



SYLLABI OF BIOTECHNOLOGY SEC PAPERS

SEMESTER-I

BTC SEC 101 MICROBIOLOGY

Marks = 100 [ESE (50) IT (20) LAB (30)]

Course Objective: The objective of the course in Microbiology is to provide students with a comprehensive understanding of the field of microbiology, including the history, classification, morphology and cell structure of microorganisms. The course aims to explain the basic concepts of microbial growth, culture techniques and sterilization methods. It also covers various applications of microbiology in environmental, industrial, agricultural, food, and fermented food sectors.

PART-A: Theory

Contact hours: 30

UNIT 1

(6 Lectures)

History of microbiology: major discoveries and contributors to the field. **Microbial classification:** criteria for grouping microorganisms and major taxonomic groups. **Overview of microorganisms:** cell structure of major groups of microorganisms - bacteria, algae, fungi and protozoa; unique features of viruses.

UNIT 2

(6 Lectures)

Microbial growth: growth curve; generation time; factors affecting growth of bacteria; nutritional categories of micro-organisms **Genetic exchange in bacteria:** conjugation transformation and transduction.

UNIT 3

(5 Lectures)

Microbial culture techniques: preparation of culture media; inoculation; pure culture techniques. **Sterilization techniques:** Physical and chemical methods for sterilization.

UNIT 4

(7 Lectures)

Environmental microbiology: nutrient cycling and biogeochemical processes – e.g. carbon, nitrogen and phosphorous. **Industrial microbiology:** microbial production of antibiotics and enzymes. **Agricultural microbiology:** plant growth promoting bacteria; plant-microbe interactions – e.g. legume-rhizobia interaction; biocontrol agents.

UNIT 5

(6 Lectures)

Food Microbiology: important microorganisms in food microbiology; major food born infections; preservation of various types of foods. **Fermented Foods:** Introduction to fermented foods; importance of fermented foods; probiotics and their potential health benefits.

PART-B: Practical /Project/Field work

Contact hours: 30

The following is the list of practicals:

1. Preparation of media & sterilization methods
2. Serial dilution technique
3. Isolation of bacteria from air
4. Isolation of bacteria from water
5. Isolation of bacteria from soil
6. Grams staining and biochemical characterization of bacteria
7. Antibiotic sensitivity test

Course Outcomes: *By the end of the course, students will be familiar with the morphology and cell structure of various microorganisms, including bacteria, algae, fungi, protozoa, and viruses. Students will understand microbial growth and the mechanisms of genetic exchange in bacteria, including conjugation, transformation, and transduction. They will develop proficiency in microbial culture techniques, and attain knowledge on physical and chemical methods of sterilization in microbiological practices. Students will gain knowledge about the role of microorganisms in nutrient cycling and biogeochemical processes. Additionally, students will learn the diverse role of industrial microbiology, agricultural microbiology and food microbiology.*

SUGGESTED READING

1. Alexopoulos CJ, Mims CW, and Blackwell M. (1996). *Introductory Mycology*. 4 th edition. John and Sons, Inc.
2. Jay JM, Loessner MJ and Golden DA. (2005). *Modern Food Microbiology*. 7th edition, CBS Publishers and Distributors, Delhi, India.
3. Kumar HD. (1990). *Introductory Phycology*. 2nd edition. Affiliated East Western Press.
4. Madigan MT, Martinko JM and Parker J. (2009). *Brock Biology of Microorganisms*. 12th edition. Pearson/Benjamin Cummings.
5. Pelczar MJ, Chan ECS and Krieg NR. (1993). *Microbiology*. 5th edition. McGraw Hill Book Company.
6. Stanier RY, Ingraham JL, Wheelis ML, and Painter PR. (2005). *General Microbiology*. 5th edition. McMillan.
7. Tortora GJ, Funke BR, and Case CL. (2008). *Microbiology: An Introduction*. 9 th edition. Pearson Education.
8. Willey JM, Sherwood LM, and Woolverton CJ. (2008). *Prescott, Harley and Klein's Microbiology*. 7th edition. McGraw Hill Higher Education.