

Holy Cross College (Autonomous), Nagercoil
Kanyakumari District, Tamil Nadu.
Accredited with A⁺ by NAAC - IV cycle – CGPA 3.35

Affiliated to

Manonmaniam Sundaranar University, Tirunelveli



Semester I - IV

POs, PSOs & COs

DEPARTMENT OF CHEMISTRY



2023-2026

(With effect from the academic year 2024-2025)

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	Upon completion of M. Sc. Chemistry Programme, the graduates will be able to:	Mapping with Mission
PEO1	apply scientific and computational technology to solve social and ecological issues and pursue research.	M1, M2
PEO2	continue to learn and advance their career in industry both in private and public sectors.	M4 & M5
PEO3	develop leadership, teamwork, and professional abilities to become a more cultured and civilized person and to tackle the challenges in serving the country.	M2, M5 & M6

PROGRAMME OUTCOMES (POs)

POs	Upon completion of M.Sc. Chemistry Programme, the graduates will be able to:	Mapping with PEOs
PO1	apply their knowledge, analyze complex problems, think independently, formulate and perform quality research.	PEO1 & PEO2
PO2	carry out internship programmes and research projects to develop scientific and innovative ideas through effective communication.	PEO1, PEO2 & PEO3
PO3	develop a multidisciplinary perspective and contribute to the knowledge capital of the globe.	PEO2
PO4	develop innovative initiatives to sustain eco-friendly environment	PEO1, PEO2
PO5	through active career, team work and using managerial skills guide people to the right destination in a smooth and efficient way.	PEO2
PO6	employ appropriate analysis tools and ICT in a range of learning scenarios, demonstrating the capacity to find, assess, and apply relevant information sources.	PEO1, PEO2 & PEO3
PO7	learn independently for lifelong executing professional, social and ethical responsibilities leading to sustainable development.	PEO3

Programme Specific Outcomes (PSOs)

PSO	Upon completion of M.Sc Chemistry programme, the graduates will be able to:	Mapping with POs
PSO-1	impart in-depth knowledge about various aspects of chemistry within an environment committed to excellence	PO1
PSO-2	develop critical thinking, technical skills and innovative ideas in analysing and solving problems in the field of chemistry	PO2, PO3
PSO-3	explore and expedite the recent avenues in chemistry research across the globe with professional competency	PO4
PSO-4	inculcate positive approach towards environment and ecology from the chemistry perspective	PO4, PO7
PSO-5	promote entrepreneurial skills and become self-reliant	PO5, PO6

Mapping of PO'S and PSO'S (Science)

POs	PSO1	PSO 2	PSO3	PSO4	PSO5
PO 1	3	3	2	3	2
PO 2	3	2	3	3	3
PO 3	3	3	3	2	2
PO 4	3	3	2	3	3
PO 5	3	3	3	2	3
PO 6	2	3	3	3	2
PO 7	3	2	2	3	2
Total	20	19	18	19	17
Average	2.7	2.7	2.5	2.7	2.4

Strong -S (3), Medium – M (2), Low – L (1)

COURSE OUTCOMES
SEMESTER I
CORE COURSE I: ORGANIC REACTION MECHANISM – I
Course Code : CP231CC1

On the successful completion of the course, student will be able to:		
1.	remember & understand the basic concepts of reaction mechanisms, stereochemistry and conformation in organic compounds	K1 & K2
2.	apply the reaction mechanism, stereochemistry and conformation for the synthesis of organic compounds	K3
3.	analyze the types of reaction mechanisms involved in synthetic organic transformation.	K4
4.	evaluate the suitable reaction mechanisms for the synthesis of organic compounds	K5
5.	design and synthesize new organic compounds by correlating the stereochemistry of organic compounds.	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

SEMESTER – I
CORE COURSE– II: STRUCTURE AND BONDING IN INORGANIC COMPOUNDS
Course Code : CP231CC2

On the successful completion of the course, student will be able to:		
1.	recall & understand the structure and bonding in inorganic compounds	K1 & K2
2.	apply the concepts of chemical bonding to predict the structure of inorganic compounds	K3
3.	analyze the types of bonding, crystal defects and interpret the crystal lattices using diffraction techniques.	K4
4.	evaluate bond energy, lattice energy, properties of inorganic compounds	K5
5.	create new crystal structures by adopting various crystal growth methods	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

CORE LAB COURSE– I: ORGANIC CHEMISTRY PRACTICAL

Course Code : CP231CP1

On the successful completion of the course, student will be able to:		
1	understand the methods for the separation and estimation of organic compounds	K2
2	apply the theoretical concepts to identify and synthesize organic compounds	K3
3	analyze the elements and functional groups using microscale analysis	K4
4	evaluate the quality and quantity of organic compounds	K5
5	create organic compounds using various rearrangement reactions	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

SEMESTER I

ELECTIVE COURSE II: a) NANO MATERIALS AND NANO TECHNOLOGY

Course Code : CP231EC1

On the successful completion of the course, student will be able to:		
1.	understand the basic concept of nano chemistry and its applications	K1 & K2
2.	apply the principle of nanotechnology for the synthesis and characterization of nanomaterials in various fields	K3
3.	analyze the physical and chemical properties of nanoparticles	K4
4.	evaluate the properties of nanoparticles using various analytical techniques	K5
5.	create and characterize novel nanomaterials	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

SEMESTER – I
ELECTIVE COURSE-I : b) PHARMACEUTICAL CHEMISTRY
Course Code : CP231EC2

On the successful completion of the course, student will be able to:		
1.	understand the concepts of pharmaceutical chemistry	K2
2.	apply the principles of drug action and computers in drug formulation.	K3
3.	analyze the drug dosage forms in drug delivery system.	K4
4.	evaluate the structure activity relationship in drug formulation.	K5
5.	synthesize new drugs after understanding the concepts of SAR.	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

SEMESTER I
ELECTIVE COURSE I: c) ANALYTICAL CHEMISTRY
Course Code : CP231EC3

On the successful completion of the course, student will be able to:		
1.	understand the principle and instrumentation of various analytical techniques	K1 & K2
2.	apply the principle of analytical techniques to predict the purity, stability and concentrations of compounds	K2 & K4
3.	analyse chemical compound using various analytical techniques	K1 & K2
4.	evaluate the quality and quantity of chemical compounds	K2 & K3
5.	understand the principle and instrumentation of various analytical techniques	K2 & K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

SEMESTER I

ELECTIVE COURSE II : a) ELECTROCHEMISTRY

Course Code : CP231EC4

On the successful completion of the course, student will be able to:		
1.	understand the behaviour of electrolytes in solution.	K2
2.	apply Butler-Volmer and Tafel equations to predict the kinetics of electrode reactions	K3
3.	analyze the different electrochemical processes	K4
4.	evaluate the theories of electrolytes, electrical double layer, electrostatics and activity coefficient of electrolytes.	K5
5.	design new storage devices using the mechanism of electrochemical reaction	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

SEMESTER I

ELECTIVE COURSE II: B) MOLECULAR SPECTROSCOPY

Course Code : CP231EC5

On the successful completion of the course, student will be able to:		
1.	understand the advanced concepts of spectroscopy.	K2
2.	apply the different spectral techniques to elucidate the structure of compounds.	K3
3.	analyze the structure of compounds using spectroscopic techniques.	K4
4.	evaluate different electronic spectra of simple molecules using electronic spectroscopy.	K5
5.	develop the knowledge on principle, instrumentation and structural elucidation of simple molecules using Mass Spectrometry, EPR and Mossbauer Spectroscopy techniques.	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

SEMESTER I
ELECTIVE COURSE II: c) INDUSTRIAL PRODUCTS
Course Code : CP231EC6

On the successful completion of the course, student will be able to:		
1.	understand the manufacturing processes of cement and glass.	K1 & K2
2.	apply different methods for manufacturing industrial products	K3
3.	analyze the types of dyes, pigments and paints.	K4
4.	evaluate the composition versus quality of industrial products	K5
5.	Synthesize new industrial products	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

SEMESTER - I
SPECIFIC VALUE ADDED COURSE
HERBAL PRODUCT DEVELOPMENT AND FORMULATION
Course Code : CP231V01

On the successful completion of the course, student will be able to:		
1	understand the role of natural products in herbal medicines.	K1 & K2
2	apply the extraction techniques in herbal drug formulation.	K3
3	analyse crude drugs and herbal formulation to determine their quality.	K4
4	evaluate crude drugs and herbal formulations as per the WHO and cGMP guidelines and stability testing of herbal drugs.	K5
5	synthesize herbal products.	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

SEMESTER I
SPECIFIC VALUE-ADDED COURSE
ECOLOGY AND WASTE MANAGEMENT

Course Code : CP231V02

On the successful completion of the course. students will be able to:		
1	recognize the importance of biodiversity in maintaining balanced ecosystem	K1
2	Know the principle of waste management and disposal of waste	K2
3	apply 3R principle to minimize the waste	K3
4	analyze the environmental issues associated with pollution and identify the strategies for proper disposal of waste	K4
5	evaluate the consequences of environmental degradation	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

SEMESTER II
CORE COURSE III: ORGANIC REACTION MECHANISM – II

Course Code : CP232CC1

On the successful completion of the course, students will be able to:		
1.	remember the basic principles of organic compounds.	K1
2.	understand the mechanism of various types of organic reactions.	K2
3.	apply the suitable reagents for the conversion of selective organic compounds.	K3
4.	analyze the principles of substitution, elimination, and addition reactions.	K4
5.	evaluate the reaction mechanisms and design new routes to synthesis of organic compounds.	K5 &K6

K1 - Remember; **K2** - Understand; **K3**– Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

SEMESTER II
CORE COURSE IV - PHYSICAL CHEMISTRY – I

Course Code : CP232CC2

On the successful completion of the course, student will be able to:		
1.	recall the basic concepts of thermodynamics.	K1
2.	understand the classical and statistical concepts of thermodynamics.	K2
3.	apply the thermodynamic concepts to study the kinetics of chemical reactions.	K3

4.	analyze the thermodynamics for real gases and mixtures.	K4
5.	evaluate the various kinetic methods of chemical reactions.	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate

SEMESTER II
CORE COURSE II: INORGANIC CHEMISTRY PRACTICAL
Course Code : CP232CP1

On the successful completion of the course, students will be able to:		
1.	recall & understand the basic principles in the analysis of cations from a given mixture	K1 & K2
2.	apply the principles of semi micro qualitative analysis to categorize the cations	K3
3.	analyze the cations by selecting suitable confirmatory tests and spot tests.	K4
4.	evaluate the amount of ions present in a binary mixture using complexometric titrations	K5
5.	synthesize coordination compounds using appropriate ligands and metal ions.	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

SEMESTER II
ELECTIVE COURSE III: a) MEDICINAL CHEMISTRY
Course Code : CP232EC1

On the successful completion of the course, students will be able to:		
1.	understand the drug properties based on its structure.	K2
2.	apply the relationship between drug's chemical structure and its therapeutic properties.	K3
3.	analyze the factors that affect the absorption, distribution, metabolism, and excretion in drug design.	K4
4.	evaluate the different theories of drug actions at molecular level.	K5
5.	design new drugs for the treatment of various diseases.	K6

K1 - Remember; **K2** - Understand; **K3** - Apply

SEMESTER II
ELECTIVE COURSE III: b) GREEN CHEMISTRY
Course Code : CP232EC2

On the successful completion of the course, student will be able to:		
1.	recall the basic chemical techniques used in conventional industrial preparations and in green innovations.	K1

2.	understand the various techniques used in chemical industries and in laboratory	K2
3.	apply the principles of PTC, ionic liquid, microwave and ultrasonic assisted organic synthesis.	K3
4.	analyze the advantages of organic reactions assisted by renewable energy sources and non-renewable energy sources.	K4
5.	evaluate, design and synthesize new organic compounds by green methods.	K5 & K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

SEMESTER II
ELECTIVE COURSE III: c) TRANSITION METAL CHEMISTRY
Course Code : CP232EC3

On the successful completion of the course, student will be able to:		
1.	recall the general characteristics and understand the reaction mechanisms of transition metal compounds.	K1&K2
2.	apply the reaction mechanisms in the synthesis of complexes.	K2
1.	analyze the various types of reactions involved in transition metal complexes	K3
2.	evaluate the various parameters involved in the spectra of transition metal complexes	K4
3.	design new routes for the synthesis of organometallic compounds	K5 & K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

SEMESTER II
ELECTIVE COURSE IV: a) BIO-INORGANIC CHEMISTRY
Course Code : CP232EC4

On the successful completion of the course, student will be able to:		
1.	understand the importance trace elements in biological processes.	K1& K2
2.	analyze the mechanism of biological redox systems.	K2& K4
3.	interpret the role of nitrogen in biological systems.	K2& K3

4.	identify the toxicity of metals and suggest suitable diagnostic agents for cancer treatment.	K4& K5
5.	evaluate the kinetics and effect of pH, temperature on enzyme reactions	K3 & K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

SEMESTER II
ELECTIVE COURSE IV: b) MATERIAL SCIENCE
Course Code : CP232EC5

On the successful completion of the course, student will be able to:		
1.	understand and recall the synthesis and characteristics of crystal structures, semiconductors, magnets, nanomaterials and renewable energy materials.	K1 & K2
2.	apply and assess the structure of different materials and their properties.	K3
3.	analyse and identify new materials for energy applications.	K4
4.	validate the importance of crystal structures, piezoelectric and pyroelectric materials, nanomaterials, hard and soft magnets, superconductors, solar cells, electrodes, LED uses, structures and synthesis.	K5
5.	design and develop new materials with improved property for energy applications.	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

SEMESTER II
ELECTIVE COURSE IV: c) ORGANOMETALLIC CHEMISTRY
Course Code : CP232EC6

On the successful completion of the course, student will be able to:		
1.	understand the basic concepts of organometallic, supramolecular and bio-organometallic chemistry.	K1 & K2
2.	apply the basic concepts to understand the reactive mechanism of organometallic compounds as catalysts.	K3
3.	analyse the nature of bonds, types and various theories of organometallic compounds.	K4

4.	evaluate the different types of reactions in metal carbonyls, cluster and polymers .	K5
5.	synthesize cancer drugs from organometallic compounds and supramolecules in the biosystems.	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

SEMESTER II
SKILL ENHANCEMENT COURSE III: HEALTH SCIENCE
Course Code : CP232SE1

On the successful completion of the course, student will be able to:		
1	recall and understand the importance of health, drugs, body fluids and vitamins	K1&K2
2	apply the function of drugs, nutrients, vitamins and their mode of action	K3
3	analyze and identify blood group and matching.	K4
4	evaluate the functions of drugs and vitamins	K5
5	develop skills to identify blood group and assist in first aid to provide health care to the community.	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

SEMESTER – I & II
LIFE SKILL TRAINING – I ETHICS
Course Code : PG23LST1

Course Outcomes	On completion of this course the student will be able to	
CO1	understand deeper insight of the meaning of their existence.	K1
CO2	recognize the philosophy of life and individual qualities	K2
CO3	acquire the skills required for a successful personal and professional life.	K3
CO4	develop as socially responsible citizens.	K4
CO5	create a peaceful, communal community and embrace unity.	K3

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

SEMESTER III
CORE COURSE V: ORGANIC SYNTHESIS AND PHOTOCHEMISTRY

Course Code : CP233CC1

On the successful completion of the course- students will be able to:		
1.	recall the basic principles of organic chemistry and understand the various reactions of organic compounds with reaction mechanisms.	K1 & K2
2.	apply the versatility of various special reagents and to correlate their reactivity with various reaction conditions.	K3
3.	analyze the synthetic strategies in the preparation of various organic compounds.	K4
4.	evaluate the suitability of reaction conditions in the preparation of tailor-made organic compounds.	K5
5.	design and synthesize novel organic compounds with the methodologies learnt during the course.	K6

K1 - Remember; K2 - Understand; K3 – Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

**SEMESTER III
CORE COURSE VI: COORDINATION CHEMISTRY – I
Course Code : CP233CC2**

On the successful completion of the course- students will be able to:		
1.	remember the elementary aspects of crystal field theory and molecular orbital theory	K1
2.	understand the various theories of coordination compounds.	K2
3.	apply various experimental methods to determine the stability of complexes.	K3
4.	analyze the spectroscopic and magnetic properties of coordination complexes.	K4
5.	evaluate the mechanism of substitution reactions in octahedral and square planar complexes.	K5

K1 - Remember; K2 - Understand; K3– Apply; K4 - Analyze; K5 - Evaluate

**SEMESTER III
CORE LAB COURSE III: PHYSICAL CHEMISTRY PRACTICAL
Course Code : CP233CP1**

On the successful completion of the course. students will be able to:		
1.	recall the basic theory of titrations and understand the principle of conductometric and potentiometric titrations	K1 & K2

2.	apply the principles of conductometry and potentiometry to determine the strength of unknown solutions.	K3
3.	analyze the strength of acids by adsorption method	K4
4.	evaluate conductance- dissociation constant and heat of solution	K5
5.	construct the phase diagram of two component system forming congruent melting solid.	K6

K1 - Remember; **K2** - Understand; **K3**– Apply; **K4** - Analyze; **K5** - Evaluate; **K6**-Create

SEMESTER III
CORE RESEARCH PROJECT
Course Code : CP233RP1

Upon completion of this course the students will be able to:		
1.	understand new areas of research in Chemistry	K2
2.	apply research sources and tools to identify research problem	K3
3.	analyze the synthesized samples using various spectroscopic techniques	K4
4.	evaluate the results and findings of the research work	K5
5.	publish the research findings in reputed journals.	K6

K1 - Remember; **K2** - Understand; **K3**– Apply; **K4** - Analyze; **K5** - Evaluate; **K6**-Create

SEMESTER III
ELECTIVE COURSE V: a) RESEARCH TOOLS AND TECHNIQUES
Course Code : CP233EC1

On the successful completion of the course- students will be able to:		
1.	remember the information gathered from diverse sources in research.	K1
2.	understand the advanced search strategies and analytical techniques relevant to research topics.	K2
3.	apply the research tools and techniques for advance research and development.	K3
4.	analyze the scientific data from diverse sources in research.	K4
5.	evaluate the scientific output to interpret the research findings.	K5

K1 - Remember; **K2** - Understand; **K3**– Apply; **K4** - Analyze; **K5** - Evaluate

SEMESTER III
ELECTIVE COURSE V: b) PHARMOCOGNOSY AND PHYTOCHEMISTRY
Course Code : CP233EC2

On the successful completion of the course- students will be able to:		
1.	recall the sources of natural medicines and analysis of crude drugs.	K1
2.	understand the methods of evaluation based on various parameters.	K2
3.	apply various techniques to discover new alternative medicines.	K3
4.	analyze the isolated drugs	K4
5.	evaluate the isolated drugs for various pharmacological activities	K5

K1 -Remember; **K2** -Understand; **K3** – Apply; **K4** -Analyse; **K5** -Evaluate

SEMESTER III
ELECTIVE COURSE V: c) SURFACE CHEMISTRY AND CATALYSIS
Course Code :CP233EC3

On the successful completion of the course- students will be able to:		
1.	recall and understand the definitions, basics of surface, interfacial phenomena, catalysis, colloids and surface characterization.	K1 & K2
2.	apply homogeneous and heterogeneous catalysis- photo and bio catalysis- express the properties of colloids and classify surface analytical tools.	K3
3.	analyze the mechanism involved in various catalysis and principles of conventional and spectroscopic surface characterization techniques.	K4
4.	evaluate the importance of the characteristics of surface- interfacial phenomena- colloids and limitations of surface analytical techniques.	K5
5.	develop analytical skills in interpreting the results of surface analytical tools and to choose the appropriate among homogeneous- heterogeneous- photo and bio catalyst for industrial applications and research.	K6

K1 -Remember; **K2** -Understand; **K3** – Apply; **K4** -Analyse; **K5** -Evaluate; **K6** -Create

SEMESTER III
SKILL ENHANCEMENT COURSE II: CHEMICAL ANALYSIS - TOOLS AND TECHNIQUES
Course Code :CP233SE1

On the successful completion of the course, student will be able to:		
1	understand the chemical analysis procedures effectively, including sample collection, preparation, analysis, interpretation of results, and report writing.	K1&K2

2	apply separation and purification techniques to isolate and purify substances based on their physical and chemical properties.	K3
3	analyze and interpret experimental data obtained from analysis, physical properties determination, and separation techniques	K4
4	evaluate the importance of food preservation techniques and apply appropriate methods for preserving food products	K5
5	collaborate effectively with peers in laboratory settings, demonstrating teamwork and communication skills.	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

SEMESTER III
SPECIFIC VALUE-ADDED COURSE: FOOD PRESERVATION AND TECHNOLOGY
Course Code : CP233V01

On the successful completion of the course. students will be able to:		
1	recall the fundamental concepts of food preservation.	K1
2	understand the principle of food preservation methods.	K2
3	apply various methods for preserving food	K3
4	analyze the reasons for spoilage of foods	K4
5	measure the nutritive value of different foods.	K5

K1- Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyze; **K5** - Evaluate

SEMESTER III
SPECIFIC VALUE-ADDED COURSE: PAINTS AND COATINGS
Course Code : CP233V02

On the successful completion of the course, student will be able to:		
1.	understand the principles underlying the formulation and manufacturing processes of paints	K1 & K2
2.	apply the extraction techniques in herbal drug formulation.	K3
3.	analyze the practical applications and challenges in the field	K4
4.	evaluate the environmental impact of paints and coatings and explore strategies for sustainable development.	K5
5.	develop proficiency in surface preparation techniques and paint application methods.	K6

K1-Remember; **K2**- Understand; **K3** – Apply; **K4** - Analyze; **K5**- Evaluate; **K6**- Create

SEMESTER III
SELF LEARNING COURSE: PETROCHEMICALS AND COSMETICS

Course Code : CP233SL1

On the successful completion of the course, students will be able to:		
1.	understand the common substances and products within the field of petrochemistry and cosmetics.	K1
2.	understand the data and diagrams illustrating the structures and properties of organic compounds used in perfumes and cosmetics.	K2
3.	analyze the impact of environmental regulations and market trends on the petrochemical industry.	K3
4.	apply the knowledge of petrochemical processes to analyze real-world examples of fuel production, petroleum refining, and industrial organic synthesis.	K4
5.	generate innovative ideas for improving the efficiency and sustainability of cosmetic production processes.	K5 & K6

K1 - Remember; **K2** - Understand; **K3**– Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

SEMESTER IV
CORE COURSE VII: COORDINATION CHEMISTRY – II
Course Code : CP234CC1

On the successful completion of the course- students will be able to:		
1.	recall the fundamental concepts and understand the structural aspects of coordination compounds.	K1 & K2
2.	apply the concepts and mechanisms to study the structure and bonding in inorganic compounds.	K3
3.	analyze and predict the structure of coordination complexes using spectroscopic tools.	K4
4.	evaluate the spectral characteristics of complexes	K5
5.	design new catalysts from organometallic compounds	K6

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

SEMESTER IV
CORE COURSE VIII: PHYSICAL CHEMISTRY-II
Course Code : CP234CC2

On the successful completion of the course- students will be able to:		
1.	remember the basic laws, equations and understand the characteristics of wave functions and symmetry functions.	K1 & K2
2.	apply the concept of quantum mechanics and group theory to predict the electronic structure.	K3
3.	classify the symmetry operation and wave equations.	K4
4.	evaluate eigen values and eigen functions	K5
5.	construct the character table for different point groups	K6

K1 -Remember; **K2** -Understand; **K3** – Apply; **K4** -Analyse; **K5** -Evaluate; **K6** -Create

SEMESTER IV
CORE LAB COURSE IV: ANALYTICAL INSTRUMENTATION TECHNIQUES PRACTICAL
Course Code : CP234CP1

On the successful completion of the course- students will be able to:		
1.	recall the basic concepts in analytical chemistry and understand the basic principles of instrumental methods of analysis.	K1 & K2
2.	apply the principles of instrumental methods of analysis.	K3
3.	analyze the constituents in a sample by selecting suitable analytical techniques.	K4
4.	evaluate the physical parameters using various analytical techniques.	K5
5.	design different experiments for the determination of physical parameters.	K6

K1 - Remember; **K2** - Understand; **K3**– Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

SEMESTER IV
ELECTIVE COURSE VI: a): POLYMER CHEMISTRY
Course Code : CP234EC1

On the successful completion of the course. students will be able to:		
1	learn the basic concepts of bonding and understand the importance of polymer chemistry	K1 & K2
2	apply the processing techniques in the manufacture of synthetic polymer	K3
3	analyze glass transition temperature- crystallinity and degradation in	K4

	polymers.	
4	evaluate molecular weight and size of the polymer	K5
5.	synthesize new polymers for special applications.	K6

K1 - Remember; **K2**- Understand; **K3** – Apply; **K4** - Analyze; **K5**- Evaluate; **K6** - Create

SEMESTER IV
ELECTIVE COURSE VI: b) BIOMOLECULES AND HETEROCYCLIC COMPOUNDS
Course Code : CP234EC2

On the successful completion of the course- students will be able to:		
1.	recall the basic concepts of biomolecules and natural products.	K1
2.	understand the different methods of preparation of structurally different biomolecules and natural products.	K2
3.	apply the applications of biomolecules and their functions in the metabolism of living organisms.	K3
4.	analyze and rationalize the structure and synthesis of heterocyclic compounds.	K4
5.	evaluate the structure of biologically important heterocyclic compounds by different methods.	K5

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyze; **K5** - Evaluate

SEMESTER IV
ELECTIVE COURSE VI: c) CHEMISTRY OF NATURAL PRODUCTS
Course Code : CP234EC3

On the successful completion of the course- students will be able to:		
1.	remember the biological importance of chemistry of natural products.	K1
2.	understand the process of isolation and characterization of synthesized natural products.	K2
3.	interpret the experimental data scientifically to improve biological activity of active components.	K3
4.	analyze the structure of phytochemical constituents by chemical and physical methods.	K4
5.	elucidate the structure of alkaloids- terpenoids- carotenoids- falvanoids and anthocyanins.	K5

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyze; **K5** – Evaluate

SEMESTER IV
ELECTIVE COURSE VII: a) RENEWABLE ENERGY SOURCES
Course Code : CP234EC4

On the successful completion of the course- students will be able to:		
1.	remember and understand the importance of various sources of non-conventional energy.	K1 & K2
2.	apply the principles of renewable energy and sustainability in energy conservation.	K3
3.	analyze the advantages and disadvantages of different non-conventional energy sources	K4
4.	evaluate solar energy radiation- wind energy data and conversion efficiency of fuel cells	K5
5.	design fuel cells for sustainable energy development	K6

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyse; **K5** - Evaluate; **K6** - Create

SEMESTER IV
ELECTIVE COURSE VII: b) SUPRAMOLECULAR CHEMISTRY
Course Code : CP234EC5

On the successful completion of the course- students will be able to:		
1.	recognize the aromaticity of molecules and understand the foundational concepts and terminology of supramolecular chemistry.	K1 & K2
2.	apply MOFs in drug design and their applications in NLO materials and OLEDs.	K3
3.	analyze molecular and supramolecular electronic devices- including molecular wires and switchable molecular wires.	K4
4.	evaluate the role of supramolecular chemistry in the development of nanoscience and technology- particularly in sensor technologies.	K5
5.	synthesize macromolecules for special application.	K6

K1 - Remember; **K2** - Understand; **K3**– Apply; **K4** - Analyse; **K5** - Evaluate; **K6**– Create

SEMESTER IV
ELECTIVE COURSE VII: c) ENVIRONMENTAL SCIENCE
Course Code : CP234EC6

On the successful completion of the course. students will be able to:		
1	recall the knowledge about environment and understand the phosphate- carbon- hydrogen- nitrogen and hydrological cycles in ecosystem.	K1 & K2
2	apply the knowledge gained to propose solutions and strategies for improving air- water and soil quality.	K3
3	identify the causes and consequences of air pollution- water pollution and soil	K4

	pollution	
4	evaluate the water quality parameters	K5
5	create eco-friendly recycling process.	K6

K1- Remember; **K2** -Understand; **K3** – Apply; **K4** -Analyse; **K5** -Evaluate; **K6** -Create

SEMESTER IV
SKILL ENHANCEMENT COURSE III: BUSINESS SKILLS FOR CHEMISTS
Course Code : CP234SE1

On the successful completion of the course, student will be able to:		
1	understand financial statements, including balance sheets, income statements, and cash flow statements.	K1&K2
2	apply financial principles to analyze the economic viability of chemical projects and make informed business decisions.	K3
3	identify market opportunities and develop strategies for product commercialization and market penetration.	K4
4	assess market demand for chemical products and technologies.	K5
5	cultivate a professional network within the chemical industry and negotiate effectively to achieve business objectives and foster collaboration.	K6

K1- Remember; **K2** -Understand; **K3** – Apply; **K4** -Analyse; **K5** -Evaluate; **K6** -Create

SEMESTER IV
SELF LEARNING COURSE: CHEMISTRY FOR COMPETITIVE EXAMINATIONS
Course Code : CP234SL1

On the successful completion of the course, students will be able to:		
1	understand the basic chemistry principles and solve related problems effectively.	K1
2	understand the chemical concepts through observation and simple experiments.	K2
3	recognize different types of pollution and their impact on the environment.	K3
4	apply chemistry knowledge to understand and improve materials.	K4
5	gain hands-on abilities in chemical processes for real-world applications.	K5 &K6

K1 - Remember; **K2** - Understand; **K3**– Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

SEMESTER – III & IV
LIFE SKILL TRAINING – II - VALUES
Course Code : PG23LST2

On completion of this course the student will be able to		
1	recognize the perception of life and lead a positive life	K1
2	understand relationship with family, friends and the society	K2
3	develop as socially responsible citizens.	K3
4	assess goals, fix targets and value life	K4
5	create a peaceful, communal community and embrace unity.	K6

K1-Remember; K2-Understand; K3-Apply; K4 – Analyse; K6- Create