



## Koneru Lakshmaiah Education Foundation

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

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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, Governorpel, Vijayawada - 520 002. Ph: +91 - 866 - 3500122, 2576129

### DEPARTMENT OF CHEMISTRY

### PROGRAM: M. SC CHEMISTRY

ACADEMIC YEAR: 2019-2020

Course Code	Course Title	CO No	Description of the course Outcome
19CY5101	General Chemistry-I	CO1	Discuss various principles of statistical data treatment to validate analytical results
		CO2	Relate suitable chemical reactions to titrations with its mechanism
		CO3	Understand the basic principles of Visible spectrophotometry and potentiometry to employ them in analytical applications
		CO4	Developing small computer code to solve basic chemistry problems.
19CY5102	Inorganic Chemistry- I	CO1	Explain the bonding fundamentals for both ionic and covalent compounds, including electronegativities, bond distances and bond energies using MO diagrams and Thermodynamic data.
		CO2	Predicting geometries of simple molecules
		CO3	Explain the uses of group theory to recognize and assign symmetry characteristics to molecules and objects, and to predict the appearance of a molecule's vibrational spectra as a function of symmetry
		CO4	Illustrate the bonding models, structures, reactivities, and applications of coordination complexes, boron hydrides, metal carbonyls, and organometallics.
		CO5	The design and application of an analysis related to a question of relevance based on experience in the laboratory and research of the scientific literature.

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**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.

19CY5103	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.
		CO3	Evaluate the properties of organic chemical constituents with respect to their spatial orientation.
		CO4	Adopt the green synthetic approaches for developing conventional and nano materials.
		CO5	Knowledge in this course will train the students in scientific research approach.
19CY5104	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 analyze, generate experimental skills towards the industrial applications.
19CY5201	General Chemistry-II	CO1	Describe symmetry elements, operations and groups by representing them in matrices
		CO2	Demonstrate various molecular spectroscopic terms with their theoretical background
		CO3	Apply the basic principles of classical and quantum theory of Raman spectroscopy in analytical applications
		CO4	Employ Nuclear magnetic resonance spectroscopy to interpret organic molecules
		CO1	Understand the principles behind the formation of metal cluster compounds.

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**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.

19CY5202	Inorganic Chemistry- II	CO2	Explain the synthesis, properties, bonding and structures of $\pi$ -complexes of transition metals.
		CO3	Illustrate the principles behind the Metal Ligand equilibria in solution with respect to the formation, their Kinetic and thermal stability, and determinations.
		CO4	Explain the features of Inorganic reaction mechanisms
		CO5	Ability to prepare complex compounds and determine the concentrations
19CY5203	Organic Chemistry - II	CO1	Derive the Electrophilic addition reaction mechanisms of C=C compounds
		CO2	Describe the relationship among aromatic substitution and addition reactions.
		CO3	Apply various reaction pathways to develop new and notable organic compounds.
		CO4	Differentiate the Alkaloids and Terpenoids by their unique properties.
		CO5	An ability to analyze, generate experimental skills towards the industrial applications.
19CY5204	Physical Chemistry- II	CO1	Physical methods of molecular structure determination.
		CO2	Application of Electron Spin Resonance spectroscopy.
		CO3	Discuss fundamental aspect of electrochemistry for energy device application.
		CO4	Electrochemistry of electrode electrolyte interface
		CO5	An ability to analyze, generate experimental skills towards the industrial applications.
19CY5301	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.

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 Department of Chemistry  
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 Green Fields, Vaddeswaram-522 303,  
 Guntur Dist., A.P., India.

		CO4	Comprehend the basic knowledge of mass spectroscopy and X-ray spectroscopy to characterize the unknown molecules
		CO5	Ability to analyze chemicals by Instrumental methods
19CY5302	Quality Control and Traditional Methods of Analysis-I	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 Redox systems involved in the classical Volumetric methods of Analysis.
		CO4	Explain the various principles involved in the analysis of Organic Functional Groups
19CY5303	Applied Analysis-I	CO1	Understand the principles, methodology and adoptability various procedures for the analysis of Analysis of Iron, Manganese, Chromite, Phosphate and Aluminum 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
19CY5304	Separation Techniques-I (Elective)	CO1	Discuss principle of chromatography, different techniques and its modification to adsorption chromatography for analytical applications
		CO2	Apply gas chromatography phenomenon for the analysis of gases, petroleum products.
		CO3	Understand the basic principle of LC-MS
		CO4	Employ GC-MS and HPLC concepts in the application of pharmaceutical drug analysis.

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**Dr. J.V. Shanmukha Kumar**  
 Head of the Department  
 Department of Chemistry  
 Koneru Lakshmaiah Education Foundation  
 (Deemed to be University)  
 Green Fields, Vaddeswaram-524 307,  
 Guntur Dist., A.P., India.

19CY5305	Applications of Chemical Spectroscopy (Elective)	CO1	Discuss the fundamental principles of basic characterization techniques
		CO2	Apply NMR techniques in the elucidation of complex molecules
		CO3	Determination of elemental or isotopic signature of sample
		CO4	Identification of chemical structure of a molecule by spectroscopy
19CY5306	Bio Analytical Chemistry (Elective)	CO1	Understand the basic principles of bioanalysis.
		CO2	Explain the basic concept of Radiochemical Manometric and Calorimetric.
		CO3	Apply electrophoretic method in bioassay
		CO4	Explain and apply biosensors in biomolecule analysis
19CY5307	Environmental Chemistry (Elective)	CO1	Understand the greenhouse effect concept.
		CO2	Employ various sampling techniques for air sampling
		CO3	Understand various pollution monitoring techniques
		CO4	Explain environmental Impact Assessment process
19CY5308	Surface Analytical Techniques (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.
19CY5309	Analysis of Food and Drugs (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
19CY5310	Organic Synthesis-I	CO1	Build carbon- carbon single bond associated molecules (carbenes- carbenoids)

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 Department of Chemistry  
 Koneru Lakshmaiah Education Foundation  
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 Guntur Dist., A.P., India.

		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 synthesis organic molecules for general health Issues.
19CY5311	Natural Products and Biomolecules	CO1	Illustrate the synthesis and significance of microbial metabolites
		CO2	Outline the origin & chemical nature of Terpenes
		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.
19CY5312	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 & $^{13}\text{C}$ NMR and mass spectrometry methods of analysis.
		CO4	Able to apply spectroscopic methods (UV, IR, $^1\text{H}$ -NMR, $^{13}\text{C}$ -NMR & mass spectrometry) in organic structure elucidation.
19CY5313	Photo Chemistry and Pericyclic Reactions	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.

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19CY5314	Organo metallic Chemistry	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 effective report writing, experimental design and data analysis.
19CY5315	Bio Organic Chemistry	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.
		CO3	Understand the signaling pathways of Lipids and Amino acids.
		CO4	Demonstrate the chemistry and kinetics of enzymes.
19CY5316	Green Chemistry	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.
19CY5317	Food Chemistry	CO1	Explain properties and reactions of carbohydrates, lipids and proteins during storage and processing of food.
		CO2	Identify the important sources of vitamins and minerals in food and their effect in quality aspects of food.
		CO3	Explain the importance of water for stability and quality of food.
		CO4	Understand the sources of important classes of undesirables in food and the HACCP term.
19CY5318	Medicinal Chemistry	CO1	To understand the drug metabolic pathways adverse effects and the therapeutic value of drugs.

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		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
19CY5401	Instrumental Methods of Analysis-II	CO1	Discuss and understand the principles and instrumentation involved in Flame photometry, Atomic Absorption Spectrometer, inductively coupled plasma spectrometer and Arc and Spark spectrographic Direct analysis.
		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.
		CO5	Ability to analyse chemicals by Instrumental methods
19CY5402	Advanced Applied 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.
19CY5403	Dissertation with Research Publication	CO5	Inculcate research aptitude and enhance the thinking and analytical competencies.
19CY5404	Separation Techniques -II	CO1	Discuss principle of paper chromatography, different techniques and its modification to thin layer chromatography for analytical Applications.

*V. Shanmukha Kumari*

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		CO2	Apply ion exchange phenomenon employing different resins to separate ions and polar molecules of environmental and biological importance
		CO3	Identify suitable sampling methods of solid, liquid and gas to meet the criteria of analysis.
		CO4	Develop analytical methods to solve industrial problems and solvent extraction as significant analytical method of purification and separation.
19CY5405	Quality Control and Traditional Methods of Analysis-II	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
19CY5406	Sensor Based Techniques and Body Fluid Analysis	CO1	Understand the principles of various chemical sensors
		CO2	Analysis of biomolecules in body fluids
		CO3	Employ analytical techniques in the determination of vitamins
		CO4	Apply Immunoanalytical Techniques in clinical analysis
19CY5407	Organic Synthesis -II	CO1	Explain the properties of Oxidising agents and reducing agents
		CO2	Illustrate reaction mechanisms for some Organosilane related compounds.
		CO3	Explain theory and principles involved in Disconnection approach and principles of Phase transfer catalysis.
		CO4	Explain about the Retrosynthesis and applied to various cyclic organic molecules.
		CO5	To carry out multistep synthesis of organic molecules.
19CY5408	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

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		CO3	Apply the aromaticity, reactivity and synthesis of heterocyclic compounds with more than heteroatoms.
		CO4	Apply the synthesis, structure, reactivity and stability of larger ring heterocyclics.
		CO5	Ability to synthesize heterocyclic compounds
19CY5409	Dissertation with Research Publication	CO-5	Inculcate research aptitude and enhance the thinking and analytical competencies.
19CY5410	Advanced Organic Spectroscopy	CO1	Outline optical rotatory dispersion and circular dichroism.
		CO2	Examine the separation of chemical shifts and coupling on 2D axis
		CO3	Take part in fragmentation of organic molecules associated with functional groups
		CO4	Elucidate organic structures using mass fragmentation ORD & CD
19CY5411	Chemistry of Drugs and Pharmaceuticals	CO1	Understand the medicinal and pharmaceutical importance of the organic compounds.
		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 glycosides etc.,
		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.
19CY5412	Nano Chemistry	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.

  
Academic Professor I/C

  
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