INSTITUTE	**FACULTY OF SCIENCE**
PROGRAM	**MASTER OF SCIENCE (MICROBIOLOGY)**
SEMESTER	**3**
COURSE TITLE	**FOOD AND DAIRY MICROBIOLOGY**
COURSE CODE	**02MB0508**
COURSE CREDITS	**4**

Objective:

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

Course Outcomes: After completion of this course, student will be able to:

1 Examine types and composition of milk, preservation methods, and quality assessment to ensure safety, nutritional value, and production of dairy products.

2 Identify food classification, microbial contamination, and spoilage factors to ensure food safety, quality, and prevention of foodborne illnesses.

3 Utilize principles of food preservation, additives, and packaging technologies to enhance food safety, shelf life, and quality.

4 Utilize microbial fermentation and bioprocessing techniques for the production of traditional fermented foods, industrial enzymes, alcoholic beverages, and probiotics.

Pre-requisite of course:NA

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
4	0	0	50	30	20	0	0

Contents : Unit	Topics	Contact Hours
1	**Microbiology of milk and milk products** Definition and Composition of milk, Types of Milk (skimmed, toned and homogenized), Factors affecting quality and quantity of milk, Nutritive value of milk, Physical and Chemical properties of milk. Microbiology of milk: Common micro-organisms found in milk, Fermentation and spoilage of milk, Milk borne diseases. Milk preservation and 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 microbial 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.	14

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Contents : Unit	Topics	Contact Hours
2	**Food spoilage and food borne infections** 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: Molds, yeasts, and bacteria, Intrinsic and extrinsic factors affecting microbial growth in food. Food spoilage: factors responsible for food spoilage, microorganisms involved in food spoilage. Spoilage of meat and poultry products, bread, fruits and vegetables, eggs, sea foods, canned foods etc. Food infection and food poisoning by Staphylococcus aureus, Clostridium botulinum, Aspergillus flavus, Salmonella typhimurium, Bacillus, Vibrio parahemolyticus, Listeria, Escherichia coli, Shigella, Campylobacter, Brucella, Yersinia etc. Foodborne outbrakes – laboratory testing procedures.	17
3	**Food preservation:** Principles of food preservation. Thermal destruction - use of low temperature and high temperature, Determination of TDP, TDT, D, F, and Z values. Physical methods: Canning, chilling, freezing, dehydration, control of water activity, ultrafiltration, sterilization, radiations. Chemical methods: use of chemicals, antibiotics, preservatives. Food additives: definition, uses, functions of acid, base, buffer systems, salts and chelating/sequestering agents. Low calorie and non nutritive sweeteners. Antioxidants, emulsifying and stabilizing agents, anti-caking agents, thickeners, firming agents. Anti microbial agents / Class I and Class II preservatives as per PFA Act. Colorants, Flavoring agents and related substances, clarifying agents and other additives. Food packaging: types of antimicrobial packaging, introduction to Tetra pack technology.	16
4	**Food products produced using microorganisms** Traditional fermented foods (pickles, Kimchi, sauerkraut, soya sauce etc.), Microbial cells as food (SCP), Production of alcoholic beverages – beer and wine; vinegar fermentation, steroid conversions, industrial enzyme production – amylase, protease, lipase, cellulose; amino acid production, Bakery products, genetically modified foods, mushroom cultivation; Probiotics: Evaluation, role and production.	13
Total Hours		**60**

Textbook :

1 Fundamentals of Dairy Microbiology, Prajapati J.B., Nadiad Akta Prakashan, 1995

2 Food Microbiology , William C. Frazier, Dennis C. Westhoff, N. M. Vanitha , McGraw-Hill Education (India), 2013

3 Modern food microbiology, James M. Jay, Martin J. Loessner, David A. Golden, Springer Science & Business., 2005

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References:

1 Food Microbiology, Food Microbiology, Adams MR and Moss MO, Royal Society of Chemistry Publication, Cambridge., 1995

2 Milk and milk products, Milk and milk products, Clarence Henry Eckles, Willes Barnes Combs, Harold Macy, McGraw-Hill , 1943

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as 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 / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
5.00	10.00	30.00	30.00	20.00	5.00

Instructional Method:

1 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

2 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.

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

Supplementary Resources:

1 https://archive.nptel.ac.in/courses/126/105/126105013/

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