Syllabus template

Semester: IV	
Course : Microbiology	
Paper Title: Food and Dairy Microbiology	
Paper code: :C2MB230422T/P	**Credits: 4**
Hours/week : 5	
Category: Core/MDC/SEC/VAC: Core (Major)	
Theory / Practical / Composite : Composite	
No of Modules : No modules	

Course Overview: This course provides an insight into the association of microorganisms with the food we humans consume. This association can be harmful as microbes can spoil our food. An understanding of the microbial spoilages of food and their preservation is detailed here. On the other hand, the beneficial aspects of microbial fermentation in food is also dealt with. Food can be the source of several diseases, an account of which is equally covered. Lastly, tests to analyse microbiological quality of food, food quality, regulations and safety is also discussed. AI use for predictive microbiological food preservation is mentioned in this course.

As a composite paper, students will also learn practical components to support what they are learning in theory. Experiments like study on spoiled fruits, and other food items, tests for food analysis have been covered.

Course Outcome:

1. Remember: The basics of how several factors help microbes to growth while several others inhibit growth.
2. Understand: To understand food spoilages and the principles of microbial spoilages of food.
3. Apply: To apply the knowledge of microbial activity in food to help preserve them.
4. Analyze: To analyze how food borne microbes may be the cause of certain diseases.
5. Evaluate: To assess the microbiological quality and safety issues in food production
6. Create: To be able to create avenues for better management and handling of fresh, fermented and processed foods.

Prerequisites: ***Basic knowledge about any prior course***

SYLLABUS

UNIT/~~Module~~	**CONTENT**	**HOURS or NUMBER OF CLASSES**	**CO Mapping**	**COGNITIVE LEVEL**
I.	**Food as a substrate for microorganisms:** Intrinsic and extrinsic factors that affect growth and survival of microbes in foods, natural flora and source of	**4**	**CO1**	**K1**

	contamination of foods in general.			
II.	**Microbial spoilage of various foods:** Principles, Spoilages of vegetables, fruits, meat, fish, eggs and milk.	**8**	**CO1, CO2**	**K1, K2**
III.	**Food preservation & analysis:** Principles of food preservation. Physical methods of food preservation: High temperature (Pasteurization, Appertization), Low temperature, Drying, Irradiation, Hydrostatic pressure, microwave processing and packaging. Chemical methods of food preservation: Organic acids and their salts, sulfites, nitrates and nitrites, ethylene oxide, salts and sugars, antibiotics and bacteriocins. MBRT, SPC, Alkaline Phosphatase test.	**10**	**CO1, CO3, CO5**	**K1, K3,K5**
IV.	**Fermented foods:** Fermented foods: Definition and types, Dairy starter cultures, fermented dairy products: yogurt and dahi, kefir and koumiss, cheese. Fermented foods: Soy sauce, sauerkraut. Probiotics (Types of microorganisms, health benefits, probiotic foods in the market).	**8**	**CO1, CO3,CO6**	**K1, K3,K6**
V.	**Food borne diseases:** Food infections: *Bacillus cereus, Escherichia coli,* Salmonellosis, Shigellosis, *Vibrio parahaemolyticus*, Food intoxications: *Staphylococcus aureus, Clostridium botulinum* and mycotoxins (Causative agents, symptoms, foods involved and preventive measures of each).	**8**	**CO1, CO4,CO5**	**K1, K4, K5**
VI.	**Quality control of food:** HACCP and FSSAI	**2**	**CO5**	**K5**

VII.	**Culture based and rapid detection methods of food borne pathogens in foods**. Nucleic-acid-based methods, immunological methods, and biosensor-based methods. AI based predictive microbiology a via machine learning for food preservation.	**2**	**CO5**	**K5**
VIII.	**PRACTICAL** 1. Isolation of any food borne bacteria from food products. 2. Isolation of spoilage microorganisms from spoiled vegetables/fruits. 3. Isolation of spoilage microorganisms from bread. 4. MBRT of milk samples and their standard plate count. 5. Alkaline phosphatase test to check the efficiency of pasteurization of milk. 6. Detection of adulteration in food. 7. Estimation of ascorbic acid in food samples. 8. Detection of food borne pathogens/microbial contamination by ELISA technique.	**24**	**CO1, CO2, CO3, CO4,CO5 ,CO6**	**K1, K2, K3, K4,K5,K6**

Text Books

1. Adams MR and Moss MO. (1995). Food Microbiology. 4th edition, New Age International (P) Limited Publishers, New Delhi, India.

2. Banwart JM. (1987). Basic Food Microbiology. 1st edition. CBS Publishers and Distributors, Delhi, India.

3. Davidson PM and Brannen AL. (1993). Antimicrobials in Foods. Marcel Dekker, New York.

4. Dillion VM and Board RG. (1996). Natural Antimicrobial Systems and Food Preservation. CAB International, Wallingford, Oxon.

5. Frazier WC and Westhoff DC. (1992). Food Microbiology. 3rd edition. Tata McGraw-Hill Publishing Company Ltd, New Delhi, India.

6. Gould GW. (1995). New Methods of Food Preservation. Blackie Academic and Professional, London.

7. Jay JM, Loessner MJ and Golden DA. (2005). Modern Food Microbiology. 7th edition, CBS Publishers and Distributors, Delhi, India.

Suggested readings **1. Lund BM, Baird Parker AC, and Gould GW. (2000). The Microbiological Safety and Quality of Foods. Vol. 1-2, ASPEN Publication, Gaithersberg, MD.** **2. Tortora GJ, Funke BR, and Case CL. (2008). Microbiology: An Introduction. 9th edition. Pearson Education.**
Web Resources
1.
2.
3.
4.
Evaluation Theory CIA (10+3+2), Practical CA (38+2)
Paper Structure for Theory Semester Exam Module : Full Marks: 45 Long questions: 4 (each 10 marks) from 6 (4x10=40) Short questions: 5 (each 1 mark) from 7 (5x1=5)

Course outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive levels
CO1	Remember: The basics of how several factors help microbes to growth while several others inhibit growth.	K1
CO2	Understand: To understand food spoilages and the principles of microbial spoilages of food.	K2
CO3	Apply: To apply the knowledge of microbial activity in food to help preserve them.	K3
CO4	Analyze: To analyze how food borne microbes may be the cause of certain diseases.	K4
CO5	Evaluate: To assess the microbiological quality and safety issues in food production	K5
CO6	Create: To be able to create avenues for better management and handling of fresh, fermented and processed foods	K6