

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

*Re-accredited by NAAC with 'A' Grade – 3.64 CGPA out of 4 (3rd Cycle)*

*College of Excellence (UGC)*

*Coimbatore – 641 029*

**DEPARTMENT OF CHEMISTRY (Unaided)**

**COURSE OUTCOMES (CO)**

**M.Sc. CHEMISTRY**

**For the students admitted**

**In the**

**Academic Year 2018-2019**

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code: 18PCH101</b>		<b>Title: C.P.1- Organic Chemistry - I</b>		
Batch 2018-2020	Semester I	Hours/Week 5	Total Hours 75	Credits 5

### 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</b>	<b>CO1</b>	Remember the rules of aromaticity, postulates of different types of reaction mechanism and retain information about some intermediate compounds
<b>K2</b>	<b>CO2</b>	Understand the mechanisms of electrophilic and nucleophilic substitution reactions
<b>K3</b>	<b>CO3</b>	Apply the guidelines of retro synthetic approach in solving problems in the planning of organic synthesis
<b>K4</b>	<b>CO4</b>	Sketch and analyze the synthesis of some terpenoid compounds

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code : 18PCH102</b>		<b>Title: C.P.2 - Inorganic Chemistry - I</b>		
Batch 2018-2020	Semester I	Hours/Week 6	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	CO1	Take into account the periodic properties of atoms and theories of acids and bases
K2	CO2	Appreciate the structures of some ionic solids and spinels
K3	CO3	Apply the theory of X-Ray Diffraction to solve the structure of a cubic system
K4	CO4	Analyze the properties of <i>f</i> -block elements and applications of radioisotopes

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code : 18PCH203</b>		<b>Title: C.P.3 - Physical Chemistry - I</b>		
Batch 2018-2020	Semester II	Hours/Week 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	CO1	Keep in mind different symmetry operations and recollect rate of chemical reactions
K2	CO2	Realize the relationship between symmetry and point groups and differences between homogenous and heterogeneous catalysis, and polymer kinetics
K3	CO3	Predict degeneracy, to classify vibrational modes and determine rate of different reactions
K4	CO4	Investigate various adsorption isotherms and evaluate kinetics of polymerization reaction

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code: 18PCH204</b>		<b>Title: C.P.4 - Organic Chemistry-II</b>		
Batch 2018-2020	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</b>	<b>CO1</b>	Recollect the basic mechanism of addition and elimination reactions.
<b>K2</b>	<b>CO2</b>	Comprehend different types of notations in stereochemistry
<b>K3</b>	<b>CO3</b>	Relate correlation and FMO approach for electrocyclic, cycloaddition and Sigmatropic reactions.
<b>K4</b>	<b>CO4</b>	Analyze the structural elucidations of some alkaloids

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code : 18PCH205</b>		<b>Title: C.P.5 - Inorganic Chemistry - II</b>		
Batch 2018-2020	Semester II	Hours/Week 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	CO1	Bear in mind the nomenclature of coordination compounds and the postulates of Crystal Field Theory and Molecular Orbital Theory
K2	CO2	Understand Term symbols, Orgel and Tanabe-Sugano diagrams of coordination complexes
K3	CO3	Formulate the mechanism of reactions of transition metal complexes
K4	CO4	Explore the role of metals in biology and study about several bioinorganic compounds

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code : 18PCH2CL</b>		<b>Title: C.Pr.1 - Organic Chemistry Practical- I</b>		
Batch 2018-2020	Semester I & II	Hours/Week 5	Total Hours 120	Credits 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)**

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

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code : 18PCH2CM</b>		<b>Title: C.Pr.2 - Inorganic Chemistry Practical- I</b>		
Batch 2018-2020	Semester I and II	Hours / Cycle 5	Total Hours 120	Credits 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)**

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



<b>Programme Code: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code : 18PCH2CN</b>		<b>Title: C.Pr.3 - Physical Chemistry Practical I</b>		
Batch 2018 - 2020	Semester I & II	Hours / Cycle 5	Total Hours 120	Credits 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: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code : 18PCH306</b>		<b>Title: C.P.6 - Physical Chemistry - II</b>		
Batch 2018-2020	Semester III	Hours/Week 6	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	CO1	Recall the postulates of quantum mechanics and compare classical and quantum mechanical principles
K2	CO2	Realize and derive Schrodinger wave equation for harmonic oscillators
K3	CO3	Employ perturbation and variation method to Helium atom
K4	CO4	Probe different electrochemical theories and examine the methods of coulometry, voltametry and polarography

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code : 18PCH307</b>		<b>Title: C.P.7 - Spectroscopy</b>		
Batch 2018-2020	Semester III	Hours/Week 5	Total Hours 75	Credits 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	CO1	Recall the selection rules in IR spectroscopy
K2	CO2	Know the rules for solving UV spectrum of a compound
K3	CO3	Investigate the fragmentation pattern in a mass spectrum and determine the structural information of some compounds
K4	CO4	Scrutinize the $^1\text{H}$ and $^{13}\text{C}$ NMR spectra of simple organic molecules

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code: 18PCH308</b>		<b>Title: C.P.8 - Organic Chemistry-III</b>		
Batch 2018-2020	Semester III	Hours/Week 5	Total Hours 75	Credits 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</b>	<b>CO1</b>	Remember the various types of molecular rearrangements
<b>K2</b>	<b>CO2</b>	Understand the synthetic utility of different reagents in oxidation and reduction reactions
<b>K3</b>	<b>CO3</b>	Elucidate the structure of selected steroids and vitamins
<b>K4</b>	<b>CO4</b>	Appraise the chemistry of some important reagents for organic synthesis

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code : 18PCH309</b>		<b>Title: C.P.9 - Inorganic Chemistry -III</b>		
Batch 2018-2020	Semester III	Hours/Week 6	Total Hours 75	Credits 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)

K1	CO1	Reminisce about the rules for classifying organometallic compounds
K2	CO2	Apprehend the structure and reaction mechanism of various organometallic complexes
K3	CO3	Apply some spectroscopic techniques for solving the structures of inorganic compounds
K4	CO4	Inquest the formation and structures of various inorganic polymeric compounds

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code: 18PCH3CO</b>		<b>Title: C. Pr.4 - Physical Chemistry Practical - II</b>		
Batch 2018-2020	Semester III	Hours/Week 4	Total Hours 60	Credits 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: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code : 18PCH410</b>		<b>Title: C.P.10 - Physical Chemistry - III</b>		
Batch 2018-2020	Semester IV	Hours/Week 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	CO1	Place in mind the second and third law of thermodynamics
K2	CO2	Appreciate the theories of probability and thermodynamic probability
K3	CO3	Apply thermodynamic quantities for deriving distribution laws and partition functions
K4	CO4	Review the various photophysical processes taking place in excited molecules

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code : 18PCH4CP</b>		<b>Title: C.Pr.5 - Organic Chemistry Practical- II</b>		
Batch 2018-2020	Semester III and IV	Hours/Cycle 5	Total Hours 120	Credits 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)

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



<b>Programme Code: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code : 18PCH4CQ</b>		<b>Title: C.Pr.6 - Inorganic Chemistry Practical- II</b>		
Batch 2018-2020	Semester III & IV	Hours/Week 5	Total Hours 120	Credits 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)**

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

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>
<b>Course Code : 18PCH4Z1</b>		<b>Title: Project work &amp; viva-voce</b>
Batch 2018-2020	Semester III & IV	Credits 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)**

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

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>
<b>Batch : 2018-2020</b>		<b>Title: ME- Physical Methods in Chemistry</b>
Hours/Cycle 5	Total Hours 75	Credits 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	CO1	Keep in mind the concepts of mean, median, standard deviation, etc.,
K2	CO2	Comprehend the principles and instrumentation of chromatographic methods and various thermoanalytical methods
K3	CO3	Relate ESR and Mossbauer spectroscopy for the identification of metal complexes
K4	CO4	Probe the principle and applications of ORD and CD

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>
<b>Batch: 2018-2020</b>		<b>Title: ME- Polymer Science and Technology</b>
Hours/Cycle 5	Total Hours 75	Credits 5

### Course Objectives

1. To gain knowledge in polymer chemistry.
2. To introduce the structure, properties and uses of various polymers, fibres and elastomer
3. To understand about various properties of polymers, fibres, elastomers and their applications in industries

### Course Outcomes (CO)

K1	CO1	Remember the preparation and properties of some important polymers
K2	CO2	Empathize the process of fabrication
K3	CO3	Realize the applications of fibre and elastomer technology in the field of industries
K4	CO4	Explore the chemistry of elastomers

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>
<b>Batch: 2018-2020</b>		<b>Title: ME - Green and Nano Chemistry</b>
Hours/Cycle 5	Total Hours 75	Credits 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	CO1	Memorize the twelve basic principles of green chemistry
K2	CO2	Appreciate the concept of supramolecular chemistry
K3	CO3	Appraise the chemistry of nanomaterials
K4	CO4	Examine the applications and environmental hazards of nanomaterials

<b>Programme Code: 4</b>		<b>Title :</b> Chemistry
<b>Batch: 2018-2020</b>		<b>Title:</b> ME - Bioinorganic Chemistry
Hours/Cycle 5	Total Hours 75	Credits 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	CO1	Revive the role of metal ions in biological systems.
K2	CO2	Realize the physiology and functions of haemoglobin and myoglobin
K3	CO3	Integrate the structure and functions of metalloenzymes
K4	CO4	Study the functions and toxicity of elements in biological systems

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>
<b>Batch: 2018 – 2020</b>		<b>Title: NME- Environmental Chemistry</b>
Hours / Week 5	Total Hours 75	Credits 5

#### **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</b>	<b>CO1</b>	Retain information about the composition of air and the concepts of green house effect and global warming
<b>K2</b>	<b>CO2</b>	Know the different sources of water pollutants and to understand the effects of water pollution
<b>K3</b>	<b>CO3</b>	Recognize the types and consequences of soil and radioactive pollutants
<b>K4</b>	<b>CO4</b>	Scrutinize the causes and harmful effects of thermal and soil pollution

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>
<b>Batch: 2018 – 2020</b>		<b>Title: NME- Scientific Thesis Writing and Paper Presentation</b>
Hours / Week 5	Total Hours 75	Credits 5

#### **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</b>	<b>CO1</b>	Know how to write the Introduction chapter of a thesis or dissertation
<b>K2</b>	<b>CO2</b>	Understand the guidelines for writing ‘Materials and Methods’ and ‘Results’ of a thesis
<b>K3</b>	<b>CO3</b>	Apply the strategies specified for writing ‘Discussion’ and ‘Abstract’
<b>K4</b>	<b>CO4</b>	Adopt the format for preparing manuscript for oral and poster presentation



<b>Programme Code: 4</b>		<b>Title : Chemistry</b>
<b>Batch: 2018 – 2020</b>		<b>Title: NME – Agricultural Chemistry</b>
Hours / Week 5	Total Hours 75	Credits 5

### Course Objectives

1. To introduce students to the concepts of agricultural chemistry.
2. To focus on the preparation, applications and toxic effects of fertilizers and pesticides.
3. On successful completion of the syllabus, the students should have known about the principles of soil science, applications and hazards of fertilizers, pesticides, fungicides and herbicides.

### Course Outcomes (CO)

<b>K1</b>	<b>CO1</b>	Remember the physical and chemical properties of soil, and different theories of nutrient supply to soil
<b>K2</b>	<b>CO2</b>	Understand the requisites and classification of fertilizers
<b>K3</b>	<b>CO3</b>	Relate the importance of nitrogenous and phosphate fertilizers
<b>K4</b>	<b>CO4</b>	Appraise the chemistry of pesticides

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>
<b>Batch: 2018 – 2020</b>		<b>Title: NME – Industrial Chemistry</b>
Hours / Week 5	Total Hours 75	Credits 5

#### **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</b>	<b>CO1</b>	Recall the raw materials used for the manufacture of several types of glass
<b>K2</b>	<b>CO2</b>	Understand the manufacturing process of cement
<b>K3</b>	<b>CO3</b>	Recognize the importance of nitrogenous fertilizers
<b>K4</b>	<b>CO4</b>	Assess the chemistry of paints and pigments

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

*Re-accredited by NAAC with 'A' Grade – 3.64 CGPA out of 4 (3rd Cycle)*

*College of Excellence (UGC)*

*Coimbatore – 641 029*

**DEPARTMENT OF CHEMISTRY (Unaided)**

**COURSE OUTCOMES (CO)**

**M.Sc. CHEMISTRY**

**For the students admitted**

**In the**

**Academic Year 2019-2020**

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code: 19PCH101</b>		<b>Title: C.P.1- Organic Chemistry - I</b>		
Batch 2019-2020	Semester I	Hours/Week 5	Total Hours 75	Credits 5

### 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</b>	<b>CO1</b>	Remember the rules of aromaticity, postulates of different types of reaction mechanism and retain information about some intermediate compounds
<b>K2</b>	<b>CO2</b>	Understand the mechanisms of electrophilic and nucleophilic substitution reactions
<b>K3</b>	<b>CO3</b>	Apply the guidelines of retro synthetic approach in solving problems in the planning of organic synthesis
<b>K4</b>	<b>CO4</b>	Sketch and analyze the synthesis of some terpenoid compounds

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code : 19PCH102</b>		<b>Title: C.P.2 - Inorganic Chemistry - I</b>		
Batch 2019-2020	Semester I	Hours/Week 6	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	CO1	Take into account the periodic properties of atoms and theories of acids and bases
K2	CO2	Appreciate the structures of some ionic solids and spinels
K3	CO3	Apply the theory of X-Ray Diffraction to solve the structure of a cubic system
K4	CO4	Analyze the properties of <i>f</i> -block elements and applications of radioisotopes

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code : 19PCH203</b>		<b>Title: C.P.3 - Physical Chemistry - I</b>		
Batch 2019-2020	Semester II	Hours/Week 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	CO1	Keep in mind different symmetry operations and recollect rate of chemical reactions
K2	CO2	Realize the relationship between symmetry and point groups and differences between homogenous and heterogeneous catalysis, and polymer kinetics
K3	CO3	Predict degeneracy, to classify vibrational modes and determine rate of different reactions
K4	CO4	Investigate various adsorption isotherms and evaluate kinetics of polymerization reaction

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code: 19PCH204</b>		<b>Title: C.P.4 - Organic Chemistry-II</b>		
Batch 2019-2020	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</b>	<b>CO1</b>	Recollect the basic mechanism of addition and elimination reactions.
<b>K2</b>	<b>CO2</b>	Comprehend different types of notations in stereochemistry
<b>K3</b>	<b>CO3</b>	Relate correlation and FMO approach for electrocyclic, cycloaddition and Sigmatropic reactions.
<b>K4</b>	<b>CO4</b>	Analyze the structural elucidations of some alkaloids

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code : 19PCH205</b>		<b>Title: C.P.5 - Inorganic Chemistry - II</b>		
Batch 2019-2020	Semester II	Hours/Week 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	CO1	Bear in mind the nomenclature of coordination compounds and the postulates of Crystal Field Theory and Molecular Orbital Theory
K2	CO2	Understand Term symbols, Orgel and Tanabe-Sugano diagrams of coordination complexes
K3	CO3	Formulate the mechanism of reactions of transition metal complexes
K4	CO4	Explore the role of metals in biology and study about several bioinorganic compounds



<b>Programme Code: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code : 19PCH2CL</b>		<b>Title: C.Pr.1 - Organic Chemistry Practical- I</b>		
Batch 2019-2020	Semester I & II	Hours/Week 5	Total Hours 120	Credits 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)**

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

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code : 19PCH2CM</b>		<b>Title: C.Pr.2 - Inorganic Chemistry Practical- I</b>		
Batch 2019-2020	Semester I and II	Hours / Cycle 5	Total Hours 120	Credits 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)**

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

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code : 19PCH2CN</b>		<b>Title: C.Pr.3 - Physical Chemistry Practical I</b>		
Batch 2019 - 2020	Semester I & II	Hours / Cycle 5	Total Hours 120	Credits 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: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code : 19PCH306</b>		<b>Title: C.P.6 - Physical Chemistry - II</b>		
Batch 2019-2020	Semester III	Hours/Week 6	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	CO1	Recall the postulates of quantum mechanics and compare classical and quantum mechanical principles
K2	CO2	Realize and derive Schrodinger wave equation for harmonic oscillators
K3	CO3	Employ perturbation and variation method to Helium atom
K4	CO4	Probe different electrochemical theories and examine the methods of coulometry, voltametry and polarography

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code : 19PCH307</b>		<b>Title: C.P.7 - Spectroscopy</b>		
Batch 2019-2020	Semester III	Hours/Week 5	Total Hours 75	Credits 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	CO1	Recur the selection rules in IR spectroscopy
K2	CO2	Know the rules for solving UV spectrum of a compound
K3	CO3	Investigate the fragmentation pattern in a mass spectrum and determine the structural information of some compounds
K4	CO4	Scrutinize the $^1\text{H}$ and $^{13}\text{C}$ NMR spectra of simple organic molecules

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code: 19PCH308</b>		<b>Title: C.P.8 - Organic Chemistry-III</b>		
Batch 2019-2020	Semester III	Hours/Week 5	Total Hours 75	Credits 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</b>	<b>CO1</b>	Remember the various types of molecular rearrangements
<b>K2</b>	<b>CO2</b>	Understand the synthetic utility of different reagents in oxidation and reduction reactions
<b>K3</b>	<b>CO3</b>	Elucidate the structure of selected steroids and vitamins
<b>K4</b>	<b>CO4</b>	Appraise the chemistry of some important reagents for organic synthesis

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code : 19PCH309</b>		<b>Title: C.P.9 - Inorganic Chemistry -III</b>		
Batch 2019-2020	Semester III	Hours/Week 6	Total Hours 75	Credits 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)

K1	CO1	Reminisce about the rules for classifying organometallic compounds
K2	CO2	Apprehend the structure and reaction mechanism of various organometallic complexes
K3	CO3	Apply some spectroscopic techniques for solving the structures of inorganic compounds
K4	CO4	Inquest the formation and structures of various inorganic polymeric compounds

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code: 19PCH3CO</b>		<b>Title: C. Pr.4 - Physical Chemistry Practical - II</b>		
Batch 2019-2020	Semester III	Hours/Week 4	Total Hours 60	Credits 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: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code : 19PCH410</b>		<b>Title: C.P.10 - Physical Chemistry - III</b>		
Batch 2019-2020	Semester IV	Hours/Week 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	CO1	Place in mind the second and third law of thermodynamics
K2	CO2	Appreciate the theories of probability and thermodynamic probability
K3	CO3	Apply thermodynamic quantities for deriving distribution laws and partition functions
K4	CO4	Review the various photophysical processes taking place in excited molecules

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code : 19PCH4CP</b>		<b>Title: C.Pr.5 - Organic Chemistry Practical- II</b>		
Batch 2019-2020	Semester III and IV	Hours/Cycle 5	Total Hours 120	Credits 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)**

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

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>		
<b>Course Code : 19PCH4CQ</b>		<b>Title: C.Pr.6 - Inorganic Chemistry Practical- II</b>		
Batch 2019-2020	Semester III & IV	Hours/Week 5	Total Hours 120	Credits 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)**

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

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>
<b>Course Code : 19PCH4Z1</b>		<b>Title: Project work &amp; viva-voce</b>
Batch 2019-2020	Semester III & IV	Credits 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)**

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

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>
<b>Batch : 2019-2020</b>		<b>Title: ME- Analytical Chemistry</b>
Hours/Cycle 5	Total Hours 75	Credits 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	CO1	Keep in mind the concepts of mean, median, standard deviation, etc.,
K2	CO2	Comprehend the principles and instrumentation of chromatographic methods and various thermoanalytical methods
K3	CO3	Relate ESR and Mossbauer spectroscopy for the identification of metal complexes
K4	CO4	Probe the principle and applications of ORD and CD

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>
<b>Batch: 2019-2020</b>		<b>Title: ME- Polymer Science and Technology</b>
Hours/Cycle 5	Total Hours 75	Credits 5

### Course Objectives

1. To gain knowledge in polymer chemistry.
2. To introduce the structure, properties and uses of various polymers, fibres and elastomer
3. To understand about various properties of polymers, fibres, elastomers and their applications in industries

### Course Outcomes (CO)

K1	CO1	Remember the preparation and properties of some important polymers
K2	CO2	Empathize the process of fabrication
K3	CO3	Realize the applications of fibre and elastomer technology in the field of industries
K4	CO4	Explore the chemistry of elastomers

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>
<b>Batch: 2019-2020</b>		<b>Title: ME - Green and Nano Chemistry</b>
Hours/Cycle 5	Total Hours 75	Credits 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	CO1	Memorize the twelve basic principles of green chemistry
K2	CO2	Appreciate the concept of supramolecular chemistry
K3	CO3	Appraise the chemistry of nanomaterials
K4	CO4	Examine the applications and environmental hazards of nanomaterials

<b>Programme Code: 4</b>		<b>Title :</b> Chemistry
<b>Batch:</b> 2019-2020		<b>Title:</b> ME - 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	CO1	Revive the role of metal ions in biological systems.
K2	CO2	Realize the physiology and functions of haemoglobin and myoglobin
K3	CO3	Integrate the structure and functions of metalloenzymes
K4	CO4	Study the functions and toxicity of elements in biological systems



<b>Programme Code: 4</b>		<b>Title : Chemistry</b>
<b>Batch: 2019 – 2020</b>		<b>Title: NME-Chemistry of Environment</b>
Hours / Week 5	Total Hours 75	Credits 5

#### **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</b>	<b>CO1</b>	Retain information about the composition of air and the concepts of green house effect and global warming
<b>K2</b>	<b>CO2</b>	Know the different sources of water pollutants and to understand the effects of water pollution
<b>K3</b>	<b>CO3</b>	Recognize the types and consequences of soil and radioactive pollutants
<b>K4</b>	<b>CO4</b>	Scrutinize the causes and harmful effects of thermal and soil pollution

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>
<b>Batch: 2019 – 2020</b>		<b>Title: NME- Scientific Thesis Writing</b>
Hours / Week 5	Total Hours 75	Credits 5

#### **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</b>	<b>CO1</b>	Know how to write the Introduction chapter of a thesis or dissertation
<b>K2</b>	<b>CO2</b>	Understand the guidelines for writing 'Materials and Methods' and 'Results' of a thesis
<b>K3</b>	<b>CO3</b>	Apply the strategies specified for writing 'Discussion' and 'Abstract'
<b>K4</b>	<b>CO4</b>	Adopt the format for preparing manuscript for oral and poster presentation

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>
<b>Batch: 2019 – 2020</b>		<b>Title: NME – Agricultural Chemistry</b>
Hours / Week 5	Total Hours 75	Credits 5

#### **Course Objectives**

1. To introduce students to the concepts of agricultural chemistry.
2. To focus on the preparation, applications and toxic effects of fertilizers and pesticides.
3. On successful completion of the syllabus, the students should have known about the principles of soil science, applications and hazards of fertilizers, pesticides, fungicides and herbicides.

#### **Course Outcomes (CO)**

<b>K1</b>	<b>CO1</b>	Remember the physical and chemical properties of soil, and different theories of nutrient supply to soil
<b>K2</b>	<b>CO2</b>	Understand the requisites and classification of fertilizers
<b>K3</b>	<b>CO3</b>	Relate the importance of nitrogenous and phosphate fertilizers
<b>K4</b>	<b>CO4</b>	Appraise the chemistry of pesticides

<b>Programme Code: 4</b>		<b>Title : Chemistry</b>
<b>Batch: 2019 – 2020</b>		<b>Title: NME – Industrial Chemistry</b>
Hours / Week 5	Total Hours 75	Credits 5

#### **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</b>	<b>CO1</b>	Recall the raw materials used for the manufacture of several types of glass
<b>K2</b>	<b>CO2</b>	Understand the manufacturing process of cement
<b>K3</b>	<b>CO3</b>	Recognize the importance of nitrogenous fertilizers
<b>K4</b>	<b>CO4</b>	Assess the chemistry of paints and pigments