

SUPPORTIVE COURSES OFFERED

Semester	Paper	Subject	Hrs Per week	University examination		Credits
				Duration in Hrs.	Max. Marks	
SEMESTER I	09MBT	Fermentation technology	2	3	100	2
SEMESTER II	09MBTD	Food biotechnology	2	3	100	2
SEMESTER III	09MBT	Clinical microbiology	2	3	100	2

SUPPORTIVE PAPER I: FERMENTATION TECHNOLOGY

PREAMBLE

Scope

This paper throws light on the biological processes involved in Biotechnology Industries

Objective

This paper aims to empower the students with the knowledge about various microbial processes in Industries and the means to improve the process

Goal

The students will be able to understand the biological processes undergoing in Industries and exploit the knowledge to improve the process

CONTENTS

UNIT I

Microbial techniques: Isolation of microbes from various sources, serial dilution technique, pure culture techniques and culture preservation techniques. Microbial culture collection centres. Staining techniques – Gram, endospore, negative, flagellar and methylene blue staining. Inoculum development – Development of inocula for yeast, bacterial, mycelial and vegetative fungal processes; aseptic inoculation of the fermentor.

UNIT II

Sterilization methods: Moist heat; dry heat, flame, filter, gas (ethylene oxide), Richards' rapid method - HTST (high temperature/short time) treatments – continuous sterilizers and pasteurizers - Sterility, asepsis, Uses of UV and non-ionizing radiation. Sterilization methods – medium sterilization, batch sterilization, continuous sterilization, filter sterilization.

UNIT III

Microbiological media: Types of media, composition of media – carbon sources, nitrogen sources, vitamins and growth factors, mineral, inducers, precursors and inhibitors. Selection and optimization of media

Strain improvement methods: Recombinant cell culture process – guidelines for choosing host, vector systems, plasmid sterility in recombinant cell culture, limits to over expression.

UNIT IV

Types of fermentation processes: Analysis of batch, Fed-batch and continuous bioreactions; Air-lift, stirred tank, tower, fluidized bed, packed bed, pulsed, photobioreactors.

UNIT V

Downstream processing:

Removal of microbial cells and solid matter, foam separation, precipitation, filtration, centrifugation, cell disruptions, liquid-liquid extraction, chromatography, membrane process, drying and crystallization.

REFERENCES

1. Fermentation Microbiology and Biotechnology (2002), Mansi El-Mansi and Charlie Bryce, Taylor and Francis Ltd., London (Replika Press Pvt. Ltd., Kundli – 131 028)
2. Manual of Industrial Microbiology and Biotechnology, III edition (1999), Arnold L. Demain and Julian Davies, ASM press, Washington DC
3. Principles of Fermentation technology, Stanbury PF and Whitaker A. Pergamon Press, Oxford

SUPPORTIVE II: FOOD BIOTECHNOLOGY

PREAMBLE

Scope

This paper adds information about the role of microorganisms in many food industries both in production and spoilage processes.

Objective

To encode the importance of the role of microorganisms in food industries both in beneficial and harmful ways

Goal

The students will be able to manipulate this knowledge in prevention of spoilage and also exploit the microbes for improved food quality.

CONTENTS

UNIT 1

Introduction: Nutritive factors of food constituents – protein, carbohydrates, fats in nutrition, bioavailability of nutrients, stability of nutrients. Microbes as direct food (Single cell protein and Baker's yeast); mycoprotein and yeast extract.

UNIT II

Fermentation products: Dairy products: General principles of manufacture of Cheese and Yogurt; Fermented foods: Soy sauce and Miso; Fermented vegetable: Sauer Krant and pickles. Fermented sausages.

UNIT III

Distilled beverages: Alcohol, wine, brandy and beer; **Food additives:** Production of additives - organic acid (acetic acid), amino acid (glutamic acid), food flavourants and pigments.

UNIT IV

Food spoilage and public health: *Staphylococcal*, *Salmonellosis*, *E.coli*, Botulism, aflatoxin.

Food preservation: Principles of food preservation – methods of preservation: Physical (irradiation, drying, heat processing, chilling and freezing, high pressure and modification of atmosphere); Chemical (Sodium benzoate Class I & II); Boiological: Probiotics and bacteriocins.

UNIT V

Food process technology: Canning, Microwave heating, thermal inactivation of microorganisms, freezing and thawing of foods. Food process operations: Evaporation - single and multi effect evaporation, dehydration, psychometric charts; drying-tunnel, tray, spray, drum, freezeing; distillation; food processing aid through biotechnology.

REFERENCES

1. Industrial Microbiology, 1983, 4th Edition, Prescott and Dunn's, Gerald Reed, AVI Publishing Company Inc. Conneticut.
2. Food Biotechnology. 1982. by Knorr, D. Marcel Dekker, New York

SUPPORTIVE III: CLINICAL MICROBIOLOGY

PREAMBLE

Scope

This paper imparts information about the microorganisms involved in human pathogenesis, their spread and control.

Objective

To enable the students to better understand the disease epidemiology, immune system, antibiotics, vaccines and gene therapy.

Goal

The students will be able to identify the pathogens causing disease, the specific antibiotic for the treatment and also the techniques of vaccine production.

CONTENTS

UNIT 1

Infection and immunity: General principles of infection, antigens, antibodies, antigen – antibody reactions, complement system.

UNIT II

Pathogenic/Parasitic organisms: Bacterial, viral and protozoal infections of the gastrointestinal system, nervous system, lung, liver, and eye; sexually transmitted diseases, skin infections, zoonoses, arthropod borne diseases. Transmission and spread of diseases – disease epidemiology.

UNIT III

Control and prevention of infections: Drugs and antibiotics, drug resistance, mycobacteria, leprosy and malarial parasite – importance, life cycle, spread and control. Control of vectors – mosquito control – biotechnological approaches.

UNIT IV

Vaccines : Types and methods of action. Biotechnological approaches to disease control and vaccine production. Genetic disorders and gene therapy.

UNIT V

Biochemical changes due to infections: Blood test and tissue analysis. Isolation and identification of organisms from tissue samples. Disease detection – conventional and molecular techniques.

REFERENCES

1. Immunology, Roitt, I.M., Brestoff and Male D.K., 1996.
2. Text book of microbiology, C.J.K. Panicker.
3. Molecular biotechnology, Glick.
4. Clinical microbiology, Ananthanarayanan.