



**S.K.R. & S.K.R. Govt. College for Women (Autonomous), Kadapa.**  
**Reaccredited with 'B' Grade by NAAC**  
**Y.S.R.Kadapa District – 516001, Andhra Pradesh**

## DEPARTMENT OF MICROBIOLOGY

# Syllabus-Semester V & VI

SKR&SKR GOVT.COLLEGE FOR WOMEN(A)-KADAPA  
III B.Sc – SEMESTER- V MICROBIOLOGY SYLLABUS-2019-21  
PAPER-V : ENVIRONMENTAL & AGRICULTURAL MICROBIOLOGY

**TOTAL HOURS: 60**

**CREDITS: 3**

### UNIT – I

**No. of hours: 8**

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: 8**

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:MPN test,presumptive 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: 6**

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: 7

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: 7

Plant diseases.Principles and casual agents- bacteria, fungi, and viruses. Symptoms and disease control of - groundnut rust, Citrus canker and tomato leaf curl.

### PRACTICAL-V : ENVIRONMENTAL & AGRICULTURAL MICROBIOLOGY

**TOTAL HOURS: 30**

**CREDITS: 2**

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, Bhenđi yellow vein mosaic, Rusts, Smuts, Powdery mildews, Tomato leaf curl.

SKR&SKR GOVT.COLLEGE FOR WOMEN(A)-KADAPA  
III B.Sc – SEMESTER- VI: MICROBIOLOGY SYLLABUS-2019-21  
PAPER-VII : FOOD AND INDUSTRIAL MICROBIOLOGY

TOTAL HOURS: 60

CREDITS: 3

**UNIT- I No. of hours: 8**

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).

**UNIT – II No. of hours: 7**

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

**UNIT – III No. of hours: 6**

Microorganisms of industrial importance – yeasts, moulds, bacteria, actinomycetes. Isolation and Screening of industrially-important microorganisms. Outlines of strain improvement.

**UNIT – IV No. of hours: 8**

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

**UNIT – V No. of hours: 7**

Microbial production of Industrial products - Citric acid, Ethanol, amylases, penicillin, glutamic acid and vitamin B12.

**PRACTICAL-VII: FOOD AND INDUSTRIAL MICROBIOLOGY**

TOTAL HOURS: 30

CREDITS: 2

1. Isolation of bacteria and fungi from spoiled bread/fruits/vegetables
2. Preparation of Yogurt/Dahi
3. Determination of the microbiological quality of milk sample by MBRT
4. Isolation of antagonistic microorganisms by crowded plate technique
5. Design of Fermenter
6. Microbial fermentation for the production and estimation of ethanol from Grapes.
7. Microbial fermentation for the production and estimation of citric acid.

**B.Sc MICROBIOLOGY SYLLABUS**

**THIRD YEAR – SEMESTER-VI**

**CLUSTER ELECTIVE**

**PAPER-VIII-A1 : COMPUTATIONAL METHODS AND BIOINFORMATICS**

**HOURS:45**

**CREDITS:3**

**UNIT-I**

Definition of statics, population and universe, the sample and population, statistical inference Parameters and statistics. Internal data: Construction of histograms & interpretation. The normal distribution of mean, mode, median , standard deviation and standard error

**UNIT-II**

A) Analysis of variance: introduction and methods( t-Test and F-Test)  
B)Introduction to Correlation , regression and line fitting through graph points.

**UNIT-III**

A) Computer fundamentals - Basic definitions - hard ware and soft ware , Program flowchart computer architecture fundamentals of internet.

B) Introduction to windows 2000: Desktop files and folders: simple operations (creation deletion, moving, copying files or folders using window explorer). Searching files and folders and other simple operations.

**UNIT-IV**

A) Word processing: opening, Typing, navigating, selecting, editing and sorting, checking spelling and grammar formatting - changing appearance of page - importing graphics, working with tables, documents printing. Basis of power point  
B) Use of internet and working systems.

**UNIT-V**

A) Bioinformatics: Definition concept scope and relevance of bioinformatics Applications of genomics, proteomics, databases Structure and functional relationship of biomolecules and other application of bioinformatics .  
B) Sequence analysis: Concepts, importance and alignment methods.  
C) Phylogenetic Analysis - concept evolution of p. trees gene predictions -methods .

**PRACTICAL- VIII-A1 : COMPUTATIONAL METHODS AND BIOINFORMATICS**

**TOTAL HOURS: 30**

**CREDITS: 2**

1. Introduction to Bioinformatics data bases: NCBI
2. Sequence retrieval using BLAST
3. Sequence alignment and Phylogenetic analysis using CLUSTAL W
4. Pick out a given gene from genomes using Gene Scan or other softwares
5. Protein structure: Primary structure analysis, Secondary structure prediction.

**B.Sc MICROBIOLOGY (CBCS) SYLLABUS**

**THIRD YEAR – SEMISTER-VI**

**PAPER-VIII-A2 : BIOFERTILIZERS AND BIOPESTICIDES**

**TOTAL HOURS: 45**

**CREDITS: 3**

**UNIT – I No of Hours: 10**

General account of the microbes used as biofertilizers for various crop plants and their advantages over chemical fertilizers. Symbiotic N<sub>2</sub> fixers: *Rhizobium* - Isolation, characteristics, types, inoculum production and field application( legume/pulses plants). *Frankia* from non-legumes and characterization. Cyanobacteria from *Azolla*, field application.

**UNIT – II No of Hours: 6**

Asymbiotic or Free living nitrogen fixers: *Azospirillum*, *Azotobacter* - isolation, characteristics, mass inoculum production and field application.

**UNIT – III No of Hours: 6**

Phosphate solubilizing microbes - Isolation, characterization, process of 'P' solubulates mass inoculum production, field application

**UNIT – IV No of Hours: 7**

Importance of mycorrhizal inoculum, types of mycorrhizae and associated plants, Mass inoculum production of VAM, field applications of Ectomycorrhizae.

**UNIT – V No of Hours: 7**

General account of microbes used as bioinsecticides, advantages over synthetic pesticides. *Bacillus thuringiensis* - production, Field applications. Viruses - NPV cultivation and applications.

**PRACTICAL-VIII-A2: BIOFERTILIZERS AND BIOPESTICIDES**

**TOTAL HOURS: 30**

**CREDITS: 7**

1. Isolation of *Rhizobium* from root nodules.
3. Isolation of phosphate solubilizers from soil
4. Staining and observation of VAM
3. A visit to biofertilizer production unit.

**B.Sc MICROBIOLOGY (CBCS) SYLLABUS**  
**THIRD YEAR - SEMESTER- VI**  
**PAPER-VIII-A3: MICROBIAL QUALITY CONTROL IN FOOD AND**  
**PHARMACEUTICAL INDUSTRIES**

**TOTAL HOURS: 45**

**CREDITS: 3**

**UNIT - I No. of Hours: 8**

Good laboratory practices : Biosafety cabinets – Working of biosafety cabinets, using protective clothing, specification for BSL-1, BSL-2, BSL-3. Discarding biohazardous waste – Methodology of Disinfection, Autoclaving & Incineration

**UNIT - II No. of Hours: 8**

Culture and microscopic methods - Standard plate count, Most probable numbers. Direct microscopic counts, Biochemical and immunological methods; Limulus lysate test for endotoxin. gel diffusion, sterility testing for pharmaceutical products

**UNIT - III No. of Hours: 8**

Molecular methods - Nucleic acid probes(Hybridization),FISH, PCR based detection, biosensors.

**UNIT - IV No. of Hours: 8**

Enrichment culture technique, Detection of specific microorganisms - on XLD agar, (*Salmonella* Shigella Agar), Mannitol salt agar, EMB agar, McCornkey Agar, Sabouraud Agar Ascertaining microbial quality of milk by MBRT.

**UNIT - V No. of Hours: 4**

Hazard analysis of critical control point (HACCP) - Principles, flow diagrams, limitations  
Microbial Standards for Different Foods and Water - BIS standards for common foods and drinking water.

**PRACTICAL-VIII-A3: MICROBIAL QUALITY CONTROL IN FOOD AND**  
**PHARMACEUTICAL INDUSTRIES**

**TOTAL HOURS: 30**

**CREDITS: 2**

1. Microbiological laboratory safety- General rules & Regulations.
2. Sterility tests for Instruments – Autoclave & Hot Air Oven
3. Disinfection of selected instruments & Equipments
4. Sterility of Air and its relationship to Laboratory & Hospitals.
5. Sterility testing of Microbiological media
6. Sterility testing of Pharmaceutical products –Antibiotics, Vaccines & fluids
7. Standard qualitative analysis of water.
8. Quantitative analysis of water – Membrane filter method
9. Analysis of food samples for Mycotoxins