PROGRAMME NAME: B. SC. BIOTECHNOLOGY

Program Code: 22R

Graduate attributes:

GA1	Domain Knowledge	**Knowledge**
GA2	Domain Analysis	
GA3	Design and Development of Solutions	
GA4	Communication Skills	**Skills**
GA5	Innovative and Entrepreneurial Skills	
GA6	Leadership and Management Skills	
GA7	Individual and Team Work	**Attitude**
GA8	Ethical and Social Responsibility	
GA9	Life-long Learning	

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The **B.Sc., Biotechnology** program describe accomplishments that graduates are expected to attain within five to seven years after graduation	
PEO1	Have enormous opportunities to become an effective researcher in the field of Life sciences.
PEO2	Acquire skills to face Various Government competitive exams viz., TNPSC, UPSC and SSC etc.,
PEO3	Become socially responsible with morel and intellectuals.
PEO4	Become an entrepreneur and product developer.
PEO5	Graduates will empower skills to meet the global challenges through current teaching learning methodologies.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

After the successful completion of B.Sc., Biotechnology program, the students are expected to	
PSO1	Graduates acquire Problem solving ability- solving social issues and engineering problems
PSO2	Graduates will develop interest in lifelong learning
PSO3	Graduates develop an ability to design and conduct experiments
PSO4	Graduates will be enriched with skill based practical which aid them to become self employed
PSO5	Graduates will obtain requisite knowledge on the structure, function and applications of living organisms and thereby explore it in academia and industry

PROGRAMME OUTCOMES (POs)

On successful completion of the B. Sc. Biotechnology programme,	
PO1	The students should be able to demonstrate proficiency in basic science and fundamental biotechnological tools
PO2	The graduates could understand the working principles of advanced biological sciences
PO3	The graduates acquire employability skills in the field of Pharma, food and agricultural industries
PO4	The graduates get motivated towards deep learning, higher studies and research in life sciences
PO5	The graduates develop health and environment awareness towards social responsibility

COURSE OUTCOME (CO's)

SEMESTER - I

COURSE NAME: CELL BIOLOGY

#	Course Outcome	
CO1	Design the model of a cell.	K6
CO2	Differentiate the structure of prokaryotic and eukaryotic cell.	K2
CO3	Explain the organization of Genes and chromosomes, chromosome morphology and its aberrations	K2
CO4	Compare and contrast the events of cell cycle and its regulation	K4
CO5	Explain the communications of cells with other cells and to the environment.	K2
C06	To know the cell organelles and locate its parts along with functions	K1

COURSE NAME: BIOINSTRUMENTATION

#	Course Outcome	
CO1	Demonstrate the basics of instrumentation by analysis	K4
CO2	Exemplify the structure of atoms and molecules by using the principles of spectroscopy	K1
CO3	Evaluate by Separating and Purifying the components	K5
CO4	understand the need and applications of imaging techniques	K3
CO5	categorize the working principle and applications of fluorescence and radiation based techniques	K2

COURSE NAME: LAB IN CELL BIOLOGY,BIOINSTRUMENTATION AND MICROBIOLOGY

#	Course Outcome	
CO1	Be aware of the laboratory rules and regulations.	K1
CO2	Understand the importance, evolution and diversity of cells and preparation of buffers	K2
CO3	Learns to visualize the cells by employing different types of microscopes	K2
CO4	Bring in the concepts of microbial culturing techniques.	K4
CO5	Analysis of phenotypic characterization of known and unknown microbes and basic instruments	K4

COURSE NAME: BASIC MATHEMATICS

#	Course Outcome	
CO1	Student can understand, apply & analyze about binomial, exponential, logarithmic & summation series.	K2,K3,K4
CO2	Students can apply the inverse matrix problem in cryptography.	K3
CO3	Remember & Understand about differentiation.	K1, K2
CO4	Understand the integration by parts.	K2
CO5	Students can apply the Central Tendency in real life.	K3

SEMESTER - II

COURSE NAME: MICROBIOLOGY

#	Course Outcome	
CO1	Remember and recall the historical events which paved the development of different types of microscopes.	K1
CO2	Understand and differentiate the different types of microbes.	K2
CO3	Analyze the media composition and grow the desired microbe.	K3
CO4	Apply the knowledge to enumerate the microorganisms from natural environment.	K4
CO5	Evaluate the success of understanding the viruses.	K5

COURSE NAME: ALLIED : CHEMISTRY

#	Course Outcome	
CO1	Understand the importance of bonding and order	K1,K2
CO2	Apply the gained knowledge in analyzing the water parameters	K3
CO3	Analyse the adulteration in food	K4
CO4	Evaluate the role of agricultural, pharmaceutical and textile chemistry	K5
CO5	Think innovatively to solve the environmental issues	K6

COURSE NAME: ALLIED CHEMISTRY PRACTICAL

#	Course Outcome	
CO1	Understand the practical skills in chemistry	K2
CO2	Acquire skills in handling of chemicals	K2
CO3	Calculate the normality of a given solution	K3
CO4	Analyse the functional groups of the given compound	K4
CO5	Evaluate the parameters of water	K5

SEMESTER - III

COURSE NAME: BIOCHEMISTRY

#	Course Outcome	
CO1	Understand the significance of Biochemistry.	K1
CO2	Describe the chemistry of carbohydrates, lipids, proteins and amino acids.	K2
CO3	Understand the basics of enzymes.	K1
CO4	Describe the classification and structural organization of proteins	K3
CO5	The students will understand about the structure and function of nucleosides and nucleotides.	K5

COURSE NAME: GENETICS

#	Course Outcome	
CO1	Obtain acquaintance on historical overview of microbial genetics and genetic materials	K3
CO2	Comprehend the concept of replication of genetic materials	K2
CO3	Understand about regulation of gene expression and mutation	K1
CO4	Demonstrate the genetic exchange mechanism in microorganisms	K6
CO5	Gain knowledge on Mutation	K5

COURSE NAME: LAB IN GENETICS AND BIOCHEMISTRY

#	Course Outcome	
CO1	Successfully quantify the important biological constituents of cell.	K5
CO2	Analyze the sex chromatin present in different cells.	K4
CO3	Examine and evaluate the stages of Mitosis.	K5
CO4	Develop the skills of DNA isolation technique	K2
CO5	Could able to separate and interpret the mixture of components	K4

COURSE NAME: ALLIED COMPUTER APPLICATIONS I : INTRODUCTION TO COMPUTER

#	Course Outcome	
CO1	Use basic fundamental utilities which are required again and again on daily basis to work on operating system.	K6
CO2	Configure important services to connect ports.	K2
CO3	To inculcate the basic knowledge on Computer Networks and technologies	K2
CO4	To impart strong knowledge on spreadsheet application in biological data analytics	K4
CO5	Enable to know about basic presentation graphical representation of data.	K2

COURSE NAME: SKILL BASED SUBJECT 1: HUMAN PHYSIOLOGY

#	Course Outcome	
CO1	Understand various systems in human body.	K2
CO2	Know the activities of various organs.	K1
CO3	apply terminologies applicable to pathology and describe the courses and natural progress of human disease.	K3
CO4	outline the current research in disease-specific disciplines and what is currently known about treatment options for various human diseases.	K4
CO5	Know about Kidney functions and disorders.	K5

SEMESTER - IV

COURSE NAME: MOLECULAR GENETICS

#	Course Outcome	
CO1	To remember the Organization of genome.	K1
CO2	To understand Structure and function of DNA.	K2
CO3	To describe the transcriptional regulation in prokaryotes.	K2
CO4	To analyze the operon concept-lac operon.	K4
CO5	Evaluate the post translational modifications and folding of newly assembled polypeptides.	K5

COURSE NAME: ALLIED COMPUTER APPLICATIONS – II: 'C' AND PYTHON PROGRAMMING

#	Course Outcome	
CO1	Understand the students have the programming ability in C Language.	K6
CO2	Ability to write C Programming for logical concepts.	K2
CO3	Ability to design and write application to manipulate coding logics for biological concepts.	K2
CO4	Develop their own applications to analysis with data.	K4
CO5	To inculcate knowledge on basic Python programming skills.	K2

COURSE NAME: ALLIED PRACTICAL: COMPUTER APPLICATIONS I & II

#	Course Outcome	
CO1	Understand the practical skills in office oriented applications	K2
CO2	Acquire skills in handling internet	K2
CO3	Write programs which employs basic concepts of C	K3
CO4	Ability to develop C Programming that allows applications to make efficient skills	K4
CO5	Write programs which employs basic concepts of python for biological purpose	K5

COURSE NAME: SKILL BASED SUBJECT – 2: HUMAN PATHOLOGY

#	Course Outcome	
CO1	Distinguish the metabolic disorders in human being	K4
CO2	Explain the basic nature of diseases and their causes	K2
CO3	Apply knowledge of pathology in disease diagnosis and management	K3
CO4	Acquire knowledge to maintain the healthy body	K1
CO5	Evaluate the condition of body to prevent the diseases.	K5

SEMESTER - V

COURSE NAME: PLANT AND ANIMAL BIOTECHNOLOGY

#	Course Outcome	
CO1	Understand scientific and technical skills on plants and animal study	K1
CO2	Know about animal products	K1
CO3	Acquire knowledge on limitations and challenges in animal cell tissue culture.	K2
CO4	Know the applications of Plant and animal Biotechnology.	K3
CO5	Learn the preservative methods of cells	K4
CO6	Evaluate and discuss public and ethical concerns over the use of animal Biotechnology.	K4

COURSE NAME: IMMUNOLOGY

#	Course Outcome	
CO1	Know about the history of Immunology	K1
CO2	Compare and contrast innate and adaptive immunity	K2
CO3	Design a model of Immunoglobulin/Antibodies	K6
CO4	Describe which cell types and organs present in the immune response.	K2
CO5	Illustrate various mechanisms that regulate immune responses and maintain tolerance	K3
CO6	Exemplify the adverse effect of immune system including Allergy, hypersensitivity and autoimmunity	K2
CO7	Apply basic techniques for identifying antigen antibody interactions	K3
CO8	Explain the stages of transplantation responses	K2
CO9	Describe the immunological response against tumor and blood transfusion	K2

COURSE NAME: ENVIRONMENTAL BIOTECHNOLOGY

#	Course Outcome	
CO1	Classify microbes according to energy source and carbon source and evaluate energy outcome of the energy metabolism according to electron acceptor and electron donor usage	K1
CO2	Describe suitable methods for characterizing the activity, function, diversity, and composition of microbial communities	K2
CO3	Explain the microbial processes and growth requirements underlying the activated sludge process, nitrification, Denitrification, enhanced phosphorus removal, and anaerobic digestion	K1
CO4	Describe the most commonly applied disinfection methods, and the steps typically involved in drinking water treatment process train	K3
CO5	Evaluate the potential for biodegradation of organic pollutants, taking microbial and physical/chemical environments, as well as the chemical structure of the compound itself, into consideration	K5
CO6	Describe biotechnological solutions to address environmental issues including pollution, mineral resource winning, renewable energy and water recycling.	K4
CO7	Describe existing and emerging technologies that are important in the area of environmental biotechnology	K6

COURSE NAME: RECOMBINANT DNA TECHNOLOGY

#	Course Outcome	
CO1	Acquaint with the vocabulary involved in molecular cloning strategies and techniques used to probe DNA for specific genes of interest	K1
CO2	Apprehend with the tools and techniques in rDNA technology and types of Vectors	K2
CO3	Relate the role of restriction and modifying enzymes in recombinant DNA technology	K3
CO4	Explore the techniques involved in construction of genomic DNA library and cDNA library	K4
CO5	Design the protocols for analyzing gene transfer methods and to explore knowledge on hybridization based markers	K5
CO6	Acquaint with the vocabulary involved in molecular cloning strategies and techniques used to probe DNA for specific genes of interest	K1

COURSE NAME: SKILL BASED SUBJECT 3: DIAGNOSTIC TOOLS

#	Course Outcome	
CO1	Compare and contrast the various blood and urine parameter analysis	K1
CO2	Understand the techniques to diagnose the abnormality in health	K2
CO3	Acquire a basic understanding about the components in blood to be checked	K2
CO4	Analyze the fundamental principles of advanced molecular techniques	K4
CO5	Evaluate the pros and cons of advanced techniques	K5

COURSE NAME: MICROBIAL BIOTECHNOLOGY & rDNA TECHNOLOGY

#	Course Outcome	
CO1	Narrate the scope and economics of Microbial Biotechnology	K1
CO2	Understand the need of microbial products for the mankind	K2
CO3	Examine the learned techniques in production of industrially important products	K3
CO4	Think about the innovativeness in the production of new beneficial metabolites	K6
CO5	Apply the IPR law to real problems and also learn patenting for creative products	K3,K5

COURSE NAME: LAB IN IMMUNOLOGY AND PLANT TISSUE CULTURE

#	Course Outcome	
CO1	Understand the practical skills in Immunology	K2
CO2	Acquire skills in plant tissue culture	K2
CO3	Defining the fundamental concepts of immunology, disease diagnosis and Plant tissue culture techniques	K3
CO4	Developing and applying the recent technology involved in diagnostic techniques of immunology and Plant cell culture	K4
CO5	Examining and analyzing the results involved in immune techniques and Plant tissue Culture	K5

COURSE NAME: LAB IN MICROBIAL BIOTECHNOLOGY AND rDNA TECHNOLOGY

#	Course Outcome	
CO1	Acquire an overview about the fundamentals of Bioprocess Technology and r-DNA technology tools and their application in agriculture, medicine and biodiversity conservation.	K1
CO2	Acquire expertise in isolation of Plasmids and DNA and to validate the steps involved in isolation process	K2
CO3	Gain confidence to apply the knowledge in pursuing bioprocess and DNA techniques at pilot scale for biotechnological application	K3
CO4	Analyse, interpret gene amplification and identify copies to integrate transgene by PCR and Southern blot analysis.	K4
CO5	Demonstrate the practical experience to begin a career in Biotech as well as well as in R and D research laboratories for advanced research.	K5

SEMESTER - VI

COURSE NAME: PHARMACOLOGY

#	Course Outcome	
CO1	Compare and contrast the specific pharmacology of the major classes of drugs, important distinctions among members of each class	K1
CO2	Understand the medicinal and pharmaceutical importance of drug compounds	K2
CO3	Students acquire a basic understanding about the drug research.	K2
CO4	Analyze the fundamental principles of pharmacokinetics and pharmacodynamics.	K4
CO5	Evaluate the risks and benefits, in relation to the organ systems they affect, and the diseases for which they are used therapeutically.	K5

COURSE NAME: AGRICULTURAL BIOTECHNOLOGY

#	Course Outcome	
CO1	Explain the growth and historical perspective of agricultural biotechnology.	K1
CO2	The students will be provided with a firm understanding in the principles and application of agriculture biotechnology.	K2
CO3	Understand the importance of biofertilizers	K2
CO4	Analyse the current practices and production of biofertilizers.	K4
CO5	Create new practices in production of biofertilizers.	K6

COURSE NAME: BIOREMEDIATION

#	Course Outcome	
CO1	Explain the definition of bioremediation.	K1
CO2	To Understand the bioreactors for remedial processes.	K2
CO3	To describe the various phytoremediation processes.	K2
CO4	To Create biotechniques for air pollution.	K6
CO5	To Analyze Biodegradation of xenobiotics.	K4

COURSE NAME: INTRODUCTION TO BIOINFORMATICS

#	Course Outcome	
CO1	Demonstrate the concepts in computational Biology	K1
CO2	Understand the interrelationship between Biology, Computer and mathematics	K2
CO3	Apply the knowledge on existing software effectively to extract information from large databases and to use those information in computer modeling	K3
CO4	Analyze the molecular data using insilico tools	K4
CO5	Think critically and get motivated to do higher studies to develop evaluation skills in bioinformatics	K5

COURSE NAME: MEDICAL BIOTECHNOLOGY

#	Course Outcome	
CO1	To remember the role of biotechnology in healthcare.	K1
CO2	To understand the worldwide market and work in medical biotechnology.	K2
CO3	To describe the pharming for human proteins and neutraceuticals.	K2
CO4	To analyze the diagnosis and prediction of disorders.	K4
CO5	Evaluate the recent developments in medical biotechnology.	K5

COURSE NAME: BIOTECHNOLOGICAL APPROACH FOR WASTE WATER TREATMENT

#	Course Outcome	
CO1	Acquire skills on handling domestic and industrial waste water	K1
CO2	Understand the different levels of waste water treatment	K2
CO3	Become employable in ETP lab and pollution control board	K3
CO4	Analyze the parameters before and after treating waste water	K3
CO5	Apply knowledge in designing effluent treatment plant for the dyeing industries	K4, K6

COURSE NAME: GENOMICS

#	Course Outcome	
CO1	Gain information on next generation sequencing tools and next generation mapping portals	K1
CO2	Understand the stages of genes expression, genome projects and genomic databases	K2
CO3	Acquire skills in managing and processing Omics data	K3
CO4	Obtain and analyse information and data relating to genes using specific organism databases	K4
CO5	Validate appropriate knowledge and skills in the area of Biological sciences	K5

COURSE NAME: INDUSTRIAL BIOTECHNOLOGY

#	Course Outcome	
CO1	Increase their understanding that industrial biotechnology is based on using machines to control the growth of microorganisms	K2
CO2	Acquire basic theoretical skills on operating fermentor under various parameters	K3
CO3	Exemplify the production of alcoholic beverages and organic acids	K3
CO4	Analyze the potential business opportunities in fermentation-based biotechnology	K4
CO5	Become innovative in search of new microbes for microbial product production	K6

COURSE NAME: BIOETHICS & BIOSAFETY

#	Course Outcome	
CO1	Distinguish knowledge of biosafety and risk assessment of products derived from recombinant DNA research and environment release of genetically modified organisms, national and international regulations.	K1
CO2	Analyze ethical aspects related to biological, biomedical, health care and biotechnology research	K4
CO3	Awareness education on genetically engineered organism	K2
CO4	Evaluate the levels and their impact on Environment	K5
CO5	Understand the Ethics in clinical trials and Good Clinical Practices	K2

COURSE NAME: PROTEOMICS

#	Course Outcome	
CO1	Acquire skills on protein databases and their retrieval	K1
CO2	Able to interpret the protein interactions	K3
CO3	Identify and investigate the structure of protein	K4
CO4	Know the Evaluation of mass of the protein	K5
CO5	Develop analytical skills in identifying new proteins thereby interpreting with databases	K6