JYOTI NIVAS COLLEGE AUTONOMOUS
SYLLABUS FOR 2018 BATCH AND THEREAFTER

Programme: B.Sc. **Semester: II**

BIOTECHNOLOGY PAPER II

MICROBIOLOGY

Course Code: 18IIBT2 **No. of Hours: 60**

COURSE OBJECTIVES:

- The candidate will gain knowledge about the microbial diversity along with the basic principles of microscopy.
- Control of microbial growth by physical and chemical methods plus the use of antibiotics and their efficacy testing are emphasized.
- Applications of microorganisms in agricultural environmental and food industrial sectors.

LEARNING OUTCOMES: After successful completion of the course the students will be able to

- Know about the different parts and working mechanisms of basic light microscope up to electron microscopes with deep knowledge on the sample preparation, staining techniques and cultivation methods.
- Gain insights into the important characteristics features of bacteria, fungi, viruses and protozoa.
- Understand the significance of microbes in understanding food borne diseases, cleaning up of environment and used as biofertilizers and biopesticides.

UNIT I HISTORY AND SCOPE OF MICROBIOLOGY & MICROSCOPY 06 HRS

Contributions of Antony Van Leuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister and Alexander Fleming. **Microscopy** - Principles of different types of Microscopes – simple, Compound, Phase contrast, Fluorescence and Electron Microscopes (Scanning and Transmission).Staining techniques – Simple and differential (Negative, Gram's Staining and Endospore staining).

UNIT II MICROBIOLOGICAL TECHNIQUES 10 HRS

Culture Media and types. Pure culture techniques and preservation. Culture collection centres [ATCC & MTCC]. Bacterial growth and growth curve. Control of Microorganisms – Physical & Chemical method.

UNIT III MICROBIAL DIVERSITY 14 HRS

Structure and general characteristics of Bacteria: Classification of Bacteria based on Morphology, Staining, Nutrition, Environment, biochemical, serology, nucleic acid method. Overview of Bergy's manual. Ultra-structure of Bacterial cell.

Study of – *Spirochaetes* and Rickettsia.

Salient features of Cyanobacteria, Mycoplasma and Actinomycetes.
Viruses – Structure, classification and reproduction of viruses - *TMV* (Plant virus), *HIV* (Animal virus), *T4* and *Lambda (*Bacteriophage).
Fungi - General Structure, classification and reproduction in fungi. *Saccharomyces cerevisiae* (Yeast). Overview of Protozoa (*Plasmodium*) and Helminthes (*Platyhelminthes*).

UNIT IV AGRICULTURAL MICROBIOLOGY 10 HRS

Microbial inoculants, Mass production (Biofertilizers – *Vesicular Arbuscular Mycorrhiza*) Plant growth promoting rhizobacteria (PGPR), *Rhizobium*, *Azotobacter,* Blue Green Algae], Biopesticides – *Trichoderma*.

UNIT V ENVIRONMENTAL MICROBIOLOG 10 HRS

Microbiology of air, water and soil. Composting (organic and vermicompost), Bioremediation and biodegradation of xenobiotic (hydrocarbons), Superbug and bioleaching (definition, types and applications, bioleaching of copper).

UNIT VI FOOD MICROBIOLOGY 10 HRS

Food as substrates for microbes, Useful microbes in food industries, Food spoilage, Food preservations and Food borne illness.

REFERENCES:

1. Microbiology fundamentals and applications by Atlas R.M., 2nd Edition, **Publisher:** McMillan Publishing House, (1998)
2. Biology of Microorganisms by Brock T.D & Madigan M.T., 1992, 6th Edition, **Publisher:** Prentice Hall, Englewood cliffs, New Jersey. (1992)
3. Microbiology by Pelczar Jr. M.J., Chan E.C.S. &Kreig N.R., **Publisher:** McGraw Hill Inc. New York. (1992)
4. Manual of Microbiology – Tools & Techniques By Kanika Sharma, **Publisher:** Ane Books, New Delhi. (2005).
5. General Microbiology Volume I & II ByPowar C.B. &Daginawala H.F., **Publisher:** Himalaya Publishing House. (1982).
6. Industrial Microbiology – An Introduction by Michael J. Waites and others, **Publisher:** Blackwell Science Limited. (2002).
7. Microbiology: Principles and Explorations by Jacquelne black, (2015).
8. Prescott's Microbiology by Joanne Willey, Linda Sheerwood. (2011).

PRACTICALS – PAPER II - MICROBIOLOGY **15 UNITS**

1. Biosafety measures in Microbiology Laboratory (Personal protective equipment's [PPE]) and Cleaning and Sterilization of Glasswares 1UNIT
2. Study of instruments - Compound microscope, incubator, Autoclave, Hot air Oven, Laminar Air flow, Colony counter, pH meter and biosafety cabinets 1UNIT
3. Media preparation (Nutrient agar, Marin Rose Bengal Agar and Nutrient broth) 1UNIT
4. Isolation of Bacteria and Fungi from air by petri plate exposure method 1UNIT
5. Isolation of Bacteria and Fungi from soil 1UNIT
6. Staining Techniques (Negative, Gram, Endospore and Fungal Staining) 2UNITS
7. Biochemical tests – IMViC, Catalase, oxidase and starch hydrolysis 2UNITS
8. Antibiotic sensitivity Test 1UNIT
9. Total count of yeast cells (Haemocytometry) 1UNIT
10. Study of *Rhizobium* from Root nodules 1UNIT
11. Water analysis – MPN test 2UNITS

Tests and Repetition.