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)

MICROBIOLOGY

SEMESTER:I

COURSE:1 INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY(THEORY)

CO	COURSE OUTCOMES	LEVEL
CO1	Explain the importance and applications of microbiology.	L2
CO2	Understand the general characteristics of Prokaryotic Microorganisms and Viruses	L2
CO3	Understand the vegetative structure, photosynthetic pigments, and reproductive mechanisms of fungi, algae, and protozoa.	L2
CO4	Understand selective, enrichment, and differential media, as well as preservation techniques for microbial cultures.	L2
CO5	Apply pure culture techniques such as dilution-plating, streak-plate, spread-plate, pour-plate, and micromanipulator.	L3
CO6	Understand sterilization and disinfection techniques, including physical, radiation, and chemical methods.	L2

COURSE:1 INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY LAB(PRACTICAL)

CO	COURSE OUTCOMES	LEVEL
CO1	Understand the purpose of each ingredient used in the preparation of culture media.	L2
CO2	Analyze the growth characteristics of different fungi on Sabouraud's agar.	L4
CO3	Evaluate the impact of autoclaving on the quality of the sterilized medium.	L5
CO4	Understand the principles of dry heat sterilization and its applications.	L2
CO5	Apply proper staining techniques to visualize bacterial cells under the microscope.	L3
CO6	Apply proper Gram staining techniques to differentiate between Gram-positive and Gram-negative bacteria.	L3

SEMESTER:II

COURSE:2 MICROBIAL PHYSIOLOGY AND BIOCHEMISTRY(THEORY)

CO	COURSE OUTCOMES	LEVEL
CO1	Understand the structure and function of carbohydrates, lipids, proteins, and nucleic acids in biological systems.	**L2**
CO2	Understand the roles of coenzymes, cofactors, and different types of enzyme inhibition in regulating enzyme activity.	**L2**
CO3	Demonstrate the principles and applications of colorimetry, chromatography (including paper, thin-layer, and column chromatography), spectrophotometry (UV & visible), centrifugation, and gel electrophoresis.	**L2**
CO4	Understand the phases of microbial growth in batch cultures and factors influencing microbial growth.	**L2**
CO5	Apply methods for measuring microbial growth such as direct microscopy, viable count estimates, turbidometry, and biomass measurement in microbial culture experiments	**L3**
CO6	Understand the biochemical reactions and energy production mechanisms involved in aerobic respiration, anaerobic respiration, fermentation, and photosynthesis.	**L2**

COURSE:2 MICROBIAL PHYSIOLOGY AND BIOCHEMISTRY LAB (PRACTICAL)

CO	COURSE OUTCOMES	LEVEL
CO1	Understand the principles of various qualitative tests for carbohydrates such as Molisch's test, Benedict's test, and others.	**L2**
CO2	Apply qualitative tests to identify the presence of specific amino acids in a given sample.	**L3**
CO3	Analyze the colorimetric readings obtained from the assay to calculate protein concentration.	**L4**
CO4	Analyze the colorimetric readings obtained from the assay to calculate protein concentration.	**L4**
CO5	Understand the mechanisms behind paper and thin layer chromatography and how they separate components of mixtures.	**L2**
CO6	Understand the mechanisms behind paper and thin layer chromatography and how they separate components of mixtures.	**L2**

SEMESTER:III

COURSE:3 MOLECULARBIOLOGYANDMICROBIAL GENETICS(THEORY)

CO	COURSE OUTCOMES	LEVEL
CO1	Explain the structure and functions of DNA and RNA, as well as the organization of DNA in prokaryotes.	**L4**
CO2	Understand the proof of the semi-conservative mechanism of DNA replication, such as the Meselson-Stahl experiment.	**L2**
CO3	Describe the concept of a gene, including muton, recon, and cistron, and the genetic code.	**L2**
CO4	Understand the processes of transcription and translation in prokaryotes, as well as the regulation of gene expression in bacteria, including the lac operon.	**L2**
CO5	Apply knowledge of mutations, damage, and repair mechanisms to analyze genetic abnormalities and predict outcomes in genetic studies.	**L3**
CO6	Understand the different types of vectors used in genetic engineering, such as plasmids, cosmids, phagemids, and lambda phage vectors, as well as gene cloning methods	**L2**

COURSE:3 MOLECULARBIOLOGYANDMICROBIAL GENETICS LAB (PRACTICAL)

CO	COURSE OUTCOMES	LEVEL
CO1	Apply knowledge of DNA and RNA structures to interpret micrographs and model representations.	**L3**
CO2	Apply proper techniques for isolating genomic DNA from E. coli cultures.	**L3**
CO3	Analyze spectrophotometric data to calculate DNA concentration and assess sample purity.	**L4**
CO4	Analyze spectrophotometric data to calculate DNA concentration and assess sample purity.	**L4**
CO5	Understand how SDS denatures proteins and imparts a uniform charge-to-mass ratio for separation.	**L2**
CO6	Evaluate the efficiency of UV mutagenesis for generating desired mutations in bacteria.	**L5**

SEMESTER:IV

COURSE:4 IMMUNOLOGY AND MEDICAL MICROBIOLOGY(THEORY)

CO	COURSE OUTCOMES	LEVEL
CO1	Describe the functions of B and T lymphocytes, monocytes, macrophages, neutrophils, basophils, eosinophils, and the complement system,concept of innate and adaptive immunity	**L2**
CO2	Apply knowledge of immune responses to analyze antigen-antibody interactions	**L3**
CO3	Understand the pathogenesis, epidemiology, diagnosis, prevention, and control of bacterial, fungal, protozoal, and viral diseases	**L2**
CO4	Apply knowledge of microbial diseases to analyze their causative organisms, transmission routes, and preventive measures.	**L3**
CO5	Understand the methods used for microbial identification, including culturing, biochemical tests, molecular assays, and serological tests.	**L2**
CO6	Explain the modes of action of antibacterial, antifungal, and antiviral agents, as well as tests for antimicrobial susceptibility and antibiotic resistance.	**L4**

COURSE:4 IMMUNOLOGY AND MEDICAL MICROBIOLOGY LAB(PRACTICAL)

CO	COURSE OUTCOMES	LEVEL
CO1	Understand the principles of blood typing techniques such as agglutination reactions.	**L2**
CO2	Apply proper techniques to separate serum from whole blood samples.	**L3**
CO3	Evaluate the sensitivity and specificity of the Ouchterlony method for detecting antigen-antibody complexes.	**L5**
CO4	Understand the principles of swabbing techniques for microbial sampling.	**L2**
CO5	Evaluate the diagnostic significance of identifying various malarial parasite stages in blood smears.	**L5**
CO6	Understand the principles of biochemical tests such as IMViC, urease production, and catalase tests for bacterial identification.	**L2**

COURSE:5 MICROBIAL ECOLOGY AND INDUSTRIAL MICROBIOLOGY(THEORY)

CO	COURSE OUTCOMES	LEVEL
CO1	Interpret the role of microorganisms in various biogeochemical cycles (carbon, nitrogen, phosphorus).	L3
CO2	Explain different types of microbe-microbe interactions such as synergism, mutualism, commensalism, antagonism, competition, parasitism, and predation.	L4
CO3	Apply knowledge of microbial detection techniques to assess the potability of drinking water using standard qualitative procedures and membrane filter techniques. Also, analyze intrinsic and extrinsic parameters affecting microbial growth in food.	L3
CO4	Apply knowledge of industrial microbiology to assess the suitability of different microorganisms for specific industrial applications and techniques for improving their performance.	L3
CO5	Understand different types of fermentation processes such as solid-state, liquid-state, batch, fed-batch, and continuous, along with the composition of fermentation media, the design principles of fermentation processes including control of pH, temperature, dissolved oxygen, foaming, and aeration	L2
CO6	Understanding microbial production processes for various industrial products such as citric acid, ethanol, penicillin, glutamic acid, vitamin B12, amylase, and yogurt.	L2

COURSE:5 MICROBIAL ECOLOGY AND INDUSTRIAL MICROBIOLOGY LAB(PRACTICAL)

CO	COURSE OUTCOMES	LEVEL
CO1	Apply proper techniques for selective isolation of amylase-producing microorganisms from soil samples.	L2
CO2	Analyze the characteristics of isolated microorganisms to determine their role in food spoilage.	L4
CO3	Understand the microbial fermentation process that converts milk into yogurt.	L2
CO4	Understand the concept of microbial growth inhibition and competition in crowded plate technique.	L2
CO5	Evaluate the effectiveness of isolation methods in capturing diverse soil microflora.	L5
CO6	Apply proper techniques for filtration or enrichment of water samples to isolate microorganisms.	L3

SEMESTER:V

COURSE:6A FOOD ,AGRICULTURE AND ENVIRONMENTAL MICROBIOLOGY(THEORY)

CO	COURSE OUTCOMES	LEVEL
CO1	Apply knowledge of food-borne diseases like salmonellosis and their detection methods.	**L3**
CO2	Understanding the principles of food preservation, including both physical and chemical methods.	**L2**
CO3	Describe microbial groups present in soil and their roles in the transformation of carbon, nitrogen, phosphorus, and sulfur.	**L2**
CO4	Explain beneficial microorganisms in agriculture, including biofertilizers (bacterial, cyanobacterial, and fungal), microbial insecticides, and agents for controlling plant diseases.	**L4**
CO5	Understand plant-microbe interactions and diseases caused by bacteria and fungi in various commercial and food crops.	**L2**
CO6	Apply knowledge of sewage treatment processes, including primary, secondary, and tertiary treatments, and understand their applications in waste management	**L3**

COURSE:6A FOOD ,AGRICULTURE AND ENVIRONMENTAL MICROBIOLOGYLAB(PRACTICAL)

CO	COURSE OUTCOMES	LEVEL
CO1	Explain the principles behind the isolation techniques used and the reasons for food spoilage by microorganisms.	**L5**
CO2	Understand the role of specific microorganisms, such as lactobacilli, in yogurt fermentation.	**L2**
CO3	Apply the MBRT method to determine the microbial load in milk samples	**L3**
CO4	Understand the concept of rhizosphere and its influence on microbial communities.	**L2**
CO5	Apply the isolation techniques to obtain pure cultures of rhizobium from root nodules.	**L3**
CO6	Understand the role of Azotobacter in nitrogen fixation and soil fertility.	**L2**

COURSE:7A MANAGEMENT OF HUMAN MICROBIAL DISEASES AND DIAGNOSIS

CO	COURSE OUTCOMES	LEVEL
CO1	Understand bacterial, viral, fungal, and protozoan diseases affecting various human body systems and the clinical samples used for their diagnosis	**L2**
CO2	Explain the collection of clinical samples from different body sites and the precautions required. Also, understand the methods of transport and storage of clinical samples.	**L4**
CO3	Demonstrate staining techniques like Gram stain, Ziehl-Neelsen staining for tuberculosis, and Giemsa-stained thin blood film for malaria. Also, understand the preparation and use of culture media for bacterial growth.	**L2**
CO4	Interpret serological methods like agglutination and ELISA, nucleic acid-based methods like PCR, and their applications in diagnosing diseases like Typhoid, Dengue, HIV, and Swine flu.	**L2**
CO5	Explain the importance of antibiotic resistance and methods for determining bacterial resistance/sensitivity using the disc diffusion method and minimal inhibitory concentration (MIC) determination.	**L4**
CO6	Apply knowledge of antibiotic resistance and epidemiological investigations to assess and address the challenges posed by drug-resistant bacteria.	**L3**

COURSE:7A MANAGEMENT OF HUMAN MICROBIAL DISEASES AND DIAGNOSISLAB(PRACTICAL)

CO	COURSE OUTCOMES	LEVEL
CO1	Explain the importance of proper labeling, recording, and dispatching of clinical specimens to ensure accurate diagnosis and patient safety.	**L2**
CO2	Analyze the physical, chemical, and microscopic characteristics of clinical samples to identify abnormalities and potential indications of disease.	**L4**
CO3	Evaluate the effectiveness of different isolation and identification methods in detecting E. coli, Salmonella, and Pseudomonas from clinical specimens.	**L5**
CO4	Assess the reliability and accuracy of hemoglobin estimation results obtained using the acid hematin and cyanmethemoglobin methods, considering factors such as sample integrity and procedural errors.	**L5**
CO5	Interpret ESR and PCV values in relation to various clinical conditions and diseases	**L2**
CO6	Analyze blood group typing results to determine ABO and Rh blood groups and interpret discrepancies.	**L4**