

Course Code	Course Name	Credits
26BY504	ADVANCED MICROBIOLOGY	04

### Course Objectives

- Explain the fundamental concepts of microbiology used in microbial culture and control.
- Analyze the role of microorganisms in soil ecosystems.
- Apply principles of industrial and agricultural microbiology in the production of microbial products and enhancement of plant growth and protection.
- Evaluate the significance of microorganisms in environmental processes, including biogeochemical cycles, bioremediation and metal-microbe interactions.

### Learning Outcomes

Upon successful completion of this course it is intended that a student will be able to:

- Describe microbial diversity, structure and growth patterns and demonstrate knowledge of culture techniques and methods for controlling microbial growth.
- Explain rhizosphere dynamics and assess the interactions between plants and microorganisms in soil ecosystems.
- Illustrate the use of microbes in industrial production and evaluate their role in agriculture.
- Analyze microbial roles in environmental sustainability.

### Unit 1 - Introductory Microbiology (12 Hrs.)

History and scope of microbiology, Characterization and classification of microorganisms, Microbial structure, Techniques of microbial culture, Batch and continuous cultures, Measurement of microbial growth, Control of microbial growth.

### Unit 2 - Soil Microbiology (12 Hrs.)

Soil microorganisms, Rhizosphere architecture, Plant-microbe interaction in the rhizosphere.

### Unit 3 - Industrial Microbiology (12 Hrs.)

Selection of industrially useful microbes, Fermentation, Microbial products, Production of alcohol, lactic acid, vinegar and single cell protein, Methods of microbial enzyme production.

### Unit 4 - Agriculture Microbiology (12 Hrs.)

Direct and indirect mechanism of plant growth promoting microbes, Symbiotic and non-symbiotic nitrogen fixation, Phosphate solubilising microorganisms, Rhizosphere engineering and agriculture, Microbial control of plant pathogens, pests and weeds, Applications of biological control in field.

### Unit 5 - Environmental Microbiology (12 Hrs.)

Microbes and their role in biogeochemical cycling, Process and types of bioremediations, Metal-microbe interactions and mechanism of metal removal, Bioleaching, Biomining.

### Reference Books:

1. Dubey, R. C. (2014). A textbook of biotechnology (5th rev. ed.). S. Chand & Company Ltd.
2. Dickinson, M. (2003). Molecular plant pathology. BIOS Scientific Publishers.
3. Gross, T., Faull, J., Ketteridge, S., & Springham, D. (1995). Introductory microbiology. Springer Science+Business Media B.V.
4. Willey, J. M., Sherwood, L. M., & Woolverton, C. J. (2009). Prescott's microbiology (7th ed.). Wm. C. Brown Publishers.
5. Sullia, S. B., & Shantharam, S. (2005). General microbiology. Oxford & IBH Publishing Co. Pvt. Ltd.