Semester – I

BRANCH	Subject Title	Subject Code
B.Sc. (MICROBIOLOGY – MAJOR)	GENERAL MICROBIOLOGY AND CELL STRUCTURE	MBM1

Course Learning Outcomes (CLO) -

1. After completing this course in Microbiology, a student shall have understanding of -
2. Indian traditional knowledge and historical background of Microbiology.
3. Structure and transmission of Viruses.
4. Cell structures and cell organization of bacteria.
5. Different kinds of unicellular prokaryotic and eukaryotic microorganisms based on specific characteristics.
6. General characteristics of important Eubacteria.

CONTENT

Unit - I

1. The Microbial World

1.1 Indian traditional knowledge and global historical background of Microbiology.

1.2 Theory of Biogenesis, Germ theory of disease, Fermentation.

1.3 Significance of microbiology-

(a) Branches of microbiology

(b)Thrust area of microbiology- Genetic engineering and Biotechnology.

1.4 Contribution of following scientists in the field of microbiology - Louis Pasteur, Robert Koch, Edward Jenner, Alexander Fleming, Joseph Lister, Serge N. Winogradsky, Martinus Willem Beijerink, Dmitrii Ivanowsky, Wendell M. Stanley and Hans Christian Gram.

Unit - II

Acellular and Prokaryotic Microorganisms

2.1 Virus - General characters of following viruses - Bacteriophage (T4 and λ phage), Plant viruses (TMV), Prions and Viroids.

2.2 Whittaker's System of Five Kingdom Classification: Monera, Protista, Fungi, Plantae and Animalia.

2.3 Carl Woese's Three Domain System of Classification: Archaea, Eubacteria, and Eukaryotes.

2.4 Bacteria - Study of Spirochete, Rickettsia, Chlamydia, Mycoplasma and Actinomycetes.

2.5 Cyanobacteria - Study of Anabaena and Spirulina.

Unit - III

Eukaryotic Microorganisms

3.1 Basic knowledge of Eukaryotic organisms and their evolutionary pattern.

3.2 Fungi -Study of Saccharomyces cerevisiae, Mucor, Aspergillus, Rhizopus and Penicillium.

3.3 Protozoa - Study of Euglena, Trypanosoma, Leishmania, Amoeba, Entamoeba and Plasmodium.

Unit - IV

Introduction to Microbial Cell Structure

4.1 Study of Bacteria - Size, shape and arrangement of bacterial cells.

4.**2 Structures External to Plasma Membrane-**Glycocalyx (capsule, slime layer), flagella, fimbrae, stalk, prostheca and cell wall of Gram +ve and Gram-ve bacteria.

4.3Structures Internal to Cell wall-Cell membrane, cytoplasm, cytoplasmic inclusions, genome, spores and cysts.

4.4 Reproduction in Bacteria-Binary fission, budding and fragmentation.

Practical Course

1. Isolation of autotrophic bacteria and Cyanobacteria, Rhizobia from root nodules

2. Isolation of lactobacillus from curd.

3. Isolation of yeast from ripened fruits.

4.Preparation of temporary wet mount and microscopic examination of Mucor, Aspergillus, Rhizopus and Penicillium.

5. Preparation of smear and microscopic examination of Staphylococcus, Lactobacillus Escherichia Vibrio and Leptospira.

6. Preparation of temporary wet mount and microscopic examination of Amoeba, Euglena, Paramaecium and Chlamydomonas.

7. Study of the structure of important animal viruses (rhabdo, influenza, paramyxo, hepatitis B and retroviruses) using electron micrographs.

8. Study of the structure of important plant viruses (caulimo, Gemini, tobacco ring spot, cucumber mosaic and alpha-alpha mosaic viruses) using electron micrographs.

9. Study of the structure of important bacterial viruses (6X174, T4, A phage) using electron micrograph.

10. Any other experiment may be designed on the basis of theoretical aspects.

Semester – II

BRANCH	Subject Title	Subject Code
B.Sc. (Microbiology – Major)	MICROBIAL TECHNIQUES	

Course Learning Outcomes (CLO) -

After completing this course in Microbiology, a student shall have understanding of -

- Recall the basic lab glassware to be used in the laboratory.
- Summarize different methods of sterilization and isolation of pure cultures.
- Understand the working of different kinds of instruments and microscopes.
  Apply serial dilution technique to isolate the bacteria.
- Practice different methods to culture bacteria in the laboratory
- Illustrate a method to differentiate between Gram positive and Gram negative bacteria.

CONTENT

Unit - I

Microscopy and Staining

1.1 Microscopy - Principles and applications of simple and compound Bright-field microscopy, Dark-field microscopy, Fluorescence microscopy, Phase-contrast microscopy, Transmission electron microscopy and Scanning electron microscopy.

1.2 Preparation for Light Microscope Examination - Wet- mount and hanging-drop techniques.

(iii). Preparation for smear and fixation.

1.3 Staining - Principles of staining, negative staining, simple staining, differential staining (Gram and acid fast staining), flagella staining, capsule and endospore staining.

Unit - II

Instruments

Electronic Balance, Autoclave, Centrifuge, Colony counter, Deep freezer, Homogenizer, Hot air Oven, Incubator, Laminar air flow, Magnetic stirrer, pH Meter, Spectrophotometer, Vortex mixture, Water bath, Water distiller, Chromatography Chambers, Anaerobic chamber and Electrophoresis apparatus.

Unit - III

Sterilization and Culture Medium

3.1 Physical methods of sterilization - Dry heat, Moist heat, Filtration and Incineration.

3.2 Chemical methods of sterilization - Phenol and phenolic compounds, Alcohol, Halogens and Detergents.

3.3 Types of culture media -Natural, synthetic, complex, enriched and selective. Anaerobic (Thioglycolate broth, Robertson's media, Microaerophilic), broth culture of aerobic bacteria.

Unit - IV

Isolation, Cultivation and Preservation

4.1 Natural microbial population - Pure culture.

4.2 Isolation of microbial population - From air, water and soil.

4.3 Methods for isolation - Streak plate, Pour plate and Spread plate. Serial dilution and Micromanipulator methods. Cultivation on liquid and solid media. Isolation of microorganisms on potato slice and bread.

4.4 Maintenance and preservation for short term and long term.

4.5 Cultivation of anaerobic bacteria and accessing non- cultivable microorganisms.

Part B-Content of Practical Course

1. Demonstration and briefing about principles and working of basic instruments.

2. Basic media preparation technique, autoclaving, cleaning and sterilization of glassware.

3. Preparation of liquid culture media - Peptone water, nutrient broth

4. Preparation of solid culture media - Nutrient agar (agar slant/ agar plate)

5. Isolation of microbes from water, soil and air by serial dilution agar plating method.

6. Isolation of fungi from water, soil and air by serial dilution agar plating method.

7. Isolation of microorganisms by pour plate method.

8. Isolation of microorganisms by streak plate method.

9. Isolation of microorganisms by spread plate method.

10 Any other experiment may be designed on the basis of theoretical aspects.