



ANDHRA UNIVERSITY

TRANS-DISCIPLINARY RESEARCH HUB

BIO PROCESS ENGINEERING

Unit I:

Bioprocess Principles: Kinetics of biomass production, substrate utilization and product formation, Batch and continuous culture, fed-batch culture

Unit II

Introduction to fermentation process general requirement of formulation process overview of aerobic and anaerobic formation process and their application in industries. medium requirement for fermentation process, Examples of simple and complex media design and usage of commercial media for industrial fermentation. Thermal death kinetics of micro organisms, heat sterilization of liquid media filter sterilization of liquid media and air

Unit III:

Enzyme Technology – microbial metabolism of enzyme- classification and properties applied enzyme catalysis kinetics of enzyme catalytic reactions, metabolic pathways protein synthesis in cells

Unit IV:

Bioreactor Design and operation selection, scale-up, operation of bioreactors. Mass transfer in heterogeneous biochemical reaction systems, Oxygen transfer in submerged fermentation processes, Oxygen uptake rates and coefficients. Role of aeration and agitation in oxygen transfer heat transfer processes in biological systems.

Recovery and purification of production:-

Primary separation; separation of insoluble- sedimentation, centrifugation, filtration and cell disruption. Isolation and concentration – extraction micro-filtration, ultra filtration .

Purification: precipitation, Chromatographic separation adsorption and electrophoresis. Final purification: Crystallization, Drying

Unit V:

Introduction to instrumentation and process control in bioprocesses: measurement of physical and Chemical parameters in bioreactors, monitoring and control of dissolved Oxygen, PH, Impeller speed and temperature in a stirred-tank fermenter.

TEXT/REFERENCES:

1. M.L. shuler and F. Kargi, “ Bio-Process Engineering, 2nd prentice Hall of India, NewDelhi – 2002
2. Rajiv Dutta, “Fundamentals of Biochemical Engineering, 1st edn., springlar, 2008.
3. H.W. Blanch and Doughlour S. Clark, Biochemical Engineering spl. Indian Edn.,marieI-Dekker, 2007
4. J.E Bailey and D.F. Ollis, “Biochemical Engineering Fundamentals” 2nd edn., MCGrow Hill Publishing company, New york 1986.



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Time: 3 Hours

Max. marks: 100

All questions carry equal marks.

Answer any FIVE

1. Discuss the kinetics of growth, substrate utilization and product formation.
2. Define Sterilization. Describe the methods of air sterilization with suitable diagrams.
3. Derive Michaeli's- Menten equation for enzyme catalyzed reaction.
4. Discuss the methods used for finding k_{La} in bioreactors.
5. List out the criteria to be followed for scaling up of a bioreactor.
6. Explain any two bioreactors in detail with their applications.
7. What are the various steps in downstream processing? Explain them in detail with a neat schematic diagram.
8. Write on:
 - i) Monod Growth kinetics
 - ii) Bioreactors instrumentation and control
 - iii) Thermal death kinetics