B.Tech. Biotechnology: Semester-VI

BBT 604: DOWNSTREAM PROCESSING

Teaching Scheme	Examination Scheme
Lectures: 3 hrs/Week	Class Test -12 Marks
Tutorials: 1 hr/Week	Teachers Assessment – 6 Marks
Credits: 4	Attendance – 12 Marks
	End Semester Exam – 70 marks

Course Objective

To give brief introduction about industrial bioprocess to students and to describe the importance and techniques involved in downstream processing, in product development involving the purification steps, fill finishing and in waste management.

Course Learning Outcomes

After completing the course, the student shall be able to:
CO1: Understand various classes of bioproducts
CO2: Analyze different purification methods in downstream process
CO3: Differentiate chromatographic techniques used in downstream process
CO4: Evaluate the purity of finishing products in downstream process.
CO5: Differentiate between upstream and downstream processing.

Unit 1: Requirement of purification
Overview of a bioprocess including upstream and Downstream processing. Characteristics of biotechnology products, classes of bioproducts, physicochemical basis of bioseparation. **Cell disintegration:** Separation of particulate by filtration, centrifugation, settling, sedimentation, decanting and micro filtration. Primary isolation methods including solvent extraction, sorption, precipitation, ultra filtration and reverse osmosis.
Unit 2: Purification methods
Fractional precipitation, electrophoresis, electro dialysis and various kinds of chromatography. Emerging separation techniques: Dynamic immobilization, reverse osmosis, super critical fluid extraction evaporation, super liquid extraction and foam based separation. Separation of intracellular, extracellular, heat and photosensitive materials. Finishing operations: Crystallization, Drying and formulation.
Unit 3: Downstream processes and effluent treatment
Applications of Unit Operations in Downstream with special reference to membrane separations & extractive fermentation, anaerobic and aerobic treatment of effluents. Typical examples for downstream Processing and effluent disposal in process industries

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