

Course Description:

This course offers an in-depth exploration of the microbial biome, focusing on the intricate details of microbial taxonomy, cellular biology, metabolism, genetics, and molecular biology. It also emphasizes advanced laboratory techniques for culturing, identifying, and analysing microorganisms, preparing students for cutting-edge research and applications in microbiology. This course aims to deepen their understanding and expertise in this field of study.

Learning Objectives:

1. To understand the taxonomy and types of various microorganisms.
2. To gain knowledge on biochemical tests, microscopic tests and modern evaluation of microbes
3. To understand the concepts of food and industrial microbiology

Pedagogy:

Hands on practical exposure, Skill development, technical module briefing

Syllabus:**Unit I – Taxonomy and types of microbes**

Bacteria-General characteristics, morphology, modern classification, identification of bacteria, Gram's staining, Biochemical tests-catalase test, motility, oxidase test, methyl red test, hydrogen sulphide test.

Yeast & mold- General characteristics, morphology, modern classification of yeast and fungi, identification of fungi and yeast, lactophenol cotton blue staining.

Viruses- General characteristics, morphology, modern classification of viruses, identification of viruses- bacteriophages.

Unit II -Determination of microorganisms

Culture- Modern methods of cell culture: synchronous and co- cell culture, continuous cell culture in liquid and solid media, Cell immobilization and applications, Pre and probiotics cultures, sampling methods, microscopy, microscopic techniques, use of different microscopes, physical, chemical, immunological methods-fluorescent antibody, serological tests.

Unit III – Food microbiology

Foods as ecological niches, Relevant microbial groups, Microbes found in raw materials and foods that are detrimental to quality, Factors that influence the development of microbes in food, spoilage of fruits and vegetables, spoilage of fresh and processed meat, seafood, poultry, eggs, milk and milk products, cereals, pulses and plantation crops.

Unit IV – Pathogenic microorganisms

Introduction to pathogenic microorganisms-bacteria, fungi, yeast and virus, taxonomy, vehicle foods, detection and enumeration, Culturing-specific media, growth media, control media, prevention and control

Unit V – Industrial Microbiology

Fermentation media, Dual or multiple fermentations, types of fermentation processes-antibiotic fermentation, aerobic and anaerobic fermentation, hydrocarbon fermentation. Enzymes as fermentation products, bioactive molecules from microorganism, secondary metabolites. Factors affecting the growth rate-intrinsic and extrinsic factors.

References:

1. Practical Food Microbiology & Technology - Harry H. Weiser, Mountney, J. and Gord, W.W.,2021
2. Jay M.J (2015) Modern Food Microbiology, Fourth Edition, CBS Publishers and Distributors, New Delhi
3. Ramesh, K.V (2012) Food Microbiology, MJP Publishers, Chennai.
4. Tamine, A (2015) Probiotic Dairy Products, Blackwell Publishing, USA.
5. William C. Frazier (2014) Food Microbiology, Tata McGraw Hills Publishing Company Limited, Chennai.

Course Outcome:

CO1: Outline on the basic characteristics, taxonomy and classification of bacteria, yeast & mold and fungi using biochemical tests.

CO2: Apply the knowledge on various modern determination methods of microbes

CO3: Illustrate on the spoilage of microorganisms on various food products and the factors that influence the growth of microbes.

CO4: Summarize on the pathogenic microorganisms present, their prevention and control.

CO5: Outline on the various fermentation process in industry scale level.

Evaluation Pattern:

Assessment	Internal	External Semester
Periodical 1 & Periodical 2 / Midterm	30	
*Continuous Assessment (CA)	20	
End Semester		50

*CA - Can be Quizzes, Assignment, Projects, and Reports, and Seminar

Employability:

This course will position the students in various placement opportunities in the field of research, diagnostics, biotechnology, public health, quality control and assurance.