DANTULURI NARAYANA RAJU COLLEGE
(Autonomous)
BHIMAVARAM, W.G.DIST, ANDHRA PRADESH, INDIA, PIN- 534202.
(Accredited at 'B++' level by NAAC)
(Affiliated to Adikavi Nannaya University, Rajamahendravaram)

BIOTECHNOLOGY

SEMESTER I

COURSE: BIOMOLECULES & ANALYTICAL TECHNIQUES

CO	COURSE OUTCOME	LEVEL
CO1	Describe the structure of carbohydrates at the molecular level, including monosaccharides, disaccharides, and polysaccharides.	L2
CO2	Explain the roles of vitamins as coenzymes, antioxidants, and regulators of various metabolic pathways.	L2
CO3	Apply appropriate analytical techniques to solve specific research questions or practical problems	L3
CO4	Analyze electrophoretic data to determine the sizes, charges, and concentrations of separated molecules.	L4
CO5	Explain the theoretical basis behind different analytical techniques including spectroscopy, chromatography and mass spectrometry.	L2
CO6	Apply appropriate statistics tests to analyze biological data, such as t-tests, ANOVA, chi-square tests, and regression analysis.	L4

COURSE: BIOMOLECULES & ANALYTICAL TECHNIQUES LAB

CO	COURSE OUTCOME	LEVEL
CO1	Explain carbohydrate identification using qualitative tests, demonstrating understanding.	L2
CO2	Apply technques to quantify carbohydrate concentrations accurately.	L3
CO3	Employ Lowery method to quantitate protein levels precisely	L3
CO4	Apply diphenylamine reagent to estimate DNA content accurately.	L3
CO5	Utilize orcinol reagent to estimate RNA content accurately.	L3
CO6	Conduct protease activity assay, quantifying enzyme activity effectively.	L3

SEMESTER II

COURSE: MICROBIOLOGY,CELL AND MOLECULAR BIOLOGY

CO	COURSE OUTCOME	LEVEL
CO1	Utilize microscopy and staining techniques to visualize and identify microbial specimens.	**L3**
CO2	Interpret taxonomic keys and databases to identify and classify microorganisms based on morphological, biochemical, and genetic characteristics.	**L2**
CO3	Explain the structural organization of cell membranes and their roles in maintaining cellular homeostasis, communication	**L2**
CO4	Evaluate the mechanisms underlying cellular processes such as cell signalling, cell division, and cell differentiation	**L4**
CO5	Analyze experimental data related to DNA replication, repair, and gene expression regulation to identify patterns, trends, and relationships.	**L4**
CO6	Explain the processes of DNA replication, transcription, and translation, including the molecular machinery involved and the regulation of gene expression.	**L2**

COURSE: MICROBIOLOGY,CELL AND MOLECULAR BIOLOGY LAB

CO	COURSE OUTCOME	LEVEL
CO1	Prepare nutrient agar medium, applying sterile technique proficiently.	**L3**
CO2	Formulate PDA medium, demonstrating accurate preparation techniques.	**L3**
CO3	Explain sterilization methods, understanding autoclave, hot air oven, and filtration.	**L2**
CO4	Isolate bacteria from soil samples, applying aseptic techniques effectively.	**L3**
CO5	Perform simple staining, demonstrating technique with proficiency.	**L3**
CO6	Apply differential staining, distinguishing between bacterial cell types accurately.	**L3**

SEMESTER III

COURSE: IMMUNOLOGY AND r-DNA TECHNOLOGY

CO	COURSE OUTCOME	LEVEL
CO1	Explain the functions and interactions of different immune cell types in innate and adaptive immunity.	**L2**
CO2	Apply knowledge of immune cell function to understand the pathogenesis of infectious diseases, autoimmune disorders, allergies, and immunodeficiency's.	**L3**
CO3	Interpret the mechanisms of DNA manipulation techniques, including DNA digestion, ligation, transformation, and gene expression.	**L2**
CO4	Utilize recombinant DNA technology to engineer genetically modified organisms (GMOs) for agriculture, medicine, and industry.	**L3**
CO5	Analyze experimental data from cloning experiments to evaluate the efficiency and fidelity of gene cloning and expression.	**L4**
CO6	Apply computational tools and software to analyze biological sequences, genomes, and molecular structures.	**L3**

COURSE: IMMUNOLOGY AND r-DNA TECHNOLOGY LAB

CO	COURSE OUTCOME	LEVEL
CO1	Perform blood group determination, applying appropriate laboratory techniques.	**L3**
CO2	Conduct Widal test, interpreting results accurately and proficiently.	**L3**
CO3	Perform ELISA assay, analyzing samples for antigen-antibody reactions	**L3**
CO4	Isolate plasmid DNA using alkaline lysis method, demonstrating proficiency.	**L3**
CO5	Analyze plasmid DNA using gel electrophoresis technique accurately.	**L3**
CO6	Describe blood collection, serum separation, and storage techniques accurately	**L2**

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SEMESTER IV

COURSE: PLANT AND ANIMAL BIOTECHNOLOGY

CO	COURSE OUTCOME	LEVEL
CO1	Apply aseptic techniques to handle plant materials and prepare culture media for establishing and maintaining plant tissue cultures.	L3
CO2	Use molecular markers for genotyping experiments to analyze genetic diversity and trait inheritance patterns in populations.	L3
CO3	Interpret the requirements for maintaining cell viability and growth in culture, including nutrient requirements and environmental conditions.	L2
CO4	Use appropriate cell culture methods to isolate, propagate, and characterize animal cell lines for specific research purposes.	L3
CO5	Apply transgenic techniques to generate genetically modified animals for studying gene function, disease mechanisms, and preclinical drug testing.	L3
CO6	Implement biosafety protocols and best practices to ensure the safe handling, storage, and disposal of biological materials and hazardous agents in laboratory environments.	L3

COURSE: PLANT AND ANIMAL BIOTECHNOLOGYLAB

CO	COURSE OUTCOME	LEVEL
CO1	Explain MS media composition, understanding its role in plant culture.	L2
CO2	Induce callus from explants, analyze callus cytology proficiently.	L3
CO3	Propagate plants via tissue culture, applying shoot tip and nodal techniques	L3
CO4	stablish plant cell culture in solid and liquid media effectively.	L3
CO5	Count cells using hemocytometer, applying accurate counting techniques.	L3
CO6	Estimate cell viability using Trypan blue, applying dye exclusion method.	L3

SEMESTER IV

COURSE: ENVIRONMENTAL & INDUSTRIAL BIOTECHNOLOGY

CO	COURSE OUTCOME	LEVEL
CO1	Interpret the environmental, social, and economic impacts of pollution on ecosystems, biodiversity, and public health.	L2
CO2	Apply bioremediation principles and techniques to remediate contaminated sites, including soil, water, and air pollution.	L3
CO3	Explain the different types of biofuels, including first-generation (e.g., biodiesel, ethanol) and advanced biofuels	L2
CO4	Apply biofuel production techniques to convert biomass feedstocks into liquid or gaseous fuels for transportation, heating, and electricity generation	L3
CO5	Explain the role of microorganisms in biotechnological processes, including their use in food production, pharmaceuticals, and environmental remediation.	L2
CO6	Analyze data from fermentation processes to assess product yield and quality.	L4

COURSE: ENVIRONMENTAL & INDUSTRIAL BIOTECHNOLOGY LAB

CO	COURSE OUTCOME	LEVEL
CO1	Measure water hardness and alkalinity, applying appropriate analytical techniques.	L3
CO2	Determine dissolved oxygen concentration in water sample accurately.	L3
CO3	Assess sewage sample's biological oxygen demand using standard methods.	L3
CO4	Measure sewage sample's chemical oxygen demand precisely.	L3
CO5	Isolate industrially important microorganisms from soil using sterile techniques.	L3
CO6	Isolate amylase-producing organisms from soil, employing appropriate cultivation methods.	L3

SEMESTER V
COURSE: ORGANIC FARMING

CO	COURSE OUTCOME	LEVEL
CO1	Analyze soil properties and their effects on plant growth.	L4
CO2	Apply knowledge of plant nutrition to develop fertilizer recommendations for specific crops and soils.	L3
CO3	Demonstrate organic soil management practices, such as composting, cover cropping, and crop rotation.	L3
CO4	Compare different organic farming methods and their suitability for different climates, crops, and scales of production.	L2
CO5	Explain the concept of the carbon-to-nitrogen ratio and its significance in composting.	L2
CO6	Apply knowledge of biofertilizer selection and application techniques to optimize crop yield and quality in various agricultural settings.	L3

COURSE: ORGANIC FARMINGLAB

CO	COURSE OUTCOME	LEVEL
CO1	Collect various soil samples, applying proper sampling techniques.	L3
CO2	Estimate soil NPK levels qualitatively, employing appropriate testing methods	L3
CO3	Gather fruit, vegetable, and domestic waste, using proper collection methods.	L3
CO4	Collect vermin castings from vermicomposting systems using appropriate techniques.	L3
CO5	Sieve, dry, and pack vermicompost, following standard procedures accurately.	L3
CO6	Prepare media, isolate biofertilizers, employing sterile techniques proficiently.	L3

SEMESTER V

COURSE: BIOFERTILLIZERS AND BIOPESTICIDES PRODUCTION

CO	COURSE OUTCOME	LEVEL
CO1	Explain the mechanisms by which biofertilizers contribute to soil fertility and plant nutrition.	**L2**
CO2	Explain the symbiotic relation3ship between mycorrhizal fungi and plant roots, including nutrient exchange mechanisms.	**L2**
CO3	Demonstrate proper application methods for biopesticides, including spray application, baiting, or incorporation into soil or growing media.	**L3**
CO4	Apply knowledge of biopesticide selection criteria to choose the most appropriate product for managing specific pest problems in agriculture.	**L3**
CO5	Explain the principles behind mass production methods, including division of labor, specialization, and standardization of processes.	**L2**
CO6	Apply knowledge of field application methods to select the most suitable technique for specific agricultural inputs, such as fertilizers, pesticides, or irrigation water.	**L3**

COURSE: BIOFERTILLIZERS AND BIOPESTICIDES PRODUCTION LAB

CO	COURSE OUTCOME	LEVEL
CO1	Prepare Nutrient agar, YEMA, and PDA media accurately.	**L3**
CO2	Isolate Rhizobium from root nodules, using proper isolation techniques.	**L3**
CO3	Isolate Azotobacter from soil samples, employing correct isolation methods.	**L3**
CO4	Perform Gram staining on bacteria samples accurately.	**L3**
CO5	Stain VAM roots, applying staining techniques proficiently.	**L3**
CO6	Raise legume seedlings with Rhizobium treatment effectively.	**L3**