Hajee Karutha Rowther Howdia College

(Autonomous)

Uthamapalayam 625 533, Theni District.

Department of Chemistry

Programme Specific Outcomes (PSOs)

Programme Outcomes (POs)

Course Outcomes (COs)

B.Sc. Chemistry

Programme Specific Outcomes (PSOs):

PSO1: Expertise in Chemistry: Will be able to nurture the needs of industries / laboratories related to chemistry including pharmaceutical / analytical chemistry

PSO2: Professional Growth: Will be able to demonstrate information literacy skillsfor acquiring knowledge of chemistry, as a chemist/researcher and also as a life-long learner

PSO3: Analytical Skills: Will be able to communicate effectively the scientific information and research results in written and oral formats, to both professional scientists and to the public

PSO4: Research Skills: Will be able to do research

PSO5: Employability and Leadership: Students will be equipped with the life-long learning process for self-sustainability, employability and leadership roles in our dynamic society.

Programme Outcomes (POs):

PO1: Recall the knowledge of organic, inorganic, physical, thermodynamics, nuclear chemistry, polymers, photochemistry, nanostructure materials, drugs, catalysis, colloids, electrochemistry, cheminformatics and chemotherapy.

PO2: Explain the experiments in the area of physical chemistry experiments, preparation, estimation and analysis of organic and inorganic compounds.

PO3: Develop critical thinking, analytical reasoning, problem-solving techniques and innovative methods to design and perform experiments.

PO4: Create an awareness of the impact of chemistry in various disciplines like biological, biodiversity, pollution, disaster management, environment, forensic, analytical and pharmaceutical fields. Use communication skills with comprehensive subject knowledge for competitive examinations.

PO5: Pursue post graduate program in higher educational institutions and also to get suitable employment opportunities in industries and academic institutions.

Course Outcomes (COs):

Course Code: 20UCHC11	**Course Title:** General Chemistry – I

Course Outcomes (COs):

CO1: Recall IUPAC nomenclature, classification of organic compounds and outline the uses of methane, ethane, ethylene, propene and acetylene

CO2: Demonstrate the detection of nitrogen, Sulphur and halogens in organic compounds

CO3: Spell the atomic structure of atom and related theories and concepts

CO4: Develop the knowledge to adopt safety measures in laboratory

CO5: Identify the preparation, properties and applications of colloids

Course Code: 20UBYA11	**Course Title:** Ancillary Botany - I

Course Outcomes (COs):

CO1: Illustrate the structure, life cycle of Nostoc, Sargassum and economic importance of algae.

CO2: Explain the structure, lifecycle of Fungi with the reference of Saccharomyces, Agaricus and economic importance, listing the general features of Bacteria and its economic importance.

CO3: Compare and contrast the general structure and life cycle of Funaria, Selaginella and Pinus.

CO4: Discuss the physiological process and mechanism of transpiration,photo synthesis and respiration

CO5: Interpret the adaptation of hydrophytes, xerophytes and factors affecting the vegetations.

Course Code: 20UZYA11	**Course Title:** General Zoology (Ancillary Zoology - I)

Course Outcomes (COs):

CO1: Find and characteristic features, morphology and classification the classify aceolomates .

CO2: Explain and classify pseudocoelomates.

CO3: Outline the economic importance and evolutionary significance of Phylum Arthropoda, Mollusca and Echinodermata.

CO4: Illustrate the Identify Prochordates, Pisces and Amphibians.

CO5: Compare poisonous and non-poisonous snakes and explain the adaptive features in Aves and Mammalia.

Course Code: 20UCHC21	**Course Title:** General Chemistry – II

Course Outcomes (COs):

CO1: Explain the Kinetic theory of gases, molecular velocities, Maxwell- Boltzmann distribution and viscosity

CO2: Compare the behavior of real and ideal gases and interpret the Critical phenomenon

CO3: Identify the preparation, properties and uses of hydrides, oxides and outline the redox reactions

CO4: Utilize the fundamental concepts and theories of electrochemistry

CO5: Analyze the reaction mechanism in relation to nucleophilic substitution, elimination, rearrangement and polymerization reactions

Course Code: 20UCHC2P	**Course Title:** Inorganic Semi Micro Qualitative Analysis

Course Outcomes (COs):

CO1: Analyze the acid radicals present in any given inorganic salt

CO2: Plan to eliminate the interfering acid radicals

CO3: Identify the basic radical and its group

CO4: Identify various colored chemical reactions of metalions

CO5: Develop analytical skills in inorganic qualitative analysis and Laboratory safety

Course Code: 20UBYA21	**Course Title:** Ancillary Botany – II

Course Outcomes (COs):

CO1: Outline the classification off lowering plants with its economic importance and medicinal uses of some medicinal plants

CO2: Illustrate the ultra structure of plant cell and its organelles and solve men deli an genetics

CO3: Interpret the structure of simple and complex permanent issues and compare the primary structure of dicot plants with monocot plants.

CO4: Explain the structure of anther, male game to phyte, female game to phyte and dicot embryo and extend the knowledge on the pollination, fertilization, types of ovules and Parthen ogenesis.

CO5: Build Plant Tissue Culture methods and production of bio diesel and biogas.

Course Code: 20UBYA2P	**Course Title:** Ancillary Botany Practical

Course Outcomes (COs):

CO1: Observe the morphology and anatomy of Thallophyta, Bryophyta, Pteridophyta and Gymnospermae

CO2: Define the floral characters of Angiosperm plants and find them with suitable locally available plants

CO3: Compare an atomy of dicot stem with monocot stem

CO4: Re call the structure of cell organelles, show how to solve men delian genetics and find the tools used in Plant tissue culture

CO5: Demonstrate the Physiology setup and identify ecological adaptations of plants

Course Code: 20UZYA21	**Course Title:** Animal Organisation (Ancillary Zoology - II)

Course Outcomes (COs):

CO1: Recall that provides basic understanding of principles of animal taxonomy

CO2: Explain invertebrate and chordates organ systems

CO3: Illustrate the adaptations invertebrate and chordate animals

CO4: Experiment with nerve co-ordination on different animals sensoryorgans

CO5: Analyze and classify invertebrate and chordates excretion systems

Course Code: 20UZYA2P	**Course Title:** General Zoology & Animal Organisation (Ancillary Zoology)

Course Outcomes (COs):

CO1: Acquire knowledge on structural organization and skeletal system in Invertebrates and Chordates.

CO2: Identify and classify Protozoa, Porifera and Coelenterata.

CO3: Assess the importance of phyla, Arthropoda - Mollusca and Echinoderms.

CO4: Knowledge on morphological and anatomical features of ediblefishes.

CO5: Explain the architecture of skull, girdles and vertebrae in Chordates.

Course Code: 20UCHC31	**Course Title:** Organic and InorganicChemistry

Course Outcomes (COs):

CO1: Comprehend the preparation, properties and mechanism ofalcohols, ethers, thioalcohols and thioethers.

CO2: Explain the aromaticity of organic molecules and predict the reactivity and orientation of electrophiles and nucleophiles during the chemical reactions

CO3: Outline the preparation, properties and uses of aromatic hydrocarbons and aromatic halogen compounds

CO4: Predict the hybridization and geometry of molecules based on VB and VSEPR theories and explain the molecular orbital theory (MOT) of homo and heteronuclear diatomic molecules

CO5: Explain the basic concepts of nuclear chemistry

Course Code: 20UCHC32	**Course Title:** Physical Chemistry – I
Course Outcomes (COs): **CO1:** Recognize the structure and defects of solids **CO2:** Predict chemical reaction orders using kinetics **CO3:** Describe the theories of chemical reaction rate **CO4:** Summarize the different categories of surface phenomena and catalysis **CO5:** Explain the physical and chemical properties of liquids	

Course Code: 20UPHA11	**Course Title:** Mechanics, Properties of Matter and Sound (Ancillary Physics - I)
Course Outcomes (COs): **CO1:** Analyze the laws of motion and central force **CO2:** Discuss the centre of mass of a rigid body-motion **CO3:** Discuss the variation of acceleration due to gravity **CO4:** Understand the properties of matter like elasticity and viscosity **CO5:** Discuss the Properties of Sound Waves	

Course Code: 20UCHC41	**Course Title:** Organic and Physical Chemistry
Course Outcomes (COs): **CO1:** Relish the concept, grasp the preparation, properties and applications of aromatic nitro andamino compounds **CO2:** Insight on some advanced organic name reactions and various factors influencing the acidity of phenols **CO3:** Comprehend the effect of substituents on acidiccharacter of aromatic acids. **CO4:** Illustrate the phase diagram of differentchemical systems **CO5:** Outline the fundamentals of first lawof thermo dynamics.	

Course Code: 20UCHC42	**Course Title:** Inorganic Chemistry - I
Course Outcomes (COs): **CO1:** Explain the various metallurgical processes involved in the metal extraction **CO2:** Apply the basic concepts and theories of acids and bases and their properties. **CO3:** Comprehend the properties and structure of allotropes of carbon, silicates and carbon compounds and acquire the knowledge on preparation, properties and uses of nitrogen compounds **CO4:** Name the basic terms, nomenclature involved in coordination compounds and explain the theories of coordination compounds **CO5:** Gain knowledge on structure and functions of hemoglobin and my oglobin	

Course Code: 20UCHC4P	**Course Title:** Volumetric Analysis
Course Outcomes (COs): **CO1:** Apply acidimetric and alkali metric method for the quantitative volumetric estimation of acids and bases **CO2:** Estimate the amount of sample by permanganometry andDichrometry **CO3:** Estimate the amount of sample by Iodometry **CO4:** Demonstrate the quantitative estimation of analyte by precipitation titration **CO5:** Estimate the hardness of water by Complexometric Tltratlons	

Course Code: 20UPHA21	**Course Title:** Optics, Spectroscopy and Electronics (Ancillary Physics - II)
Course Outcomes (COs): **CO1:** Know the different types of lenses, principal points, cardinal points and the equivalent focal length of the lens system. **CO2:** Learn the principles of Interference, Diffraction and polarization and the experiments related to them. **CO3:** Understand the concept of optical rotation **CO4:** Gain a sound knowledge in semiconductor Physics, types of diodes, working of rectifiers and filters. **CO5:** Construct logic gates using discrete components and IC`s and to calculate their output voltage.	

Course Code: 20UPHA2P	**Course Title:** Ancillary Physics Practical
Course Outcomes (COs): **CO1:** Estimate the value of Young's modulus of a given wooden scale, the value of Rigidity modulus of a given wire and determine acceleration due to gravity. **CO2:** Estimate the viscosity of a given liquid and Comparison of capacitances using B.G and Owen's bridge **CO3:** Demonstration of interference patterns **CO4:** Experiments related to sound and light **CO5:** Verification of some simple digital circuits	

M.Sc. Chemistry

Programme Specific Outcomes (PSOs):

PSO1: Outline the essential parts of advanced fields of chemistry and pursue higher studies.

PSO2: Perform as employers in private/government institutions rising up to top positions by applying the learned concepts of chemical science.

PSO3: Utilize modern research and technological skills amongst the master students in order to become professionals and leaders in the various sectors of Chemical science.

PSO4: Recognize the importance of utilizing their research knowledge, skills, and initiative for the benefit of society.

PSO5: Participate and succeed in various state, national and international level competitive examinations to get suitable employment in government and lobal research sectors.

Programme Outcomes (POs):

PO1: Understand the essential parts of organic, inorganic, and physical chemistry.

PO2: Categorize and apply the concepts of medicinal, environmental, nano, industrial, polymer, supra molecular and Computer Chemistry in real life situations.

PO3: Utilize basic analytical and technical skills in the various fields of chemistry to become as academically sound researchers and intellectuals.

PO4: Formulate novel research ideas in different areas of chemistry to solve various challenges of the society

PO5: Participate and succeed State, National and International eligibility exams to get suitable employment in various sectors.

Course Outcomes (COs):

Course Code: 20PCHC11	**Course Title:** Organic Chemistry – I

Course Outcomes (COs):

CO1: Understand the concept of chemical delocalization, aromaticity and intermediates in the chemical reaction

CO2: Classify and explain the types of intermediates and methods of determining organic reaction mechanism

CO3: Analyze the reaction mechanism in relation to nucleophilic substitution reactions

CO4: Determine the mechanism for elimination reactions

CO5: Interpret and distinguish reaction mechanism of various addition reactions

Course Code: 20PCHC12	**Course Title:** Inorganic Chemistry –I

Course Outcomes (COs):

CO1: Comprehend the electronic structure of atom and periodic properties of elements.

CO2: Explain and compare the concepts of chemical bonding.

CO3: Apply the concepts of VB, MO and VSEPR theory to determine the structure of molecules.

CO4: Illustrate acid-base concepts, its measures and to evaluate various effects on acid base strength.

CO5: Experiment with different types of nuclear reactions, nuclear reactors and to list various nuclear waste disposal and safety measures.

Course Code: 20PCHC13	**Course Title:** Physical Chemistry-I

Course Outcomes (COs):

CO1: Explain the properties of gases, liquid crystals, theory of thermodynamic equilibrium and non- equilibrium.

CO2: Compare the thermodynamic equilibrium and non-equilibrium studies.

CO3: Apply the concepts and fundamentals of quantum chemistry.

CO4: Evaluate the quantum chemistry concepts and their applications.

CO5: Develop their knowledge in application of SWE to many electron systems

Course Code: 20PCHE11	**Course Title:** Medicinal and Pharmaceutical Chemistry

Course Outcomes (COs):

CO1: Tell the fundamentals of medicinal chemistry, QSAR, bio-isoterism, receptor and enzyme inhibitors as drugs.

CO2: Discover and evaluate Medicinally useful antibiotics and steroids

CO3: Classify the drugs such as Antineoplastic Agents, Anti-tubercular drugs, Antimalarial drugs and Diuretics.

CO4: Plan the synthesis drugs such as Antihypertensive drugs and Antihistamines.

CO5: Justify the basic concepts of Anti-inflammatory drugs, CNS stimulant drugs and CNS depresents drugs.

Course Code: 20PCHE21	**Course Title:** C-Programming: Fundamentals and Applications in Chemistry

Course Outcomes (COs):

CO1: Recall and explain the basics of C Programming; especially the operators, functions and expressions.

CO2: Build a program using proper data input and output logics.

CO3: Develop a program using the decision making looping logics.

CO4: Construct the C Programs for solving the problems by chemical formula translation.

CO5: Evaluate C programs to computer the output for chemical formula in organic, inorganic and physical chemistry.

Course Code: 20PCHC1P	**Course Title:** Organic Chemistry practical

Course Outcomes (COs):

CO1: Gain practical skill to identify the organic molecules.

CO2: Separate the organic mixture by chemical methods.

CO3: Estimate the amount of glucose and amino acid viz., glycine and formaldehyde

CO4: Apply iodometric method to estimate Ketonic compound.

CO5: Preparethe derivatives for the given organic compound.

Course Code: 20PCHC21	**Course Title:** Organic Chemistry –II

Course Outcomes (COs):

CO1: Explain the fundamentals of UV-Vis and IR spectroscopy.

CO2: Make use of the basic principles underlying NMR spectroscopy and its application in structural elucidation.

CO3: Apply the concept of mass spectroscopy, ORD and CD in analyzing and determining the structure of organic molecules.

CO4: Examine organic stereochemistry vis-à-vis optical and geometrical isomerism.

CO5: Determine the conformational analysis of cyclic, acyclic and heterocyclic system.

Course Code: 20PCHC22	**Course Title:** Inorganic Chemistry –II

Course Outcomes (COs):

CO1: Describe supramolecular chemistry of transition metal compounds, structure and their application in various fields.

CO2: Analyze the structure and defects of solids.

CO3: Compare and solve the structures of Borone, S- N, P-N of inorganic rings, cages, clusters and polymers.

CO4: Categorize the given S-N, P-N, silicone, P-O compounds and deduce their structure.

CO5: Make use of the occurance, extraction, spectral and magnetic properties of anthanides and actinides.

Course Code: 20PCHC23	**Course Title:** Physical Chemistry –II

Course Outcomes (COs):

CO1: Summarise the fundamental concepts and theories of electrochemistry.

CO2: Make use of the applications of electrochemistry.

CO3: Identify the need and fundamental derivation of statistical thermodynamics.

CO4: Examine the applications of statistical thermodynamics.

CO5: Apply the concepts of spectroscopic techniques such as IR, Raman and microwave.

Course Code: 20PCHE21	**Course Title:** Analytical Chemistry

Course Outcomes (COs):

CO1: Outline the principles of Precipitation Techniques and their applications

CO2: Make use of the minimization of errors, standard deviation, Student's test, Q test and T-test

CO3: Examine the electroravimetry, Coulometry, Voltammetry and Amperometry

CO4: Utilize the thermal analyses such as TGA, DTA and DSC.

CO5: Evaluate fundamental concepts and applications of spectroanalytical methods.

Course Code: 20PCHE22	**Course Title:** Computer applications in Chemistry

Course Outcomes (COs):

CO1: Outline Internet protocols, online usage of internet, search engine, e-publication and electronic mail.

CO2: Make use of HTML and Java programs to chemistry.

CO3: Analyze the chemical structures in scientific manner and get the mass and NMR simulations; and also get an idea about computational chemistry.

CO4: Apply the knowledge of diffraction techniques to the study of structural chemistry; and understand the applications of shelx and PLATON software in crystallography.

CO5: Evaluate the application of RASMOL and MATLAB in chemistry.

Course Code: 20PCHC2P	**Course Title:** Physical Chemistry Practical

Course Outcomes (COs):

CO1: Carryout the various types of conductometric titrations.
CO2: Do the various types of potentiometric titrations.
CO3: Develop analytical skill on adsorption experiments.
CO4: Apply colorimetric estimation techniques.
CO5: Identify various types of potentiometric titrations.

Course Code: 20PCHC31	**Course Title:** Organic Chemistry – III

Course Outcomes (COs):

CO1: Make use of chemical reagents in various organic transformation such as oxidation, reduction, catalysis etc.,
CO2: Apply the concepts and mechanism of photochemical and thermal reactions of carbonyl, alkenes and conjugated pi electrons compounds.
CO3: Analyze the structure and activity of compounds with steroid skeleton and vitamins.
CO4: Explain the structure and synthesis of amino acids, peptides, proteins and nucleic acid.
CO5: Apply their knowledge to synthesis compounds in a greener way.

Course Code: 20PCHC32	**Course Title:** Inorganic Chemistry –III

Course Outcomes (COs):

CO1: Explain various theories and properties of co-ordination compounds.
CO2: Examine the mechanism of co-ordination compounds.
CO3: Apply inorganic photochemical reactions to evaluate the reaction path and in photochemical energy conversion like solar cell, fuel cell etc.
CO4: Outline the basic principles and instrumentation of spectral techniques like IR, Raman, NMR, NQR and electronic spectroscopy and analyze their application in determining the structure and property of Inorganic compound/complexes
CO5: Outline the principles of various spectral techniques like EPR, PES, IR, MBS etc and interpretation of the spectra.

Course Code: 20PCHC33	**Course Title:** Physical Chemistry-III

Course Outcomes (COs):

CO1: Summarise the fundamentals of group theory.
CO2: Analyze the applications of group theory.
CO3: Interpret the physical concepts of electronic and Photo electron Spectroscopy.
CO4: Apply the theory and applications of ESR, Mossbauer and NQR Spectroscopic techniques.
CO5: Summarize the preparation, characterization and evaluate application of nano particles.

Course Code: 20PCHC3P	**Course Title:** Inorganic Chemistry Practical

Course Outcomes (COs):

CO1: Estimate the amount of metal ions such as like Zinc, Magnesium and Copper present in the given solution by EDTA volumetric method.
CO2: Calculate the amount of Nickel ions present in the given solution by direct and indirect EDTA volumetric methods.
CO3: Analyse the familiar cations present in the given mixture of salts.
CO4: Analyse the less familiar cations present in the given salt mixture
CO5: Acquire the laboratory skill of quantitative as well as qualitative analysis of metal ions.

Course Code: 20PCHC41	**Course Title:** Organic Chemistry- IV

Course Outcomes (COs):

CO1: Outline the chemistry of nitrogen and oxygen containing heterocyclic compounds and natural products.
CO2: Apply their knowledge on isolation, biological activity and structural studies of selective terpenoids and alkaloids
CO3: Outline synthetic route for complex organic molecules which find medicinal, industries of commercial importance.
CO4: Evaluate various methods to synthesize optically active compounds.
CO5: Apply their knowledge in writing the mechanism of molecular rearrangement reaction.

Course Code: 20PCHC42	**Course Title:** Inorganic Chemistry- IV

Course Outcomes (COs):

CO1: Define the terms EAN, 18, 16-electron rule classify the organometallic compounds, structure and properties of organimetallic compounds such as metallocenes, alkenes, alkynes and arene complexes.
CO2: Discover and evaluate the synthesis, structure and reactivity of organometallic compounds
CO3: Explain the structures and work functions of iron- sulphur proteins, blue copper proteins and cytochrome
CO4: Classify the Carboxypeptidase A, carbonic anhydrase, elements in biological systems. - metals used for diagnosis
CO5: Develop their knowledge in physical features of biochemistry.

Course Code: 20PCHC43	**Course Title:** Physical chemistry-IV

Course Outcomes (COs):

CO1: Understand the fundamental concepts on kinetics and reaction rate.
CO2: Develop knowledge on various theories of chemical kinetics.
CO3: Analyze the physical concepts of photochemistry.
CO4: Make use of the kinetics and theories of surface chemistry.
CO5: Explain the concepts of biophysical chemistry.

Course Code: 20PCHE41	**Course Title:** Polymer chemistry

Course Outcomes (COs):

CO1: Outline the fundamentals of classification of polymers and chemistry of polymerization

CO2: Develop knowledge on various types of individual polymers.

CO3: Analyze the properties of polymers.

CO4: Make use of the polymerization techniques and degradation of polymers.

CO5: Explain the basics and applications polymer processing.

Course Code: 20PCHE42	**Course Title:** Conducting Polymers

Course Outcomes (COs):

CO1: Summarise the basic concepts and synthetic methods of polymers.

CO2: Analyze the electrochemical synthesis of polymers.

CO3: Apply the concepts of semiconducting and metallic polymers

CO4: Interpret the change in electronic properties of polymer by doping.

CO5: Apply the concepts of conducting polymers in catalysis

Course Code: 20PCHC4P	**Course Title:** Project- Viva- Voce

Course Outcomes (COs):

CO1: Get skills on developing novel materials through new synthetic routes.

CO2: Characterize the materials using various analytical techniques.

CO3: Interpret the analytical data and able to correlate theoretical and experimental results.

CO4: Communicate the laboratory scientific results both in oral, written and electronic format to both chemists and non-chemists.

CO5: Learn research methodologies along with literature survey.