FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: Bachelor of Technology (Dairy Technology)

Semester: III

Course Code: 202200301

Course Title: Fundamentals of Dairy Microbiology

Course Group: Basic Science Course

Course Objectives: To provide in-depth knowledge to students on different aspects of microbial growth and associated spoilage in foods. Demonstrate students on principles, different preservation methods of food and mode of action of various preservation methods on microbes. Acquaint students with types of fermentation processes and microbial production of industrial products

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Theory		J/V/P*		Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	
3	0	2	4	50 / 18	50/ 17	25 / 9	25 / 9	150 / 53

* **J**: Jury; **V**: Viva; **P**: Practical

Sr. no.	Content	Hours
1	**Overview of History and Scope of Microbiology** Discovery of Microorganisms and Microscopy (types, working principles and applications); Theories of Biogenesis and abiogenesis; Contributions of Leeuwenhoek,Pasteur, Tyndal, Joseph Lister, Robert Koch, Edward Jenner and Alexander Fleming; Scope and application of microbiology in fields like Dairy, Food, Pharmaceutical, Industrial, Medical and agriculture.	**07**
2	**Classification and Diversity of Microbes** Microbial classification systems, numerical taxonomy, General properties and principles of microbial classification, Whittaker's five kingdom and Carl Woese's three domain classification system; Systematics of bacteria and Bergey's manual of systematic bacteriology, Phylogenetic tree. Viruses: Structure and Classification; Bacteriophages; Differences between viruses and bacteria; Fungi: Classification of Fungi; Reproduction in Fungi; Protozoa and algae. Biosafety, bioterrorism, Microorganisms adapted to extreme environmental conditions	**08**
3	**Prokaryotic and Eukaryotic Microorganisms** Structure and functions of prokaryotic cells; Differences between prokaryotes	**06**

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	and eukaryotes; Differences between cell wall of Gram positive and Gram negative bacteria; Structure of Archeal cell wall.	
4	**Microbial Growth and Nutrition** Bacterial growth curve; factors affecting growth of bacteria, direct and indirect methods of measurement of bacterial growth; Bacteriostatic and bactericidal agents; Common nutrient requirements and nutritional types of microorganisms.	**06**
5	**Basics of Microbial Genetics and Host-Microbe Interactions** DNA as the genetic material, Structure of DNA/ RNA, DNA replication, transcription and translation; Basic concepts of immunology; Role of immune system in governing host-microbe interactions, Microbial Commensalism, Colonization, Infection, Disease and Vaccines.	**07**
6	**Introduction to Microbial Genetics** Microbial genome, plasmids, modification, conjugation, transformation, transduction, recombination, rapid detection methods like PCR, ELISA, Blotting	**06**
7	**Microorganisms Relevant to Dairy Industry** Thermodurics, probiotics, prebiotics, Microorganisms involved in causing mastitis, dairy food borne diseases.	**05**
	Total	**45**

List of Practical:	
1	General instruction for microbiological laboratory and introduction to Microscope- simple and compound, autoclave, incubator, centrifuge, laminar airflow.
2	Simple staining- methylene blue; crystal violet
3	Negative staining
4	Differential staining (Gram)
5	Differential staining (Spore, acid fast)
6	Motility of microorganisms - hanging drop technique
7	Preparation of commonly used growth media liquid and solid
8	Preparation of simple and differential media
9	Isolation techniques for microorganisms – Streak, spread and pour plate.
10	Enumeration of microorganisms in milk.
11	Enumeration of microorganisms in water: total viable count, coliform (MPN).

Reference Books:

1	General Microbiology by Roger Y. Stanier, John L. Ingram, Mark L. WheelsandPage R. Painter. (Macmillan Press Ltd.)
2	Microbiology by M. J. Pelczar Jr., E.C.S Chan and Noel R Krieg. Tata McGraw-Hill
3	Food Microbiology, W C Frazier and D C Westhoff, McGraw Hill Book Company,NY
4	A comprehensive dairy microbiology, J. S. Yadav, Sunita Grover, V. K. Batish, Publisher: Metropolitan, New Delhi, India, 1993
5	Industrial Microbiology, A H Patel Mac Millan Press

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6	Dairy Microbiology Handbook: The Microbiology of Milk and Milk Products, Third Edition, Editor(s):Richard K. Robinson, Print ISBN:9780471385967

Supplementary learning Material:	
1	http://highered.mcgraw-hill.com/sites/0072556781/student_view0/chapter13/animation_quiz_1.html
2	http://highered.mcgraw-hill.com/sites/0072943696/student_view0/chapter3/animation.html

Pedagogy:

- Direct Classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Interactive methods
- Seminar/Poster presentation

Internal Evaluation:

Teacher may consider some components for the continuous evaluation where individual component weightage should not exceed 20%.

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks						**R**: Remembering; **U**: Understanding; **A**: Application, **N**: Analyze; **E**: Evaluate; **C**: Create
R	**U**	**A**	**N**	**E**	**C**	
15%	25%	20%	20%	15%	5%	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Identify the microorganisms based on their structural and growth characteristics	**15**
CO-2	Identify and quantify the microorganisms using rapid techniques (molecular, immunological, proteomic)	**20**
CO-3	Develop concept of genetic transfer mechanisms leading to multidrug resistance	**15**
CO-4	Understand and characterize the natural microflora, starter, probiotic and pathogenic	**15**
CO-5	Understand the methods to control microorganisms	**15**
CO-6	Understand the factors affecting growth of microorganisms in food	**20**

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Curriculum Revision:	
Version:	1
Drafted on (Month-Year):	Dec-22
Last Reviewed on (Month-Year):	-
Next Review on (Month-Year):	Jun-25

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