

Course Code	Course Name	Credits
26BY102	FOOD MICROBIOLOGY	04

### Course Objectives

- Analyze microbial roles in fermentation/spoilage and design starter cultures for regional foods.
- Evaluate dairy fermentation processes and probiotic functionality under stress conditions.
- Assess intrinsic/extrinsic factors controlling microbial growth and predict contamination risks.
- Develop HACCP-based preservation strategies and food safety management systems.

### Learning Outcomes

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

- Select starter cultures (*Saccharomyces*/*Lactobacillus*) and optimize SCP/vitamin production.
- Design pasteurization protocols and evaluate Northeast Indian fermented foods (bamboo shoot/soybean).
- Model microbial growth curves using  $a_w$ /pH/Redox data and predict shelf-life.
- Implement HACCP for *Salmonella*/*Listeria* control and develop toxin mitigation strategies.

### Unit 1 - Food Microbiology & Biotechnology (12 Hrs.)

Food microbiology scope. Beneficial microbes: *Saccharomyces*, *Lactobacillus*, *Streptococcus*, *Aspergillus*. Starter cultures. SCP production. Microbial vitamins (B12/B2). Industrial enzymes (amylase/protease). Probiotic genomics.

### Unit 2 – Dairy & Regional Fermentation (12 Hrs.)

Milk microbiology. Preservation: pasteurization/sterilization/dehydration. Methylene Blue Reduction Test (MBRT) testing. Dairy products: curd/butter/ghee/cheese. Probiotics (yogurt/kefir). Northeast India ferments: bamboo shoot (soibum), soybean (hawajjar/kinema), starter culture dynamics.

### Unit 3 - Microbial Growth Factors (12 Hrs.)

Food as microbial substrate. Intrinsic factors: pH,  $a_w$ , nutrients, Redox potential, natural antimicrobials. Extrinsic factors: temperature, Relative Humidity, gas atmosphere. hurdle technology concepts. Predictive microbiology models.

### Unit 4 – Contamination & Pathogens (12 Hrs.)

Contamination sources: pre-harvest and post-harvest contamination from soil/water/air/equipment/handling. Pathogens: *Salmonella*, *Escherichia coli*, *Listeria*, *Staphylococcus*, *Clostridium*. Spoilage microbes. Toxins: aflatoxins/ochratoxin/patulin; botulinum/staphylococcal enterotoxins. Biofilm formation control.

### Unit 5 - Preservation & Safety Systems (12 Hrs.)

Preservation: Heat (pasteurization/canning), cold (refrigeration/freezing), drying and dehydration, chemicals, irradiation. HACCP (Hazard Analysis and Critical Control Points) implementation. Quality control: rapid detection methods. Safe storage practices.

### Reference Books:

1. Adams, M. R., & Moss, M. O. (2020). Food Microbiology (4th ed.). Royal Society of Chemistry.
2. Ray, B., & Bhunia, A. (2018). Fundamental Food Microbiology (5th ed.). CRC Press.
3. Doyle, M. P., & Buchanan, R. L. (2020). Food Microbiology: Fundamentals and Frontiers (5th ed.). ASM Press.
4. Jay, J. M., Loessner, M. J., & Golden, D. A. (2022). Modern Food Microbiology (8th ed.). Springer.
5. Tamang, J. P. (2024). Microbiology of Fermented Foods (2nd ed.). Springer.

