

I Year & II Sem.; M.Tech. Biotechnology & Bioprocess Engg. L T P TO C
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(BT528) UPSTREAM & DOWNSTREAM PROCESSING

Objectives of the course:

The objective of this course is to familiarize students with the downstream section of a bioprocess for the production of biotechnological products. To familiarize the student regarding removal of insolubles, product isolation, high-resolution techniques and product polishing.

UNIT I : Upstream processing :

Development of inocula for industrial fermentation.

Fermentation Media: Media composition, media sterilization and contamination, inoculum media, media economics, screening for fermentation media.

Size reduction: Criteria for comminution, energy requirement and efficiency, equipment for size reduction, screening of particles and screening efficiency.

UNIT II: Primary Separation and Recovery Processes:

Cell disruption methods for intracellular products, removal of insolubles, biomass (and particulate debris) separation techniques, flocculation and sedimentation, centrifugation and Filtration methods.

UNIT III: Enrichment Operations:

Membrane based separations micro and ultra filtration theory, design and configuration of Membrane separation equipment, applications, Precipitation methods (with salts, organic solvents, and polymers) Extractive separations, aqueous two-phase extraction, insitu product removal, integrated bioprocessing.

UNIT IV: Product Resolution / Fractionation and polishing:

Adsorptive chromatographic separation processes, electrophoretic separations (all electrophoresis techniques including capillary electrophoresis) Hybrid separation technologies (membrane chromatography, electro chromatography etc) Gel Permeation Chromatography, dialysis, Crystallization.

UNIT V: New and Emerging Techniques :

Pervaporation, Super critical extraction, foam based separation, Product recovery trains-few examples.

TEXT BOOKS :

1. James E Bailey, David F., "Ollis, Biochemical Engineering Fundamentals", 2nd ed., Mc Graw Hill , 1993.
2. Asenjo J.M., "Separation Processes in Biotechnology " , Marcel Dekker Inc. 1993.
3. "Product Recovery in Bioprocess Technology", BIOTOL Series, VCH, 1990.

REFERENCE BOOKS :

1. Wankat P.C, " Rate Controlled Separations " , Elsevier, 1990.
2. Belter PA and Cussler E, " Bioseparations " , Wiley , 1985
3. McCabe, Smith, Harriott, "Unit Operations of Chemical Engineering", 5th ed.,Tata Mc Graw Hill.