JYOTI NIVAS COLLEGE AUTONOMOUS BANGALORE – 560 095
DEPARTMENT OF BIOTECHNOLOGY
B.Sc. II SEMESTER BIOTECHNOLOGY PAPER II SYLLABUS (2024 SEP BATCH)
MICROBIOLOGY

Course title	**MICROBIOLOGY**
Course code	**24IIBT2T**
Course credits	**03**
Total contact hours	**56 Hours**
Duration of ESA	**03 Hours**
Continuous Internal assessment (CIA)	**20 Marks**
End Semester Examination	**80 Marks**

COURSE OUTCOMES :

- Compare and contrast about the microbial diversity along with the basic principles of microscopy.
- Illustrate the control of microbial growth by physical and chemical methods and the use of antibiotics and their efficacy testing are emphasized.

LEARNING OUTCOMES:

- Summerize the different parts and working mechanisms of basic light microscope up to electron microscopes with deep knowledge on the sample preparations and staining techniques .
- Demonstrate the sterilization and microbial techniques routinely used in microbial techniques.
- Explain the significance of microbes in understanding antimicrobial agents and its action against various microbes like bacteria, fungi and viral strains.

Unit 1: Microbial diversity & Microscopic techniques 14HRS

Viruses: Structure, classification and reproduction of viruses TMV, adenovirus , bacteriophage (T4 and Lambda) .

Structure and general characteristics of Bacteria: Classification of Bacteria based on Morphology Staining, Nutrition, Environment, biochemical, serology, nucleic acid method. Overview of Bergy manual. Ultra-structure of Bacterial cell. Salient features of Cyanobacteria. .**Fungi** -General Structure, classification

Microscopy: Principles of Microscopy resolving power, numerical aperture, working principle and applications of Compound microscope, Dark field microscope, Phase contrast microscope, Fluorescence Microscope, confocal microscope, Electron Microscopes-TEM and SEM.

Unit-2 Microbiological methods 14 HRS

Culture Media: Components of media, natural and synthetic media, chemically defined media, complex media, selective, differential, indicator, enriched and enrichment media **Pure culture methods:** Serial dilution and plating methods (pour, spread, streak); cultivation, maintenance and preservation/stocking of pure cultures; cultivation of anaerobic bacteria **Stains and staining techniques:** Principles of staining. Types of stains-simple stains, structural stains and differential stains(gram staining).

Unit-3 Control of Microorganisms 14 HRS

Definition of terms-sterilization, disinfectant, antiseptic, sanitizer, germicide, microbicidal agents, micro biostatic agent and antimicrobial agent.

Physical methods of control: Principle, construction and applications of moist heat sterilization Boiling, Pasteurization, Fractional sterilization-Tyndallisation and autoclave. Dry heat sterilization-Incineration and hot air oven. Filtration - Diatomaceous earth filter, seitz filter, membrane filter and HEPA; Radiation: lonizing radiation-y rays and non-ionizing radiation- UV rays.

Chemical methods: Alcohol, aldehydes, phenols, halogen, metallic salts, Quaternary ammonium compounds and sterilizing gases as antimicrobial agents.

Unit-4: Antimicrobial agents 14 HRS

Five modes of action with one example each: Inhibitor of nucleic acid synthesis; Inhibitor of cell wall synthesis; Inhibitor of cell membrane function; Inhibitor of protein synthesis;Inhibitor of metabolism
Antifungal agents: Mechanism of action of Amphotericin B, Griseofulvin
Antiviral agents: Mechanism of action of Amantadine, Acyclovir, Azidothymidine
Antibiotic resistance- MDR, XDR, MRSA, NDM-1
Antibiotic sensitivity testing methods: Dise and Agar well diffusion techniques
Economic and medically important Bacteria and fungi , An Overview on Gut microbiome-prebiotics and probiotics .

BIOTECHNOLOGY PRACTICAL: II

MICROBIOLOGY

Course title	**Microbiology**
Course code	**24IIBT2P**
Course credits	**02**
Total contact hours	**3 Hours / week**
Duration of ESA	**03 Hours**
Continuous Internal assessment (CIA)	**10 Marks**
End Semester Examination	**40 Marks**

1. To study the principle and applications of important instruments (biological safety cabinets, autoclave, incubator, BOD incubator, hot air oven, light microscope, pH meter) used in the microbiology and Biotechnology laboratory. 1 Unit

2. Sterilization of medium using Autoclave and assessment for sterility. Sterilization of glassware using Hot Air Oven and assessment for sterility 1 Unit

3. Preparation of culture media for bacteria, fungi and their cultivation. 1 Unit

4. Isolation of bacteria and fungi from soil and air 2 Units

5. Plating techniques: Spread plate, pour plate and streak-plate. 1 Unit

6. Colony characteristics study of bacteria isolated from air and soil 2 Units

7. Staining techniques: Bacteria- Gram, Negative staining &
Fungal staining by Lactophenol cotton blue stain 1 Units

8.Study of *Rhizopus, Penicillium, Aspergillus* using temporary mounts 1 Unit

9. Biochemical Tests - IMVIC, Starch hydrolysis, Catalase test. 2 Units

10.Bacterial cell motility - hanging drop technique. 1 Unit

11)Antibiotic sensitivity test . 1 Unit

Text Books/References:

1. Microbiology fundamentals and applications by Atlas R.M., 2nd Edition, Publisher: McMillan Publishing House, (1998).

2. Microbiology: Principles and Explorations by Black JG and Black LJ. 9th edition. Publisher :John Wiley &Sons (2015).

3. Brock Biology of Microorganisms by Madigan MT, and Martinko JM. 14th edition. Publisher: Pearson education (2014)

4. Microbiology by Pelczar Jr. M.J., Chan E.C.S. &Kreig N.R., 5 th edition , Publisher: Assorted editorial. (2023).

5. Prescott's Microbiology by Joanne Willey, Kathleen sandman & Dorothy wood 12 th edition publisher :Mc Graw- Hill. (2022).