
IV Year B.Tech. Biotechnology I - Semester	L	T	P	To	C
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BT 419 FERMENTATION TECHNOLOGY (ELECTIVE-IV)

Course Description & Objectives :

This course helps to familiarize important aspects of fermentation technology like media, process optimization, inoculum levels, solid state fermentation and bioprocess considerations for animal and plant cell cultivation

Course Outcomes:

1. After completing this course, students will be able to verbally describe the most common equipment, materials and methods related to biotechnological processes, microbial growth and cultivation and sterilization.
2. Understand the difference in bioprocess of various reactors and develops the processes for bioproducts.
3. Student can design the medium requirements for bioprocess of plant cells, animal cells and microorganisms.
4. Be Able to apply different mathematical formulas for biocatalysis and for the bioreactor performance and use those to plan and analyze bioprocesses.
5. The student will also be able to produce, analyze and interpret data from bioprocesses.

UNIT - I : Fermentation Process:

General requirements of fermentation processes, Basic design and construction of fermentor and ancillaries, Main parameters to be monitored and controlled in fermentation processes; An overview of aerobic and anaerobic fermentation processes and their application in the biotechnology industry, solid-substrate, slurry fermentation and its applications, whole cell immobilization, behaviour of microbes in different reactors (air lift, fluidized, batch, continuous and fed batch condition).

Unit - II: Fermentation inputs:

Nutrient requirement for fermentation process, carbon, nitrogen source, macro and micronutrients, renewable energy sources (carbon and nitrogen), C/N ratio, development of inocula for microbial, plant and animal cell cultivations, supply of air/nitrogen for aerobic and anaerobic process

UNIT - III : Bioprocess optimization :

Conventional optimization process (one variable at a time approach), need for statistical experimental design, screening techniques-Plackett Burman design, response surface methodology-Box-Benken design, central composite design and self directing optimization

UNIT - IV : Solid state fermentation :

Introduction to solid state fermentation (SSF), comparison of SSF with submerged fermentation, applications in industry, growth kinetics in SSF, Heat and Mass transfer problems in SSF, SSF bioreactors, Scale up of SSF.

UNIT - V: Plant and animal cell cultivation :

Plant and animal cells compared to microbial cultivation, Bioreactor considerations for plant cell-suspension culture, immobilization culture and organized tissues. Methods used for cultivation of animal cells, Bioreactor consideration for animal cell culture-suspension culture, anchorage dependent cultivation. Important industrial products from plant and animal cell cultivation.

TEXT BOOKS:

1. Stanbury P.F, Stephen J. Hall and Whitaker A - Principles of Fermentation Technology, 2nd edition, Butter Worth - Heinemann, An imprint of Elsevier, India pvt. Ltd., 2005.
2. Shuler, M.L. and Kargi - F. " *Bioprocess Engineering - Basic concepts* Second Edition, Prentice Hall of India Pvt. Ltd., 2005.

REFERENCE BOOKS:

1. Bailey and Ollis - " Biochemical Engineering Fundamentals", 2nd Edition, McGraw Hill , 1986.
2. Pauline M. Doran - Bioprocess Engineering Calculations, First edition, BlackwellScientific Publications, 2005.

