

**K.L.E Society's
Raja Lakhamagouda Science Institute (Autonomous), Belagavi
(PO's/PSO's/CO's)**

Program: B. Sc. Chemistry & Biotechnology (UG01C12)

Programme Outcome

- PO1: Disciplinary knowledge and skills: Capable of demonstrating comprehensive knowledge and understanding of major concepts, theoretical principles and experimental findings in Chemistry & Biotechnology and its different subfields.
- PO2: Critical thinker and problem solver: Ability to employ critical thinking and efficient problem-solving skills in the four basic areas of Chemistry & Biotechnology.
- PO3: Sense of inquiry: Capability for asking relevant/appropriate questions relating to issues and problems in the field of Chemistry & Biotechnology, and planning, executing and reporting the results of an experiment or investigation.
- PO4: Lifelong learners: Capable of self-paced and self-directed learning aimed at personal development and for improving knowledge/skill development and reskilling.

Programme Specific Outcomes

- PSO1: Students will realize and develop an understanding of the impact Chemistry & Biotechnology on society and apply conceptual understanding of the Chemistry & Biotechnology in real life.
- PSO2: Perform effectively with professional ethics in analytical, scientific and technical domains.
- PSO3: Demonstrate subject-related and transferable skills that are relevant to Chemistry & Biotechnology related job trades and employment opportunities.

Course Outcomes

Semester I

Course Type	Course Code	Course Title	Course Outcome
AECC	21EN101	Generic English-I	CO1: Learn to appreciate literary texts. CO2: Obtain the knowledge of literary devices and genres. CO3: Acquire the skills of creativity to express one's experiences. CO4: Be aware of their social responsibilities. CO5: Develop the critical thinking skills.
AECC	21KA101	Kannada	CO 1: Create appreciation for Kannada language and culture through Kannada literature CO 2: Creating environmental awareness. CO 3: Developing scientific perspective through science literature. CO 4: Know the importance and various forms of Kannada Language
AECC	21HI101	Hindi	CO1: Create interest among the students by reading story. CO2: Will be familiar with the development sequence of modern Hindi story. CO3: Interest towards linguistic correctness will be created. CO4: Will be able to acquire writing skills. CO5: Know the importance and various forms of Hindi Language.
SEC	21CS111	Digital fluency	CO1: Have an intelligent conversation on the key concepts and applications of artificial intelligence (AI), Big data analytics (BDA), internet of things (IOT), Cloud computing, and cyber security. CO2: Develop holistically by learning essential skills such as effective communication, problem solving, design thinking, and team work. CO3: Build his or her personal brand has an agile and expensive learner- one who is interested in horizontal and vertical growth?
DSC	21CH101	Fundamentals of chemistry	CO1: Analyze the analytical methods, Errors and treatment of analytical data and gain knowledge about balance in redox equations, titration curves, theory of redox in metal-ion indicators and applications

			<p>CO2: Describe the dual nature of radiation and matter, Quantum mechanics, Orbital shapes, electronic configurations of the atoms and periodicity.</p> <p>CO3: Explain bond properties, electron displacement effects, organic reaction mechanism, configurationally and conformational isomers.</p> <p>CO4: Explain the existence of different states of matter, laws of ideal gases and real gases and understand cooling effect of gas.</p>
OEC	21CH111	Chemistry in Daily life-1	<p>CO1: Understand the chemical constituents in various day to day materials using by a common man.</p> <p>CO2: Understand the chemical Composition and analysis of milk and milk products, beverages, food preservatives and analysis of pesticides residue in food.</p> <p>CO3: Understand the chemical constituents in chemical fuels and polymers.</p>
DSC	21CH102	Chemistry Lab-1	<p>After successful completion of first semester in Chemistry a student should be able to;</p> <p>CO1: Understand principles of different type's titrations. Titration curves for all types of acids–base titrations.</p> <p>CO2: Gain knowledge about balance in redox equations, titration curves, theory of redox indicators and applications.</p> <p>CO3: Gain knowledge about estimation of some organic compounds such as Aniline and Amide</p>
DSC	21BT101	Cell Biology and Genetics	<p>CO1: Develop the knowledge of how the cell is considered to be the structural and functional unit of life by learning in detail about the structure and the functions of different cell organelles.</p> <p>CO2: Understanding the cell division in which is an important aspect of growth and development.</p> <p>CO3: To communicate the role of Mendelian concepts in the development of the Science and Genetics, and learning about different laws in Genetics, Gene interactions, inheritance and various important aspects.</p> <p>CO4: Students will get the knowledge of molecular basis of variability, inheritance, Chromosomal evolutionary aspects, Human genetics and genetic disorders in human.</p>

DSC	21BT102	Cell Biology and Genetics	<p>CO1: Students will learn about handling and Standard Operating Procedures of different instruments being used in biotechnology laboratory</p> <p>CO2: The students will acquire knowledge of composition and preparation of different stains and reagents being used to observe the structure and components of the cell.</p> <p>CO3: The students will understand the concept of study of divisional stages of cell division including mitosis and meiosis. They will observe the stages of division and can easily differentiate them.</p> <p>CO4: Genetics is the study of inheritance. In the practical of genetics the students will learn about the mounting of polythene chromosomes, karyotyping to analyze different diseases in human being and they will learn about solving some of the problems associated with Genetic studies.</p>
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Semester II

Course Type	Course Code	Course Title	Course Outcome
AECC	21EN201	Generic English-II	<p>CO1: Learn to appreciate literary texts.</p> <p>CO2: Obtain the knowledge of literary devices and genres.</p> <p>CO3: Acquire the skills of creativity to express one's experiences.</p> <p>CO4: Be aware of their social responsibilities.</p>
AECC	21BO311	Environmental Studies	<p>CO1: define environmental study and ecology with basic principles.</p> <p>CO2: To examine the natural resources their types and utility.</p> <p>CO3: To identify the environmental usages, types of pollutions and their impact.</p> <p>CO4: To outline the diversity and explain the conservations and its significance.</p>
AECC	21KA201	Kannada-II	<p>CO 1: A good personality is formed by literature based on life values.</p> <p>CO 2: Students become ambitious to build a better life by achieving specific goals.</p> <p>CO 3: Inspiring to always be enthusiastic in life.</p> <p>CO 4: You will get complete knowledge of modern Kannada poetry.</p>

AECC	21HI201	Hindi-II	<p>CO1: Create interest among the students by reading story.</p> <p>CO2: Will be familiar with the development sequence of modern Hindi story.</p> <p>CO3: Interest towards linguistic correctness will be created.</p> <p>CO4: Will be able to acquire writing skills.</p> <p>CO5: Know the importance and various forms of Hindi Language.</p>
DSC	21CH201	Fundamentals of chemistry - 2	<p>CO1: Understand the chemical bonding, molecular structure & periodicity of elements.</p> <p>CO2: Explain the concepts of acidic strengths of organic compounds and stereochemistry.</p> <p>CO3: Describe the solids & liquid crystals-Forms of solids and classification of Liquid-Crystals.</p> <p>CO4: Understand the Chemical Kinetics, Liquid State, Surface tension, Viscosity and Refractive index</p>
OEC	21CH211	Molecules of life	<p>CO1: Acquire knowledge about different types of sugars and their chemical structures and Identify different types of amino acids and determine the structure of peptides.</p> <p>CO2: Explain the actions of enzymes in our body and interpret enzyme inhibition, Predict action of drugs. Depict the biological importance of oils and fats.</p> <p>CO3: Understand the importance of lipids in the metabolism Differentiate RNA and DNA and their replication. Explain production of energy in our body.</p>
DSC	21CH202	Content of Chemistry Lab-2	<p>CO1: Understand the different type's titrimetric experiments</p> <p>CO2: Gain the knowledge about determination of Ba^{2+} and Cu^{2+} by gravimetric methods.</p> <p>CO2: Gain the knowledge about determination of Density, Viscosity and Surface tension.</p>
DSC	21BT201	Microbiological Methods	<p>CO1: Instruments considered to be the important part of Practical. The students will learn about the principles and standard operating procedures of different instruments being used in the field of Life Science for research and development</p> <p>CO2: Students will understand the importance of aseptic condition for the laboratory work in Biotechnology. They get the knowledge of sterilization and the microbial techniques.</p> <p>CO3: Microorganisms are omnipresent. The structure of different microbes which are present in our environment and diseases caused by these microbes will be learnt by the students.</p> <p>CO4: The action of antimicrobial agents with example is well understood.</p>

DSC	21BT202	Microbiological Methods	<p>CO1: Students will learn about handling and Standard Operating Procedures of different instruments being used in Microbiology laboratory.</p> <p>CO2: The students will acquire knowledge method and importance of Sterilization, preparation of media for the growth of microorganisms in the laboratory.</p> <p>CO3: The students will understand the inoculation techniques using different pure culture methods and the understand about the colony characterization of bacterial and fungal colonies.</p> <p>CO4: Students will acquire the knowledge of staining techniques to observe the microbes and biochemical analysis to understand the character of the microorganism.</p>
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Semester III

Course Type	Course Code	Course Title	Course Outcome
AECC	21EN301	Generic English-III	<p>CO1: Acquired enhanced LSRW (Listening, Speaking, Reading, Writing) skills</p> <p>CO2: Equipped themselves with interpersonal communication skills</p> <p>CO3: Augmented presentation and analytical skills</p> <p>CO4: Ability to critically analyses, interpret and appreciate literary texts</p> <p>CO5: An awareness of social, cultural, religious and ethnic diversities</p>
AECC	21KA301	Kannada-III	<p>CO1: By knowing about Bhakti Sahitya – Students understand humanity.</p> <p>CO2: Through travel literature, people will learn about the life and culture of different regions</p> <p>CO3: The study of ideological literature will lead to revolution.</p> <p>CO4: Know the importance and various forms of Kannada Language.</p>
AECC	21HI301	Hindi-III	<p>CO1: Able to understand One Act plays</p> <p>CO2: Learn to write various types of Letters</p>
SEC-2		Constitution of India	<p>CO1: To realise the significance of constitution of India to students from all walks of life and help them to understand the basic concepts of Indian constitution.</p> <p>CO2: To identify the importance of fundamental rights as well as fundamental duties.</p> <p>CO3: To understand the functioning of Union, State and Local Governments in Indian federal system.</p>

DSC	21CH301	Fundamentals of chemistry - 2	<p>CO1: Understand the importance of fundamental law and validation parameters in chemical analysis to know how different analytes in different matrices (water and real samples) can be determined by spectrophotometric nephelometric and turbidimetric methods.</p> <p>CO2: Suggest the plausible structures and geometries of molecules using Radius Ratio Rules, VSEPR theory</p> <p>CO3: To understand the concept of mechanism for a given reaction and also to know the importance of reaction intermediates.</p>
OEC	21CH311	Fuel Chemistry and Environmental Chemistry	<p>CO1: Understand the concept of fuels, and their classifications.</p> <p>CO2: Learn the different types of fuels and their applications.</p> <p>CO3: Know the different types of pollution and their prevention.</p>
DSC	21CH302	Content of Chemistry Lab-2	<p>CO1: Understand the importance of instrumental methods for quantitative applications Apply colorimetric methods for accurate determination of metal ions and anions in water or real samples</p> <p>CO2: Able to evaluate acid- base titrations and generates the titration curves for strong acid and bases and also explain the reference and indicator electrodes.</p> <p>CO3: Understand how functional groups in a compound is responsible for its characteristic property</p> <p>CO4: Learn the importance of qualitative tests in identifying functional groups.</p> <p>CO5: Learn how to prepare a derivative for particular functional groups and how to purify it.</p>
DSC	21BT301	Biotechnology-III	<p>CO 1. Students will understand the different types of Carbohydrates, their detailed structure and properties and also understand about Metabolism of various biological pathways and can understand the different amino acids and amino acid metabolism.</p> <p>CO 2. Students are able to understand the different biological functions and Classification of Lipids, Enzyme Kinetics and typed of enzyme Inhibition and also can understand the different clinical applications of enzymes.</p> <p>CO 3. Students will get to know about the biological role of Vitamins and their deficiency diseases, and all types, structure of Nucleic Acids that is of DNA and RNA, here students also understand the chemical Nature and Structure of different Hormones.</p> <p>CO 4. The applications and techniques of different Bio analytical tools will be understood.</p>

DSC	21BT302	Practical's-III	<p>CO1: Students will understand Definitions and calculation of Molarity, Molality, Normality, Mass percent % (w/w), Percent by volume (% v/v), parts per million (ppm), parts per billion (ppb), Dilution of concentrated solutions.</p> <p>CO2: Standard solutions, stock solution, solution of acids. Reagent bottle label reading and precautions. Preparation of standard buffers– Acetate, phosphate, Tris and determination of pH of solution using pH meter.</p> <p>CO3: Qualitative analysis of Carbohydrates, Proteins, Estimation of maltose by DNS method and proteins by Bradford method and amino acid by Ninhydrin method. Students will also understand Determination of α-amylase activity by DNS method and iodine number of lipids.</p>
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Semester IV

Course Type	Course Code	Course Title	Course Outcome
AECC	21EN401	Generic English-IV	<p>CO1: Acquired creative, interpretative and critical thinking</p> <p>CO2: Skills to communicate confidently and effectively</p> <p>CO3: Obtained persuasive and creative social media writing skills</p> <p>CO4: Developed analytical and evaluative skills</p> <p>CO5: Learnt to identify and understand social contexts and ethical frameworks in the texts</p>
AECC	21KA401	Kannada-IV	<p>CO 1: Learn to live in harmony by learning about the oppressed race.</p> <p>CO 2: students will live in tolerance with each other.</p> <p>CO 3: By understanding the life of common people, one will know the essence of simple life</p> <p>CO 4: Know the importance and various forms of Kannada Language</p>
AECC	21HI401	Hindi-III	<p>CO1: Able to understand Hindi Novels</p> <p>CO2: Able to understand the importance of Mass Media and Communication</p>
SEC-2		Artificial Intelligence	<p>CO1: To get introduce about the concept of artificial intelligence and machine learning.</p> <p>CO2: Understanding data analysis process i.e., preparation, modelling, visualization.</p> <p>CO3: It is to learn about the robotics, types of robots and also components of robots.</p>

DSC	21CH401	Fundamentals of chemistry - IV	<p>CO1: Able to define chromatography and also know the steps involved in a chromatography investigation.</p> <p>CO2: Predict the nature of the bond formed between different elements Identify the possible type of arrangements of ions in ionic compounds. Write Born-Haber cycle for different ionic compounds Relate different energy parameters like, lattice energy, entropy, enthalpy and solvation energy in the dissolution of ionic solids</p> <p>CO3: To understand the concept of mechanism for a given reaction and also to know the importance of reaction intermediates,</p> <p>CO4: Understand the concept of rate of a chemical reaction, integrated rate equations, energy of activation and determination of order of a reaction based on experimental data and to Know the different types of electrolytes, usefulness of conductance and ionic mobility measurements Determine the transport numbers</p>
OEC	21CH411	Electrochemistry, Corrosion and Metallurgy	<p>CO 1: Understand the concept of conductance in electrolytic solutions, electrolysis and redox reactions involved in electrode reactions.</p> <p>CO 2: Able to understand the Different types of Batteries their principal construction and working, lead-acid storage and lithium-ion battery. Study of Fuels cells.</p> <p>CO 3: Gain the knowledge of ores and minerals, extraction of metals from their ores, and purification.</p>
DSC	21CH402	Content of Chemistry Lab-IV	<p>CO1: Understand the chemical reactions involved in the detection of cations and anions.</p> <p>CO2: Explain basic principles involved in classification of ions into groups in semi-micro qualitative analysis of salt mixture Carry out the separation of cations into groups and understand the concept of common ion effect.</p> <p>CO 1: understand the use of instruments like conductivity meter to obtain various physicochemical parameters and also know the theory about chemical kinetics and determine the velocity constants of various reactions.</p> <p>CO 3: Learn to fit experimental data with theoretical models and interpret the data</p>
DSC	21BT401	Biotechnology-IV	<p>CO 1. Students will understand the Molecular structure of genes, Genetic Code and its properties also different experiments to proof DNA and RNA as Genetic material.</p>

			<p>CO 2. Different proteins involved in the DNA replication process and the DNA damage and repair mechanism, also understand by this unit.</p> <p>CO 3. Students can understand the Mechanism of Transcription, Translation Process and different factors involved in the mechanism.</p> <p>CO 4. The process of Operon concept, gene mapping, and Gene regulation Process will understand.</p>
DSC	21BT402	Practical's-IV	<p>CO1: Students will understand DNA model making, Estimation of DNA, RNA and Protein by DPA, Orcinol, and FCR method respectively.</p> <p>CO2: Students will gain knowledge about Quantification of DNA/Protein by spectroscopic method and Estimation of protein by FCR method, students will also understand Extraction and partial purification of protein from plant source by Ammonium sulphate precipitation.</p>