

## SEMESTER-V

### COURSE 5: INDUSTRIAL BIOTECHNOLOGY

Theory Credits: 3

3 hrs/week

#### I. LEARNING OUTCOMES

On successful completion of the course, the students will be able to

1. Learn about industrially important microorganisms
2. Learn about bioreactor and its types
3. Learn about production of different substances through fermentation
4. Learn about industrially useful enzymes
5. Learn about industrially produced amino acids and vitamins.

#### II. Syllabus

##### Unit I.

Isolation, Screening, Preservation and Improvement of Industrially Important Microorganisms. Synthetic and Natural Medium, Precursors, Antifoams, Sterilization Methods and Inoculum Preparation.

##### Unit II.

Definition and design of bioreactor, basic principles of bioreactor. Classification of bioreactors. Analysis of batch, continuous, fed batch and semi-continuous bioreactors.

##### Unit III.

Ethanol Production by Fermentation using Molasses, Starchy Substances. Production of Alcoholic Beverages like Beer and Wine. Production of Citric Acid by Submerged and Solid State Fermentations.

##### Unit IV.

Sources of Industrial Enzymes, Production of Microbial Enzymes like Amylase and protease. Backer's Yeast and SCP Production. Production of Antibiotics: Penicillin, streptomycin

##### Unit V.

Amino Acid Production (glutamine or glutamic acid) Vitamin Production - Vitamin B12, Production of Recombinant Proteins Having Therapeutic and Diagnostic Applications (Insulin, Growth Hormone, Recombinant Vaccines, Monoclonal Antibody).

#### III. Skills Outcome

On Successful Completion of this Course, Student shall be able to

1. Learn about different isolations of microorganisms from various sources
2. Learn about production of alcohol and
3. Learn about citric acid fermentation

**SEMESTER-V**  
**COURSE 6: FOOD & NUTRITIONAL BIOTECHNOLOGY**  
Theory Credits: 3 3 hrs/week

**I. LEARNING OUTCOMES**

On successful completion of the course, the students will be able to

1. Learn about food Preservation and microorganisms associated with it
2. Learn about packaging of different foods
3. Learn types of Foods and their nutritional values
4. Learn about components of foods and their deficiency disorders
5. about Essential minerals, BMR and RDA

**II. Syllabus**

**Unit I**

Principles of food preservation. Microorganisms associated with foods. Infection, food intoxication, definition of shelf-life, perishable foods. Food preservation by freezing, refrigeration. Storage at high temperature: sterilization, pasteurization, blanching, drying, dehydration, evaporation and irradiation.

**Unit II.**

Food packing, methods of cooking – dry heat methods (Baking, roasting and grilling) – advantages and disadvantages, moist heat methods (Boiling, Steaming, Stewing) - advantages and disadvantages, frying (Shallow and deep) and microwave cooking. Canning, fermentations, and adulteration. Food additives and Food preservatives.

**Unit III**

Animal and sea foods - their importance, nutritional values, and preservation methods  
Microbiology of milk, dairy products – cheese, yoghurt, butter, ice – cream, milk powder and their preparation. Food preservation by salting, smoking, curing and crystallization

**Unit-IV**

Components of food: Carbohydrates, Fats, Proteins, fibre, vitamins and their importance in daily diet. Deficiency disorders: Protein deficiency disorders, Calorie maintenance diet, Malnutrition, Kwashiorkor, Marasmus, Starvation. Vitamins: classification of vitamins, sources of various vitamins. and their biological role in metabolisms. Vitamin deficiency disorders

**Unit V**

Basal Metabolic Rate (BMR) and its determination. Calorific values of foods, Atherosclerosis and obesity. Body Mass Index (BMI). Recommended dietary allowances for pregnant women, lactating women, infants, children and adults, Nutraceuticals. Food allergy and its importance in health, Essential minerals: Ca, Mg, Fe, I, Co, Mo, Zn, Se & F. Their role and deficiency disorders.

**III . Skills Outcome**

On Successful Completion of this Course, Student shall be able to

1. Learn about Qualitative analysis of food Learn about preservation methods
2. Learn about isolation on food spoiling Microorganisms