

KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

Re-accredited to NAAC With “A+” Grade (4th Cycle)

College of Excellence (UGC)

Coimbatore – 641 029.

PG & RESEARCH DEPARTMENT OF CHEMISTRY

COURSE OUTCOMES (CO) OF M.Sc., CHEMISTRY

For the students admitted in the year

2022-23

Programme Code: 04		M.Sc., Chemistry		
Course Code: 22PCH101		Core Paper 1 – Organic Chemistry I		
Batch	Semester	Hours / Cycle	Total Hours	Credits
2022-2024	I	5	75	5

Course Objectives

1. To motivate the students to comprehend a knowledge on aromaticity and reaction mechanism.
2. To gain understanding in electrophilic and nucleophilic substitution reactions and disconnection approach.
3. To enable the students to elucidate the structure of some terpenoids compounds.

Course Outcomes (CO)

K1 to K5	CO1	Recall the concepts of aromaticity, chemistry of intermediates, substitution reactions, retrosynthesis and terpenoids
	CO2	Review the mechanism of electrophilic substitution reactions
	CO3	Illustrate the mechanisms of aliphatic and aromatic nucleophilic substitution reactions
	CO4	Connect the guidelines of retro synthetic approach to solve problems in the planning of organic synthesis
	CO5	Appraise the structural elucidation and synthesis of some important terpenoid compounds

Programme Code: 04		M.Sc., Chemistry		
Course Code : 22PCH102		Core Paper 2 – Inorganic Chemistry I		
Batch 2022-2024	Semester I	Hours/Cycle 5	Total Hours 75	Credits 5

Course Objectives

1. To introduce the principles and applications of solid state and nuclear chemistry.
2. To learn about inorganic crystals and structural determination methods
3. To acquire the knowledge of periodic properties and f-block elements, nuclear model, modes of decay and detection, measurement of radio activity, nuclear reactors and applications.

Course Outcomes (CO)

K1 to K5	CO1	Enumerate the fundamentals of acid-base concepts, solid state chemistry, nuclear chemistry and <i>f</i> -block chemistry
	CO2	Describe the structures of some ionic solids, spinels and related structures
	CO3	Discover several diffraction techniques for structure determination
	CO4	Examine the concepts of Nuclear Chemistry and the applications of radioisotopes
	CO5	Assess the chemistry of <i>f</i> -block elements

Programme Code: 04		M.Sc., Chemistry		
Course Code : 22PCH103		Core Paper 3 – Physical Chemistry I		
Batch 2022-2024	Semester I	Hours/Cycle 5	Total Hours 75	Credits 5

Course Objectives

1. To make the students to comprehend knowledge on symmetry elements, symmetry operations and rate of the reactions
2. To illustrate symmetry concepts and to demonstrate the scope of the symmetry and group theory to inorganic chemistry
3. To know the principles of chemical kinetics to allow exploration of gas-phase and liquid-phase reactions.

Course Outcomes (CO)

K1 to K5	CO1	Narrate the fundamentals of group theory and chemical kinetics
	CO2	Relate the relationship between symmetry and point groups and discuss the applications of group theory
	CO3	Experiment different theories of reaction rates and the kinetics of fast reactions
	CO4	Correlate various catalysis mechanisms with the kinetics
	CO5	Appraise the kinetics of polymerization reaction

Programme Code: 04		M.Sc., Chemistry		
Course Code:22PCH204		Core Paper 4 – Organic Chemistry II		
Batch	Semester	Hours/Cycle	Total Hours	Credits
2022-2024	II	5	75	5

Course Objectives

1. To gain knowledge about mechanism of elimination and addition reactions.
2. To enable a comprehensive knowledge on conformational analysis and stereochemistry, concerted reactions and pericyclic reactions of organic compounds to the students.
3. To give a thorough introduction to the study of organic photochemistry and isolation, general structural elucidation of alkaloids.

Course Outcomes (CO)

K1 to K5	CO1	Outline the essentials of addition and elimination reactions, stereochemistry, pericyclic reactions, photochemistry and alkaloids
	CO2	Identify the different types of notations in stereochemistry
	CO3	Relate correlation and FMO approach with electrocyclic, cycloaddition and Sigmatropic reactions
	CO4	Illustrate the mechanisms of various organic photochemical reactions
	CO5	Describe the structural features of some important compounds of alkaloids

Programme Code: 04		M.Sc., Chemistry		
Course Code : 22PCH205		Core Paper 5 – Inorganic Chemistry II		
Batch 2022-2024	Semester II	Hours/Cycle 5	Total Hours 75	Credits 5

Course Objectives

1. To promote an awareness about bonding in coordination complexes to the students.
2. To gain knowledge in term symbols and electronic spectra of complexes.
3. On successful completion of the syllabus, the students should have known about theories of bonding in inorganic complexes and application, substitution reaction mechanism of coordination complexes, electron transfer mechanism of coordination complexes and magnetic behavior.

Course Outcomes (CO)

K1 to K5	CO1	Read the elemental ideas of coordination chemistry and reaction mechanisms
	CO2	Cite the postulates of Crystal Field Theory and Molecular Orbital Theory
	CO3	Compute Term symbols and construct Orgel and Tanabe-Sugano diagrams of coordination complexes
	CO4	Elucidate the mechanisms of reactions of transition metal complexes and calculate their stability constants
	CO5	Compare and contrast the different types of electron transfer reactions

Programme Code: 04		M.Sc., Chemistry		
Course Code : 22PCH2CL		Core Practical 1 – Organic Chemistry Practical I		
Batch	Semester	Hours/Cycle	Total Hours	Credits
2022-2024	I & II	3 or 5	120	3

Course Objectives

1. To make the students aware about separation of mixture of organic compounds and analyzing the unknown compounds.
2. To allow the students to know and practice the techniques of preparation of some organic compounds.

Course Outcomes (CO)

K1 to K5	CO1	Describe systematic procedures for carrying out experiments
	CO2	Identify organic compounds by their characteristic reactions towards standard reagents
	CO3	Relate the principle of separation for separating two organic compounds in a given mixture
	CO4	Categorize the components present in the organic mixture and report the same
	CO5	Evaluate the crude and recrystallised form of the given organic compound

Programme Code: 04		M.Sc., Chemistry		
Course Code : 22PCH2CM		Core Practical 2– Inorganic Chemistry Practical I		
Batch	Semester	Hours / Cycle	Total Hours	Credits
2022-2024	I and II	3or 5	120	3

Course Objectives

1. To give an idea to the students about the separation and analysis of cations from the given mixture.
2. To allow the students to know and practice the techniques in preparation of some inorganic complexes.
3. To know about the colorimetric principle in estimation of metal ions.

Course Outcomes (CO)

K1 to K5	CO1	Read the procedure for the group separation and systematic analysis of cations
	CO2	Identify the appropriate preparation method of complexes
	CO3	Experiment the preparation of some inorganic complexes
	CO4	Analyze and report two familiar metal cations and two less familiar metal cations
	CO5	Estimate the amount of metal ions present in the whole of the given solution by colorimetric method

Programme Code: 04		M.Sc., Chemistry		
Course Code : 22PCH2CN		Core Practical 3 – Physical Chemistry Practical I		
Batch	Semester	Hours / Cycle	Total Hours	Credits
2022 - 2024	I & II	4 or 5	135	2

Course Objectives

1. To promote an awareness about potentiometric titrations to the students.
2. To arm the future chemist with the knowledge of electrical conductance measurement and conductometric titrations.
3. On successful completion of the syllabus, the students should have known to interpret, evaluate and report upon observations and experimental results of determination of molecular weight, partition coefficient, unknown composition in Simple Eutectic System and acid-base, precipitation and redox titrations.

Course Outcomes (CO)

K1 to K5	CO1	Recall the disciplinary regulations to be followed inside a physical chemistry lab
	CO2	Describe the determination of equilibrium constant of a reaction
	CO3	Use the principle of potentiometric titrations for estimating the strength of solutions
	CO4	Calculate the molecular weight of a compound by Rast's method
	CO5	Evaluate the properties of matter by Simple Eutectic System

Programme Code: 04		M.Sc., Chemistry		
Course Code : 22PCH306		Core Paper 6– Physical Chemistry II		
Batch 2022-2024	Semester III	Hours/Cycle 5	Total Hours 75	Credits 5

Course Objectives

1. To enable a comprehensive knowledge on quantum mechanics and students will be able to remember concepts of electrochemistry and surface chemistry
2. To understand electrochemical systems of electric energy production
3. To know the electrochemical processes of surface treatment and production of materials

Course Outcomes (CO)

K1 to K5	CO1	Recall the elementary aspects of quantum chemistry and electrochemistry
	CO2	Illustrate the quantum mechanical operations in solving Schrodinger wave equations
	CO3	Apply various approximation methods to Helium atom
	CO4	Outline different electrochemical theories and point out their importance
	CO5	Describe the methods of coulometry, voltametry and polarography

Programme Code: 04		M.Sc., Chemistry		
Course Code:22PCH307		Core Paper 7– Organic Chemistry III		
Batch	Semester	Hours/Cycle	Total Hours	Credits
2022-2024	III	5	75	5

Course Objectives

1. To foster an awareness in the student the ideas of molecular rearrangement and oxidation and reduction reactions of organic compounds.
2. To introduce steroids and to enable the students to elucidate their structures.
3. To gain knowledge about the classification, characterization of proteins, vitamins and some heterocyclic compounds.

Course Outcomes (CO)

K1 to K5	CO1	Enumerate the mechanisms of various molecular rearrangements, reagents and biologically important compounds
	CO2	Discuss the synthetic utility of different reagents in oxidation and reduction reactions
	CO3	Sketch and elucidate the structure of selected steroids
	CO4	Classify proteins and vitamins; examine their structures and biological importance
	CO5	Appraise the chemistry of some plant pigments and reagents for organic synthesis

Programme Code: 04		M.Sc., Chemistry		
Course Code : 22PCH308		Core Paper 8– Inorganic Chemistry III		
Batch 2022-2024	Semester III	Hours/Cycle 5	Total Hours 75	Credits 4

Course Objectives

1. To create an awareness in the student the fundamental concepts of inorganic photochemistry and bioinorganic chemistry.
2. To allow the students to get introduced to the study of organometallic complexes and their applications as catalysts for chemical reactions.
3. On successful completion of the syllabus, the students should have acquired knowledge in the nature, preparation and properties of metal carbonyl complexes, photochemistry of metal complexes and various applications and the role metals in biological systems.

Course Outcomes (CO)

K1 to K5	CO1	Record the essentials of organometallic chemistry, bioinorganic chemistry and inorganic polymers
	CO2	Explain the structure, reactions and bonding in several organometallic compounds
	CO3	Illustrate the role of organometallic compounds in catalysis
	CO4	Discover the chemistry and significance of bioinorganic compounds
	CO5	Appraise the chemistry of inorganic polymers; justify the structures of cages and clusters using Wade's rules

Programme Code: 04		M.Sc., Chemistry		
Course Code: 22PCH3CO		C. Pr.4 –Physical Chemistry Practical II		
Batch	Semester	Hours/Cycle	Total Hours	Credits
2022-2024	III	4	60	2

Course Objectives

1. To arm the future chemist with the knowledge of electrical conductance measurements and conductometric titrations.
2. To gain knowledge in making and recording observations in conductometric titrations and chemical kinetics.

Course Outcomes (CO)

K1 to K5	CO1	Read the various laws used for measuring electrical conductance
	CO2	Relate the principle of conductometric titrations to the estimation of the strengths of solutions
	CO3	Apply Freundlich adsorption isotherm for the adsorption of oxalic acid on charcoal
	CO4	Examine the reaction kinetics of two different solutions
	CO5	Evaluate the electrical properties of solution and estimate the strength of the given solution

Programme Code: 04		M.Sc., Chemistry		
Course Code : 22PCH409		Core Paper 9–Physical Chemistry III		
Batch 2022-2024	Semester IV	Hours/Cycle 5	Total Hours 75	Credits 5

Course Objectives

1. To enable a complete knowledge on chemical and statistical thermodynamics
2. To make the students understand the third law of thermodynamics, probability theorems, distribution laws, partition functions
3. To foster an awareness in the student the fundamental concepts of photochemistry

Course Outcomes (CO)

K1 to K5	CO1	Define the vitals of chemical thermodynamics, statistical thermodynamics and photochemistry
	CO2	Discuss the third law of thermodynamics, theories of probability and thermodynamic probability
	CO3	Apply the principles of statistical thermodynamics to derive distribution laws
	CO4	Derive the expressions for the partition functions of molecules
	CO5	Summarize various photophysical processes taking place in excited molecules

Programme Code: 04		M.Sc., Chemistry		
Course Code : 22PCH410		Core Paper 10 – Spectroscopy		
Batch	Semester	Hours/Cycle	Total Hours	Credits
2022-2024	IV	5	75	5

Course Objectives

1. To understand the principles and instrumentation of various spectroscopic techniques.
2. To gain knowledge of the applications of IR, UV and NMR spectra.
3. To identify the structure of compounds using various spectral techniques.

Course Outcomes (CO)

K1 to K5	CO1	List the fundamental concepts of IR, UV, Mass and NMR spectroscopic techniques
	CO2	Discuss the theories and rules for solving UV spectrum of a compound
	CO3	Interpret the fragmentation pattern in a mass spectrum and determine the structural features of some compounds
	CO4	Elucidate the ^1H spectra of simple organic molecules
	CO5	Solve the ^{13}C NMR spectra of organic compounds

Programme Code: 04		M.Sc., Chemistry		
Course Code : 22PCH4CP		Core Practical 5 - Organic Chemistry Practical- II		
Batch	Semester	Hours/Cycle	Total Hours	Credits
2022-2024	III and IV	3 or 5	120	3

Course Objectives

1. To attain knowledge in estimating organic compounds quantitatively.
2. To learn and practice the methods of preparation of some organic compounds.

Course Outcomes (CO)

K1 to K5	CO1	Define clearly, the procedures of quantitative estimations
	CO2	Report the significance of the preparation of Aspirin and Paracetamol drugs
	CO3	Apply the principle involved in double stage preparation of some organic compounds and prepare the compounds
	CO4	Analyze Reichert-Meisel value, saponification value and iodine value in the given oil or fat
	CO5	Evaluate quantitatively the amount of organic compounds present in the whole of the given solution

22PCH4CQ

Programme Code: 04		M.Sc., Chemistry		
Course Code : 22PCH4CQ		Core Practical 6 – Inorganic Chemistry Practical II		
Batch	Semester	Hours/Cycle	Total Hours	Credits
2022-2024	III & IV	3 or 5	120	2

Course Objectives

1. To make the students aware about separation of mixture of inorganic compounds and quantifying them using volumetric and gravimetric principles
2. To know and apply the principle of UV-Visible Spectral studies
3. To learn about the preparation and analyse the properties of inorganic complexes

Course Outcomes (CO)

K1 to K5	CO1	Recall the principles of Gravimetry
	CO2	Demonstrate the chromatographic separation techniques for the prepared compounds
	CO3	Apply the principle of UV-Visible Spectroscopy to solve the structures of complexes
	CO4	Comment on the physical properties such as melting point, etc., of the prepared inorganic complexes
	CO5	Estimate the amount of cations present in a solution mixture

22PCH4Z1

Programme Code: 04		M.Sc., Chemistry
Course Code : 22PCH4Z1		Project & viva-voce
Batch 2022-2024	Semester IV	Credits 4

Course Objectives

1. To make the students acquire the basic tools needed to carry out independent chemical research.
2. On successful completion of the course, the students will be able to be proficient in their specialized area of chemistry and successfully complete the project.

Course Outcomes (CO)

K1 to K5	CO1	Choose scrupulously, an appropriate research topic
	CO2	Summarize the findings of a thorough literature review
	CO3	State exactly, the problem of the experimental study/ research undertaken
	CO4	Interpret the results of the research using some basic tools
	CO5	Evaluate the research outcomes and present them in written and oral

Programme Code: 04		M.Sc., Chemistry
Batch : 2022-2024		Major Elective –Analytical Chemistry
Hours/Cycle	Total Hours	Credits
5	75	5

Course Objectives

1. To introduce the ideas of error analysis to the students.
2. To enable the students to attain knowledge on various chromatographic techniques and thermoanalytical methods.
3. To gain knowledge in ESR and Mossbauer spectroscopy, AAS and polarimetry.

Course Outcomes (CO)

K1 to K5	CO1	Define the ideas of error analysis, chromatography, thermogravimetry, ESR, AAS, ORD and CD
	CO2	Discuss the principles and instrumentation of several chromatographic methods
	CO3	Discover the principles, instrumentation and applications of various thermo analytical techniques
	CO4	Interpret ESR and Mossbauer spectra of several metal complexes
	CO5	Assess the principle and applications of AAS , ORD and CD

Programme Code: 04		M.Sc., Chemistry
Batch: 2022-2024		Major Elective – Green and Nanochemistry
Hours/Cycle	Total Hours	Credits
5	75	5

Course Objectives

1. To introduce the concepts of green chemistry.
2. To stimulate the students to know about green synthesis.
3. To acquire a clear idea about various synthesis of nanomaterials and techniques.
4. To gain knowledge on principles of green chemistry, microwave assisted reactions and ultrasound assisted reactions.

Course Outcomes (CO)

K1 to K5	CO1	List the basic principles of green chemistry and the essentials of nanochemistry
	CO2	Relate the twelve principles of green chemistry with several green syntheses
	CO3	Discover the microwave and ultra sound assisted syntheses
	CO4	Elucidate the chemistry of nanomaterials and their synthetic methods
	CO5	Describe various characterization techniques for nanomaterials; summarize the applications of nanomaterials

Programme Code: 04		M.Sc., Chemistry
Batch: 2022-2024		Major Elective – Bioinorganic Chemistry
Hours/Cycle	Total Hours	Credits
5	75	5

Course Objectives

1. To introduce the role of metal ions in biological systems.
2. To enable the students to know the structure, function and physiology of Haemoglobin and myoglobin.
3. To recognize electron transfer, respiration, photosynthesis, function of metalloenzymes and the applications of metals in medicine.

Course Outcomes (CO)

K1 to K5	CO1	State the role of metal ions in biological systems
	CO2	Identify the physiology and functions of haemoglobin and myoglobin
	CO3	Examine several electron transfer reactions in biological systems
	CO4	Discover the structure and functions of metalloenzymes
	CO5	Appraise the functions and applications of metals in medicine

Programme Code: 04		M.Sc., Chemistry
Batch: 2022-2024		Major Elective – Drug design and development
Hours/Cycle	Total Hours	Credits
5	75	5

Course Objectives

1. To create awareness among the students about various drugs used for therapeutic purposes.
2. To enable the students to know the principle of drug designing and drug targeting.
3. On successful completion of the syllabus, the students should have learnt about various drugs, their design and development.

Course Outcomes (CO)

K1 to K5	CO1	Describe the chemistry of drugs and their action as therapeutics
	CO2	Discuss the action mechanism of drugs
	CO3	Examine the physicochemical properties of drugs
	CO4	Outline the Structure Activity Relation of several therapeutic agents
	CO5	Assess drug design and drug target interaction

Programme Code: 04		M.Sc., Chemistry
Batch: 2022 -2024		Non Major Elective – Chemistry of Environment
Hours / Cycle	Total Hours	Credits
4	60	4

Course Objectives

1. To create awareness among the students about various environmental issues like pollution of air, water and soil which threaten the mankind.
2. To motivate the students to know the measures to prevent and control pollution.
3. On successful completion of the syllabus, the students should have learnt about various pollution, their sources, effects and control measures.

Course Outcomes (CO)

K1 to K5	CO1	Enumerate the different sources of pollutants and their effects
	CO2	Classify water pollutants; Report their sources and harmful effects
	CO3	Identify different sources of soil pollution, their effects and control measures
	CO4	Discover the types and consequences of radioactive pollutants
	CO5	Assess the causes and harmful effects of thermal and noise pollution

Programme Code: 04	M.Sc., Chemistry	
Batch: 2022 – 2024	Non Major Elective – Scientific Thesis Writing	
Hours / Cycle 4	Total Hours 60	Credits 4

Course Objectives

1. To introduce students the research prospectus and thesis/dissertation writing process with the focus on both the rhetorical framework and grammatical patterns germane to these tasks and the purpose of the research project.
2. To focus on the communication problems encountered in research and writing a thesis.
3. On successful completion of the syllabus, the students should have trained themselves how to write a thesis.

Course Outcomes (CO)

K1 to K5	CO1	Discover the ways to write the ‘Introduction’, ‘Review of Literature’ and other chapters of a thesis or dissertation
	CO2	Discuss the guidelines for writing ‘Materials and Methods’ chapter of a thesis
	CO3	Explain the strategies adopted for writing ‘Discussion’, ‘Abstract’, and ‘Synopsis’ sections of a thesis
	CO4	Elucidate the different types of reference citation in a thesis
	CO5	Distinguish between oral and poster presentation; Compare various article types in journal publication

Programme Code: 04		M.Sc., Chemistry
Batch : 2022-2024		Non Major Elective – Textile and Dye Chemistry
Hours/Cycle	Total Hours	Credits
4	60	4

Course Objectives

1. To understand the classification, structure, properties of various textile fibres.
2. To enable the students to attain knowledge to understand the interaction between dye and textile fibres.
3. To learn about types of fibres and dyeing processes and after treatment techniques.

Course Outcomes (CO)

K1 to K5	CO1	Examine the chemistry of fibres and dyes
	CO2	Explain the manufacture and processing of fibres
	CO3	Illustrate various theories of colour and dye-fibre interactions
	CO4	Analyze the principle of dyeing
	CO5	Evaluate several treatment processes involved in dyeing

Programme Code: 04		M.Sc., Chemistry		
Course Code: 22PGI4N2		Non Major Elective – Information Security		
Batch	Semester	Hours/Cycle	Total Hours	Credits
2022-2024	IV	4	60	4

Course Objectives

1. Students will identify the core concepts of Information security.
2. To examine the concepts of Information Security.
3. To design and implement the security features for IT and Industrial sectors.

Course Outcomes (CO)

K1 to K5	CO1	To Learn the principles and fundamentals of information security.
	CO2	To Demonstrate the knowledge of Information security concepts
	CO3	To Understand about Information Security Architecture.
	CO4	To Analyze the various streams of security in IT and Industrial sector.
	CO5	To know about Cyber Laws and Regulations.

JOB ORIENTED COURSE

Programme Code: 04	M.Sc., Chemistry	
Course Code : 22PCH0J1	Job Oriented Course – Pharmaceutical chemistry	
Batch 2022 – 2024	Total Hours 30 (Out of Class hours)	Credits 2

Course Outcomes

1. To give the students a thorough introduction to the study of drugs.
2. To educate the students and to create an awareness about first aid.
3. On successful completion of the syllabus, the students should have been aware of the causes, treatment and prevention of some common diseases, biological role of some elements, the structure, uses and adverse effects of analgesics, antiseptics and disinfectants.