# BT VII: Process Biotechnology

**Marks: 75 Hours: - 45**

**Objective:**

To learn the microbial techniques for the Isolation, Screening, Preservations and maintenance of Microorganisms. To become aware about the designs and types of bioreactors.

# Outcome:

Students will understand the various laboratory methods for the isolation and preservation of Microorganisms. They will learn the Industrial use of bioreactor and also become aware about the media optimization.

# Unit I

Isolation, Screening, Preservations and maintenance of Microorganisms, Strain improvement, Mutagenesis, Genetic Engineering for Strain Improvement. Selection of Mutants producing improved level of Primary Metabolites with suitable Example. Isolation of mutants which do not produce feedback inhibitors or repressors. Isolation of mutants which do not recognize presence of inhibitors or repressors. Modification of Permeability.

# Unit II

Basic aspect of Bioreactor Designing, Types of Bioreactors, Ideal Properties of Bioreactor, Body Construction, Agitator, Impeller, Baffles, etc. Types of Bioreactor: Packed-bed reactor, Air –lift, Trickle bed, Photo bioreactors, Rotating Biological Reactors

# Unit III

Fluid flow and mixing, Classification of fluids, concept of Reynolds’s number, Rheological properties of fermentation process (Viscosity, cell concentration, product concentration etc.) Mass transfer in bioreactors (Oxygen and heat transfer). Measurement and control of Bioprocess parameters, Automation for monitoring and Control (online and offline sensors, Biosensors) Use of Computers: Data logging, data analysis, and process control, Process scale up: factors involved, steps involved, Immobilization techniques for cell and enzyme

# Unit IV

Media formulation & optimization its need and significance, Sterilization of media and air, exhaust air, Batch sterilization; Del factor D and Z value, Continuous Sterilization: Design and Methods, sterilization kinetics, inoculum development.

# Unit V

Microbial growth and its kinetics (Batch & Continuous) Types of Processes-Batch, fed batch, continuous, concept of scale up of fermentation. Comparative account of batch and continuous sterilization. Types of fermentation processes, Comparison between SSC and SLC, Factors affecting solid-state fermentations, Economic Applications.

# Reference Books:

1. Basic Biotechnology- Colin Ratledge – Cambridge Publication
2. Fundamentals of Biochemical Engineering -Bailay & ollis- TataMcGraw Hill
3. Principles of Bioprocess Engineering.-Pauline M. Doran – Elsevier Publication
4. Basic of Bioprocess Engineering- Shuler and Kargi
5. Comprehensive Biotechnology Vol III- Mooyoung Elsevier Publication
6. Principles of Fermentation Technology- Stanbury Whitkar – Elsevier Publication
7. Introduction to Industrial microbiology- Cruger-ACS Publication
8. Industrial microbiology- Casida- ACS Publication

# Practical:

1. Media formulation and optimization
2. Study of Growth Kinetics of Bacteria and Yeast by turbidometry & SCP
3. Screening of industrially important microorganism- Acids, Antibiotics, Enzymes
4. Study of scale up of fermentation
5. Study of design of bioreactor
6. Determination of TDP
7. Determination of TDT and design of sterilizer
8. Study of types of fermentation process (Surface and submerged)
9. Problems based on: - Growth kinetics, fluid flow, Reynolds’s number
10. Visit to fermentation Industry