

Institute of Microbiology and Molecular Genetics
Faculty of Life Sciences
University of the Punjab, Lahore
Course Outline



Programme	BS	Course Code	MMG301	Credit Hours	3(2+1)
Course Title	FOOD MICROBIOLOGY				
COURSE INTRODUCTION					
<p>This course explores the role of microorganisms in food production, preservation, and spoilage. It covers microbial physiology, microbial growth patterns in food, and the impact of microorganisms on food safety and quality focusing on both beneficial and harmful aspects, and methods for detecting and controlling microbial contaminants. Students will explore the principles of microbiology as they apply to food safety, preservation, and quality. Key topics include microbial growth, foodborne pathogens, fermentation processes, and the impact of microorganisms on food spoilage and safety. The course combines theoretical knowledge with practical applications, including laboratory work and case studies.</p>					
LEARNING OUTCOMES					
<p>On the completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1. Students will be able to identify and classify various microorganisms (bacteria, fungi, yeasts, molds, and viruses) that affect food production, spoilage, preservation, and safety using both traditional and molecular techniques. 2. Develop strategies to control or inhibit microbial growth in food, including sanitation practices, preservative use, and thermal processing. 3. Evaluate the impact of microbial activities on foodborne illnesses and public health. 					
COURSE CONTENT					
<p>Overview of food microbiology and its importance/scope., History and scope of food microbiology, Food and nutrients/human nutrition, Major groups of microorganisms in foods (bacteria, yeasts, molds), Sources of microorganisms in food, Principles of microbial growth (lag, log, stationary, death phases), Factors affecting microbial growth (temperature, pH, moisture, oxygen), Metabolic pathways and their impact on food, microbial sporulation and germination, Common foodborne pathogens (e.g., Salmonella, E. coli, Listeria), Mechanisms of pathogenicity and infection, Symptoms and treatment of foodborne illnesses, Beneficial uses of microbes such as microbes and food fermentation, biochemistry and genetics of beneficial traits, starter culture and bacteriophages. Types of food spoilage (bacterial, fungal, enzymatic) and important factors in food spoilage, Detection and identification of spoilage microorganisms (Food spoilage indicators). Control of microorganisms in food (Cleaning and sanitation, heat, cold drying, irradiation antimicrobial preservatives, non-thermal method and hurdle concept), Principles of food safety and hygiene, Impact of global changes on food safety (e.g., climate change, globalization), Future trends and challenges in food microbiology. Food safety regulations and standards (e.g., FDA, USDA), Role of microbiology in quality assurance and control.</p>					
PRACTICALS					
<p>Collection and submission of food samples for microbiological analysis, Laboratory techniques for isolating and identifying microorganisms, Microbial load in food using serial dilution and colony forming units (CFU), Quality and microbial analysis in milk (Aerobic mesophilic count, Dye reduction test, mastitis test, acidity test) enumeration of spores in different spices, microbial count</p>					

in different water and other food samples, antimicrobial activity of vinegar and different spices, isolation of starter culture from yoghurt and their biochemical characterization, Hazard Analysis and Critical Control Points (HACCP), application of theoretical knowledge in practical scenarios, analysis and interpretation of laboratory results

TEXTBOOKS AND READING MATERIAL

1. Bibek R., Arun b., (2008). *Fundamentals of Food Microbiology*, 4th edition. CRC Press Taylor and Francis Group U.K.
2. Modi, H. A., (2007). *Introductory Food Microbiology*, 1st edition. Asvishkar Publishers, ditributors, India.
3. Brennan, J. G. (2006). *Food Processing Handbook*, Wiley, John Wiley and Sons, N.Y.
4. Guthrie, R. K. (1980). *Food Sanitation*. AVI Publishing Company Inc. N.Y.
5. Han, J. (2005). *Innovations in Food Packaging*. Elsevier Science, U.S.A.
6. Jay, J. M. (2000). *Modern Food Microbiology*. Aspen Publishers, U.S.A.
7. Jay, J. M., Loessner, M. J. and Golden, D. A. (2006). *Modern Food Microbiology*, 7th edition, Springer Science, U.S.A.
8. Jay, J. M.(1990). *Modern Food Microbiology*. D. Van Nostrand Company, N.J.
9. Luck, E., Jager, M. and Laichen, S. F. (2000). *Antimicrobial Food Additives: Characteristics, Uses, Effects*. Springer-Verlag, N.Y.
10. Matthews, K. R. and Doyle, M. P. (2006). *Microbiology of Fresh Produce*. American Society for Microbiology, Washington, D.C.
11. Molins, R. A. (2001). *Food Irradiations: Principles and Applications*. John Wiley and Sons, N.Y.
12. Steele, J. L. and Marth, E. H. (2001). *Applied Dairy Microbiology*. Marcel Dekker, N.Y.

ASSESSMENT

Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
2.	Formative Assessment	25%	Continuous assessment includes Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on activities, short tests, projects, practicals, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, fieldwork , report writing etc.