

B.Sc. Biotechnology: Semester-V BST 501: Bioprocess Technology	
Teaching Scheme Lectures: 3 hrs/Week Tutorials: 1 hr/Week Credits: 4	Examination Scheme Class Test -12Marks Teachers Assessment - 6Marks Attendance – 12 Marks End Semester Exam – 70 marks

Prerequisite: - BST203 Microbiology, BST404 Genetics


Course Objectives:

- 1 To give the basic concept of fermentation and types of bioreactors in fermentation industry.
2. To give complete knowledge of various types of fermentation, sterilization and microbes used in fermentation industry.
3. To explain the process of different techniques of upstream and downstream processing.
4. To explain the importance of processing of major fermented foods and beverages.
5. To explain and emphasize the importance of food additive: colors, flavors, preservatives in food industry.

Course Outcomes:

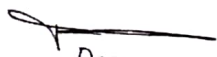
After completing the course, students will be able to:

- CO1: To define the basic concept of fermentation and types of fermentors and bioreactors used in fermentation industry: their working mechanism.
- CO2: To understand various types of fermentation like Batch, fed batch and continuous; Conventional fermentation v/s biotransformation; Solid substrate, surface and submerged fermentation
- CO3: To determine the mechanisms sterilization and their types.
- CO4: To analyze different techniques of upstream and downstream processing in detail: Bioseparation - filtration, centrifugation, sedimentation, flocculation; Cell disruption; Liquid-liquid extraction; Purification by chromatographic techniques; Reverse osmosis and ultra filtration; Drying; Crystallization; Storage and packaging; Treatment of effluent and its disposal.
- CO5: To evaluate the processing of major fermented foods and beverages; Food ingredients and additives prepared by fermentation and their purification.
- CO6: To explain the use of microbes and their use in pickling, producing colours and flavours, alcoholic beverages and other products; Process wastes-whey, molasses, starch substrates and other food wastes for bioconversion to useful products.
- CO7: To explain role of preservatives in food industry: Bacteriocins from lactic acid bacteria – Production and applications in food preservation.



Head

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Detailed Syllabus::

UNIT-1 Bioreactor designs

Bioreactor designs; Types of fermentation and fermenters; Concepts of basic modes of fermentation - Batch, fed batch and continuous; Conventional fermentation v/s biotransformation; Solid substrate surface and submerged fermentation; Fermentation economics; Fermentation media; Fermenter design- mechanically agitated; Pneumatic and hydrodynamic fermenters; Large scale animal and plant cell cultivation and air sterilization; Upstream processing: Media formulation; Sterilization; Aeration and agitation in bioprocess; Measurement and control of bioprocess parameters; Scale up and scale down process

UNIT-2 Bioseparation


Bioseparation - filtration, centrifugation, sedimentation, flocculation; Cell disruption; Liquid-liquid extraction; Purification by chromatographic techniques; Reverse osmosis and ultra filtration; Drying; Crystallization; Storage and packaging; Treatment of effluent and its disposal

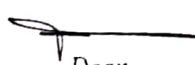
UNIT-3 Fermented foods and beverages


Fermented foods and beverages; Food ingredients and additives prepared by fermentation and their purification; fermentation as a method of preparing and preserving foods; Microbes and their use in pickling, producing colours and flavours, alcoholic beverages and other products; Process wastes-whey, molasses, starch substrates and other food wastes for bioconversion to useful products; Bacteriocins from lactic acid bacteria - Production and applications in food preservation

Text and Reference Books

1. Voet D, Voet JG & Pratt CW, Fundamentals of Biochemistry, 2nd Edition. Wiley Jackson AT., Bioprocess Engineering in Biotechnology, Prentice Hall, Engelwood Cliffs, 1991.
1. Shuler ML and Kargi F., Bioprocess Engineering: Basic concepts, 2nd Edition, Prentice Hall, Engelwood Cliffs, 2002.
2. Stanbury RF and Whitaker A., Principles of Fermentation Technology, Pergamon press, Oxford, 1997.
3. Baily JE and Ollis DF., Biochemical Engineering fundamentals, 2nd Edition, McGraw-Hill Book Co., New York, 1986.
4. Aiba S, Humphrey AE and Millis NF, Biochemical Engineering, 2nd Edition, University of Tokyo press Tokyo, 1973.
5. Comprehensive Biotechnology: The Principles, Applications and Regulations of Biotechnology in Industry.


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