THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS), SIVAKASI – 626 123.

(Affiliated to Madurai Kamaraj University, Re-accredited with A Grade by NAAC,
College with Potential for Excellence by UGC and Mentor Institution under UGC PARAMARSH)

DEPARTMENT OF CHEMISTRY

UG DEGREE PROGRAMME IN CHEMISTRY

PROGRAMME EDUCATIONAL OBJECTIVES	
The Graduates will	
PEO1.	nurture the needs of industries/laboratories and become successful chemists in chemical, pharma, fireworks industries and pursue higher studies.
PEO2.	possess skills of keen observation and drawing logical inferences from the practical experiments.
PEO3.	emerge as a successful women entrepreneur to run small scale industries like toiletry products, cosmetics, printing and fireworks.
PEO4.	adopt safety measures in the laboratory and create awareness on environmental issues produced by chemicals.

PROGRAMME SPECIFIC OUTCOMES	
By the Completion of B.Sc Chemistry programme, the learners will be able to	
PSO1.	recall the comprehensive knowledge acquired in organic, inorganic, physical and applied chemistry.
PSO2.	utilize the critical thinking and logical reasoning to find solutions for chemical problems locally and globally.
PSO3.	develop skills in safe handling of apparatus, chemicals, maintain record and interpret the results of experiments.
PSO4.	utilize computers in data processing, chemical simulation and computational softwares for data analysis.
PSO5.	work in teams to arrive at solutions for problems in laboratories and environmental issues.
PSO6.	follow safe, ethical and responsible practices of chemistry in the society.
PSO7.	emerge as a self- paced and self-directed learner and recognize their responsibility in preserving the renewable resources.

COURSE OUTCOME

Core Course	
Course Code: GLCH11	**Course Title: INORGANIC CHEMISTRY-I**
On successful completion of the course, the learners should be able to	
CO1.	recall the principles behind hygiene and safety measures in laboratory, semi-micro methods, classification and periodic properties of elements, nuclear chemistry and theory of bonding.
CO2.	explain the principles of semi-micro qualitative analysis and theories of radioactivity
CO3.	illustrate the periodic properties and safety measures followed in the laboratory.
CO4.	apply the concepts of chemical bonding to deduce the geometry of molecules
CO5.	analyze the periodic properties of elements and adopt laboratory hygiene and safety.

Core Course	
Course Code: GLCH12	**Course Title: PHYSICAL CHEMISTRY-I**
On successful completion of the course, the learners should be able to	
CO1.	recall the principles underlying solid state chemistry, liquid crystals, colloids, photochemistry and kinetic theory of gases.
CO2.	classify the crystal structure, liquid crystal, photochemical process and different types of velocities.
CO3.	explain the kinetics of photo chemical reactions and theories of velocities.
CO4.	utilize the different laws for arriving at information regarding structure of molecules/crystals, mechanism & efficiency of reactions and molecular velocities
CO5.	analyze the properties of colloids, crystals, liquid crystals.

Core Course	
Course Code: GLCH21	**Course Title: ORGANIC CHEMISTRY - I**
On successful completion of the course, the learners should be able to	
CO1.	summarize the chemistry of alkanes, cyclo alkanes, cyclo alkenes, aliphatic halogen compounds and aliphatic nitrogen compounds.
CO2.	classify the organic compounds and name them according to the IUPAC system and the various types of organic reactions, intermediates
CO3.	compare the properties of alkanes and their derivatives.
CO4.	appraise the chemistry of petroleum products
CO5.	illustrate the preparation, properties and uses of aliphatic halogen derivatives and nitrogen compounds.

Core Course	
Course Code: GLCH2L	**Course Title: SEMI MICRO INORGANIC QUALITATIVE ANALYSIS**
On successful completion of the course, the learners should be able to	
CO1.	recall the principles behind semi micro qualitative analysis and adulteration of food materials.
CO2.	identify the anions and cations present in the mixture.
CO3.	apply the methods to eliminate various interfering radical.
CO4.	apply the intergroup separation to categorize the metal ions into different groups.
CO5.	elaborate about food adulteration and create awareness to the public about the adulterants in food materials.

Core Course	
Course Code: GLCH31	**Course Title: ORGANIC CHEMISTRY-II**
On successful completion of the course, the learners should be able to	
CO1.	recall the chemistry of aromatic and its substituted compounds.
CO2.	demonstrate the theory of aromatic hydrocarbons and aromatic substitution reactions.
CO3.	compare the reactions, properties and uses of aromatic hydrocarbons, nitro compounds, hydroxyl compounds and aromatic heterocyclic reactions.
CO4.	apply the mechanism of substituted aromatic compounds.
CO5.	analyze the orientation, aromaticity and non aromaticity nature of organic compounds.

Core Course	
Course Code: GLCH32	**Course Title: INORGANIC CHEMISTRY-II**
On successful completion of the course, the learners should be able to	
CO1.	recall definitions, principles & requirements of volumetric titrations and electronic configuration of d-block elements.
CO2.	summarize the concepts of acids and bases, reactions occurring in liquid NH_3, preparation and properties of d-block elements, metallic carbonyls and halogen compounds.
CO3.	apply VSPER theory to identify & describe the type and structure of halogen compounds & metallic carbonyls; apply EAN rule.
CO4.	analyze the relative acidity of HY and HOY molecules; compare the chemical reactions occurring in liquid NH_3 & H_2O and properties of d-block elements.
CO5.	evaluate the effect of pH and choose appropriate indicators to experiment different volumetric titrations.

Core Course	
Course Code: GLCH41	**Course Title: PHYSICAL CHEMISTRY-II**
On successful completion of the course, the learners should be able to	
CO1.	explain the principles, postulates, theories and concepts of quantum mechanics, catalysis, acids and bases, electrolytic conductance and summarizes the colligative properties of dilute solutions.
CO2.	describe about the operators, types of catalysis, acid- base titrations and electrolytes.
CO3.	the fundamental knowledge to derive Schrodinger's wave equation, expressions for colligative properties and kinetics for catalytic reactions
CO4.	develop problem solving skills in quantum mechanics, colligative properties, catalysis, ionic equilibria and electrochemistry.
CO5.	discuss the applications of solubility product principle, Kohlrausch's law and conductance measurements.

Core Course	
Course Code: GLCH4L	**Course Title: VOLUMETRIC ESTIMATION**
On successful completion of the course, the learners should be able to	
CO1.	apply the principles underlined in the volumetric analysis.
CO2.	categorize the types of volumetric titrations.
CO3.	analyze the water quality parameters
CO4.	estimate the metal ions by complexometric titrations.
CO5.	analyze the various parameters in soil.

Core Course	
Course Code: GLCH51	**Course Title: ORGANIC AND PHARMACEUTICAL CHEMISTRY**
On successful completion of the course, the learners should be able to	
CO1.	explain the concept of stereochemistry, spectroscopy and chemotherapy of organic compounds.
CO2.	identify the optical activity and assign the configuration to various organic molecules.
CO3.	summarize the applications of spectroscopic techniques.
CO4.	analyze the structure of the organic compounds using spectral technique.
CO5.	list out the activity and therapeutic uses of pharmaceutical drugs.

Elective Course	
Course Code: GLCH5E1	**Course Title: INORGANIC CHEMISTRY – III**
On successful completion of the course, the learners should be able to	
CO1.	restate the fundamentals of coordination chemistry, electron deficient compounds, bioinorganic chemistry and isolation, separation and properties of noble gas.
CO2.	apply the theories of co-ordination chemistry in complexes.
CO3.	classify the types, properties and structure of co-ordination complexes, boranes, silicones, silicates and xenon complexes.
CO4.	justify the importance of zero group elements and detect the structure of the complexes.
CO5.	explain the toxicity, role of metal ions and function of enzymes in living systems.

Elective Course	
Course Code: GLCH5E2	**Course Title: NON – CONVENTIONAL ENERGY RESOURCES**
On successful completion of the course, the learners should be able to	
CO1.	restate the fundamentals of energy science and different sources of energy.
CO2.	classify the sources of energy.
CO3.	explore the significance and applications of non conventional energy resources
CO4.	discuss the advantages and disadvantages of non conventional energy resources.
CO5.	create awareness on preserving the available non conventional energy resources.

Elective Course	
Course Code: GLCH5E3	**Course Title: PHYSICAL CHEMISTRY – III**
On successful completion of the course, the learners should be able to	
CO1.	recall the basic concepts of thermodynamics, polymers and group theory.
CO2.	illustrate the relationship between microscopic properties of molecules with macroscopic thermodynamic observables.
CO3.	apply the fundamentals to classify polymers, predict the mechanism of polymerization and symmetry elements in molecules.
CO4.	derive expressions for the thermodynamic Properties and construct the group multiplication table.
CO5.	develop problem solving skills in polymers and thermodynamics.

Elective Course	
Course Code: GLCH5E4	**Course Title: COMPUTER APPLICATIONS IN CHEMISTRY**
On successful completion of the course, the learners should be able to	
CO1.	summarise the fundamental concepts of C language.
CO2.	solve the chemistry problems by writing programs.
CO3.	discriminate various branching and looping.
CO4.	construct programs for various concepts of chemistry.
CO5.	draw chemical structures using Chem. Draw Software.

Core Course	
Course Code: GLCH5L1	**Course Title: PHYSICAL CHEMISTRY PRACTICAL**
On successful completion of the course, the learners should be able to	
CO1.	retrieve the procedures and instrumental operation applied in the practical tasks of Physical Chemistry
CO2.	adapt the micro scale handling in the laboratory in order to reduce the usage of chemicals.
CO3.	utilize their skills in carrying out physical chemistry laboratory techniques.
CO4.	record, review and analyse the observed experimental data.
CO5.	interpret the observed data following the laboratory ethics.

Core Course	
Course Code: GLCH6L1	**Course Title: ORGANIC ANALYSIS AND ESTIMATION**
On successful completion of the course, the learners should be able to	
CO1.	restate the basic concepts of organic estimation and preparation
CO2.	analyse the organic compounds
CO3.	estimate the amount of organic compound in solution
CO4.	design simple methodology of synthesizing organic compounds
CO5.	apply these techniques to carry out analysis in Research laboratories and industries

Core Course	
Course Code: GLCH61	**Course Title: PHYSICAL CHEMISTRY-IV**
On successful completion of the course, the learners should be able to	
CO1.	recall the basic concepts about electrochemical cells, molecular spectroscopy and kinetics.
CO2.	illustrate the relationship between chemical energy and electrical energy in an electrochemical cell.
CO3.	apply the EMF measurements for the determination of electrochemical and thermo chemical properties.
CO4.	solve the problems related to electrochemistry, chemical kinetics and spectroscopy.
CO5.	analyze about the interaction between electromagnetic radiation & matter, order & molecularity of reactions and applications of spectroscopy methods.

Core Course	
Course Code: GLCH62	**Course Title: PRINCIPLE AND APPLICATION OF ANALYTICAL TECHNIQUES**
On successful completion of the course, the learners should be able to	
CO1.	state the principle and theories of various analytical techniques.
CO2.	illustrate the different ways of minimizing experimental errors and statistical treatment of analytical data.
CO3.	apply various thermal and spectro analytical techniques for quantitative determination.
CO4.	compare the various chromatographic and spectroscopic techniques.
CO5.	analyze the chemicals qualitatively and quantitatively using spectroscopic techniques.

Elective Course	
Course Code: GLCH6E1	**Course Title: CHEMISTRY OF NATURAL PRODUCTS**
On successful completion of the course, the learners should be able to	
CO1.	outline the functions of amino acids and proteins, nucleic acids, carbohydrates, alkaloids and terpenoids.
CO2.	categorize various types of amino acids and proteins, nucleic acids, carbohydrates, alkaloids and terpenoids.
CO3.	explain the structure, synthesis, functions and metabolism of amino acids, proteins and nucleic acids.
CO4.	summarize the characteristics of alkaloids and terpenoids.
CO5.	discuss the biological importance of carbohydrates, amino acids and proteins, nucleic acids, alkaloids and terpenoids.

Elective Course	
Course Code: GLCH6E2	**Course Title: STEREOCHEMISTRY**
On successful completion of the course, the learners should be able to	
CO1.	recall the concepts of stereo chemical reactions.
CO2.	apply the stereochemistry in substitution reactions.
CO3.	discuss the importance of stereochemistry in elimination relations**.**
CO4.	illustrate the applications of stereochemistry in addition reactions.
CO5.	analyze and draw the conformations of acyclic and cyclic compounds

Core Practical	
Course Code: GLCH6L2	**Course Title: GRAVIMETRIC ESTIMATIONS AND INORGANIC PREPARATIONS**
On successful completion of the course, the learners should be able to	
CO1.	recall the basic principle behind gravimetric estimation, inorganic preparations, flame photometry **.**
CO2.	estimate metal ions using gravimetric techniques.
CO3.	prepare inorganic complexes.
CO4.	demonstrate flame photometry and identify cations by flame photometric method.
CO5.	assess the quality of pyrotechnic raw materials.

Allied Course	
Course Code: GLCH1A	**Course Title: FUNDAMENTALS OF CHEMISTRY**
On successful completion of the course, the learners should be able to	
CO1.	restate the fundamentals of organic chemistry, carbohydrates, analytical chemistry, metallurgy and dyes
CO2.	outline the importance and chemistry of carbohydrates and dyes.
CO3.	identify the suitable qualitative and quantitative methods for the analysis and separation of elements and radicals.
CO4.	explain the occurrence of ores and the various steps involved in the extraction of metals of ores.
CO5.	interpret the role of chromophores and auxochromes on the colour and constitution of dyes and hybridization.

Allied Course	
Course Code: GLCH2A	**Course Title: PHYSICAL AND INDUSTRIAL CHEMISTRY**
On successful completion of the course, the learners should be able to	
CO1.	restate the basic concepts of photochemistry, industrial and water chemistry, amino acids, proteins, chemical kinetics and catalysis.
CO2.	explain the chemistry of fuel gases, fertilizers, silicones, water and catalysis.
CO3.	classify photophysical process, fuel gases, fertilizers, silicones, hardness of water, amino acids, proteins, nucleic acids and catalysis.
CO4.	examine the biological importance of amino acids, proteins, peptides and nucleicacids
CO5.	explain the order of the reactions, mechanism and application of catalyst.

Allied Practical	
Course Code: GLCH2AL	**Course Title: VOLUMETRIC ESTIMATION**
On successful completion of the course, the learners should be able to	
CO1.	summarize the principles underlined in the volumetric analysis.
CO2.	estimate inorganic salts by titrations involving acidimetry - alkalimetry, permanganometry, dichrometry and complexometry.
CO3.	implement the volumetric principles for the estimation of the hardness of water.
CO4.	utilize EDTA as complexing agent for estimation of suitable cations.
CO5.	discriminate external and internal indicators and relate to the appropriate titration.

Allied Course	
Course Code: GLCH3A	**Course Title: FUNDAMENTALS OF CHEMISTRY**
On successful completion of the course, the learners should be able to	
CO1.	summarize the chemistry of Vitamins, carbohydrates, fertilizers, analytical chemistry, oils, fats, soaps and detergent.
CO2.	explain the physico-chemical properties of carbohydrates, oils, fats, vitamins, fertilizers, soaps and detergents.
CO3.	demonstrate the principles and manufacturing process of carbohydrates, oils, fats, fertilizers, soaps and detergents
CO4.	analyze the purity of chemical compounds using chromatographic, qualitative and quantitative methods.
CO5.	discuss the essentiality of vitamins and fertilizer in biological system.

Allied Course	
Course Code: GLCH4A	**Course Title: PHYSICAL AND INDUSTRIAL CHEMISTRY**
On successful completion of the course, the learners should be able to	
CO1.	acquire the basic idea on photochemistry, industrial chemistry, water technology, amino acids, proteins, nucleic acids, silicones and bioinorganic compounds.
CO2.	demonstrate the photophysical process, fuels, industrial techniques, silicones, water treatment, amino acids, proteins, nucleic acids and bioinorganic compounds.
CO3.	classify and analyze the hardness of water.
CO4.	identify the need of fuels, water treatment, nucleic acids, silicones and bioinorganic compounds.
CO5.	discuss the biological role of amino acids, proteins, photochemistry, metal complexes.

Allied Practical	
Course Code: GLCH4AL	**Course Title: VOLUMETRIC ESTIMATION**
On successful completion of the course, the learners should be able to	
CO1.	acquire skill in volumetric analysis.
CO2.	estimate inorganic salts by titrations involving acidimetry-alkalimetry, permanganometry, dichrometry and complexometry.
CO3.	estimate the metal ions using Complexometric titration.
CO4.	demonstrate the analysis of water and quality parameter.
CO5.	explain the principles underlying volumetric analysis

Non Major Elective Course	
Course Code: GLCH3N	**Course Title: CHEMISTRY IN DAILY LIFE**
On successful completion of the course, the learners should be able to	
CO1.	summarize the types of soaps and detergents, food chemistry, milk products and pharmaceutical chemistry.
CO2.	illustrate food preservation and processing techniques.
CO3.	identify the role of drugs, food adulteration and soaps and detergents in daily life.
CO4.	categorize different types of food adulterants and classification of drugs.
CO5.	discuss innovative ideas on drug synthesis and preventing food adulteration.

Non Major Elective Course	
Course Code: GLCH4N	**Course Title: INDUSTRIAL CHEMISTRY**
On successful completion of the course, the learners should be able to	
CO1.	recall the fundamentals of polymer chemistry, pyrotechnic chemistry, explosives, toiletry and household products.
CO2.	classify the resins, rubber, plastics, matches, pyrotechnic and explosives.
CO3.	explain the preparation and properties of polymer chemistry, pyrotechnic chemistry, explosives, toiletry and household products.
CO4.	identify the composition present in the matches, pyrotechnic and explosives.
CO5.	compare the resins, plastics and rubber.

Discipline Specific Course	
Course Code: GLCH4DSL	**Course Title: CHEMISTRY FOR ENTREPRENEURS - PRACTICALS**
On successful completion of the course, the learners should be able to	
CO1.	quote the raw materials in preparing toiletry and house hold products.
CO2.	explain the preparatory methods involved in the preparation.
CO3.	apply their skill in the small scale preparation of toiletry products.
CO4.	solve the problems during their preparatory work.
CO5.	assess the quality of the product following professional ethics.

Self Employment Courses	
Course Code: GLGV51	**Course Title: CAREER GUIDANCE AND SUBJECT VIVA**
On successful completion of the course, the learners should be able to	
CO1.	recall vocabulary in Tamil and English & basic concepts about general awareness.
CO2.	demonstrate skills in oral communication through subject viva.
CO3.	identify the inventors of Science and Technology inventions and stay updated on the latest inventions.
CO4.	apply the mathematical knowledge to solve different problems.
CO5.	analyze the problems related to mental ability and reasoning power.

Self Employment Courses	
Course Code: GLSE63	**Course Title: BASICS OF PRINTING PROCESSES**
On successful completion of the course, the learners should be able to	
CO6.	recall the basic principles of mini offset, screen, printing and modern printing processes.
CO7.	classify various printing processes.
CO8.	appraise the use of chemicals in printing industry.
CO9.	apply various modern printing processes and techniques.
CO10.	become an entrepreneur.

Self Employment Courses	
Course Code: GLSE63L	**Course Title: PRINTING PRIMER PRACTICAL**
On successful completion of the course, the learners should be able to	
CO1.	retrieve the printing technical skills.
CO2.	select specific process for various applications.
CO3.	prepare stencils and screen.
CO4.	able to operate printing machines.
CO5.	begin and run own printing press.

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DEPARTMENT OF CHEMISTRY

PG DEGREE PROGRAMME IN CHEMISTRY

PROGRAMME EDUCATIONAL OBJECTIVES The Graduates will	
PEO1.	apply the analytical skills to work effectively in pharmaceutical companies, fertilizer industries, material synthesis, glass industries, polymer industries and pursue research in reputed institutions.
PEO2.	employ critical thinking, scientific inquiry in the performance, design, interpretation and documentation of innovative research work.
PEO3.	run independently analytical laboratories, coaching centers for competitive examinations and play the role of consultant for chemical and fireworks manufacturing industries, clinical laboratories, printing and dyeing industries etc.
PEO4.	realize the social, economic, environmental and technological implications of chemistry.

PROGRAMME SPECIFIC OUTCOMES By the Completion of M.Sc Chemistry programme, the learners will be able to	
PSO1.	understand the concepts of organic, inorganic, physical, pharmaceutical, computational and analytical chemistry and apply them in their research.
PSO2.	identify, formulate and solve the problems by applying the concepts of chemistry.
PSO3.	design, develop and demonstrate the research problems related to safety, industrial, global, social and environmental issues.
PSO4.	defend the findings of research by communicating effectively and deliver messages and suggestions in national, international level seminars/symposium and conferences with the aid of videos and power point presentations.
PSO5.	play the role of team leader and imbibe the value based behaviors such as tolerance, to carry out research in team
PSO6.	be a responsible citizen with ethical and human values in research and related fields.
PSO7.	evolve as lifelong learners in their chosen carriers and update the recent developments in both chemistry and allied fields in science and technology.

OUTCOME

Core Course	
Course Code: HLCH11	**Course Title: ORGANIC CHEMISTRY - I**
On successful completion of the course, the learners should be able to	
CO1.	list out the principles of stereochemistry, selection rules for UV, IR spectroscopy and understand the mechanism of aromatic substitution reactions, aromaticity and computational chemistry.
CO2.	apply Huckel's rule to classify the aromatic and non aromatic compounds and stereochemical rules to predict the configuration and optical activity.
CO3.	analyze the principles and theory of UV and IR for structural elucidation.
CO4.	compare the docking procedure, Chem draw, energy minimization and build the LEAD compounds by docking studies using computational software.
CO5.	elaborate the mechanism for substitution reactions.

Core Course	
Course Code: HLCH12	**Course Title: INORGANIC CHEMISTRY - I**
On successful completion of the course, the learners should be able to	
CO1.	summarize the fundamentals of periodic properties, nuclear reactor technology, bonding and the solid state, structure and fluxional behavior, pseudo rotation in molecules, non aqueous solvents and MO treatment for hetero nuclear molecules.
CO2.	illustrate the gradation in periodicity of elements, types and structure of crystal lattices, reaction chemistry in non aqueous solvents, types of reactors nuclear hazards and waste management.
CO3.	analyze the MO diagrams, the term symbols and fluxionality of molecules.
CO4.	justify the variation in periodic properties, structure of crystal lattices, feasibility of chemical reactions in non aqueous solvents and molten salts.
CO5.	explain the angular, radial wave functions, symmetry and energies of orbitals and electronic arrangements in poly electronic atoms

Core Course	
Course Code: HLCH13	**Course Title: PHYSCIAL CHEMISTRY - I**
On successful completion of the course, the learners should be able to	
CO1.	explain the concepts of electrolytic conductance of solutions and thermodynamic properties of real and ideal gases.
CO2.	determine the electrical and thermodynamic properties of molecules.
CO3.	describe the theories of electrolysis, corrosion, polarization and non equilibrium thermodynamics.
CO4.	list the properties of ideal, non-ideal, electrolytic solutions and methods of preventing corrosion.
CO5.	discuss the applications of electrical instruments.

Core Course	
Course Code: HLCH1L1	**Course Title: ORGANIC CHEMISTRY PRACTICALS - I**
On successful completion of the course, the learners should be able to	
CO1.	separate the mixture of organic compounds.
CO2.	analyze the organic compounds for functional group.
CO3.	determine the melting points / boiling points using digital apparatus.
CO4.	apply chromatographic methods in separation.
CO5.	adapt new methods to synthesize various organic compounds.

Core Course	
Course Code: HLCH1L2	**Course Title: INORGANIC CHEMISTRY PRACTICALS - I**
On successful completion of the course, the learners should be able to	
CO1.	analyse the less familiar cations in a mixture.
CO2.	classify the cations into various groups.
CO3.	apply the basic principles of complexometric method.
CO4.	determine the concentration of metal ions by complexometric method.
CO5.	estimate the analyte by spectrofluorimetric and spectrophotometric method.

Elective Course	
Course Code: HLCH1E1	**Course Title: PHARMACEUTICAL CHEMISTRY**
On successful completion of the course, the learners should be able to	
CO1.	outline the sources, metabolism of drugs, causes of common disease and drugs used.
CO2.	summarize the first aid techniques, suitable drugs for various diseases and their mechanism of action.
CO3.	apply the knowledge gained about drugs, materials, poisons and first aid to lead a healthy living.
CO4.	classify and explain the action of drugs and diseases.
CO5.	explain the action and adverse effects of various drugs.

Elective Course	
Course Code: HLCH1E2	**Course Title: BIOINFORMATICS**
On successful completion of the course, the learners should be able to	
CO1.	understand the principles of bioinformatics.
CO2.	predict the bioactivity using structure and evolutionary relationship.
CO3.	drawing structures using software.
CO4.	realize the importance of drug designing.
CO5.	carry out interdisciplinary research.

Core Course	
Course Code: HLCH21	**Course Title: ORGANIC CHEMISTRY - II**
On successful completion of the course, the learners should be able to	
CO1.	recognize the structure of carbohydrates, terpenoids and the basic principles of mass spectrometry, ORD, CD and NMR techniques.
CO2.	explain the mechanism of Nucleophilic and electrophilic substitution and elimination reactions mechanisms.
CO3.	outline the applications of Mass spectrometry, ORD,CD and NMR spectraltechniques.
CO4.	solve the spectroscopy problems.
CO5.	elucidate the structure of carbohydrates and terpenoids.

Core Course	
Course Code: HLCH22	**Course Title: INORGANIC CHEMISTRY - II**
On successful completion of the course, the learners should be able to	
CO1.	summarize the concepts of bonding theories and reaction, kinetics and mechanisms, theory and principle of electronic, Photo electron, Auger, Mossbauer spectra of coordination complexes.
CO2.	apply the spectral data for the interpretation of the structure of inorganic compounds
CO3.	investigate the magnetic properties, stability, reaction kinetics and mechanism of coordination compounds.
CO4.	synthesize the coordination compounds using electron transfer and substitution reactions.
CO5.	assign the possible electronic transitions and calculate 10Dq and B for complexes.

Core Course	
Course Code: HLCH23	**Course Title: PHYSICAL CHEMISTRY - II**
On successful completion of the course, the learners should be ar3ble to	
CO1.	recall the basic concepts of quantum chemistry, polymer chemistry and data analysis.
CO2.	illustrate the role of operator algebra to solve simple problems.
CO3.	utilize the knowledge of data analysis and polymer chemistry for solving problems.
CO4.	apply the Schrodinger wave equation for simple systems and to use approximation methods and valence bond & molecular orbital theories in solving molecular systems.
CO5.	analyze the type of polymerization, methods used for the determination of molecular weight of polymers and types of errors.

Core Course	
Course Code: HLCH2L1	**Course Title: ORGANIC CHEMISTRY PRACTICALS- II**
On successful completion of the course, the learners should be able to	
CO1.	recall the principle underlying synthesis and estimation of organic analysis.
CO2.	design two stage preparations of organic compounds.
CO3.	establish the structure of synthesized organic compounds using spectral data.
CO4.	estimate the organic compounds in the research laboratories and industry.
CO5.	adopt green synthetic methods through the sophisticated instruments like microwave oven and sonnicator to protect the environment.

Core Course	
Course Code: HLCH2L1	**Course Title: PHYSICAL CHEMISTRY PRACTICALS- I**
On successful completion of the course, the learners should be able to	
CO1.	recollect the principle of conductometry, thermochemistry and spectroscopy.
CO2.	apply the electrochemical methods for determination of concentration and other physical constants.
CO3.	determine the heat of solution by solubility method.
CO4.	prove the validity of Beer – Lambert's law and measure the strength of the colored solution.
CO5.	record and interpret the experimental data.

Elective Course	
Course Code: HLCH2E	**Course Title: SAFETY FIREWORKS**
On successful completion of the course, the learners should be able to	
CO1.	sequence the history, manufacturing methods and safety aspects of firework industry.
CO2.	outline the ingredients of fireworks and to detect the techniques for hazards identification.
CO3.	analyze the ingredients present in the firework composition and check the quality of firework products.
CO4.	demonstrate the general regulations and guidelines for housekeeping.
CO5.	adopt preventive methods to avoid fire accidents

Core Course	
Course Code: HLCH31	**Course Title: ORGANIC CHEMISTRY - III**
On successful completion of the course, the learners should be able to	
CO1.	relate the essential concepts of reaction mechanism, energy correlation, steroids, molecular rearrangements, photochemistry and pericyclic reactions.
CO2.	correlate reaction mechanism and energy.
CO3.	recall the various stages in the synthesis of steroids.
CO4.	apply molecular rearrangements and photochemistry in organic synthesis.
CO5.	discuss the pericyclic reactions using symmetry properties.

Core Course	
Course Code: HLCH32	**Course Title: INORGANIC CHEMISTRY - III**
On successful completion of the course, the learners should be able to	
CO1.	summarize the synthesis, structure and bonding in inorganic chains, rings, cages and cluster compounds, π complexes, properties of lanthanides and actinides, principles of EPR, NQR and NMR spectroscopy.
CO2.	compute the spectral data for the interpretation of the structure of inorganic compounds and explain the structure of boranes and polyacids.
CO3.	justify the position, compare and contrast the properties of lanthanides and actinides, structure of boranes by Wade's rule.
CO4.	evaluate the structure of inorganic compounds and reaction rate of chemical exchange on spectra.
CO5.	investigate the structure of inorganic compounds from NQR, ESR and NMR data.

Core Course	
Course Code: HLCH33	**Course Title: PHYSICAL CHEMISTRY - III**
On successful completion of the course, the learners should be able to	
CO1.	illustrate the fundamental terminologies, principles, phenomenon, effects and theorems of group theory and molecular spectroscopy.
CO2.	apply the basic knowledge to derive matrix representation for symmetry operations; predict point groups of molecules, construct the multiplication & character tables and solve delocalization energy, molecular bonding and spectral problems.
CO3.	analyze spectral activity and spectral lines of molecules; examine the transitions between rotational, vibrational, electronic and spin energy levels.
CO4.	analyze factors affecting chemical shift in NMR; hyperfine and zero-field splitting in ESR spectra and advantages of FT-IR over dispersive FT-IR.
CO5.	discuss the applications of Fermi resonance, Fortrat diagram, double resonance techniques and Nuclear Overhauser effects.

Core Course	
Course Code: HLCH3L1	**Course Title: INORGANIC CHEMISTRY PRACTICALS- II**
On successful completion of the course, the learners should be able to	
CO1.	repeat skill in gravimetric analysis, inorganic synthesis and electrochemical measurements.
CO2.	separate the binary mixture of various inorganic compounds.
CO3.	synthesize inorganic complexes.
CO4.	restate the applications of cyclic voltammetry.
CO5.	interpret cyclic voltammogram.

Core Course	
Course Code: HLCH3L1	**Course Title: PHYSICAL CHEMISTRY PRACTICALS- II**
On successful completion of the course, the learners should be able to	
CO1.	develop experimental skills on potentiometer and chemical kinetic methods.
CO2.	interpret X-ray diffractogram.
CO3.	evaluate the data obtained from experimental methods for strength, pH, Ka and Ks of analytes.
CO4.	work together as team and individual to carry out physico-chemical experiments.
CO5.	follow the laboratory safety measures and ethics to maintain the electrical instruments like weighing balances, potentiometer, electrodes, record note books and avoid malpractices, data manipulation, copying.

Elective Course	
Course Code: HLCH3E1	**Course Title: CSIR UGC-NET PREPARATORY COURSE - CHEMISTRY**
On successful completion of the course, the learners should be able to	
CO1.	recall the fundamentals underlying physical, inorganic and organic chemistry.
CO2.	apply the concept to solve various problems in chemistry.
CO3.	analyze the structure of organic and inorganic molecules by physical methods.
CO4.	solve the problems and find solutions with scientific reasoning.
CO5.	interpret the structure of the compounds using analytical and spectroscopic techniques.

Elective Course	
Course Code: HLCH3E2	**Course Title: MATERIALS SCIENCE.**
On successful completion of the course, the learners should be able to	
CO1.	explain the principles and properties of materials
CO2.	demonstrate the different types of conducting materials
CO3.	explore the principles and theory of modern engineering materials
CO4.	estimate properties of Biomaterials
CO5.	understand the chemistry of nanophase materials

Core Course	
Course Code: HLCH41	**Course Title: ORGANIC CHEMISTRY - IV**
On successful completion of the course, the learners should be able to	
CO1.	explain the basic principles of conformational analysis, synthetic reagents and green chemistry.
CO2.	categorize the role of synthetic reagents in conventional and green synthesis.
CO3.	design the synthesis of organic compounds.
CO4.	justify the principles of green chemistry.
CO5.	list out the different green synthetic methods and their applications.

Core Course	
Course Code: HLCH42	**Course Title: INORGANIC CHEMISTRY - IV**
On successful completion of the course, the learners should be able to	
CO1.	describe the chemistry in biological systems and instrumentation for various electro analytical and spectro analytical techniques
CO2.	apply the various spectro and electro analytical techniques for the qualitative and quantitative analysis.
CO3.	examine the physiological reactions in biological systems.
CO4.	explain the reactions in organometallic compounds.
CO5.	discuss the function of organometallic compounds in homogenous and heterogeneous catalysis reactions.

Core Course	
Course Code: HLCH43	**Course Title: PHYSICAL CHEMISTRY - IV**
On successful completion of the course, the learners should be able to	
CO1.	recall the basic concepts, hypothesis of kinetics, statistical thermodynamics, photochemistry, surface chemistry and nano chemistry.
CO2.	explain the experimental techniques and applications of photochemistry, surface chemistry, kinetics and nanochemistry.
CO3.	apply statistical principles to formulate the Boltzmann, Fermi-Dirac statistics, Bose-Einstein statistics and partition functions.
CO4.	analyze the conductivity& defects of solids; photo-physical & quenching processes and adsorption isotherms.
CO5.	describe fast reaction techniques and the techniques to characterize nano materials and discuss the applications of photochemistry in energy conserving processes.

Core Course	
Course Code: HLCH4P	**Course Title: PROJECT AND VIVA VOCE**
On successful completion of the course, the learners should be able to	
CO1.	review the literature in their respective research area.
CO2.	develop positive attitude and skill in research work.
CO3.	find the research gap, design and execute the innovative research schemes with ethics.
CO4.	utilize the knowledge of instrumentation and characterization techniques in their research work .
CO5.	evaluate, summarize and discuss the scientific results of their team projects.

Elective Course	
Course Code: HLCH4E1	**Course Title: BIOCHEMISTRY**
On successful completion of the course, the learners should be able to	
CO1.	recall the role of amino acids, proteins, enzymes, lipids and vitamins in biological systems.
CO2.	elaborate the biological role of chemical compounds with their structure.
CO3.	outline the mechanistic pathway of the metabolic process.
CO4.	explain the importance of metabolites.
CO5.	list out the various deficiency diseases and the ways to prevent them to lead a healthy life.

Elective Course	
Course Code: HLCH4E2	**Course Title: BIOMEDICAL INSTRUMENTATION**
On successful completion of the course, the learners should be able to	
CO1.	understand the modern medical equipments in hospitals and research institutes.
CO2.	appreciate the recent advances in biomedical instrumentation.
CO3.	develop knowledge in design and function of various medical equipments.
CO4.	handle biomedical equipments.
CO5.	council the public regarding health problems.

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS), SIVAKASI – 626 123.

(Affiliated to Madurai Kamaraj University, Re-accredited with A Grade by NAAC,
College with Potential for Excellence by UGC and Mentor Institution under UGC PARAMARSH)

DEPARTMENT OF CHEMISTRY

M.Phil DEGREE PROGRAMME IN CHEMISTRY

PROGRAMME EDUCATIONAL OBJECTIVES The Graduates will	
PEO1.	develop skills in handling scientific instruments, planning and executing laboratory experiments required for performing well in research or industries .
PEO2.	pursue research and find innovative chemical technological solutions for sustainable development.
PEO3.	understand the scientific phenomena and their relevancies in the day to day life and successfully emerge as a young women entrepreneur.
PEO4.	imbibe positive attitude, self regulation, and discernment necessary to realize how development of science provide better solutions to lead a successful life.

PROGRAMME SPECIFIC OUTCOMES By the Completion of M.Phil Chemistry programme, the learners will be able to	
PSO1.	synthesize and characterize the chemical compounds using laboratory skills and instrumentation techniques
PSO2.	think creatively and finding solutions for socially relevant problems
PSO3.	critically analyze and compile the research finding as report
PSO4.	develop various communication skills such as reading, listening, speaking etc which will help in expressing ideas and views clearly about their research problems effectively in various scientific forums.
PSO5.	influence and inspire the team as leader and provide in providing better solutions and new ideas for sustainable development
PSO6.	acquire the civilized personality with ethical and moral values and avoid falsicfication, fabrication, misinterpretation of data and plagiarism
PSO7.	realize that pursuit of knowledge is a lifelong activity and will evolve as a successful chemist

COURSE OUTCOME

Core Course	
Course Code: RLCH11	**Course Title: RESEARCH METHODOLOGY**
On successful completion of the course, the learners should be able to	
CO1.	restate the basic concepts of C language, error analysis and able to review the literature
CO2.	solve chemistry problems in spectroscopy, error analysis.
CO3.	apply C language to solve problems
CO4.	construct reaction mechanism and summarize the concept of linear free energy relationships.
CO5.	extend electro and spectra analytical techniques for interpretation of spectra.

Core Course	
Course Code: RLCH12	**Course Title: COURSE WORK**
On successful completion of the course, the learners should be able to	
CO1.	describe the basics of group theory, bio inorganic chemistry, supramolecular chemistry, Medicinal chemistry, nano chemistry, photochemistry and identify organic reagents in sy
CO2.	apply group theory to spectroscopy and molecular problems.
CO3.	summarize enzyme and proteins and the interaction of metal complexes with nucleic acids.
CO4.	discuss the types of drugs and drug action.
CO5.	explain the preparation, properties and applications of Nanoparticles and nanostructural ma & application of photo chemistry.

Core Course	
Course Code: RLCH13A	**Course Title: ADVANCED ORGANIC CHEMISTRY**
On successful completion of the course, the learners should be able to	
CO1.	recall the basic concepts of conformational analysis, organic ragents, enzymes and enolates
CO2.	relate the conformation, reactivity and energy in biosystems .
CO3.	categorize the simple organic and organometallic reagents based on their applications
CO4.	summarize the concepts of enolates.
CO5.	apply the basics to solve real time research problems.

Core Course	
Course Code: RLCH13B	**Course Title: ADVANCED INORGANIC CHEMISTRY**
On successful completion of the course, the learners should be able to	
CO1.	realize the principles of inorganic polymers, rearrangements and reactions of Organometallic compounds, coordinated ligands , importants of Metal in Medicine and energies in environment
CO2.	identify the general properties and reactions of coordinated ligands
CO3.	Utilize the chemistry of organometalic compounds
CO4.	study the application of metal ions in medicine.
CO5.	understand the different types of non - conventional energy systems

Core Course	
Course Code: RLCH13C	**Course Title: ADVANCED PHYSICAL CHEMISTRY**
On successful completion of the course, the learners should be able to	
CO1.	analyze the knowledge in Conducting polymer and gel type polymer electrolyte for lithium batteries, Chemical sensors and bio electrochemistry, chemical kinetics
CO2.	relate the fullerenes and catalytic action
CO3.	understand the fundamental concepts of chemical sensors and bio electrochemistry
CO4.	derive advanced knowledge on novel materials
CO5.	assess the application of chemical kinetics