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PG DEPARTMENT OF CHEMISTRY

Programme Outcomes (PO)

PO1	Students should have an advanced level understanding of at least three of the following areas of chemistry - Analytical, Inorganic, Organic and Physical Chemistry.
PO2	Students should have a professional Skill to handle standard equipment's and to analyze the data.
PO3	Ability to carry out independent chemical research and present chemical research results to a technically literate audience by means of an oral presentation, scientific poster or a written report.
PO4	Having a clear understanding of professional, ethical responsibility and cross cultural competency exhibited by working as a member or in teams.
PO5	To make the Department a growing center of excellence in teaching, cutting-edge research, curriculum development and popularizing Chemistry.

Programme Specific Outcomes (PSO)

PSO1	Acquire broad understanding of knowledge and applications of major concepts in all disciplines chemistry.
PSO2	Impart the basic instrumentation in analytical and technical skills to work effectively at an advanced level.
PSO3	Critical thinking and design, carry out, record and analyze the complex chemical experiments as per research standardsis of data, synthetic logic, spectroscopy, team-based problem solving, etc.,
PSO4	Design and execute experiments with proper use of good laboratory practices and proper handling of waste generated in the laboratory.

PSO5	Identify current research problems, formulate the research from literature, the ability to synthesize, separate and characterize compounds using published reactions, protocols, standard laboratory equipment, and modern instrumentation.

Course Outcomes (CO)

Subject Code: 20PCY101

Subject Title: Inorganic Chemistry –I – Solid state and Nuclear Chemistry

K1	CO1	Distinguish the types of solids and their defects.
K2	CO2	Remember the introduction of acid-base concepts and nuclear chemistry.
K3	CO3	Identify and extend the applications of inorganic compounds as rings and clusters, non- aqueous solvents in reactions.
K4	CO4	Apply the electrical properties of solid state, radioactive and counter techniques.
K5	CO5	Evaluate n/p ratio, binding energy and Q-value of nuclear reactions.

Subject Code: 20PCY102

Subject Title: Organic Chemistry –I – Reactions and Mechanisms

K1	CO1	Remember the aromaticity of compounds and Develop skills for identifying the kinetics of reactions.
K2	CO2	Understand the mechanism of different types of substitution, addition and elimination reactions for synthesizing organic compounds.
K3	CO3	Apply the mechanisms in solving chemical reactions.
K4	CO4	Inspect the different types of reactions involved in chemical synthesis.
K5	CO5	Evaluate the various types of reaction intermediate.

Subject Code: 20PCY103

Subject Title: Physical Chemistry –I – Group Theory and Chemical Kinetics

K1	CO1	Classify molecules based on their different point groups and recollect rate of chemical reactions.
K2	CO2	Apply the point groups of various molecules and construct the character table for point groups and understand the different theories of chemical kinetics.
K3	CO3	Predict the IR and Raman active vibration modes for molecules and type of hybridization in nonlinear molecules based on group theory.
K4	CO4	Detect the principles of Photochemistry and its important applications.
K5	CO5	Examine hybridization scheme for orbital in simple molecules.

Subject Code: 20PCY204

Subject Title: Inorganic Chemistry - II Coordination and Organometallic Chemistry

K2	CO1	Explain the bonding characteristics in coordination compounds in terms of Crystal Field Theory and Molecular Orbital Theory.
K4	CO2	Examine the spectra of complexes using TS and Orgel diagrams.
K5	CO3	Formulate mechanisms for reactions of transition metal complexes.
K3	CO4	Appraise the preparation, properties and uses of metal carbonyls.
K4	CO5	Apply coordination complexes as catalyst for reactions.

Subject Code: 20PCY205

Subject Title: Organic Chemistry –II – Organic reactions and Stereochemistry

K1	CO1	Understand the basic of oxidation and reduction reactions, and photochemistry.
K2	CO2	Outline the importance of pericyclic reactions, to figure out isomerism and conformational analysis of stereochemistry and to understand the structural elucidation of alkaloids.
K3	CO3	Implement the basic values and analyze the functions of the natural product such as alkaloids.
K4	CO4	Analyse the reagents in chemical reactions, to execute photochemical and pericyclic reactions.
K5	CO5	Evaluate the stereochemical isomerisation, configuration and conformations of molecules.

Subject Code: 20PCY206

Subject Title: Physical Chemistry –II – Quantum and Electrochemistry

K1	CO1	Remember the dual character of electrons. To understand the concepts of classical and quantum mechanics, to picture out the failure of classical mechanics.
K2	CO2	Understand the Schrödinger wave equation to particles in a system.
K3	CO3	Comprehend the approximate methods in quantum mechanics and apply it to simple molecules.
K4	CO4	Analyze the final solution, energy and wave function for H atom and to review the mechanisms.
K5	CO5	Estimate the Current- Voltage relationship and Theories of Elecrokinetics.

Subject Code: 20PCY2N1

Subject Title: Non Major Elective-I - Chemistry in Day to Day Life

K1	CO1	Remember fundamental concepts of applied chemistry
K2	CO2	Understand the drugs used in day to day life.
K3	CO3	Test the various forms of drugs, cosmetics and milk products in day to day life.
K4	CO4	Predict the knowledge about the paints and cleansing agents
K5	CO5	Analyze the composition of fertilizers, pesticides and milk products.

Subject Code: 20PCY2N2

Subject Title: Non Major Elective-II - Chemistry in Context

K1	CO1	Remember different types of pollution
K2	CO2	Understand harmful effects of air pollution, applications of solar energy and nuclear energy.
K3	CO3	Implement the disposal of plastics.
K4	CO4	Analyze the hazards of air pollution and radioactivity
K5	CO5	Implement to reduce global warming.

Subject Code: 20PCY207

Subject Title: Inorganic Chemistry Practical -I

K3	CO1	Remember the analysis of cations alone.
K4	CO2	Separate common and rare cations
K5	CO3	Analyse and report cations in a mixture
K5	CO4	Prepare and report coordination compounds
K5	CO5	Develop skills in the synthesis of inorganic complexes

Subject Code: 20PCY208

Subject Title: Organic Chemistry Practical -I

K3	CO1	Remember the analysis of organic compounds and aromatic substitution reactions.
K4	CO2	Separate organic mixtures by solvent extraction.
K5	CO3	Analyze organic compounds
K5	CO4	Develop skills in the synthesis of organic compounds
K5	CO5	Determine boiling point /melting point

Subject Code: 20PCY209

Subject Title: Physical Chemistry Practical -I

K3	CO1	Recollect the concept of potentiometric titration. .
K4	CO2	Understand the simple eutectic system, molecular weight determination by Rast method, partition coefficient and estimation of metal ions using colorimetry.
K4	CO3	Examine the strength of the solutions and Ka values by potentiometry
K5	CO4	Calculate the molecular weight of chemical compounds from K_f values by Rast micro method.
K5	CO5	Estimate the metal ions using colorimetry.

Subject Code: 19PCY310

Subject Title: Organic Chemistry –III

K1	CO1	To remember the classes of natural products and the fundamental of condensation and molecular rearrangement reactions.
K2	CO2	To understand isolation, classification and structural elucidation of terpenoids and steroids. To comprehend the structure and synthesis of proteins, heterocyclic compounds and antibiotics. To get the idea about naming reactions which includes condensation and molecular rearrangements and to understand about the reagents in organic synthesis.
K3	CO3	To apply the reagents in organic synthesis.
K4	CO4	To review the molecular rearrangement, condensation, Reagents involved in organic synthesis and retro synthesis.
K1	CO1	To remember the classes of natural products and the fundamental of condensation and molecular rearrangement reactions.

Subject Code: 19PCY3E1

Subject Title: Major elective-I - Spectroscopy

K1	CO1	To remember about electromagnetic radiation and its frequency region
K2	CO2	To understand the theory, instrumentation and applications of IR, UV, NMR and mass spectroscopy
K3	CO3	To apply the various spectroscopic ideas on molecules to know their structural properties.
K4	CO4	To interpret and solve structural problems using various spectra
K1	CO1	To remember about electromagnetic radiation and its frequency region

Subject Code: 19PCY3E2

Subject Title: Major Elective –I - Applied Electrochemistry

K1	CO1	To recollect the fundamentals of electrochemistry.
K2	CO2	To understand the principles and applications of various current-voltage instruments. To know about the various electrochemical cells and batteries. To comprehend the effects of corrosion and corrosion control
K3	CO3	To apply the various instrumental techniques to measure current and voltage. To apply the various corrosion control inhibitors and technique to control corrosion.
K4	CO4	To analyze current and voltage using various techniques.
K1	CO1	To recollect the fundamentals of electrochemistry.

Subject Code: 19PCY3E3

Subject Title: Major Elective –I -Polymer Chemistry

K1	CO1	To learn the principles and concepts of contemporary polymer chemistry.
K2	CO2	To understand the basic concepts of polymer synthetic techniques.
K3	CO3	To Categorize the basic reactions in polymer chemistry.
K4	CO4	To Analyze the physical properties of different polymers and Characterize the polymers using various experimental techniques.
K1	CO1	To learn the principles and concepts of contemporary polymer chemistry.

Subject Code: 19PCY311

Subject Title: Physical Chemistry –III

K1	CO1	To remember the fundamentals of thermodynamics and surface chemistry.
K2	CO2	To understand the third law of thermodynamics and concept of fugacity and activity. To comprehend the quantum statistics and partition function. To know about fluorescence, phosphorescence, laser, maser and its applications.
K3	CO3	To apply the third law of thermodynamics and quantum statistics.
K4	CO4	To analyze the variation of fugacity with temperature and pressure, to interpret the mean activity and activity coefficient, to analyze the various quantum statistics in determination of probability.
K1	CO1	To remember the fundamentals of thermodynamics and surface chemistry.

Subject Code: 19PCY3E4

Subject Title: Major Elective - II - Green, Nano Chemistry and Cyber Security

K1	CO1	To recollect the hazardous effect of chemicals and solvents used in laboratory.
K2	CO2	To understand the basic principles of green chemistry, to comprehend the importance of nanotechnology and to understand the fundamentals of nanotechnology. To get the idea about problem selection, literature review and project writing. To get the idea about cyber security.
K3	CO3	To apply the concept of green chemistry in synthesis.
K4	CO4	To review the preparation and experimental techniques of Nanomaterials.
K1	CO1	To recollect the hazardous effect of chemicals and solvents used in laboratory.

Subject Code: 19PCY3E5

Subject Title: Major Elective – II - Water Pollution and Industrial Effluents treatment

K1	CO1	Understand the essential role of water in industries and to preserve the same.
K2	CO2	Acquire knowledge about Pollution of water and its Harmful effects
K3	CO3	Analyze the complete physico chemical examination of water.
K4	CO4	Recognize the industrial effluents and their treatment in brief.

Subject Code: 19PCY3E6

Subject Title: Major Elective - II - Nano Technology And Supramolecular Chemistry

K1	CO1	Recollect the characteristic of Sensors and Energy devices in Nanotechnology.
K2	CO2	Understand the synthesis and structure of supra molecules, supramolecular interactions and applications.
K3	CO3	Analyze the multiple H-bonding interactions used in crystal engineering
K4	CO4	Apply supra molecular chemistry in appropriate fields.

Subject Code: 19PCY412

Subject Title: Inorganic Chemistry - III - Bioinorganic and Inner Transition Elements

K1	CO1	Remember the general properties of Inner Transition elements and applications of inorganic metal complexes in photochemistry.
K2	CO2	Understand the magnetic properties of Inner Transition elements and homogeneous catalysis of organometallic.
K3	CO3	Apply the catalytic property of organometallic in synthesis.
K4	CO4	Analyze the mechanism involved in organometallic and the biological function of essential and non- essential elements.

Subject Code: 19PCY4E7

Subject Title: Major Elective -III - Medicinal Chemistry

K1	CO1	Outline the physicochemical properties of drugs
K2	CO2	Describe drug absorption, distribution, metabolism and excretion
K3	CO3	Synthesize and study novel Antibiotics for future generations
K4	CO4	Formulate the synthesis of few important drugs such as analgesics, antipyretics, cardiovascular, anti-tubercular drugs, antihistamines and antimalarial

Subject Code: 19PCY4E8

Subject Title: Major Elective – III - Food Science and Technology

K1	CO1	Understand the outlines of cereal and pulse processing technology.
K2	CO2	Describe the importance of nutrients in milk, fruits and vegetables.
K3	CO3	Comprehend the nutritive value of fleshy foods.
K4	CO4	Recognize the composition of sugar, spices, nuts and oilseeds.

Subject Code: 19PCY4E9

Subject Title: Major Elective - III - Dye Chemistry

K1	CO1	Understand the chemistry of dyes
K2	CO2	Interpret the various types of dyes, synthesis, reactions and applications
K3	CO3	Recognize the pigments, cosmetics and colouring agents
K4	CO4	Synthesize new dyes for the sustainable development using green chemistry principles.

Subject Code: 19PCY413

Subject Title: Physical methods in Chemistry

K1	CO1	Remember the various analytical methods.
K2	CO2	Understand the analysis of data. To comprehend the basic principle, instrumentation and applications of various chromatographic techniques, thermal analysis. To understand basic principle, instrumentation and applications of photoelectron spectroscopy, AAS, FES, electron spin resonance and Mossbauer spectroscopy. To know about polarimetry.
K3	CO3	Apply data analysis, various chromatographic techniques to separate the compounds. To apply electron spin resonance and Mossbauer spectroscopy.
K4	CO4	Interpret the data in chemical analysis.

Subject Code: 19PCY414

Subject Title: Phytochemical techniques and health chemistry (Self-study)

K1	CO1	Understanding on necessity and role of carbohydrates and vitamins for Humans.
K2	CO2	Remember the phytochemical techniques -extraction, separation and Purification.
K3	CO3	Implement the basic values and analyze the functions of food, food pyramid and Hygiene food system.
K4	CO4	Evaluate the mechanism for biological function of carbohydrates and vitamins

Subject Code: 19PCY415

Subject Title: Inorganic Chemistry Practical -II

K3	CO1	Recollect the preparation of coordination compounds.
K4	CO2	Understand the analysis of complexometric titration and mixture of cations using volumetric and gravimetric titration.
K4	CO3	Separate and estimate the metal ions in a mixture.
K5	CO4	Analyze the amount of individual cations present in a mixture using volumetric and gravimetric technique.

Subject Code: 19PCY416

Subject Title: Organic Chemistry Practical -II

K3	CO1	Remember aromatic substitution reactions and the basic principles of various chromatographic techniques.
K4	CO2	Understand the estimation of phenol, aniline, ketone and glucose and the extraction methods of natural product.
K5	CO3	Practice the preparation of organic compounds involving two Stages recrystallise and report.
K5	CO4	Estimate the amount of organic compounds present in the given solution

Subject Code: 19PCY417

Subject Title: Physical Chemistry Practical -II

K3	CO1	Recollect the concept of conductometric titration, fundamentals of adsorption and the acid hydrolysis of ester.
K4	CO2	Understand various laws of electrochemistry and applications of electrical conductance measurements and the applications of chemical kinetics.
K5	CO3	Determine the cell constant and verify the Debye-Huckel Onsager equation and Kohlrausch's law.
K5	CO4	Determine the relative strength of acids and rate of reaction.

Subject Code: 19PCY418

Subject Title: Project Work & Viva-Voce

K3	CO1	Apply the various preliminary skills in laboratory
K4	CO2	Analyze the various sources of literature review
K5	CO3	Evaluate the various techniques from the previous studies
K5	CO4	Apply the suitable parameters in the project work.

VALUE ADDED COURSE SCHEME

SEM	Course Code	Title of the Paper	Total hours	Examination				Credits
				Hours	CIA	ESE	Total	
II	19PCV101	Cosmetics chemistry: An Introduction	30	2	-	50	50	Grade
IV	19PCV102	Chemistry of Industrial Process: An Introduction	30	2	-	50	50	Grade

19PCV101-Cosmetics Chemistry: An Introduction

Course Outcomes

- Acquire basic information about the possibilities and limitations of cosmetic products, their importance and marketing.
- Knowing the prohibited, regulated and authorized ingredients for cosmetic products, their origin, chemical nature and importance.
- Familiar with the principles of production as well as composition of cosmetics and products.

19PCV102 - Chemistry of Industrial Process: An Introduction

Course Outcomes

- Define and implement cleaner production activities, industrial water management strategies for pollution and toxicity prevention.
- To Select the most appropriate treatment technology and design a wastewater treatment method to treat an industrial effluent stream for a selected industry.
- Integrate cleaner production, industrial water management, wastewater treatment processes, and disposal in the design on an industrial waste treatment process for a selected industry.
- Learn the physicochemical properties of water, different wastewater treatment process and water management strategies