

Course Code	COURSE NAME	Credits
26BT012	BIOPROCESS TECHNOLOGY	04

Course Objectives

- To impart knowledge on bioreactors for mass production of microorganisms at industrial scale.
- To introduce the concept of growth kinetics and production kinetics with biologists' perspective.
- To understand downstream processing techniques for value added production.
- Study types of bioreactors, control systems, upstream and downstream techniques.
- Learn to design and construct the Bioreactors

Learning Outcomes

Upon successful completion of this course it is intended that a student will be able to:

- Learn the importance of microbiology at industry.
- To understand the biotechnological tools to apply for large scale production.
- Derive the kinetic models for cell growth and multiplication; growth rate; doubling time.
- To learn about the methods of production and imbibe variants through innovations.
- Learn basic concepts of product quality, safety, and industrial standards.

Unit 1 - Basics of Bioprocess technology (10 Hrs.)

Introduction to Bioprocess Engineering. Isolation & screening of industrially important Micro Organism. Strain Improvement. Preservation of Microorganism. Inoculum Development for various fermentation process..

Unit 2 - Media for industrial fermentation (12 Hrs.)

Media formulation. Sterilization – Batch & continuous systems. Fermentation types- Solid state & Submerged fermentation. Stoichiometry of cell growth & Kinetics. Immobilization of cells & Enzymes.

Unit 3 - Bioreactor types and Upstream essentials (13 Hrs.)

Design of Bioreactor, Parts & their function. Types of Bioreactors – CSTR, Air lift, Bubble column, Packed bed & Tower Bioreactors.

Unit 4 - Design and construction of Bioreactors (10 Hrs.)

Monitoring and Control of variables such as temperature, agitation, pressure, PH, Dissolved oxygen. Computational control of fermentation Process..

Unit 5 - Downstream processing (15 Hrs.)

Removal of Particulates, Centrifugation. Product extraction, purification - Chromatography. Final product Formulation, Drying, Lyophilization. Microbial production of ethanol, amylase, lactic acid and Single Cell Proteins.

Reference Books:

1. Brown TA. Gene Cloning and DNA Analysis. Blackwell Publishing, Oxford, U.K. 5th Edition, 2006.
2. Clark DP and Pazdernik NJ. Biotechnology-Appling the Genetic Revolution. Elsevier Academic Press, USA. 2009
3. Glick B.R and Pasternak J.J. Molecular Biotechnology-Principles and Applications of recombinant DNA. ASM Press, Washington. 2003.
4. Primrose SB and Twyman RM. Principles of Gene Manipulation and Genomics. Blackwell Publishing, Oxford, U.K. 7th Edition, 2006.
5. Sambrook J, Fritsch EF and Maniatis T. Molecular Cloning-A Laboratory Manual. 3rd edition. Cold Spring Harbor Laboratory Press. 2001.
6. Stanbury A.H, Whittaker A and Hall S.J. Principles of fermentation technology Pergamon. 2nd Edition, 1995.