



Koneru Lakshmaiah Education Foundation

(Category -1, Deemed to be University estd. u/s. 3 of the UGC Act, 1956)

Accredited by NAAC as 'A++' ♦ Approved by AICTE ♦ ISO 21001:2018 Certified

Campus: Green Fields, Vaddeswaram - 522 302, Guntur District, Andhra Pradesh, INDIA.

Phone No. +91 8645 - 350 200; www.klef.ac.in; www.klef.edu.in; www.kluniversity.in

Admin Off: 29-36-38, Museum Road, Governorpet, Vijayawada - 520 002. Ph: +91 - 866 - 3500122, 2576129

DEPARTMENT OF CHEMISTRY PROGRAM: M. SC CHEMISTRY ACADEMIC YEAR: 2020-2021

Course Code	Course Title	CO No	Description of the course Outcome
20CY5101	Theoretical Chemistry-I	CO1	Describe symmetry elements, operations, and groups by representing them in matrices.
		CO2	Employ the basic principles of Electronic Spectroscopy & Molecular Spectroscopy.
		CO3	Employ the basic principles of Infrared spectroscopy.
		CO4	Employ the basic principles of Raman spectroscopy.
20CY5102	Inorganic Chemistry- I	CO1	Predict the shapes of molecules, illustrating the bonding models and applying them to simple molecules.
		CO2	Illustrate the structures, reactivities and chemistry of non-transition elements.
		CO3	Illustrate the bonding models, structures, reactivities, and applications of coordination complexes.
		CO4	Illustrate spectral and magnetic properties, color, and analytical applications of transition metal complexes.
		CO5	Advanced laboratory procedures are used in inorganic synthesis, identification, and characterization of small molecules. The design and application of an analysis related to a question of relevance based on experience in the laboratory and research of scientific literature. Laboratory safety protocols.
20CY5103	Organic Chemistry-I	CO1	Describe the structure and reactivity of chemical constituents of various reaction processes.
		CO2	Apply Nucleophilic Substitution reaction mechanism in the synthesis of desired organic entities.

U...

Dr. J.V. Shanmukha Kumar
Head of the Department
Department of Chemistry
Koneru Lakshmaiah Education Foundation
(Deemed to be University)
Green Fields, Vaddeswaram-522 302,
Guntur Dist., A.P., India.

		CO3	Categorize the organic chemical species with respect to their spatial orientation of the groups or atoms attached with them.
		CO4	Apply free radical reactions pathways to develop new and notable organic compounds.
		CO5	Derive the necessary pathways to identify the chemical composition in the given binary mixture and the synthesis of organic molecules.
20CY5104	Physical Chemistry-I	CO1	Understand the concepts of Classical thermodynamics & laws of thermodynamics.
		CO2	Understand the applications of Surfactants and Macromolecules.
		CO3	Discuss the different aspects of kinetics of the types of reactions.
		CO4	Understand the concepts of photo chemistry & luminescence.
		CO5	An ability to analyse, generate experimental skills towards the industrial applications.
20CY5201	Theoretical Chemistry-II	CO1	Demonstrate various molecular spectroscopic terms with their theoretical background.
		CO2	Employ Nuclear magnetic resonance spectroscopy to interpret organic molecules.
		CO3	Employ the basic principles of Electron Spin Resonance (ESR)-Spectroscopy and XRD applications.
		CO4	Write a small computer code to solve basic chemistry problems.
20CY5202	Inorganic Chemistry- II	CO1	Analyse the various reaction mechanisms of coordination complexes.
		CO2	Demonstrate structure and bonding of d-block organometallic complexes.
		CO3	Predict the thermodynamics of complex formation and properties of acids and bases in aqueous medium.
		CO4	Determine structures of metal clusters, categorize the reactions of d-block organometallic complexes, catalysis

Handwritten signature

Dr. J.V. Shanmukha Kumar
 Head of the Department
 Department of Chemistry
 Koneru Lakshmaiah Education Foundation
 (Deemed to be University)
 Green Fields, Vaddeswaram-522 302,
 Guntur Dist., A.P., India.

		CO5	Perform chemical reactions to prepare inorganic complexes and analyse samples for quantitative determinations.
20CY5203	Organic Chemistry -II	CO1	Derive the Electrophilic addition reaction mechanisms of C=C compounds, the relationship among substitution and addition reactions.
		CO2	Describe the types of elimination reactions and their mechanisms.
		CO3	Apply various reaction pathways, addition to Carbon-Hetero Multiple Bonds to develop new and notable organic compounds.
		CO4	Differentiate the Alkaloids and Terpenoids by their unique properties, recent trends and implication of Green and nano chemistry.
		CO5	An ability to analyse, generate experimental skills towards the industrial applications.
20CY5204	Physical Chemistry-II	CO1	Account for the basic principles and concepts of quantum chemistry.
		CO2	Make use of adsorption process and its mechanisms on the surfaces
		CO3	Discuss Electrochemistry of electrode electrolyte interface.
		CO4	Utilize the concepts of Classical thermodynamics & laws of thermodynamics.
		CO5	An ability to analyse, generate experimental skills towards the industrial applications.
20CY5301	Instrumental Methods of Analysis-I	CO1	Understand the concepts of excitation spectroscopic methods.
		CO2	Understand the basic concepts of rotational and vibrational spectroscopic methods.
		CO3	Illustration of the concept of Nuclear magnetic and ESR spectroscopy and their applications.
		CO4	Comprehend the basic knowledge of mass spectroscopy and X-ray spectroscopy to characterize the unknown molecules.
		CO5	Ability to analyse chemicals by Instrumental methods.
20CY5302	Quality Control and	CO1	Understand the principles of Quality control in Analytical Chemistry.

NK

[Signature]
 Dr. J.V. Shanmukha Kumar
 Head of the Department
 Department of Chemistry
 Koneru Lakshmaiah Education Foundation
 (Deemed to be University)
 Green Fields, Vaddeswaram-522 302,
 Guntur Dist., A.P., India.

	Classical Methods of Analysis	CO2	Explain the various concepts of decomposition techniques in analysis.
		CO3	Illustrate, discuss, and apply the various principles behind the various Redox systems involved in the classical Volumetric methods of Analysis.
		CO4	Explain the various principles involved in the analysis of Organic Functional Groups.
20CY5303	Applied Chemical Analysis	CO1	Understand the principles, methodology and adoptability various procedures for the analysis of Analysis of Iron, Manganese, Chromite, Phosphate and Aluminium Ores.
		CO2	Discuss, explain, and illustrate the applications of the general methods of analysis for finished products such as Steel, dolomite, fire clay, four spar and magnesite.
		CO3	Finding the adoptability by applying the general methods of analysis for Cement, Soaps, Oils, and paints analysis.
		CO4	Explain and apply the various principles involved in the chemical and physicochemical analysis of Organic Functional Groups.
		CO5	Analysis of chemicals by instrumental methods
20CY5304	Separation Techniques (Prof. Elective)	CO1	Describe the theory and principles of chromatographic separation.
		CO2	Discuss principle of paper chromatography, different techniques, and its modification to thin layer chromatography for analytical applications.
		CO3	Describe the ION exchange & ION chromatography.
		CO4	Explain the Liquid-Liquid chromatographic techniques, instrumentation, and Applications.
20CY5305	Applications of Chemical Spectroscopy (Prof. Elective)	CO1	Discuss the fundamental principles of basic characterization techniques.
		CO2	Apply NMR techniques in the elucidation of complex molecule.
		CO3	Determination of elemental or isotopic signature of sample
		CO4	Identification of chemical structure of a molecule by spectroscopy.
20CY5306	Bio Analytical Chemistry	CO1	Understand the basic principles of bioanalysis.
		CO2	Explain the basic concept of Radiochemical Manometric and Calorimetric.

Handwritten signature

Handwritten signature
Dr. J.V. Shanmukha Kumar,
 Head of the Department
 Department of Chemistry
 Koneru Lakshmaiah Education Foundation
 (Deemed to be University)
 Green Fields, Vaddeswaram-522 302,
 Guntur Dist., A.P., India.

	(Prof. Elective)	CO3	Apply electrophoretic method in bioassay.
		CO4	Explain and apply biosensors in biomolecule analysis.
20CY5307	Environmental Chemistry (Prof. Elective)	CO1	Understand greenhouse effect concept.
		CO2	Employ various sampling techniques for air sampling.
		CO3	Understand various pollution monitoring techniques.
		CO4	Explain environmental Impact Assessment process.
20CY5308	Surface Analytical Techniques (Prof. Elective)	CO1	Understand the basic principles of Electron Spectroscopy for Chemical Analysis.
		CO2	Employ Surface enhanced Raman Spectroscopy (SERS) in mapping and imaging.
		CO3	Describe Electron Energy Loss Spectroscopy.
		CO4	Apply Low Energy Ion Scattering Spectroscopy for Surface structural analysis.
20CY5309	Analysis of Food and Drugs (Prof. Elective)	CO1	Understand the importance of food analysis.
		CO2	Determination of various nutrients in food samples.
		CO3	Identification of food adulterants.
		CO4	Employ quantitative methods of analysis in food samples.
20CY5310	Organic Synthesis- I	CO1	Build carbon-carbon single bond associated molecules (carbenes-carbenoids).
		CO2	Develop carbon-carbon double bonds using notable elimination reactions.
		CO3	Make use of organic polymerization processes.
		CO4	Understand the applications of organic boranes.
		CO5	Ability to synthesise organic molecules for general health issues.
20CY5311	Natural Products and Biomolecules	CO1	Illustrate the synthesis and significance of microbial metabolites.
		CO2	Outline the origin & chemical nature of Terpenes.

Dr. J.V. Shanmukha Kumar
 Head of the Department
 Department of Chemistry
 Koneru Lakshmaiah Education Foundation
 (Deemed to be University)
 Green Fields, Vaddeswaram-522 002,
 Guntur Dist., A.P., India

		CO3	Outline the origin & chemistry of Alkaloids.
		CO4	Demonstrate properties & synthetic methods of peptides.
		CO5	Ability to isolate and estimate the bioactive compounds from various plant extracts.
20CY5312	Organic Spectroscopy	CO1	Evaluate theoretical and experimental methods of analysis using IR spectroscopy
		CO2	Evaluate theoretical and experimental methods of analysis using UV spectroscopy
		CO3	Understand proton NMR & ¹³ C NMR and mass spectrometry methods of analysis
		CO4	Able to apply spectroscopic methods (UV, IR, ¹ H-NMR, ¹³ C-NMR & mass spectrometry) in organic structure elucidation.
20CY5313	Photo Chemistry and Pericyclic Reactions (Prof. Elective)	CO1	Ability to apply nucleophilic / electrophilic pathway to synthesize new organic entities
		CO2	Apply aromatic nucleophilic and free radical substitution mechanisms in new chain linkages
		CO3	Understand organic reaction mechanism in terms of pericyclic reactions at different conditions.
		CO4	Ability to explain pericyclic reactions involved in various organic rearrangement reactions.
20CY5314	Organometallic Chemistry (Prof. Elective)	CO1	To explain the structure, synthesis, bonding, properties of the transition metal organo compounds.
		CO2	To describe the industrial significant processes through the application of organo metallic principles.
		CO3	To utilize the professional level skills in a chemical synthetic laboratories safety especially in the areas of air sensitive reagents.
		CO4	Demonstrate affective report writing, experimental design and data analysis.
20CY5315	Bio Organic Chemistry (Prof. Elective)	CO1	Recognize the structure and function of Carbohydrates, Lipids, Amino acids, proteins, nucleotides, and nucleic acids.
		CO2	Understand the reactions of the major catabolic and anabolic pathways of carbohydrates, Lipids, Amino acids, metabolism.

Dr. J.V. Shanmukha Kumar
 Head of the Department
 Department of Chemistry
 Koneru Lakshmaiah Education Foundation
 (Deemed to be University)
 Green Fields, Vaddeswaram-522 002,
 Guntur Dist., A.P., India.

		CO3	Understand the signalling pathways of Lipids and Amino acids.
		CO4	Demonstrate the chemistry and kinetics of enzymes.
20CY5316	Green & Sustainable Chemistry (Prof. Elective)	CO1	Explain basic principles of green and sustainable chemistry.
		CO2	Understand the Stoichiometric calculations and relate them to green process metrics.
		CO3	Review the principles of catalysis, photochemistry, and other interesting processes from the viewpoint of Green Chemistry.
		CO4	Apply alternative solvent media and energy sources for chemical processes.
20CY5317	Supramolecular Chemistry (Prof. Elective)	CO1	Explain concepts, properties, and reactions of supra molecular chemistry.
		CO2	Cation-binding hosts and binding of anions and neutral molecules.
		CO3	Apply the supra molecular chemistry in biology
		CO4	Apply the supra molecular chemistry in Chemistry
20CY5318	Medicinal Chemistry (Prof. Elective)	CO1	To understand the drug metabolic pathways adverse effects and the therapeutic value of drugs.
		CO2	To know the structure activity relationship of the different class of drugs.
		CO3	To describe the mechanisms pathways of different class of medicinal compounds.
		CO4	To understand the chemistry of drugs with respect to their pharmacological activity
20CY5401	Instrumental Methods of Analysis-II	CO1	Discuss and understand the principles and instrumentation involved in the Flame photometry. Atomic Absorption Spectrometer, inductively coupled plasma spectrometer and
		CO2	Discuss and apply the various principles and methodology in TGA, DTA and DSC
		CO3	Discuss and apply the principles and methodology involved in Voltammetry, polarography, Anode stripping voltammetry and Coulometry.
		CO4	Discuss the principles and methodology in assaying the analytes using Ion Selective Electrodes and Radio chemical methods.


J.V. Shanmukha Kumar
 Head of the Department
 Department of Chemistry
 Koneru Lakshmaiah Education Foundation
 (Deemed to be University)
 Green Fields, Vaddeswaram-522 302,
 Guntur Dist., A.P., India.

		CO5	Ability to analyse chemicals by Instrumental methods.
20CY5402	Advanced Applied Chemical Analysis	CO1	To discuss the concepts of analysis of ferrous, non-ferrous metals and allied Fe compounds.
		CO2	To understand analysis of soil, fertilizer, and fuel for applied purposes.
		CO3	To discuss different methods involved in analysis of different gaseous components in air.
		CO4	To determine moisture content in drugs and other samples.
		CO5	Explain the various principles involved in the analysis of Organic Functional Groups
20CY5403	Dissertation with Research Publication	CO5	To inculcate research aptitude and enhance the thinking and analytical competencies of the student.
20CY5404	Chromatographic Techniques & Method Validation (Prof. Elective)	CO1	Discuss about the GC & GC-MS Techniques and its applications
		CO2	Discuss the Liquid-Liquid partition chromatography and HPLC techniques and their applications
		CO3	Apply LC-MS and inorganic molecular sieves for various purposes.
		CO4	Develop analytical methods to solve industrial problems and solvent extraction as significant analytical method of purification and separation.
20CY5405	Classical Methods of Analysis-II (Prof. Elective)	CO1	Understand the principles of Quality control in Analytical Chemistry
		CO2	Explain the various concepts of decomposition techniques in analysis
		CO3	Illustrate, discuss, and apply the various principles behind the various Red-ox systems involved in the classical Volumetric methods of Analysis.
		CO4	Explain the various principles involved in the analysis of Organic Functional Groups
20CY5406	Chemo Sensors and Body Fluid Analysis	CO1	Understand the principles of various chemical sensors
		CO2	Analysis of biomolecules in body fluids

Vu

Dr. J.V. Shanmukha Kumar
 Head of the Department
 Department of Chemistry
 Koneru Lakshmaiah Education Foundation
 (Deemed to be University)
 Green Fields, Vaddeswaram-522 319
 Guntur Dist., A.P., India


	(Prof. Elective)	CO3	Employ analytical techniques in the determination of vitamins
		CO4	Apply Immuno-analytical Techniques in clinical analysis
20CY5407	Organic Synthesis –II	CO1	Explain the properties of Oxidising agents and reducing agents
		CO2	Illustrate reaction mechanisms for some Organ silane related compounds
		CO3	Explain theory and principals involved in Disconnection approach and principals of Phase transfer catalysis
		CO4	Explain about the Retrosynthesis and applied to various cyclic organic molecules
		CO5	To carryout multistep synthesis of organic molecules
20CY5408	Advanced Heterocyclic Chemistry	CO1	To classify, synthesis and reactivity of simple heterocyclic aromatic and non-aromatic compounds as electron deficient or electron rich and explain their reactivity based on these properties.
		CO2	Apply the aromaticity, reactivity and synthesis of Five, six membered heterocyclic compounds with two hetero atoms.
		CO3	Apply the aromaticity, reactivity, and synthesis of heterocyclic compounds with more than hetero atoms.
		CO4	Apply the synthesis, structure, reactivity, and stability of larger ring heterocyclics.
		CO5	Ability to synthesize heterocyclic compounds.
20CY5409	Dissertation with Research Publication	CO5	To inculcate research aptitude and enhance the thinking and analytical competencies of the student.
20CY5410	Drug Design & Development (Prof. Elective)	CO1	Outline the synthesis and properties of antibiotics.
		CO2	Describe the psycho active drugs and their synthesis along with properties.
		CO3	Exposed to drug design and its tools.
		CO4	Describe the QSAR Studies.
20CY5411	Chemistry of Drugs and	CO1	Understand the medicinal and pharmaceutical importance of the organic compounds.


Dr. J.V. Shanmukha Kumar
 Head of the Department
 Department of Chemistry
 Koneru Lakshmaiah Education Foundation
 (Deemed to be University)
 Green Fields, Vaddeswaram-522 601
 Guntur Dist., A.P., India



	Pharmaceuticals (Prof. Elective)	CO2	Explain the Chemical and Biological assay of the various class of compounds.
		CO3	Describe the structure and properties of Vitamins: A, B, C, D, E and K; Hormones: Sex hormones, Steroidal and Non-steroidal hormones, Adrenaline, Thyroxine and Cardiac
		CO4	Paraphrase the Pharmacological activity, uses and limitations of Antipyretics, Analgesics, Sedatives, Hypnotics, Barbiturates, Sulpha drugs, Anaesthetics, Antiseptics, Antibacterials, Diuretics, Anthelmintics, Anticoagulants, Anticonvulsants, Antihistamines, Psychotherapeutics.
20CY5412	Nano Chemistry (Prof. Elective)	CO1	Understand the effects of nano dimensions of particles.
		CO2	Exemplify links between nano science and biological systems.
		CO3	Describe several synthetic methods for the fabrication of nano particles.
		CO4	Provide perspectives on future nano chemistry developments.
20UC1102	Design Thinking and Innovation – 1	CO1	Understand the basics of design thinking and its implications in product or service development
		CO2	Understand and analyse the requirements of a typical problem.
		CO3	Plan the necessary activities towards solving the problem through ideation and prototyping
		CO4	evaluate the solution and refine them based on the customer feedback
20UC1203	Design Thinking and Innovation – 2	CO1	Understand the problem statement, requirements, and formulating approaches to solve real world problems.
		CO2	Implementing Design Thinking Framework.
		CO3	Develop innovative thinking ability through design thinking and also develop metrics for successful implementation of Design Thinking.
		CO4	Understand the copyright, IPR, Trademark, Patent, and license agreement policies for protecting own R&D innovations and enhancing brand image.


Academic Professor I/C


HOD-CHEMISTRY
Dr. S. Lakshminukha Kumar
Head of the Department
Department of Chemistry
Koneru Lakshmaiah Education Foundation
(Deemed to be University)
Green Fields, Vaddeswaram-522 302.