

**KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)**

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

College of Excellence (UGC)

Coimbatore – 641 029.

**DEPARTMENT OF CHEMISTRY (PG)**

**COURSE OUTCOMES (PO)**

**M.Sc., CHEMISTRY**

**For the students admitted in the year**

**2020-21**

<b>Programme Code: 04</b>		<b>M.Sc., Chemistry</b>		
<b>Course Code: 20PCH101</b>		<b>C.P.1 – Organic Chemistry I</b>		
Batch	Semester	Hours / Week	Total Hours	Credits
2020-2022	I	5	75	5

**20PCH101**

### Course Objectives

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

### Course Outcomes (CO)

<b>K1 to K4</b>	<b>CO1</b>	Remember the concepts of aromaticity and the chemistry of intermediates
	<b>CO2</b>	Understand the mechanism of electrophilic and nucleophilic substitution reactions
	<b>CO3</b>	Relate the guidelines of retro synthetic approach in solving problems in the planning of organic synthesis
	<b>CO4</b>	Elucidate and analyze the synthesis of some terpenoid compounds

Programme Code: 04		M.Sc., Chemistry		
Course Code : 20PCH102		C.P.2 – Inorganic Chemistry I		
Batch	Semester	Hours/Week	Total Hours	Credits
2020-2022	I	6	75	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 K4	CO1	Remember the basics of periodic properties and acid-base concepts
	CO2	Understand the structures of some ionic solids and various defects; Investigate several diffraction techniques
	CO3	Explore Nuclear Chemistry and study the applications of radioisotopes
	CO4	Analyze the properties and uses of <i>f</i> -block elements

<b>Programme Code:</b> 04		<b>M.Sc., Chemistry</b>		
<b>Course Code :</b> 20PCH103		<b>C.P.3 – Physical Chemistry I</b>		
Batch	Semester	Hours/Week	Total Hours	Credits
2020-2022	I	5	75	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)

<b>K1</b>	<b>CO1</b>	Keep in mind the fundamentals of group theory
	<b>CO2</b>	Realize the relationship between symmetry and point groups and know the applications of group theory
<b>K4</b>	<b>CO3</b>	Explore different theories of reaction rates and the kinetics of fast reactions; Investigate various catalysis mechanisms and adsorption isotherms
	<b>CO4</b>	Appraise the kinetics of polymerization reaction

<b>Programme Code: 04</b>		<b>M.Sc., Chemistry</b>		
<b>Course Code: 20PCH204</b>		<b>C.P.4 – Organic Chemistry II</b>		
Batch 2020-2022	Semester II	Hours/Week 5	Total Hours 75	Credits 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)

<b>K1 to K4</b>	<b>CO1</b>	Recollect the essentials of addition and elimination reactions
	<b>CO2</b>	Comprehend different types of notations in stereochemistry
	<b>CO3</b>	Relate correlation and FMO approach for electrocyclic, cycloaddition and Sigmatropic reactions and explore Organic Photochemistry
	<b>CO4</b>	Elucidate the structural features of some important alkaloids

<b>Programme Code: 04</b>		<b>M.Sc., Chemistry</b>		
<b>Course Code : 20PCH205</b>		<b>C.P.5 – Inorganic Chemistry II</b>		
Batch	Semester	Hours/Week	Total Hours	Credits
2020-2022	II	5	75	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)

<b>K1 to K4</b>	CO1	Bear in mind the elemental ideas of coordination chemistry
	CO2	Realize the postulates of Crystal Field Theory and Molecular Orbital Theory
	CO3	Evaluate Term symbols, study and analyse Orgel and Tanabe-Sugano diagrams of coordination complexes
	CO4	Formulate the mechanism of reactions of transition metal complexes

<b>Programme Code: 04</b>		<b>M.Sc., Chemistry</b>		
<b>Course Code : 20PCH2CL</b>		<b>C.Pr.1 – Organic Chemistry Practical I</b>		
Batch	Semester	Hours/Week	Total Hours	Credits
2020-2022	I & II	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)

<b>K3</b>	<b>CO1</b>	Pertain the principle of separation for separating two organic compounds in a given mixture
<b>K4</b>	<b>CO2</b>	Analyze the components present in the organic mixture and report the same
<b>K5</b>	<b>CO3</b>	Evaluate the crude and recrystallised form of the given organic compound

<b>Programme Code: 04</b>		<b>M.Sc., Chemistry</b>		
<b>Course Code : 20PCH2CM</b>		<b>C.Pr.2 – Inorganic Chemistry Practical I</b>		
Batch	Semester	Hours / Cycle	Total Hours	Credits
2020-2022	I and II	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)

<b>K3</b>	<b>CO1</b>	Exert the methods of preparation of some inorganic complexes
<b>K4</b>	<b>CO2</b>	Analyze and report two familiar metal cations and two less familiar metal cations
<b>K5</b>	<b>CO3</b>	Assess the amount of metal ions present in the whole of the given solution by colorimetric method

<b>Programme Code: 04</b>		<b>M.Sc., Chemistry</b>		
<b>Course Code : 20PCH2CN</b>		<b>C.Pr.3 – Physical Chemistry Practical I</b>		
<b>Batch</b> 2020 - 2022	<b>Semester</b> I & II	<b>Hours / Cycle</b> 5	<b>Total Hours</b> 120	<b>Credits</b> 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)**

<b>K3</b>	<b>CO1</b>	Relate the principle of potentiometric titrations for estimating the strength of solutions
<b>K4</b>	<b>CO2</b>	Determine the molecular weight of a compound by Rast's method
<b>K5</b>	<b>CO3</b>	Appraise the properties of matter by Simple Eutectic System

<b>Programme Code:</b> 04		<b>M.Sc., Chemistry</b>		
<b>Course Code :</b> 20PCH306		<b>C.P.6 – Physical Chemistry II</b>		
Batch	Semester	Hours/Week	Total Hours	Credits
2020-2022	III	6	75	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)

<b>K1 to K4</b>	CO1	Recall the elementary aspects of quantum chemistry, learn the postulates of quantum mechanics and compare classical and quantum mechanical principles
	CO2	Solve Schrodinger wave equation for harmonic oscillators
	CO3	Employ various approximation methods to Helium atom
	CO4	Probe different electrochemical theories and examine the methods of coulometry, voltametry and polarography

<b>Programme Code:</b> 04		<b>M.Sc., Chemistry</b>		
<b>Course Code:</b> 20PCH307		<b>C.P.7 – Organic Chemistry III</b>		
Batch	Semester	Hours/Week	Total Hours	Credits
2020-2022	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)

<b>K1 to K4</b>	<b>CO1</b>	Retain information on molecular rearrangements and study the mechanisms of various molecular rearrangements
	<b>CO2</b>	Understand the synthetic utility of different reagents in oxidation and reduction reactions
	<b>CO3</b>	Elucidate the structure of selected steroids, proteins and vitamins
	<b>CO4</b>	Appraise the chemistry of some plant pigments and reagents for organic synthesis

<b>Programme Code:</b> 04		<b>M.Sc., Chemistry</b>		
<b>Course Code :</b> 20PCH308		<b>C.P.8 – Inorganic Chemistry III</b>		
Batch	Semester	Hours/Week	Total Hours	Credits
2020-2022	III	6	75	5

### 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)

<b>K1 to K4</b>	<b>CO1</b>	Reminisce the essentials of organometallic chemistry and the chemistry of metal carbonyls
	<b>CO2</b>	Understand the structure, reactions and bonding in several organometallic compounds
	<b>CO3</b>	Explore the chemistry of bioinorganic compounds
	<b>CO4</b>	Inquest the chemistry of inorganic polymers

<b>Programme Code: 04</b>		<b>M.Sc., Chemistry</b>		
<b>Course Code: 20PCH3CO</b>		<b>C. Pr.4 – Physical Chemistry Practical II</b>		
Batch	Semester	Hours/Week	Total Hours	Credits
2020-2022	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)**

<b>K3</b>	<b>CO1</b>	Apply Freundlich adsorption isotherm for the adsorption of oxalic acid on charcoal
<b>K4</b>	<b>CO2</b>	Examine the reaction kinetics of two different solutions
<b>K5</b>	<b>CO3</b>	Evaluate the electrical properties of solution and estimate the strength of the given solution

<b>Programme Code: 04</b>		<b>M.Sc., Chemistry</b>		
<b>Course Code : 20PCH409</b>		<b>C.P.9 – Physical Chemistry III</b>		
Batch	Semester	Hours/Week	Total Hours	Credits
2020-2022	IV	5	75	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)

<b>K1 to K4</b>	<b>CO1</b>	Bring to mind the vitals of chemical thermodynamics
	<b>CO2</b>	Appreciate third law of thermodynamics and the theories of probability and thermodynamic probability
	<b>CO3</b>	Explore statistical thermodynamics and derive distribution laws and partition functions
	<b>CO4</b>	Review the various photophysical processes taking place in excited molecules

Programme Code: 04		M.Sc., Chemistry		
Course Code : 20PCH410		C.P.10 – Spectroscopy		
Batch	Semester	Hours/Week	Total Hours	Credits
2020-2022	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)

<b>K1</b> <b>to</b> <b>K4</b>	CO1	Remember the fundamentals of IR spectroscopy
	CO2	Know the theories and rules for solving UV spectra of a compound
	CO3	Investigate the fragmentation pattern in a mass spectrum and determine the structural features of some compounds
	CO4	Scrutinize the $^1\text{H}$ and $^{13}\text{C}$ NMR spectra of simple organic molecules

**20PCH4CP**

<b>Programme Code: 04</b>		<b>M.Sc., Chemistry</b>		
<b>Course Code : 20PCH4CP</b>		<b>C.Pr.5 - Organic Chemistry Practical- II</b>		
Batch	Semester	Hours/Cycle	Total Hours	Credits
2020-2022	III and IV	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)**

<b>K3</b>	<b>CO1</b>	Exert the principle involved in double stage preparation of some organic compounds and prepare the compounds
<b>K4</b>	<b>CO2</b>	Analyze Reichert-Meisel value, saponification value and iodine value in the given oil or fat
<b>K5</b>	<b>CO3</b>	Evaluate quantitatively the amount of organic compounds present in the whole of the given solution

**20PCH4CQ**

<b>Programme Code: 04</b>		<b>M.Sc., Chemistry</b>		
<b>Course Code : 20PCH4CQ</b>		<b>C.Pr.6 – Inorganic Chemistry Practical II</b>		
Batch	Semester	Hours/Week	Total Hours	Credits
2020-2022	III & IV	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 complexometric titration using EDTA method
3. To learn about the preparation and properties of inorganic complexes

**Course Outcomes (CO)**

<b>K3</b>	<b>CO1</b>	Apply the principle of complexometric titrations in estimating metals
<b>K4</b>	<b>CO2</b>	Study the physical properties such as melting point, etc., of the prepared inorganic complexes
<b>K5</b>	<b>CO3</b>	Estimate the amount of cations present in a solution mixture

<b>Programme Code: 04</b>		<b>M.Sc., Chemistry</b>
<b>Course Code : 20PCH4Z1</b>		<b>Project work &amp; viva-voce</b>
Batch	Semester	Credits
2020-2022	III & IV	6

**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)**

<b>K3</b>	<b>CO1</b>	Use foundational knowledge to carry out research in the specified area
<b>K4</b>	<b>CO2</b>	Examine the results of the research using some basic tools
<b>K5</b>	<b>CO3</b>	Evaluate the research findings and present them in written and oral

<b>Programme Code: 04</b>		<b>M.Sc., Chemistry</b>
<b>Batch : 2020-2022</b>		<b>ME – Analytical Chemistry</b>
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)**

<b>K1 to K4</b>	<b>CO1</b>	Keep in mind the ideas of error analysis
	<b>CO2</b>	Comprehend the principles and instrumentation of several chromatographic methods
	<b>CO3</b>	Discover the principles, instrumentation and applications of various thermo analytical techniques
	<b>CO4</b>	Interpret ESR, Mossbauer and AAS spectra of several metal complexes; Probe the principle and applications of ORD and CD

<b>Programme Code: 04</b>		<b>M.Sc., Chemistry</b>
<b>Batch: 2020-2022</b>		<b>ME – Green and Nano Chemistry</b>
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)

<b>K1 to K4</b>	CO1	Remember the twelve basic principles of green chemistry and other green concepts
	CO2	Appreciate the concept of green solvents; Explore the synthesis involving the principles of green chemistry and different green reactions
	CO3	Appraise the chemistry of nanomaterials
	CO4	Examine the applications and environmental hazards of nanomaterials

<b>Programme Code: 04</b>		<b>M.Sc., Chemistry</b>
<b>Batch: 2020-2022</b>		<b>ME – Bioinorganic Chemistry</b>
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)

<b>K1 to K4</b>	<b>CO1</b>	Revive the role of metal ions in biological systems
	<b>CO2</b>	Understand the physiology and functions of haemoglobin and myoglobin
	<b>CO3</b>	Analyze the electron transfer reactions in biological systems; Integrate the structure and functions of metalloenzymes
	<b>CO4</b>	Study the functions and applications of metals in medicine; Examine the toxicity of metals in biological systems

<b>Programme Code: 04</b>		<b>M.Sc., Chemistry</b>
<b>Batch: 2020-2022</b>		<b>ME – Chemistry in other dimensions</b>
Hours/Cycle	Total Hours	Credits
5	75	5

### Course Objectives

1. To understand about non-aqueous solvents.
2. To stimulate the students to know about supramolecular chemistry.
3. To acquire a clear idea about Raman and Photoelectron spectroscopic techniques.
4. To gain knowledge on principle and applications of Nuclear Quadrupole Resonance.

### Course Outcomes (CO)

<b>K1 to K4</b>	<b>CO1</b>	Refresh the rudiments of non-aqueous solvents
	<b>CO2</b>	Realize the concept of Supramolecular chemistry
	<b>CO3</b>	Apply photoelectron, rotational and Raman spectroscopic techniques for solving the structures of inorganic compounds
	<b>CO4</b>	Relate the technique of NQR for structure solving

<b>Programme Code: 04</b>		<b>M.Sc., Chemistry</b>
<b>Batch: 2020 - 2022</b>		<b>NME – Chemistry of Environment</b>
<b>Hours / Week</b>	<b>Total Hours</b>	<b>Credits</b>
4	75	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)**

<b>K1 to K4</b>	<b>CO1</b>	Bear in mind the composition of air, Know the different sources of air pollutants and their effects
	<b>CO2</b>	Understand the different sources of water pollution, their effects and control measures
	<b>CO3</b>	Recognize the types and consequences of soil and radioactive pollutants
	<b>CO4</b>	Scrutinize the causes and harmful effects of thermal and noise pollution

<b>Programme Code: 04</b>	<b>M.Sc., Chemistry</b>	
<b>Batch: 2020 – 2022</b>	<b>NME – Scientific Thesis Writing</b>	
Hours / Week	Total Hours	Credits
4	75	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)

<b>K1 to K4</b>	<b>CO1</b>	Know how to write the ‘Introduction’ and ‘Review of Literature’ chapter of a thesis or dissertation
	<b>CO2</b>	Understand the guidelines for writing ‘Materials and Methods’ chapters of a thesis; Learn about the preparation of tables
	<b>CO3</b>	Apply the strategies specified for writing ‘Discussion’, ‘Abstract’, ‘Results’ and ‘References’ sections of a thesis
	<b>CO4</b>	Adopt the format for preparing manuscript for oral/poster presentation and journal publications

<b>Programme Code: 04</b>		<b>M.Sc., Chemistry</b>
<b>Batch : 2020-2022</b>		<b>NME – Textile and Dye Chemistry</b>
Hours/Cycle	Total Hours	Credits
4	75	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.

To learn about types of fibres and dyeing processes and after treatment techniques.

#### Course Outcomes (CO)

<b>K1 to K4</b>	<b>CO1</b>	Keep in mind the chemistry of fibres
	<b>CO2</b>	Comprehend the manufacture and processing of fibres
	<b>CO3</b>	Study the different theories of colour and examine the principle of dyeing
	<b>CO4</b>	Probe the different treatment process of dyeing

<b>Programme Code: 04</b>		<b>M.Sc., Chemistry</b>
<b>Batch: 2020 – 2022</b>		<b>NME – Industrial Chemistry</b>
Hours / Week	Total Hours	Credits
4	75	4

#### Course Objectives

1. To introduce students to the chemistry of Industrial products.
2. To focus on the preparation and applications of glass, cement, fertilizer, paints and pigments.
3. On successful completion of the syllabus, the student will be able to gain knowledge about the manufacture of glass, cement and paint.

#### Course Outcomes (CO)

<b>K1 to K4</b>	<b>CO1</b>	Recall the properties, manufacture and properties of glass
	<b>CO2</b>	Understand the types and manufacturing process of cement
	<b>CO3</b>	Recognize the importance and need of fertilizers
	<b>CO4</b>	Assess the chemistry of paints and pigments, rubber and allied products