



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)

M.Sc. MICROBIOLOGY

SEMESTER –I

COURSE: MBY101- GENERAL MICROBIOLOGY(THEORY)

CO	COURSE OUTCOMES	LEVEL
CO1	Distinguish characteristics between prokaryotic and eukaryotic cells	L2
CO2	Describe concept, methods and pattern of Sterilization and its practical applicability	L2
CO3	Demonstrate staining methods, Growth media types, Preservation of Microbial cultures.	L3
CO4	Differentiate synchronous, stock, batch and continuous cultures	L4
CO5	Explain Ultra structure and chemical composition of bacteria, actinomycetes, spirochetes, rickettsiae, mycoplasma, Chlamydiae	L4
CO6	Classify characteristics and reproduction methods among various Eukaryotic microorganisms	L4

COURSE: MBY105- GENERAL MICROBIOLOGY LAB (PRACTICAL)

CO	COURSE OUTCOMES	LEVEL
CO1	Analyze the results obtained from these methods to interpret microbial growth patterns and colony counts for pour plate, streak plate and dilution methods.	L4
CO2	Apply staining techniques correctly to prepare slides for microscopic examination	L3
CO3	Evaluate the motility patterns observed and interpret their significance in microbial identification.	L5
CO4	Explain how Crystal violet blood agar, Salt nutrient agar specialized media are used to select for specific types of microorganisms.	L2
CO5	Distinguish between total and viable counts and their significance in microbiological analysis.	L4
CO6	Apply the appropriate techniques to measure bacterial growth in laboratory cultures.	L3



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COURSE: MBY 102 BACTERIOLOGY AND VIROLOGY(THEORY)

CO	COURSE OUTCOMES	LEVEL
CO1	Discuss about Biology of various bacteria	L2
CO2	Apply economic importance of bacteria in Agriculture and industries	L3
CO3	Identify Mode of action of antibiotics and chemotherapeutic drugs	L2
CO4	Describe Nature, origin and evolution of viruses, New emerging & reemerging	L2
CO5	Experiment Viruses culture – organ culture, primary and secondary cell cultures, and monolayer cell cultures, cell strains, cell lines, embryonated eggs.	L3
CO6	Differentiate replication strategies of DNA and RNA viruses	L4

COURSE: MBY 106 BACTERIOLOGY AND VIROLOGY LAB(PRACTICAL)

CO	COURSE OUTCOMES	LEVEL
CO1	Demonstrate proficiency in culturing anaerobic microorganisms in laboratory conditions.	L3
CO2	Show biochemical assays, such as Catalase, Oxidase, Indole, Methyl Red, and Voges-Proskauer tests.	L3
CO3	Separate phage particles from soil samples.	L4
CO4	Apply mechanical inoculation methods to introduce TM viruses into plant hosts.	L3
CO5	Analyze spore and cell sizes using appropriate measurement techniques.	L4
CO6	Experiment isolation and culturing techniques for fungi (yeasts and molds) and algae in laboratory settings.	L3



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COURSE: MBY103 - BIOMOLECULES (THEORY)

CO	COURSE OUTCOMES	LEVEL
CO1	Describe the Properties of Carbohydrates and Lipids	L2
CO2	Classify the Amino acids and proteins	L4
CO3	Predict Structural levels of proteins	L2
CO4	Explain structure, function and properties of DNA and RNA	L4
CO5	Demonstrate Electron transport & Bacterial photosynthesis	L2
CO6	Discuss about Mineral metabolism & Role of trace elements on microbial enzymes	L2

COURSE: MBY107 – BIOMOLECULES LAB (PRACTICAL)

CO	COURSE OUTCOMES	LEVEL
CO1	Apply qualitative tests to identify carbohydrates in various samples.	L3
CO2	Apply qualitative tests to identify proteins in different samples.	L3
CO3	By using Anthrone method to estimate reducing sugars in solutions.	L5
CO4	Utilize the Benedict's method through titration to estimate sugar concentrations.	L3
CO5	By using DPA method to estimate DNA concentrations accurately.	L5
CO6	By using orcinol method to estimate RNA concentrations effectively.	L5

COURSE: MBY104- ANALYTICAL TECHNIQUES (THEORY)

CO	COURSE OUTCOMES	LEVEL
CO1	Describe Microscopic techniques, sample preparations and Centrifugation techniques	L2
CO2	Demonstrate skills related to chromatographic techniques through hands on experience	L3
CO3	Explain Electrophoresis techniques, Immunoelectrophoresis, Immunoblotting; Isoelectric focusing,	L4
CO4	Demonstrate instrumentation and applications of Visible, ultraviolet, infrared and mass spectrophotometry	L3
CO5	Differentiate Principles of colorimetry, Turbidometry, Viscometry	L4
CO6	Discuss Radio isotopic tracers and Manometric techniques	L2



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COURSE: MBY108- ANALYTICAL TECHNIQUES LAB (PRACTICAL)

CO	COURSE OUTCOMES	LEVEL
CO1	Perform paper chromatography to separate amino acids and sugars effectively.	L4
CO2	Estimate a selected amino acid by using colorimetric techniques.	L5
CO3	Separate pigments through adsorption chromatography methods.	L4
CO4	Utilize thin layer chromatography to separate sugars and lipids efficiently.	L3
CO5	Apply the technique of subcellular fractionation through the process of differential centrifugation to isolate cellular components effectively.	L2
CO6	Demonstrate the use of a GM counter for detecting and measuring radiation levels accurately.	L2

II SEMESTER

COURSE: MBY-201-MICROBIAL PHYSIOLOGY AND METABOLISM (THEORY)

CO	COURSE OUTCOMES	LEVELS
CO1	Categorize Nutritional types, respiration in bacteria, microbial growth, cell cycle.	L4
CO2	Classify Culturing techniques, carbohydrate metabolism.	L2
CO3	Out line of Synthesis of peptide glycon and glycol proteins, fermentation processes.	L2
CO4	Analyze Metabolism of amino acids, protein metabolism and urea cycle.	L4
CO5	Classify Catabolism of amino acid, porphyrins, lipid metabolism.	L2
CO6	Explain Nucleotide metabolism ,catabolism of purines and pyrimidines ,secondary metabolism.	L2



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COURSE: MBY-205-MICROBIAL PHYSIOLOGY AND METABOLISM LAB(PRACTICAL)

CO	COURSE OUTCOMES	LEVEL
CO1	Estimate proteins by Biuret method and Folin-Ciocalteau method.	L2
CO2	Estimate DNA by Diphenyl amine method.	L2
CO3	Estimate RNA by Orcinol method	L2
CO4	Estimate Inorganic and organic phosphates by Fiske-SubbaRow method.	L2
CO5	Estimate Ammonical nitrogen and nitrates.	L2
CO6	Demonstrate UV Survival curve of E.coli. or any other bacteria.	L3

COURSE: MBY-202- CELL BIOLOGY AND ENZYMOLOGY(THEORY)

CO	COURSE OUTCOMES	LEVELS
CO1	Categorize Cell organelles, nutrient transport	L4
CO2	Explain Photosynthesis ,cell cycle, signal transduction	L2
CO3	Demonstrate Cyclic nucleotides, protein translocation	L2
CO4	Outlines of enzyme classification, mm equation, km v _{max} and k _{cat} values	L2
CO5	Apply knowledge on Factors effecting enzyme reaction, enzyme inhibitors, mechanism of action of ribonuclease, lysozyme and chymotripsin .	L3
CO6	Summarize Regulatory enzymes, haemoglobin and myoglobin, enzyme purification, immobilized enzymes and thir applications	L2

COURSE: MBY-206- CELL BIOLOGY AND ENZYMOLOGY LAB (PRACTICAL)

CO	COURSE OUTCOMES	LEVEL
CO1	Demonstrate Protoplast preparation and regeneration.	L2
CO2	Show mitosis in Onion root tips.	L3
CO3	Show meiosis in Flower buds.	L3
CO4	Measure microbial enzymes (any two) – Amylase, protease, catalase, urease and pectinase.	L5
CO5	Separate any enzyme from the microbial source.	L4
CO6	Demonstrate Enzyme Kinetics: Effect of pH, temperature and inhibitors on enzyme activity.	L2



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COURSE: MBY-203-MOLECULAR AND MICROBIAL GENETICS(THEORY)

CO	COURSE OUTCOMES	LEVELS
CO1	Explain Molecular organization of chromosomes , genomes, molecular markers	L2
CO2	Model of yeast and drosophila organisms, Classification of plasmids .	L3
CO3	Categorize transposable elements, and their classification, deletion and inversion by transposons.	L4
CO4	Categorize mutations, mutagenesis types.	L4
CO5	Classify Carsinogens UV damage of DNA and repair, bacterial genetics.	L2
CO6	Explain Bacterial recombination, tetrad analysis, recombination in bacterial cells, mapping of bacterial chromosomes.	L2

COURSE: MBY-207-MOLECULAR AND MICROBIAL GENETICS LAB (PRACTICAL)

CO	COURSE OUTCOMES	LEVEL
CO1	Demonstrate of Ames test.	L2
CO2	Manipulate microbial Strains using chemical mutagens.	L3
CO3	Demonstrate Isolation of mutants using EMS.	L2
CO4	Discuss repair mechanism for the damage caused by UV radiation.	L2
CO5	Demonstrate Chromosome isolation, banding and Karyotyping.	L2
CO6	Demonstrate Bacterial conjugation	L2



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COURSE: MBY-204-IMMUNOLOGY(THEORY)

CO	COURSE OUTCOMES	LEVELS
CO1	Classification of immunity, organs of immune system	L2
CO2	Explain Antigen antibody reactions, classification of antibodies, primary and secondary immune response.	L2
CO3	Apply Monoclonal antibodies and their applications, compliment system.	L3
CO4	Explain Humoral and cell mediated immunity, CTL,ADCC.	L2
CO5	Analyze Immune response to infectious deceases, MHC and categorize hypersensitivity reactions.	L4
CO6	Analyze Immune deficiency diseases, vaccines and principals of immunisations	L4

COURSE: MBY-208-IMMUNOLOGY LAB (PRACTICAL)

CO	COURSE OUTCOMES	LEVEL
CO1	Identify antigens using Ouchterlony double diffusion.	L2
CO2	Demonstrate Radial immunodiffusion.	L2
CO3	Demonstrate Separation of Serum - Immunoelectrophoresis.	L2
CO4	Estimate antigens by using ELISA.	L5
CO5	Demonstrate Western blotting.	L2
CO6	Examine Blood grouping, Rh typing, VDRL, WIDAL	L4



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SEMESTER- III

COURSE: MBY-301 MOLECULAR MICROBIOLOGY(THEORY)

CO	COURSE OUTCOMES	LEVEL
CO1	Explain the molecular structures of DNA and RNA as genetic material and different types of genes.	L2
CO2	Classify the molecular mechanisms involved in DNA replication, including the roles of enzymes in replication.	L2
CO3	Analyze the process of transcription, the structure and function of gene promoters. post-transcriptional processes including capping, splicing, polyadenylation, and RNA editing;	L4
CO4	Explain the structure and properties of the genetic code, including the triplet codons, the degeneracy of the code, and the universality of its usage across all living organisms.	L2
CO5	Explain the central dogma of molecular biology, including the process of translation and its role in converting mRNA sequences into functional proteins.	L2
CO6	Apply acquired knowledge on different types of operons, including inducible operons (e.g., lac operon), repressible operons (e.g., trp operon), and constitutive operons.	L3

COURSE: MBY-305MOLECULAR MICROBIOLOGY LAB (PRACTICAL)

CO	COURSE OUTCOMES	LEVEL
CO1	Separate genomic DNA (from bacteria/fungi).	L4
CO2	Separate RNA.	L4
CO3	Demonstrate Recovery of DNA from gels – Electro elution and extraction of DNA from low melting gels.	L2
CO4	Demonstrate Bacteriophage titration – Plaque forming Units (PFU).	L2
CO5	Show Induction of mutations in Bacteria by physical / chemical agents.	L3
CO6	Demonstration of conjugation and Transformation in bacteria.	L2



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COURSE: MBY-302 GENETIC ENGINEERING(THEORY)

CO	COURSE OUTCOMES	LEVEL
CO1	Explain the principles of recombinant DNA technology, blotting techniques, PCR.	L2
CO2	Categorize cloning vectors, ligation process, cloning strategies.	L4
CO3	Outline isolation of poly mRNA, synthesis of c-DNA, cloning of c-DNA in bacteria.	L2
CO4	Explain gene expression and applications of recombinant DNA technology.	L2
CO5	Apply acquired knowledge on DNA micro array, whole genome analysis.	L3
CO6	Analyze single nucleotide polymorphisms using DNA chips, protein micro array, advantages and disadvantages of protein & DNA micro array.	L4

COURSE: MBY-306 GENETIC ENGINEERING LAB (PRACTICAL)

CO	COURSE OUTCOMES	LEVEL
CO1	Separate plasmid DNA from Bacteria.	L4
CO2	Demonstrate Southern blotting.	L2
CO3	Demonstrate Transformation of E. coli with recombinant plasmid DNA.	L2
CO4	Demonstrate Restriction Enzyme digestion – ligation of lambda DNA.	L2
CO5	Demonstrate Polymerase Chain Reaction (PCR).	L2
CO6	Demonstration of nucleic acid sequencing.	L2



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COURSE: MBY-303 BIOINFORMATICS, MICROBIAL GENOMICS&PROTEOMICS(THEORY)

CO	COURSE OUTCOMES	LEVEL
CO1	Classify data bases, Utilize applications in molecular biology, human genome analysis program and protein sequences.	L3
CO2	Explain protein structure analysis, homology modeling, protein function prediction.	L2
CO3	Analyze drug discovery, drug designing, de novo sequence, molecular docking.	L4
CO4	Explain whole genome analysis, conventional and automated sequencing.	L2
CO5	Apply sequence analysis, homology algorithms.	L4
CO6	Utilize applications of omic technologies.	L3

COURSE: MBY-307 BIOINFORMATICS, MICROBIAL GENOMICS&PROTEOMICS(PRACTICAL)

CO	COURSE OUTCOMES	LEVEL
CO1	Apply Using DNA sequence, identifying the protein through database.	L3
CO2	Apply Using amino acid sequence of a protein, identifying the gene through database	L3
CO3	Apply Alignment of DNA and protein sequence using BLAST, FASTA	L3
CO4	Apply Multiple sequence alignment (MSA) of proteins and nucleic acids	L3
CO5	Construct Phylogenetic tree using CLUSTAL tools	L3
CO6	Demonstration of 2D electrophoresis	L2



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COURSE: MBY-304 MEDICAL MICROBIOLOGY(THEORY)

CO	COURSE OUTCOMES	LEVEL
CO1	Interpret the normal flora of human body, infection process.	L2
CO2	Classify diseases caused by bacteria.	L4
CO3	Explain diseases caused by protozoa.	L2
CO4	Examine laboratory diagnosis of diseases. Methods of transmission of diseases by vectors.	L4
CO5	Apply principles of chemotherapy, mode of antibiotics, drug resistance in bacteria.	L3
CO6	Explain diseases caused by viruses, interferons, induces.	L2

COURSE: MBY-308 MEDICAL MICROBIOLOGY LAB (PRACTICAL)

CO	COURSE OUTCOMES	LEVEL
CO1	Prepare different media used in diagnostics Microbiology.	L3
CO2	Examine sputum for pus cells and predominant bacteria.	L4
CO3	Prepare Ziehl-Neelsen staining to detect acid fast bacilli culturing the specimen.	L3
CO4	Examine of urine for pathogenic microorganisms.	L4
CO5	Illustrate Medical Parasitology – E. histolytica, G. lamblia, Trypanosoma, Leishmania and Plasmodium (Permanent Slide Observation).	L3
CO6	Estimate blood components by using various Serological Tests	L2



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SEMESTER- IV

COURSE: MBY 401-FERMENTATION TECHNOLOGY & INDUSTRIAL MICROBIOLOGY(THEORY)

CO	COURSE OUTCOMES	LEVELS
CO1	Explain Range of fermentation process, microorganism used in fermentation, isolation,preservation and stain improvement techniques.	L2
CO2	Categorize Screening methods, media and material required for fermentation process, growth kinetics.	L4
CO3	Demonstrate Design of fermentor, sterilization of media, types of fermentors, recovery and purification of fermented products.	L2
CO4	Experiment with Production of ethyl alcohol, beer and wine, biosensors biochips and biofilms.	L3
CO5	Illustrate Microbial leaching, microbial products from ggenetically modified organisms.	L2
CO6	Explain Biogas production, patenting, IPR.	L2

COURSE: MBY 405-FERMENTATION TECHNOLOGY & INDUSTRIAL MICROBIOLOGY(PRACTICAL)

CO	COURSE OUTCOMES	LEVEL
CO1	Produce citric acid by A.niger. Recovery & Fermentation.	L3
CO2	Estimate Ethanol by dichromate method.	L2
CO3	Produce Ethanol by fermentation and recovery.	L3
CO4	Prepare Wine from grapes by fermentation.	L3
CO5	Produce glutamic acid by fermentation.	L3
CO6	Demonstrate Microbiological Assay of Vitamin B12.	L2



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COURSE: MBY-402- ENVIRONMENTAL MICROBIOLOGY(THEORY)

CO	COURSE OUTCOMES	LEVELS
CO1	Categorize Ecosystem food chain, food web, trophic levels.	L4
CO2	Explain Growth in closed and open environment, aquatic environment IMVIC tests, water born diseases.	L2
CO3	Examine indicator organisms, sanitary examination of water, dispersal of air born microorganisms, diurnal, seasonal periodicity.	L4
CO4	Outline to Microorganisms and pollution , eutrophication.	L2
CO5	Apply knowledge on Sewage treatment, bioremediation technology.	L3
CO6	Illustrate Genetically engineered microorganism and deterioration	L2

COURSE: MBY-406- ENVIRONMENTAL MICROBIOLOGY LAB (PRACTICAL)

CO	COURSE OUTCOMES	LEVEL
CO1	Estimate bacteria, actinomyceles and fungi in soil by dilution – Plating method.	L2
CO2	Identify air-borne microflora by petriplate exposure.	L2
CO3	Predict Effect of pesticides on pure cultures of bacteria.	L2
CO4	Estimate DO.	L2
CO5	Estimate BOD.	L2
CO6	Estimate COD.	L2

COURSE: MBY-403-FOOD AND AGRICULTURE MICROBIOLOGY (THEORY)

CO	COURSE OUTCOMES	LEVEL
CO1	Apply Microbiology of food, microbiological examination of foods and their different techniques, microbial spoilage of foods.	L3
CO2	Out line Food poisoning, food preservations and methods.	L2
CO3	Explain Fermented foods, microorganism as food.	L2
CO4	Categorize Soil environment ,biogeochemical cycles.	L4
CO5	Illustrate Rhizosphere, biochelators, biofertilizers and their uses.	L2
CO6	Explain Biopesticides , biological control	L2



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COURSE: MBY-407-FOOD AND AGRICULTURE MICROBIOLOGY LAB(PRACTICAL)

CO	COURSE OUTCOMES	LEVEL
CO1	Analyze Microbiological examination of milk & milk products.	L4
CO2	Prepare Yoghurt.	L3
CO3	Analyze Microbiological examination of fresh & canned foods.	L4
CO4	Discriminate Microbiological quality testing of milk (MBRT test)	L5
CO5	Separate Rhizobium from root nodules.	L4
CO6	Separate Azotobacter from soil.	L4

COURSE: MBY-404-BIOSTATISTICS AND RESEARCH METHODOLOGY(THEORY)

CO	COURSE OUTCOMES	LEVELS
CO1	Explain Introduction to biostatistics, representation of data, construction of histogram, central tendency.	L2
CO2	Categorize Measure of variation , probability, measure of dispersion and correlation and linear regression.	L4
CO3	Classify Regression coefficient, types of errors, tests of significance, ANOVA.	L2
CO4	Build effective presentation and communication skills by presenting research findings orally and in writing, preparing scientific posters, and communicating research results to diverse audiences.	L3
CO5	Develop skills in interpreting and communicating the results of statistical analyses in the context of biomedical research, including understanding the strengths, limitations, and implications of study findings.	L3
CO6	Apply Submission of technical report patenting and IPR, research project submission and execution.	L3



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COURSE: MBY-408-BIOSTATISTICS AND RESEARCH METHODOLOGY LAB (PRACTICAL)

CO	COURSE OUTCOMES	LEVEL
CO1	Classify data, computation of mean and standard deviation.	L4
CO2	Analyze statistical data with Excel.	L4
CO3	Critical evaluation of regression studies and their implications in various fields.	L5
CO4	Apply appropriate ANOVA techniques to analyze data from various experimental designs.	L3
CO5	Prepare model research article	L3
CO6	Prepare model project proposal.	L3