Dr. V. S. KRISHNA GOVT. DEGREE COLLEGE (AUTONOMOUS)
MADDILAPALEM, VISAKHAPATNAM

B.Sc. MICROBIOLOGY (CBCS) SYLLABUS (W.E.F 2019 - 20)

FINAL YEAR – SEMESTER- V

PAPER – 3A ENVIRONMENTAL & AGRICULTURAL MICROBIOLOGY

TOTAL HOURS: 45 **CREDITS: 3**

Course outcomes: At the end of the course, the student would have achieved the following outcomes.

CO 1: Understand the dynamics between microorganisms and soil, water, air environments and special adaptations of extremophiles.

CO 2: Gain knowledge on the role of microorganisms in nutrient recycling, methods of determining the water potability and microbial interactions.

CO 3: Explain the methods of solid and liquid waste management and different levels of sewage treatment methods.

CO 4: Identify the plant growth promoting and nitrogen fixing microbes and their utility in agriculture and biofertilizers.

CO 5: Categorize various plant diseases based on symptoms and list out methods for controlling plant diseases.

UNIT - I **No. of hours: 9**

Terrestrial Environment: Soil profile and soil microflora
Aquatic Environment: Microflora of fresh water and marine habitats
Atmosphere: Aeromicroflora and dispersal of microbes
Extreme Habitats: Extremophiles: Microbes thriving at high & low temperatures, pH, high hydrostatic & osmotic pressures, salinity, & low nutrient levels.

UNIT – II **No. of hours: 9**

Role of microorganisms in nutrient cycling (Carbon, nitrogen, phosphorus).
Treatment and safety of drinking (potable) water, methods to detect potability of water samples: (a) standard qualitative procedure: presumptive test/MPN test, confirmed and completed tests for faecal coliforms (b) Membrane filter technique.Microbial interactions – mutualism, commensalism, antagonism, competition, parasitism, predation.

UNIT – III **No. of hours: 9**

Outlines of Solid Waste management: Sources and types of solid waste, Methods of solid waste disposal (composting and sanitary landfill).
Liquid waste management: Composition and strength of sewage (BOD and COD), Primary, secondary (oxidation ponds, trickling filter, activated sludge process and septic tank) and tertiary sewage treatment.

UNIT – IV **No. of hours: 9**

Plant Growth Promoting Microorganisms - Mycorrhizae, Rhizobia, *Azospirillum, Azotobacter,Frankia,* phosphate-solubilizers and Cyanobacteria.
Outlines of biological nitrogen fixation (symbiotic, non-symbiotic).
Biofertilizers - *Rhizobium*.

UNIT – V **No. of hours: 9**

Concept of disease in plants. Symptoms of plant diseases caused by fungi, bacteria, and viruses.
Plant diseases - groundnut rust, Citrus canker and tomato leaf curl.
Principles of plant disease control.

Practical: Paper – 3A ENVIRONMENTAL & AGRICULTURAL MICROBIOLOGY

TOTAL HOURS: 45 **CREDITS: 2**

Course outcomes: At the end of the practical course, the student would have achieved the following outcomes.

CO 1: Become well versed with procedures such as estimation of pH, moisture content, and water holding capacity.

CO 2: Perform isolation of microorganisms from soil and water.

CO 3: Estimate the water potability by adapting various methods such as presumptive and MPN tests.

CO 4: Undertake the isolation of nitrogen fixing microbes or check the mycorrhizal staining and observation by microscope.

CO 5: Observe the symptoms of plant diseases and categorize them as fungal, bacterial and protozoan diseases.

1. Analysis of soil – pH, Moisture content and water holding capacity.
2. Isolation of microbes (bacteria and fungi) from soil.
3. Study of air flora by petriplate exposure method.
4. Analysis of potable water: SPC, Presumptive, confirmed and completed test, determination of coliform count in water by MPN.
5. Determination of Biological Oxygen Demand (BOD) of waste water samples.
6. Isolation of *Rhizobium* from root nodules.
7. Staining and observation of Vesicular Arbuscular Mycorrhizal (VAM) fungi.
8. Observation of plant diseases of local importance - Citrus canker, Tikka disease of Groundnut, Bhendi yellow vein mosaic, Rusts, Smuts, Powdery mildews, Tomato leaf curl.

Dr. V. S. KRISHNA GOVT. DEGREE COLLEGE (AUTONOMOUS)
MADDILAPALEM, VISAKHAPATNAM

B.Sc. MICROBIOLOGY (CBCS) SYLLABUS (W.E.F 2019 - 20)

FINAL YEAR – SEMESTER- V

PAPER – 4A DIAGNOSTIC MICROBIOLOGY

TOTAL HOURS: 45 **CREDITS: 2**

Course outcomes: At the end of the course, the student would have achieved the following outcomes.

CO 1: Acquire knowledge about causative agents and the pathogenesis of various bacterial, fungal, viral and protozoan diseases.

CO 2: Understand the procedures used for collection and transport of various clinical samples such as sputum, urine, blood, CSF and stool.

CO 3: Analyze the pathogens from clinical samples by staining and their isolation of selective or enrichment medium.

CO 4: Categorize a diagnostic procedure as serological, molecular or biochemical test. List out the symptoms of endemic diseases.

CO 5: Learn the principles of antibiotic-resistance mechanisms and methods of assessing the resistance or susceptibility of a pathogen to a given antibiotic.

UNIT- I **No. of hours: 9**

Study of causative organism and pathogenesis of Bacterial (cholera), Viral(polio), Fungal(candidiasis) and Protozoan(amoebiasis) diseases and their laboratory diagnosis.

UNIT- II **No. of hours: 9**

Collection of clinical samples (oral cavity, throat, skin, blood, CSF, urine and faeces) and precautions required.
Method of transport of clinical samples to laboratory and storage.

UNIT- III **No. of hours: 9**

Examination of sample by staining - Gram stain, Ziehl-Neelson staining for tuberculosis, Giemsa-stained thin blood film for malaria

Preparation and use of culture media - Blood agar, Chocolate agar, Lowenstein-Jensen medium, MacConkey agar, Distinct colony properties of various bacterial pathogens.

UNIT- IV **No. of hours: 9**

Serological Methods - Agglutination, ELISA, immunofluorescence, Nucleic acid-based methods - PCR, Nucleic acid probes.
Study of symptoms of epidemic diseases - Typhoid, Dengue, HIV and Swine flu.

UNIT- V **No. of hours: 9**

Principle, procedure and interpretation of the methods of antimicrobial susceptibility Testing – Stokes method, Kirby-Bauer method, E-test, determination of minimum inhibitory concentration by broth dilution and agar dilution. Applications, advantages and disadvantages of these methods.

Practical: PAPER – 4A DIAGNOSTIC MICROBIOLOGY

Total hours: 45 **Credits: 2**

Course outcomes: At the end of the practical course, the student would have achieved the following outcomes.

CO 1: Acquire skills for collection of clinical samples such as sputum, urine, blood and skin swabs.

CO 2: Be able to analyze and process the clinical samples for isolation of microorganisms on selective or enrichment media.

CO 3: Undertake the antibiotic sensitivity testing by broth dilution, or Kirby-Bauer disk diffusion tests.

CO 4: Categorize a diagnostic procedure as serological, molecular or biochemical test. List out the symptoms of endemic diseases.

CO 5: Learn the principles of cryopreservation and various methods of storage of microbial isolated for long term preservation.

List of practicals:

1. Collection transport and processing of clinical specimens (Blood, Urine, Stool and Sputum). Receipts, Labeling, recording and dispatching clinical specimens.
2. Isolation of bacteria in pure culture and Antibiotic sensitivity.
3. Identification of common bacteria by studying their morphology, cultural character,Biochemical reactions, slide agglutination and other tests.
4. Maintenance and preservation of stock culture.

Dr. V. S. KRISHNA GOVT. DEGREE COLLEGE (AUTONOMOUS)
MADDILAPALEM, VISAKHAPATNAM

B.Sc. MICROBIOLOGY (CBCS) SYLLABUS (W.E.F 2019 - 20)

FINAL YEAR – SEMESTER- VI

Paper – 3B(i) - FOOD AND INDUSTRIAL MICROBIOLOGY

TOTAL HOURS: 45 **CREDITS: 3**

UNIT- I **No. of hours: 9**

Intrinsic and extrinsic parameters that affect microbial growth in food
Microbial spoilage of food - fruits, vegetables, milk, meat, egg, bread and canned foods
Food intoxication (botulism).
Food-borne diseases (salmonellosis) and their detection.

UNIT – II **No. of hours: 9**

Principles of food preservation - Physical and chemical methods.
Fermented Dairy foods – cheese and yogurt.
Microorganisms as food – SCP, edible mushrooms (white button, oyster and paddy straw).
Probiotics and their benefits.

UNIT – III **No. of hours: 9**

Microorganisms of industrial importance – yeasts(*Saccharomyces cerevisiae*),molds(*Aspergillus niger*), Bacteria(*E.coli*), actinomycetes (*Streptomyces griseus*).
Outlines of Isolation and Screening and strain improvement of industrially-important microorganisms.

UNIT – IV **No. of hours: 9**

Types of fermentation processes – solid state, liquid state, batch, fed-batch, continuous.
Basic concepts of Design of fermenter.
Ingredients of Fermentation media
Downstream processing - filtration, centrifugation, cell disruption, solvent extraction.

UNIT – V **No.of hours: 9**

Microbial production of Industrial products: Citric acid, Ethanol, Amylase, Penicillin, glutamic acid, and vitamin B12.

Practical - Paper – 3B(i) -FOOD AND INDUSTRIAL MICROBIOLOGY

TOTALHOURS:45 **CREDITS: 2**

1. Isolation of bacteria and fungi spoiled bread / fruits / vegetables
2. Preparation of yogurt / dahi
3. Determination of microbiological quality of milk sample by MBRT
4. Isolation of antagonistic microorganisms by crowd plate technique
5. Design of fermenter (Identification of various types of fermenters and labeling of parts
6. Microbial fermentation for the production and estimation of ethanol from grapes
7. Microbial fermentation for the production and estimation of citric Acid

Dr. V. S. KRISHNA GOVT. DEGREE COLLEGE (AUTONOMOUS)
MADDILAPALEM, VISAKHAPATNAM

B.Sc MICROBIOLOGY (CBCS) SYLLABUS (W.E.F 2019 - 20)

FINAL YEAR – SEMESTER- VI

Paper – 4 cluster-1 B(i) - INDUSTRIAL MICROBIOLOGY

TOTAL HOURS: 45 **CREDITS: 2**

UNIT – I **No. of hours: 9**

Microorganisms of industrial importance – yeasts, moulds, bacteria, actinomycetes. Industrially important Primary and secondary microbial metabolites. Screening techniques. Techniques involved in selection of industrially important metabolites from microbes.

UNIT – II **No. of hours: 9**

Fermentation and fermenter: concept and discovery of fermentation. Fermenter: its parts and function. Types of fermenter – batch, continuous and fed batch.

UNIT – III **No. of hours: 9**

Pharma and therapeutic enzymes. Enzymes used in detergents, textiles and leather industries. Production of amylases. Production of therapeutic enzymes. Role of microorganisms in bioleaching and textile industry.

UNIT – IV **No. of hours: 9**

Industrial microorganisms: cell growth, microbial growth kinetics, factors affecting growth, basic nutrition, principles of production media, components of media, chemical composition of media.

UNIT – V **No. of hours: 9**

Bioreactors: basic structure of bioreactor, types of bioreactors, kinetics and methodology of batch and continuous bioreactors. Sterilization of bioreactors: fibrous filter sterilization. Aeration and agitation: agitation in shake flask and tube rollers.

Practical - Paper – 4 cluster-1 B(i) - INDUSTRIAL MICROBIOLOGY

TOTAL HOURS: 45 **CREDITS: 2**

1. Production of ethanol
2. Estimation of ethanol
3. Isolation of amylase producing microorganisms from soil
4. Production and assay of amylase
5. Demonstration of fermenter
6. Production of wine from grapes
7. Growth curve and kinetics of any two industrially important microorganisms.

Dr. V. S. KRISHNA GOVT. DEGREE COLLEGE (AUTONOMOUS)
MADDILAPALEM, VISAKHAPATNAM

B.Sc MICROBIOLOGY (CBCS) SYLLABUS (W.E.F 2019 - 20)

FINAL YEAR – SEMESTER- VI

Paper – 4 cluster-1 B(ii) - FOOD MICROBIOLOGY

TOTAL HOURS: 45 **CREDITS: 2**

UNIT – I **No. of hours: 9**

Microorganisms of food spoilage and their sources. Spoilage of different food materials - fruits, vegetables, meat, fish. Canned foods. Food intoxication (botulism and staph poisoning), food-borne diseases (salmonellosis and shigellosis) and their detection.

UNIT – II **No. of hours: 9**

General account of food preservation. Microbiological production of fermented foods – bread, cheese, yogurt. Biochemical activities of microbes in milk. Microorganisms as food – SCP, edible mushrooms (white button, oyster and paddy straw).

UNIT – III **No. of hours: 9**

Microbial production of distilled beverages, gen and whisky. Introduction, processing and plant production, acetic acid bacteria and mechanism of acidic acid fermentation, commercial vinegar production processing, grades and uses of vinegar. preparation of Yogurt, Streptococcus species, *Lactobacillus bulgaricus*; Manufacture of cheese; *Penicillium roqueforti*.

UNIT – IV **No. of hours: 9**

Food processing & preservation: Methods of food preservation, Aseptic handling, pasteurization of milk, refrigeration and freezing, dehydration, osmotic pressure, chemicals – organic acids, nitrates, nitrites and cresols; Radiation – UV light, Y-irradiation.

UNIT – V **No. of hours: 9**

Probiotics: history, common properties of probiotics, examples of probiotic microorganisms. Uses of probiotics. Production of vitamins: vitamin B12 – organisms used, production method, process, recovery and assay. Vitamin C – organisms used, production method, process, recovery and assay.

Practical - Paper – 4 cluster-1 B(ii) - FOOD MICROBIOLOGY

Total hours: 45 **Credits: 2**

1. Identification of pathogens from – formulation syrup
2. Identification of pathogens from tooth paste
3. Identification of pathogens from canned food materials
4. Identification of pathogens from tablets
5. Bioassay of vitamin B12
6. Bioassay of penicillin
7. Cultivation of edible mushrooms.

Dr. V. S. KRISHNA GOVT. DEGREE COLLEGE (AUTONOMOUS)
MADDILAPALEM, VISAKHAPATNAM

B.Sc MICROBIOLOGY (CBCS) SYLLABUS (W.E.F 2019 - 20)

FINAL YEAR – SEMESTER- VI

Paper – 4 cluster-1 B(iii) - MANAGEMENT OF HUMAN MICROBIAL DISEASES

TOTAL HOURS: 45 **CREDITS: 2**

UNIT – I **No. of hours: 9**

Introduction to human microbial diseases caused by bacteria, virus, fungi and protozoa. Definition and concept of health, disease, infection, and pathogen. Types of human microbial diseases and their transmission, causative agents and symptoms of human microbial diseases.

UNIT – II **No. of hours: 9**

General account of epidemiology: principles of epidemiology, current epidemics (AIDS, nosocomal, acute respiratory syndromes). Measures for prevention of epidemic – global health consideration, emerging and re-emerging infectious diseases. Biological warfare and Biological weapons.

UNIT – III **No. of hours: 9**

Over view of diseases caused by virus – AIDS, Hepatitis, Influenza, Rabies, Chikungunya and Polio, poxvirus, herpes virus, chicken pox virus – history, causative agent, pathogenesis, diagnosis, drugs and inhibitors.

UNIT – IV **No. of hours: 9**

Harmful microbial interaction: human entry of pathogens into the host, types of bacterial pathogens, mechanism of bacterial pathogenicity, colonization and growth, virulence, virulence factors, exotoxins, enterotoxins, endotoxins, neurotoxins – avoidance of host defense mechanisms, damage to host cell, host factors for infection & innate resistance to infection.

UNIT – V **No. of hours: 9**

Laboratory diagnosis of Common infective syndromes and parasitic manifestations; Methods of transmission and role of vectors- biology of vectors. (1) House fly (2) Mosquitoes (3) sand fly. Need and significance of epidemiological studies. Epidemiological investigations to identify a disease, Problems of drug resistance and drug sensitivity. Drug resistance in bacteria.

Practical - Paper – 4 cluster-1 B(iii) - MANAGEMENT OF HUMAN MICROBIAL DISEASES

TOTAL HOURS: 45 **CREDITS: 2**

1. Clinical microbiology:
   a) Physical, Chemical & microscopic examination of clinical samples – urine, stool, puss, sputum.
2. Isolation and identification of following pathogens from clinical samples: *E.coli, Salmonella and Psedumonas.*
3. Demonstration of permanent slides of the following parasites:
   a) Entamoeba histolytica
   b) Ascaris spps.
   c) Plasmodium spps.
   d) Mycobacterium tuberculosis & Mycobacterium leprae
4. Estimation of hemoglobin (Acid hematin and cyan methanoglobin method).
5. ESR and PCV determination
6. Immuno hematology: Blood group typing by slide test & tube for ABO & Rh systems.