



PRINCIPLES OF DOWNSTREAM TECHNIQUES IN BIOPROCESS

PROF. MUKESH DOBLE

Department of Biotechnology
IIT Madras

TYPE OF COURSE : Rerun | Elective | UG/PG

COURSE DURATION : 12 weeks (26 Jul'21 - 15 Oct'21)

EXAM DATE : 23 Oct 2021

PRE-REQUISITES : Basics of biochemical engineering and thermodynamics

COURSE OUTLINE

The course covers the fundamentals, and design concepts of various down stream purification steps (unit operations) involved in a biochemical process. Down stream process is required to take a crude product from a fermentor or a bioreactor and purify it to the desired level. Hence it may involve solids, liquid and gas processing. The course covers cell breakage and recovery of intracellular material, Isolation of solids, Product recovery, Product enrichment/purification, Product polishing and finishing. This course is suitable for students pursuing their biotechnology, bioprocess engineering or other allied field. This course is also suitable for chemical engineers who would like to learn about separation techniques in biotechnology industries. The course will consist of lectures and solving problems. Problems will relate to design, estimating operating conditions and optimization of the process.

ABOUT INSTRUCTOR

Mukesh Doble: Professor at the department of Biotechnology at IIT Madras. Has previously worked in Imperial chemical Industries (ICI) and General Electric (GE) for 20 years. Areas of research are Biomaterials, Biopolymers and Drug design. Published 270 papers and 10 books and filed 10 patents (including two US). Has delivered on line video courses in Downstream processes and Biostatistics.

COURSE PLAN

Week 1 : Introduction; Mass balance, Heat Balance, flow sheet; Costing

Week 2 : Costing (continued), Physical and chemical principles in Down stream; Problems in Mass balance, flow sheet; Cell Breakage

Week 3 : Cell Breakage (continued); Solid Liquid Separation; Solid Liquid Separation (continued)

Week 4 : Solid Liquid separation-problems; Pre-treatment and Filters; Adsorption

Week 5 : Adsorption (continued); Adsorption (continued); Adsorption (continued)

Week 6 : Liquid-Liquid Extraction; Liquid-Liquid extraction (continued); Liquid-Liquid extraction (continued)

Week 7 : Liquid-Liquid extraction (continued); Reversed micellar and aqueous two phase extraction, Membranes

Week 8 : Membranes (continued); Membranes (continued); Membranes (continued)

Week 9 : Precipitation; Chromatography; Chromatography (continued)

Week 10 : Chromatography (continued); Chromatography (continued); Chromatography (continued)

Week 11 : Chromatography (continued); Chromatography (continued); Crystallisation

Week 12 : Drying; Drying and Distillation; Future trends, Summary of the course