Course Code	Course Name	Credits
26ZY510	MICROBIOLOGY	04

Course Objectives

- To understand the diversity, structure, and classification of microorganisms.
- To study the physiology, growth, and reproduction of microorganisms.
- To gain knowledge about microbial genetics, metabolism, and biotechnology.
- To understand the role of microorganisms in health, industry, agriculture, and environment.
- To develop laboratory and analytical skills related to microbiological techniques.

Learning Outcomes

- Explain the morphology, classification, and characteristics of microorganisms.
- Demonstrate knowledge of microbial growth, nutrition, and metabolism.
- Analyze the beneficial and harmful activities of microorganisms.
- Apply microbiological principles in medicine, agriculture, industry, and environmental management.
- Evaluate the importance of microorganisms in biotechnology and public health.

Unit 1 – Microbial Diversity (12 Hrs.)

Classification and characteristics of microorganisms; diversity of bacteria, fungi, viruses, algae and protozoa; morphology and structure of bacterial cell; Gram-positive and Gram-negative bacteria; growth and reproduction of microorganisms; culture media and microbial cultivation techniques; importance of microorganisms in nature and industry.

Unit 2 – Fermentation Technology (12 Hrs.)

Types of fermentation - aerobic and anaerobic; microorganisms used in fermentation; Industrial production of alcohol - ethanol and butanol, wine and beer; organic acids - lactic acid and citric acid; and antibiotics such as penicillin and streptomycin; bioreactors and fermenters; downstream processing; applications of fermentation in food, pharmaceutical and industrial microbiology.

Unit 3 – Medical Microbiology (12 Hrs.)

Host–pathogen interaction; pathogenic microorganisms and virulence factors; transmission and control of infectious diseases; bacterial diseases - tuberculosis, cholera, typhoid and pneumonia; viral diseases - AIDS, hepatitis, COVID-19 and influenza; protozoan diseases - malaria and amoebiasis; fungal diseases - candidiasis and ringworm;- diagnosis, prevention and control of microbial diseases.

Unit 4 – Food Microbiology (12 Hrs.)

Food spoilage and its causes including microbial growth, moisture, contamination and improper storage; microorganisms involved in food spoilage such as bacteria, fungi and yeasts; food preservation methods including pasteurization, refrigeration, freezing, drying, chemical preservatives and fermentation; food poisoning and foodborne diseases; important foodborne pathogens - Salmonella causing salmonellosis and Clostridium botulinum causing botulism; food safety, hygiene and quality control.

Unit 5 - Environmental Microbiology (12 Hrs.)

Microorganisms in soil, water and air; role of microorganisms in biogeochemical cycles such as carbon cycle, nitrogen cycle and sulfur cycle; nitrogen fixation and decomposition; water pollution and sewage treatment; bioremediation and biodegradation; role of microorganisms in waste management and environmental sustainability; beneficial and harmful effects of environmental microorganisms.

Reference Books:

1. Pelczar, M.J., Chan, E.C.S., and Krieg, N.R. (2005). Microbiology. Tata McGraw-Hill Publishing Co.
2. Prescott, L.M., Harley, J.P., and Klein, D.A. (2008). Microbiology. McGraw-Hill Education.
3. Tortora, G.J., Funke, B.R., and Case, C.L. (2016). Microbiology: An Introduction. Pearson Education.
4. Dubey, R.C. and Maheshwari, D.K. (2013). A Textbook of Microbiology. S. Chand Publishing.
5. Atlas, R.M. (2010). Principles of Microbiology. McGraw-Hill Higher Education.

Websites and eLearning Sources:

• https://openstax.org/details/books/microbiology
• https://www.biologydiscussion.com/microbiology
• https://www.easybiologyclass.com/category/microbiology/