



# 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 (20 Jul'20 - 9 Oct'20)

**EXAM DATE** : 17 Oct 2020

**INTENDED AUDIENCE** : B.E/B.Tech

**PRE-REQUISITES** : Basics of physics/chemistry/Maths, Mass and heat balance, and thermodynamics

## COURSE OUTLINE

A product that is manufactured in a bioreactor or a fermentor, is recovered and purified in several subsequent unit operations. The economy of a manufacturing process is determined by the cost effectiveness of these downstream operations. This course discusses these operations and the basic underlying principles with worked out problems.

## ABOUT INSTRUCTOR

Prof. Mukesh Doble is a Professor at the Department of Biotechnology at IIT Madras. He has previously worked in Imperial chemical Industries (ICI) and General Electric (GE) for 20 years. Areas of research are Biomaterials, Biopolymers, and Drug design. He has Published 250 papers and 8 books and filed 6 patents.

## 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