Subject Code: 02BT0532
Subject Name: Food and Dairy Technology (Elective)
M.Sc. Biotechnology Semester- III

OBJECTIVE: Students are expected to have the advanced learning regarding applications of microbiology and biotechnology at commercial level. The course discusses application of biotechnology in the field of agricultural field, dairy and food industry.

Credits Earned: 4 Credits

COURSE OUTCOMES: By the end of this course students should be able to:

1) Describe and comprehend the fundamental concept of dairy technology.

2) Describe and comprehend the fundamental concept of food microbiology.

3) Understand the concept and techniques of food preservation and to know different categories of food additives.

4) To learn food processing techniques for the production of different categories of food.

Pre-Requisite of Course: Basic understanding of microbiology.

Teaching Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA (M)	CSE (I)	Viva (V)	Practicals/ TW	
4	0	0	4	50	30	20	0	0	100

Contents:

Unit	Topics	Contact Hours
1	**Dairy Technology** **Milk Chemistry and Constituents:** Definition and Composition of milk, Types of Milk (skimmed, toned and homogenized), Factors affecting quality and quantity of milk, Nutritive value of milk, Physico-Chemical properties of milk. **Microbiology of milk:** Common micro-organisms found in milk, Fermentation and spoilage of milk, Milk borne diseases. **Preservation of Milk by Pasteurization & its storage:** Methods of Pasteurization – LTH, HTST, UHT, Storage specifications after pasteurization, Phosphatase test and its significance. **Microbial analysis of milk:** Dye reduction test (using methylene blue and resazurin), Total bacterial count, Brucella ring test and tests for mastitis, Somatic cell count. **Milk products:** Starter cultures, Buttermilk, yoghurt, cheese, and other dairy products like milk powder, ice creams etc., Evaluation and role of Probiotics, Nutraceuticals. **Dairy Development in India:** Role of National Dairy Development Board (NDDB), National Dairy Research Institute (NDRI), Military dairy farm, Indian Dairy Corporation (IDC), Dairy Co-operatives, Milk Grid, Operation Flood.	15
2	**Food Microbiology** **Classification of Food:** Perishable, Semi-perishable & stable. Health food, ethnic food, organic food, functional food, nutraceuticals, fabricated foods, convenience foods, GM foods, space foods Microbial flora of food products Microbial growth in food: Intrinsic and extrinsic factors (in brief). Food spoilage: Contributing factors, Spoilage bacteria, Spoilage of Meat and Poultry products, Bread, Fruits and Vegetables, Eggs, Sea foods, Canned foods. Food infection and food poisoning by *Staphylococcus aureus*, *Clostridium botulinum*, *Aspergillus flavus*, *Salmonella typhimurium*, *Bacillus*, *Vibrio parahemolyticus*, *Listeria*, *Escherichia coli*, *Shigella*, *Campylobacter*. **Fermented Foods:** alcoholic beverage, vinegar, sauerkraut and soya sauce	12
3	**Food Technology** **Food preservation:** Principles of food preservation, Thermal destruction of bacteria - use of low temperature and high temperature, Determination of TDP, TDT, D, F, and Z values. Canning, chilling, freezing, dehydration, control of water activity, ultrafiltration, sterilization, radiations, use of chemicals, antibiotics, preservatives. Food additives definitions, uses and functions of Acid, Base, Buffer systems, Salts and chelating/sequestering agents. Low calorie and non nutritive sweeteners, Polyols. Antioxidants, Emulsifying and stabilizing agents, Anti-caking agents, thickeners, Firming agents. Flour bleaching agents and Bread improvers. Anti microbial agents / Class I and Class II preservatives as per PFA Act. Colorants, Flavoring agents and related substances, Clarifying agents. Gases and Propellants. Tracers and other additives. Food packaging, introduction to Tetrapack technology.	18

4	**Food processing** Grain products processing: Milling of rice, wheat, and maize, parboiling of paddy, production of bakery products, biscuits, extruded products and breakfast cereals. Refining and hydrogenation of oil, Extraction, clarification, concentration and packaging of fruit juice. Production of jam, jelly, marmalade, squash, candies, pickles, pectin from fruit waste, tea, coffee, chocolate and essential oils from spices; Animal products processing: Drying and canning of fish, post mortem changes, tenderization and freezing of meat, egg powder. Production of SCP, SCO. Concept of QA, QC, HACCP, ISO. Government regulatory practices and policies. FDA, EPA, HACCP, ISI.	15
	Total	60

References:

1) Banwart G. J. (1989). Basic Food microbiology, 2nd Edn. Chapman and Hall. International Thompson Publishing.
2) Clarence Henry Eckles, Willes Barnes Combs, Harold Macy (1943). Milk and milk products, 4th Ed. McGraw-Hill book Company, Incorporated.
3) James M. Jay, Martin J. Loessner, David A. Golden (2005). Modern food microbiology, 7th Edn. Springer Science & Business.
4) Sukumar. De (2001). Outlines of Dairy Technology. 1st Ed. Oxford University Press Delhi.
5) William C. Frazier, Dennis C. Westhoff, N. M. Vanitha (2013). Food Microbiology, 5thEdn.McGraw-Hill Education (India).

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	20%	30%	15%	10%	5%

Instructional Method:

a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, etc.

b. The internal evaluation will be done on the basis of continuous evaluation of students in the class-room in the form of attendance, assignments, verbal interactions etc.

c. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.