Course Code	Course Name	Credits
26BY603	FOOD MICROBIOLOGY	04

Course Objectives

- Analyze microbial ecology in food systems and industrial fermentation.
- Evaluate advanced dairy/probiotic technologies and regional food processing.
- Predict microbial behaviour using hurdle technology and predictive models.
- Design contamination control and spoilage prevention strategies.
- Develop nanotechnology-based preservation and food safety systems.

Learning Outcomes

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

- Optimize starter cultures for SCP/vitamin production using genomics.
- Design postbiotic formulations for Northeast fermented foods.
- Model microbial growth using water activity/predictive microbiology.
- Implement HACCP + blockchain for contamination traceability.
- Develop nano-encapsulated antimicrobials and cold plasma preservation.

Unit 1 - Industrial Food Microbiology (12 Hrs.)

Key microbes: *Penicillium/Aspergillus* (enzymes), *Saccharomyces* (ethanol), LAB consortia (flavour). Postbiotics vs probiotics. Single Cell Proteins (yeast/fungi). CRISPR-edited strains for vitamins B12/B2. Metagenomics of fermentation microbiomes.

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

Milk microbiology, UHT/microfiltration. MBR/PCR milk quality testing. Dairy products: functional cheeses, synbiotic formulations. Northeast India: bamboo shoot (soibum), soybean (hawaijar), starter culture isolation. Postbiotic beverages.

Unit 3 - Microbial Growth Modelling (12 Hrs.)

Food substrates: Intrinsic (aw/pH/Redox), extrinsic (temperature/gases). Hurdle technology optimization. Predictive microbiology (Gompertz/Baranyi models). Climate impact on microbial ecology.

Unit 4 – Contamination & Spoilage Dynamics (12 Hrs.)

Sources: Pre/post-harvest (blockchain traceability). Biofilms in processing plants. Pathogens: *Salmonella/Listeria*/VTEC (WGS typing). Mycotoxins (climate change effects). Spoilage omics, AI spoilage prediction.

Unit 5 - Advanced Preservation Technologies (12 Hrs.)

Principles: Asepsis, anaerobiosis, thermal (ohmic heating), cold plasma, Pulsed Electric Fields (PEF). Nano-encapsulation of antimicrobials. HACCP 4.0 (IoT/blockchain). Sustainable packaging (active/intelligent).

Reference Books:

1. Ray, B., & Bhunia, A. (2019). *Fundamental Food Microbiology* (6th ed.). CRC Press.
2. Adams, M. R., & Moss, M. O. (2021). *Food Microbiology* (4th ed.). RSC Publishing.
3. Tamang, J. P. (2024). *Microbial Foods of Northeast India*. Springer.
4. Cushnie, T. P. T. (2022). *Nanotechnology in Food Microbiology*. Elsevier.
5. Frazier, W. C., & Westhoff, D. C. (2020). *Food Microbiology* (5th ed.). McGraw-Hill.
6. Doyle, M. P. (2023). *Food Microbiology: Fundamentals & Frontiers* (5th ed.). ASM Press.
7. Hui, Y. H. (2023). *Food Biotechnology* (3rd ed.). Wiley