a sense of social responsibility by formulating ethics and equity to transform students into committed professionals with a strong attitude towards the development of the nation.
PEO5	**GREEN SUSTAINABILITY** To understand the impact of professional solutions in societal and environmental contexts and demonstrate the knowledge for an overallsustainable development.

PROGRAMME OUTCOMES (POs)

PO No.	Programme Outcome On completion of M.Sc. Chemistry Programme, the students will be able to
PO1	**Problem analysis:** Provide opportunities to develop innovative design skills, including the ability to formulate problems, to think creatively, to synthesize information, and to communicate effectively.
PO2	**Scientific skills:** Create and apply advanced techniques and tools to solve the societal environmental issues.
PO3	**Environment and Sustainability:** Ascertain eco-friendly approach for sustainable development and inculcate scientific temper in the society.
PO4	**Ethics:** Imbibe ethical and social values aiming towards holistic development of learners.
PO5	**Lifelong learning:** Instill critical thinking, communicative knowledge which potentially leads to higher rate of employment and also for higher educational studies.

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO NO	Programme Specific Outcomes Students of M.Sc., Chemistry will be able to	POs Addressed
PSO1	Acquire knowledge in basic concepts, fundamental principles, and applications of chemical and scientific theories and their relevancies in the day-to-day life.	PO1 PO2
PSO2	Design experiments, analyze, synthesize and interpret data to provide solutions to different industrial problems by working in the pure, inter and multi-disciplinary areas of chemical sciences.	PO1 PO2 PO3
PSO3	Attain maneuver in diverse contexts with Global Perspective	PO3 PO4
PSO4	Gain a thorough Knowledge in the subject to be able to work in projects at different research as well as academic institutions.	PO1 PO2 PO5
PSO5	Afford Global level research opportunities to pursue Ph.D programme targeted approach of CSIR – NET examination	PO1 PO2 PO3 PO4 PO5

COURSE OUTCOMES (COs)

Course Title: Organic Chemistry -I **Course Code: 22PCH1CC1**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall and summarize the fundamentals of aromaticity, stereochemistry, selection rules and reagents inorganic synthesis.	**K1, K2**
CO2	Interpret the concept to Huckels theory, conformation analysis, substitution, FMO method, oxidation and reduction reactions.	**K3**
CO3	Categorize the aromaticity, configuration, reactivity and reagents.	**K4**
CO4	Evaluate aromatic character, stereoanalysis, pathway of reactions and catalysis.	**K5**
CO5	Predict the conditions and product of substitution mechanism, Pericyclic reactions and suitable reagents in redox reactions.	**K6**

Course Title: Inorganic Chemistry-I **Course Code: 22PCH1CC2**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recognize and execute the basic concepts of clusters and complexes in inorganic chemistry.	**K1, K2**
CO2	Sketch the synthesis of polynuclear compounds reaction mechanism of coordination compounds and their photochemical reactivity.	**K2, K3**
CO3	Examine the properties of clusters and coordination complexes.	**K3, K4**
CO4	Generalize the stabilization of clusters, kinetics of reactions, structure of metal carbonyls and ligand field photochemistry.	**K5**
CO5	Critical thinking on complex structure and properties of reactions.	**K6**

Course Title: Physical Chemistry -I **Course Code: 22PCH1CC3**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Re-phrase and discuss the basic concepts of quantum mechanics, group theory, Kinetics of reactions, catalysis and statistical thermodynamics.	**K1 &K2**
CO2	Illustrate an insight on quantum mechanical operators, character table, and theories of reaction rate, adsorption isotherm and Maxwell's distribution law.	**K3**
CO3	Analyze and interpret particles in box, Applications of HMO theory, orthogonality theorem, kinetics of complex reaction, enzyme catalysis, types of statistical thermodynamics.	**K4**
CO4	Evaluate the energy of particles in a box, Symmetry operations, factors influencing reaction rate, kinetics of enzyme catalysis, partition functions for diatomic molecules.	**K5**
CO5	Develop and write wavefunction for hydrogen like particles, character table, Michaelis Menten equation, and quantum statistics.	**K6**

Course Title: Organic Chemistry -I (P) **Course Code: 22PCH1CC1P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Apply the principles of separation in organic mixtures.	**K1**
CO2	Prepare the organic compounds by single stage method.	**K2**
CO3	Identify various functional group in organic compounds.	**K3**
CO4	Develop skills in separating techniques	**K3**
CO5	Analyze the nature of organic mixture containing two components.	**K4**

Course Title: Instrumentation Techniques (P) Course Code: 22PCH1DSE1AP		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Become familiar with fundamental concepts of instruments.	**K1**
CO2	Observe the application of Instrumentation Techniques	**K2**
CO3	To be trained in lab safety, preparation of solutions numerically.	**K4**
CO4	Develop the core skills to parse existing chromatographic protocols and identify the key factors influencing a chromatography experiment	**K5**
CO5	To develop students' ability and skill to acquire expertise in calibration techniques.	**K5**

Course Title: Nanoscience and Nanotechnology (P) Course Code: 22PCH1DSE1BP		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	To foundational knowledge of the Nanoscience and related fields	**K1**
CO2	Understand in broad outline of Nanoscience and Nanotechnology.	**K2**
CO3	Acquire an understanding the Nanoscience and Applications	**K3**
CO4	Apply principles of basic science concepts in understanding, analysis and prediction of matter at Nano scale.	**K3**
CO5	Understand the synthesis of nanomaterials and their application and the impact of nanomaterials on environment	**K2 & K5**

Course Title: Biochemistry Chemistry (P) Course Code: 22PCH1DSE1CP		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall and understand the techniques involved in isolation, separation and estimation of various biomolecules	**K1 & K2**
CO2	Develop and apply the skills in handling various chromatographic and colorimetric techniques	**K3**
CO3	Qualitatively and quantitatively analyze the biomolecules	**K4**

Course Title: Physical Methods in Chemistry -I **Course Code: 22PCH2CC4**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Understand principle of various spectral techniques involving molecular absorption of electromagnetic radiations.	**K1, K2**
CO2	Apply NMR, IR, MS, UV-Vis spectroscopic techniques in solving structure of organic molecules and in determination of their Stereochemistry	**K3**
CO3	Explain the principle, rules to analyses, compare and identify the structure of organic molecules using various spectral techniques.	**K4**
CO4	Discriminate structural and stereoisomers of compounds, radical and radical ion from adsorption pattern of molecules.	**K5**
CO5	Evaluate and identify configuration and conformation of isomers.	**K6**

Course Title: Organic Chemistry –II (P) **Course Code: 22PCH2CC2P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Explain the qualitative estimation and double stage preparation of organic compounds.	**K2**
CO2	Apply the methods in responsible and ethical scientific conduct.	**K3**
CO3	Interpret results observed in lab experiments	**K3**
CO4	Analyze qualitatively organic components in the environment	**K4**
CO5	Exercise hands-on experience with latest technical instrumentation.	**K5**

Course Title: Organic Chemistry -II **Course Code: 22PCH2CCC1A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Outline the synthesis, reactivity of organic compounds, various methods for determining the mechanism and fundamentals of photochemistry.	**K1&K2**
CO2	Interpret the reaction mechanism of various organic reactions including photochemical and heterocycles.	**K3**
CO3	Classify the different types of substitution, addition, elimination, photolytic reactions and heterocyclic compounds.	**K4**
CO4	Categorize the techniques of investigating reaction pathways and naming reactions.	**K5**
CO5	Predict the mechanism and products of organic reactions	**K6**

Course Title: Chemistry of Natural Products **Course Code: 22PCH2CCC1B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Differentiate the different types of alkaloids, terpenes, steroids, flavonoids and vitamins.	**K1**
CO2	Know the basic terms in natural product chemistry and their physiological significance.	**K2**
CO3	Evaluate the different methods of preparation of natural products	**K3**
CO4	Recognize the most important building blocks employed in the biosynthesis of natural products.	**K4**
CO5	Elaborate general methods of structural elucidation of compounds of natural origin.	**K5**

Course Title: Molecular Rearrangement **Course Code: 22PCH2CCC1C**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Know the outline for determining nature of rearrangements.	**K1, K2**
CO2	Interpret the reaction mechanism in various organic reactions.	**K3**
CO3	Classify the different types of intermediates involving in organic rearrangement reactions.	**K4**
CO4	Recognize the technique of identifying reaction mechanism in various naming reactions.	**K5**
CO5	Predict the mechanism and product of molecular rearrangement reactions.	**K6**

Course Title: Inorganic Chemistry -I (P) **Course Code: 22PCH2CC3P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Explain the quantitative estimation and estimation of inorganic compounds.	**K2**
CO2	Apply the methods and identify the components.	**K3**
CO3	Interpret results, while observing responsible and scientific conduct	**K3**
CO4	Analyze quantitatively organic components in the environment	**K4**
CO5	Hands-on experience with latest technical instrumentation	**K5**

Course Title: Green Chemistry Course Code: 22PCH2DSE2A		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Explain the basic principles of green chemistry and planning a green synthesis of the reactions	**K2**
CO2	Apply the green technology in organic synthesis.	**K3**
CO3	Categorize the organic synthesis in solid state reactions.	**K4**
CO4	Importance of various types of green solvents in organic synthesis.	**K5**
CO5	Plan the method of preparation of phase transfer catalyst conditions	**K6**

Course Title: Forensic Chemistry Course Code: 22PCH2DSE2B		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	To know the fundamental principles, technological methods and functions of forensic science	**K1 &K2**
CO2	Apply the principles of Spectroscopy in physical evidences and beverages	**K3**
CO3	Illustrate the mechanism persisting in identification of evidences, finger prints and explosives	**K4**
CO4	Appraise the role of chemistry in detection of corrupted jewels, explosives and consumed liquors	**K5**
CO5	Design the role of handwriting exemplars, alcoholic beverages, marked currency notes and hidden explosives	**K6**

Course Title: Analytical Chemistry Course Code: 22PCH2DSE2C		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Describe the basic concepts of data analysis, chromatography, electroanalytical methods, thermal methods and flame photometry.	**K1**
CO2	Understand the theory of various analytical techniques.	**K2**
CO3	Illustrates the instrumentation and experimental details of analytical techniques.	**K3**
CO4	Compare various analytical techniques based on their principles and applications.	**K4**
CO5	Evaluate the applications of data analysis, chromatography, electroanalytical methods, thermal methods and flame photometry.	**K5**

Course Title: Physical Chemistry -II Course Code: 19PCH3CC6		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Discuss the chemistry of macromolecules	**K2**
CO2	Solve the application of spectroscopy	**K3**
CO3	Examine the applications of wave mechanics to simple system.	**K4**
CO4	Compare the different techniques of surface chemistry	**K4**
CO5	Differentiate the ionic and electronic part of electrochemical reactions and their applications.	**K4**

Course Title: Chemistry for Competitive Examinations Course Code: 19PCH3CC7		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Describe the medicinal value of bio- inorganic compounds	**K2**
CO2	Interpret the spectrum of the molecules and calculate the point group.	**K3**
CO3	Explain the types of bonds and shapes of the molecules	**K4**
CO4	Compare the properties of f-block elements and analyze the catalytic behavior of organometallic compound.	**K4**
CO5	Choose the reagent and predict the mechanism of the reaction.	**K5**

Course Title: Physical Chemistry Practical – I Course Code: 19PCH3CC5P		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Explain the techniques to carry out operation of physical chemistry.	**K2**
CO2	Evaluate activation energy of a reaction, CST of immiscible liquids, colligative property to determine molecular weight, Association factor.	**K3**
CO3	Construct phase diagram of two and three component system.	**K4**

Course Title: Pharmaceutical Chemistry Course Code: 19PCH3EC2A		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Prediction of malarial, infectious, autoimmune and celiac diseases	**K3**
CO2	Relate the usage of drugs for asthma and allergic	**K3**
CO3	Diagnosis the prevention and treatment of all diseases	**K4**
CO4	Assessment of antibiotics and antiseptics	**K5**
CO5	Critique the usage of drugs in day today life	**K5**

CRITERION I **POs and COs**

Course Title: Bioorganic Chemistry **Course Code: 19PCH3EC2B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Describe the preparation, properties of amino acids, proteins and lipids.	**K2**
CO2	Outline the mechanism of enzymes and cofactors.	**K2**
CO3	Apply the concept of Bioenergetics.	**K3**
CO4	Analyze the principles of disconnection approach of organic synthesis.	**K4**
CO5	Distinguish between stereoselective and stereospecific reactions.	**K4**

Course Title: Instrumentation Techniques **Course Code: 19PCH3EC3A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Interpret the data analysis with different samples	**K2**
CO2	Predict the quality of different water samples.	**K2**
CO3	Identify the instruments and methods used to separate, identify, and quantify matter.	**K2**
CO4	construct the Instrumental methods used to separate samples using chromatography	**K3**
CO5	Point out the Classical quantitative analysis uses mass or volume changes to quantify amount.	**K4**

Course Title: Intellectual Property Rights **Course Code: 19PCH3EC3B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Indentify the basic property rights in development and management of innovative projects	**K2**
CO2	Interpret the knowledge on patents, patent regime in India and abroad	**K3**
CO3	Discriminate the system with its patent, copyright and trademark	**K4**
CO4	Evaluation of design on trademarks and registration aspects	**K5**

Course Title: Physical Methods in Chemistry -II **Course Code: 19PCH4CC8**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Explain the principles of NMR, IR, Raman, Mossbauer and electronic spectroscopy.	**K2**
CO2	Identify the applications of electronic spectroscopy to study the structure of molecules.	**K3**
CO3	Solve $\Delta 0$ and β for metal complexes.	**K3**
CO4	Analyze the spectrum of certain chemical compounds in qualitative.	**K4**
CO5	Assess the structure of a compound by various spectral data.	**K5**

Course Title: Physical Chemistry – II (P) **Course Code: 19PCH4CC6P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Analyze the electrical data	**K4**
CO2	Estimate the concentration of ions using Potentiometer	**K5**
CO3	Estimate the concentration of ions using Conductometer	**K5**

Course Title: Industrial Chemistry **Course Code: 19PCH4EC4A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Classify the fuels as saturated hydrocarbon, unsaturated hydrocarbons and aromatic hydrocarbons	**K2**
CO2	Outline the steps involved in the manufacturing of pulp, paper, glass and ceramics.	**K2**
CO3	Illumination the structure and properties of the materials used in the cosmetics and perfumes	**K3**
CO4	Analyze the milk products, composition and processing of milk	**K4**

Course Title: Selected Topics in Chemistry Course Code: 19PCH4EC4B		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Discussing about chemistry of pesticides	**K2**
CO2	Discussing about the various Naming Reactions in Organic Synthesis	**K3**
CO3	Appraise the essentials of clinical chemistry	**K4**
CO4	Explain the different steps in leather processing and analyze the effluent problems in tanneries	**K6**
CO5	Discuss about Fundamentals of Radio chemistry	**K6**

Course Title: Chemistry of Nanoscience Course Code: 19PCH4EC5A		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Classify different types of concerted methods of synthesis of nanomaterials.	**K2**
CO2	Identify the nanoparticles by characterization.	**K3**
CO3	Distinguish between clusters and naostructures.	**K4**
CO4	Discuss the applications in elctrochemical field.	**K6**
CO5	Predict the applications of nanosciece in the agricultural and food processing field.	**K6**

Course Title: Bio Fuels Course Code: 19PCH4EC5B		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Implentation of technologies for the production of biofuels by developing innovative ideas.	**K2**
CO2	Stabilize the knowledge on digestion and fermentation process for gaseous fuels from organic substrates of different origin	**K3**
CO3	Diagnose global impacts of biofuels on food and energy supplies	**K4**
CO4	Compile the regulations limits with Indian Standards	**K5**

Key Indicator - 1.1 Curriculum Design and Development

1.1.1 Curricula developed and implemented have relevance to the local, regional, national and global developmental needs, which is reflected in the Programme outcomes (POs) and Course Outcomes (COs) of the Programmes offered by the institution

Programme Outcomes (POs) and Course Outcomes (COs) – (2023-2024 Onwards)

DEPARTMENT OF CHEMISTRY

M. Sc- Chemistry

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	STATEMENTS
PEO1	**LEARNING ENVIRONMENT** To facilitate value-based holistic and comprehensive learning by integrating innovative learning practices to match the highest quality standards and train the students to be effective leaders in their chosen fields.
PEO2	**ACADEMIC EXCELLENCE** To provide a conducive environment to unleash their hidden talents and to nurture the spirit of critical thinking and encourage them to achieve their goal.
PEO3	**EMPLOYABILITY** To equip students with the required skills in order to adapt to the changing global scenario and gain access to versatile career opportunities in multidisciplinary domains.
PEO4	**PROFESSIONAL ETHICS AND SOCIAL RESPONSIBILITY** To develop a sense of social responsibility by formulating ethics and equity to transform students into committed professionals with a strong attitude towards the development of the nation.
PEO5	**GREEN SUSTAINABILITY** To understand the impact of professional solutions in societal and environmental contexts and demonstrate the knowledge for an overall sustainable development.

PROGRAMME OUTCOMES (POs)

PO No.	Programme Outcome On completion of M.Sc. Chemistry Programme, the students will be able to
PO1	**Problem analysis:** Provide opportunities to develop innovative design skills, including the ability to formulate problems, to think creatively, to synthesize information, and to communicate effectively.
PO2	**Scientific skills:** Create and apply advanced techniques and tools to solve the societal environmental issues.
PO3	**Environment and Sustainability:** Ascertain eco-friendly approach for sustainable development and inculcate scientific temper in the society.
PO4	**Ethics:** Imbibe ethical and social values aiming towards holistic development of learners.
PO5	**Lifelong learning:** Instill critical thinking, communicative knowledge which potentially leads to higher rate of employment and also for higher educational studies.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO NO	Programme Specific Outcomes Students of M.Sc., Chemistry will be able to	POs Addressed
PSO1	Acquire knowledge in basic concepts, fundamental principles, and applications of chemical and scientific theories and their relevancies in the day-to-day life.	PO1 PO2
PSO2	Design experiments, analyze, synthesize and interpret data to provide solutions to different industrial problems by working in the pure, inter and multi-disciplinary areas of chemical sciences.	PO1 PO2 PO3
PSO3	Attain maneuver in diverse contexts with Global Perspective	PO3 PO4
PSO4	Gain a thorough Knowledge in the subject to be able to work in projects at different research as well as academic institutions.	PO1 PO2 PO5
PSO5	Afford Global level research opportunities to pursue Ph.D programme targeted approach of CSIR – NET examination	PO1 PO2 PO3 PO4 PO5

COURSE OUTCOMES (COs)

Course Title: Organic Reaction Mechanism -I **Course Code: 23PCH1CC1**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall and summarize the fundamentals of reaction intermediates, electrophilic and nucleophilic substitution reactions, aromaticity, and stereochemistry.	**K1, K2**
CO2	Interpret the concept to Huckels theory, thermodynamic and kinetic requirements of reactions: conformation analysis and substitution reactions	**K3**
CO3	Categorize the determination of intermediates, aromaticity, configuration and reactivity of aliphatic and aromatic compounds towards substitution reaction.	**K4**
CO4	Evaluate aromatic character, stereo analysis, pathway of reaction mechanism.	**K5**
CO5	Predict the intermediate, conditions and product of substitution mechanism.	**K6**

Course Title: Structure and Bonding in Inorganic Compounds **Course Code: 23PCH1CC2**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Predict the geometry of main group compounds and clusters.	**K2, K3**
CO2	Explain about the packing of ions in crystals and solid state.	**K2, K3**
CO3	Understand the various types of ionic crystal systems and analyze their structural features.	**K3, K4**
CO4	Explain the types of crystal growth methods and structures of organometallic compounds.	**K4, K5**
CO5	To understand the principles of band theory and solid-state theory.	**K4, K5**

Course Title: Molecular Spectroscopy **Course Code: 23PCH1CC3**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Understand principle of various spectral techniques involving molecular absorption and emission of electromagnetic radiations.	**K1, K2**
CO2	Apply NMR and MS spectroscopic techniques in solving structure of organic molecules.	**K3**
CO3	Explain the principle, rules to analyses, compare and identify the structure of organic molecules using various spectral techniques.	**K4**
CO4	Discriminate structural and stereoisomers of compound using NMR, ESR and mass spectral techniques.	**K5**
CO5	Evaluate energy of rotational levels, isotopic mass of the elements.	**K5**

Course Title: Organic Chemistry -I (P) **Course Code: 23PCH1CC1P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Apply the principles of separation in organic mixtures.	**K1**
CO2	Prepare the organic compounds by single stage method.	**K2**
CO3	Identify various functional group in organic compounds.	**K3**
CO4	Develop skills in separating techniques estimations and preparations.	**K3**
CO5	Analyze the nature of organic mixture containing two components.	**K4**

Course Title: Analytical Instrumentation Technique (P) **Course Code: 23PCH1DSE1AP**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Become familiar with fundamental concepts of electrical and instrumentation techniques.	**K1**
CO2	Observe the application of Instrumentation Techniques	**K2**
CO3	CO3 Interpretation and identification of the given spectra of various organic compounds arrived at from spectral instruments.	**K4**
CO4	Develop the core skills to parse existing chromatographic protocols and identify the key factors influencing a chromatography and calorimetric experiment	**K5**
CO5	To develop students' ability and skill to acquire expertise in calibration techniques and interpretation of various compounds.	**K5**

Course Title: Nanoscience and Nanotechnology (P) Course Code: 22PCH1DSE1BP		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	To foundational knowledge of the Nanoscience and related fields	**K1**
CO2	Understand in broad outline of Nanoscience and Nanotechnology.	**K2**
CO3	Acquire an understanding the Nanoscience and Applications	**K3**
CO4	Apply principles of basic science concepts in understanding, analysis and prediction of matter at Nano scale.	**K3**
CO5	Understand the synthesis of nanomaterials and their application and the impact of nanomaterials on environment	**K2 & K5**

Course Title: Biochemistry Chemistry (P) Course Code: 22PCH1DSE1CP		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall and understand the techniques involved in isolation, separation and estimation of various biomolecules	**K1 & K2**
CO2	Develop and apply the skills in handling various chromatographic and colorimetric techniques	**K3**
CO3	Qualitatively and quantitatively analyze the biomolecules	**K4**
CO4	Exemplify in handling various chromatographic techniques of biomolecules.	**K5**
CO5	Interpret the importance of technical analysis required for various biomolecules	**K6**

Course Title: Physical Chemistry -I Course Code: 23PCH2CC4		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall postulates of quantum theory-operator-thermodynamic probability- and types of adsorption.	**K1, K2**
CO2	Solve Schrodinger equation, character table, various statistical models, theories of reaction rate and surface theories.	**K3, K4**
CO3	Explain Hermitian of operators, theories of unimolecular reactions, Ensembles and microstates.	**K4**
CO4	Deduce wave equation for particle in a box, rigid rotor, harmonic oscillator, classical and quantum statistics.	**K5**
CO5	Evaluate angular and radial function, character table, unimolecular reactions and kinetic models for catalysis	**K5**

Course Title: Inorganic Chemistry –I (P) Course Code: 23PCH2CC2P		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Detection of ions in an aqueous solution of the salt.	**K2**
CO2	Explain the quantitative estimation and estimation of inorganic compounds.	**K3**
CO3	Identify and separate cations and anions in a sample substance and Interpret results, while observing responsible and scientific conduct.	**K3**
CO4	Analyze quantitatively inorganic components in the environment.	**K4**
CO5	Hands-on experience with technical instrumentation.	**K5**

Course Title: Organic Reaction Mechanism -II Course Code: 23PCH2CCC1A		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Outline the synthesis, reactivity of organic compounds, nature of reagents, and fundamentals of photochemistry.	**K1&K2**
CO2	Interpret the reaction mechanism of various organic reactions Including photochemical, pericyclic, redox and heterocycles.	**K3**
CO3	Classify the different types of addition, elimination, photolytic reactions and heterocyclic compounds.	**K4**
CO4	Categorize the reaction pathways and naming reactions.	**K5**
CO5	Predict the mechanism and products of organic reactions.	**K6**

Course Title: Chemistry of Natural Products Course Code: 23PCH2CCC1B		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Differentiate the different types of alkaloids, terpenes, steroids, flavonoids and vitamins.	**K1**
CO2	Know the basic terms in natural product chemistry and their physiological significance.	**K2**
CO3	Evaluate the different methods of preparation of natural products.	**K3**
CO4	Recognize the most important building blocks employed in the Biosynthesis of natural products.	**K4**
CO5	Elaborate general methods of structural elucidation of compounds of natural origin.	**K5**

CRITERION I **POs and COs**

Course Title: Molecular Rearrangement **Course Code: 23PCH2CCC1C**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Know the outline for determining nature of rearrangements.	**K1, K2**
CO2	Interpret the reaction mechanism in various organic reactions.	**K2**
CO3	Classify the different types of intermediates involving inorganic rearrangement reactions.	**K3**
CO4	Recognize the technique of identifying reaction mechanism in various naming reactions.	**K4**
CO5	Predict the mechanism, different intermediates and product of molecular rearrangement reactions.	**K5**

Course Title: Physical Chemistry -I (P) **Course Code: 23PCH2CC3P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the principles associated with various physical chemistry experiments.	**K1,K2**
CO2	Scientifically plan and perform conductometric, kinetics, rast and Adsorption experiments.	**K3,K4**
CO3	Calculate and process the experimentally measured values and Compare with graphical data.	**K4,K5**
CO4	Interpret the experimental data scientifically to improve students' efficiency for societal developments.	**K6**
CO5	Comprehend the kinetics and mechanism of substitution reactions In octahedral and square planar complexes.	**K5**

Course Title: Green Chemistry **Course Code: 23PCH2DSE2A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Describe the basics of green chemistry and organic synthesis.	**K1**
CO2	Understand the importance of solvents, solid-state reactions, phase transfer catalyst and alternative energy sources.	**K2**
CO3	Apply green synthesis for synthesizing different organic compounds.	**K3**
CO4	Analyze the applications of green synthesis.	**K4**
CO5	Create an wrought for the synthesis of organic compounds.	**K5**

Course Title: Forensic Chemistry Course Code: 23PCH2DSE2B		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Identify the fundamental principles and functions of forensic science.	**K1**
CO2	Apply the principles of spectroscopy in forensic science.	**K2**
CO3	Analyze the techniques involved in the field of forensics.	**K3**
CO4	Appraise the role of chemistry and other branches in forensics.	**K4**
CO5	Feasibility and evaluation of explosives.	**K5**

Course Title: Analytical Chemistry Course Code: 23PCH2DSE2C		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Describe the basic concepts of data analysis, chromatography, electro analytical methods, thermal methods and flame photometry.	**K1**
CO2	Understand the theory of various analytical techniques.	**K2**
CO3	Illustrates the instrumentation, experimental and purification details of analytical techniques.	**K3**
CO4	Compare various analytical techniques based on their principle and applications.	**K4**
CO5	Evaluate the applications of data analysis, chromatography, electroanalytical methods, thermal methods and flame photometry.	**K5**

Course Title: Physical Chemistry -II Course Code: 22PCH3CC5		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Understand principle of classical and irreversible thermodynamics, interfaces of electrolytes, variation and approximation methods for wavefunctions.	**K1,K2**
CO2	Compare and correlate the thermodynamic concepts to study the kinetics of chemical reactions, variation and Perturbation method, theories of electrolytic double layer.	**K3**
CO3	Analyses thermodynamic concepts, variation theorem, perturbation method and electro-capillary phenomenon.	**K4**
CO4	Discriminate various concepts of reversible and irreversible thermodynamics and theories of quantum mechanics	**K5**
CO5	Apply the concept of TDs to study the kinetics of chemical reactions, VB and perturbation theorem to construct trial wavefunction for hydrogen like molecules and slater determinant for conjugated system to determine energy and bond order.	**K5**

Course Title: Inorganic Chemistry –II (P) Course Code: 22PCH3CC4P		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Apply the principles for the separation of cations.	**K3**
CO2	Prepare the inorganic complexes.	**K3**
CO3	Estimation of metal ions by volumetric and gravimetric methods	**K3**
CO4	Characterization of metal ions	**K4**
CO5	Identification and recrystallisation of complexes	**K5**

Course Title: Photochemistry and Chemical Kinetics Course Code: 22PCH3CCC2B		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the terms related to photochemistry, theories of reaction rates, kinetics of fast reactions and catalysis.	**K1**
CO2	Discuss the various methods to study photochemistry and chemical kinetics.	**K2**
CO3	Apply the concepts of photochemistry, chemical kinetics and solar cells.	**K3**
CO4	Analyze the importance of photochemistry, chemical kinetics, catalysis and solar cells.	**K4**
CO5	Evaluate the theory and applications of photochemistry, chemical kinetics and solar cells.	**K5**

Course Title: Electro Chemistry Course Code: 22PCH3CCC2C		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Categorize and account the importance ions in electrode reactions and applications of electrochemistry.	**K1& K2**
CO2	Demonstrate and categorize the importance of electrodics and its reactions in multi-step systems	**K3**
CO3	Understand the concept and applications of electrochemistry in photo and bio electrochemistry.	**K4**
CO4	Recognize the characterization of electrolyte in Electro-chemical reaction mechanisms with rates of reaction.	**K5**
CO5	Distinguish the categorization of electrolyte in Electro-chemical reaction mechanisms and bio electrochemistry.	**K6**

CRITERION I **POs and COs**

Course Title: Physical Chemistry – I (P) **Course Code: 22PCH3CC5P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the principles associated with various physical chemistry experiments.	**K1,K2**
CO2	Scientifically plan and perform kinetics, rast and adsorption experiments.	**K3, K4**
CO3	Calculate and process the experimentally measured values and compare with graphical data.	**K4, K5**
CO4	Interpret the experimental data scientifically to improve students' efficiency for societal developments.	**K6**
CO5	Comprehend the kinetics and mechanism of substitution reactions in octahedral and square planar complexes.	**K5**

Course Title: Chemistry for Competitive Examinations **Course Code: 22PCH3DSE3A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall and understand the modern approaches of chemical bonding, coordination compounds, reaction mechanism and various spectral techniques.	**K1, K2**
CO2	Interpret the shapes, reactions, spectrum and point group of the molecules.	**K3**
CO3	Analyze bond properties, catalytic behaviour, enzyme mechanism, reagents and frequencies of functional group.	**K4**
CO4	Explain the molecular bonding, functions of biomolecules, rearrangements and applications of various spectroscopies.	**K5**
CO5	Predict the nature of bonds, organometallic reactions, electron transfers, reagents and structure of molecules.	**K6**

Course Title: Bioorganic Chemistry **Course Code: 22PCH3DSE3B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	To understand the basic concepts of biomolecules and natural products.	**K2, K3**
CO2	To integrate and assess the different methods of preparation of structurally different biomolecules and natural products.	**K2, K3**
CO3	To illustrate the applications of biomolecules and their functions in the metabolism of living organisms.	**K3, K4**
CO4	To analyse and rationalise the structure and synthesis of heterocyclic compounds.	**K4, K5**
CO5	To develop the structure of biologically important heterocyclic compounds by different methods.	**K4, K5**

Course Title: Pharmaceutical Chemistry **Course Code: 22PCH3DSE3C**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	To identify the suitable drugs for various diseases.	**K1, K2**
CO2	To apply the principles of various drug action and drug design.	**K3**
CO3	To acquire the knowledge on product development based on SAR.	**K4**
CO4	To apply the knowledge on applications of computers in chemistry.	**K5**
CO5	To synthesize new drugs after understanding the concepts SAR.	**K6**

Course Title: Nanoscience and Nanotechnology **Course Code: 22PCH3GEC1**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Explain methods of fabricating nanostructures	**K1&K2**
CO2	To relate the unique properties of nanomaterials to reduce dimensionality of the material.	**K1, K2 &K3**
CO3	To describe tools for properties of nanostructures.	**K3**
CO4	To discuss applications of nanomaterials.	**K4**
CO5	To Perceive the health and safety related to nanomaterial.	**K5**

Course Title: Physical Methods in Chemistry - II **Course Code: 22PCH4CC6**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Explain the principles of electronic, IR, NMR, ESR and mass spectrometry.	**K1**
CO2	Describe the applications of various spectroscopy to study the inorganic molecules.	**K2**
CO3	Sketch the different types of spectrum for metal complexes.	**K3**
CO4	Analyze the spectrum qualitatively certain chemical compounds.	**K4**
CO5	Assess the structure of a compound by various spectral data.	**K5**

CRITERION I **POs and COs**

Course Title: Chemistry of Nanoscience **Course Code: 22PCH4CCC3A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Thorough knowledge of the general principles of physics, chemistry, electronics and biology that play a role on the nanometer scale	**K1**
CO2	Insight into the materials, fabrication and other experimental techniques that can be used on the nanoscale, as well as their limitations	**K2**
CO3	In-depth knowledge of at least one specialisation area within the field of nanoscience and nanotechnology	**K3**
CO4	Sufficient scientific background to undertake research.	**K4**
CO5	Proficiency in translating this knowledge into useful technological applications	**K5**

Course Title: Bio Fuels **Course Code: 22PCH4CCC3B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Know the outline about introduction of biofuels, biorefineries and environmental impacts.	**K1, K2**
CO2	Stabilize the knowledge on classifications and significance of biofuels in various fields.	**K3**
CO3	Interpret the characteristics and production methods of different biofuels and environmental impacts.	**K4**
CO4	Recognize the technique for synthesis and purification of classified biofuels.	**K5**
CO5	Predict the scope of different biofuels in various fields.	**K6**

Course Title: Bioinorganic Chemistry **Course Code: 22PCH4CCC3C**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall and summarize the fundamentals of bioinorganic chemistry	**K1, K2**
CO2	Interpret the concept to structure, function and transport of enzymes.	**K3**
CO3	Categorize the interaction and effect of biological enzymes	**K4**
CO4	Evaluate the role of metals in function of biological system	**K5**
CO5	Predict the favourable conditions of application of metals and enzymes in daily life.	**K6**

Course Title: Physical Chemistry – II (P) Course Code: 22PCH4CC6P		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Explain the various types of reactions using instruments	**K2**
CO2	Apply the methods and identify the suitability of methods	**K3**
CO3	Analyze the electrical data and correlating results graphically	**K3**
CO4	Estimate the concentration of ions using Potentiometer	**K4**
CO5	Estimate the concentration of ions using Conductometer	**K5**

Course Title: Corrosion and Pollution Management Course Code: 22PCH4GEC2		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to**	**Knowledge Level**
CO1	Recall the basic concept of corrosion and pollutions.	**K1**
CO2	Understand the types of corrosion and objectives of pollution management.	**K2**
CO3	Illustrate the significance of corrosion inhibition and pollution control.	**K3**
CO4	Analyze the methods to prevent corrosion and pollution.	**K4**
CO5	Propose a way to avoid corrosion and pollution.	**K5**