PRINCIPLES OF DOWNSTREAM TECHNIQUES IN BIOPROCESS

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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 fieldThis 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 : Lec-01 Introduction
Lec-02 Mass balance, Heat Balance, flow sheet
Lec-03 Costing

Week 2 : Lec-04 Costing (continued), Physical and chemical principles in Downs stream
Lec-05 Problems in Mass balance, flow sheet
Lec-06 Cell Breakage

Week 3 : Lec-07 Cell Breakage (continued)
Lec-08 Solid Liquid Separation
Lec-09 Solid Liquid Separation (continued)

Week 4 : Lec-10 Solid Liquid separation-problems
Lec-11 Pre-treatment and Filters
Lec-12 Adsorption

Week 5 : Lec-13 Adsorption (continued)
Lec-14 Adsorption (continued)
Lec15 Adsorption (continued)

Week 6 : Lec-16 Liquid-Liquid Extraction
Lec-17 Liquid-Liquid extraction (continued)
Lec-18 Liquid-Liquid extraction (continued)

Week 7 : Lec-19 Liquid-Liquid extraction (continued)
Lec-20 Reversed micellar and aqueous two phase extraction
Lec-21 Membranes

Week 8 : Lec-22 Membranes (continued)
Lec-23 Membranes (continued)
Lec-24 Membranes (continued)

Week 9 : Lec-25 Precipitation
Lec-26 Chromatography
Lec-27 Chromatography (continued)

Week 10 : Lec-28 Chromatography (continued)
Lec-29 Chromatography (continued)
Lec-30 Chromatography (continued)

Week 11: Lec-31 Chromatography (continued)
Lec-32 Chromatography (continued)
Lec-33 Crystallisation

Week 12 : Lec-34 Drying
Lec-35 Drying and Distillation
Lec-36 Future trends, Summary of the course