

GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. SEMESTER: VI

Bio-Technology

Subject Name: **Fundamentals of Industrial Biotechnology**

Subject Code: **160402**

Teaching Scheme				Evaluation Scheme		
Theory	Tutorial	Practical	Total	University Exam (Theory) (E)	Mid Sem Exam (Theory) (M)	Practical (I)
3	0	2	5	70	30	50

UNIT I INTRODUCTION TO INDUSTRIAL BIOPROCESSES

Sr. No	Course Content	Total Hrs.
1.	Introduction to industrial bio-process: A historical overview and requirements of industrial fermentation processes– traditional and modern biotechnology and products.	2
2.	Basic idea on fermentation process, submerged, stationary, solid and semi-solid – with their merits and demerits. Role of a bio-process engineer in the biotechnology industry.	3
3.	Outline of the various unit operations involved in an integrated bio-process Raw materials for fermentation process: Isolation, preservation and improvement of industrial micro-organisms for overproduction of primary and secondary metabolites.	5
4.	Criteria for good medium, medium requirements for fermentation processes, oxygen requirements, medium formulation of optimal growth and product formation, examples of simple and complex media.	6

UNIT II PRODUCTION OF PRIMARY AND SECONDARY METABOLITES

Sr. No	Course Content	
1.	Primary Metabolites: A brief outline of processes for the production of some commercially important organic acids (e.g. citric acid, lactic acid, acetic acid etc.); amino acids (glutamic acid, phenylalanine, aspartic acid etc.) and alcohols (ethanol, butanol etc.,	5
2.	Secondary Metabolites: Brief Study of production processes for various classes of secondary	4

	metabolites: antibiotics: beta-lactams (penicillin, cephalosporin etc.), aminoglycosides (streptomycin etc.), macrolides (erythromycin), vitamins and steroids.	
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UNIT III PRODUCTION OF ENZYMES AND OTHER BIOPRODUCTS

Sr. No	Course Content	Total Hrs.
1.	Production of industrial enzymes such as proteases, amylases, lipases, cellulases etc. in brief, Speciality bioproducts for agricultural, food and pharmaceutical industries: Biopesticides, biofertilizers, Natural biopreservatives (nisin), biopolymers (xanthan gum, PHB etc.), single cell protein.	10

UNIT IV PRODUCTION OF MODERN BIOTECHNOLOGY PRODUCTS

Sr. No	Course Content	Total Hrs.
1.	Modern biotechnological processes: Recombinant cell culture processes. Guidelines for choosing host vector systems, plasmid stability in recombinant cell culture, limits to over expression. Production of recombinant proteins having therapeutic and diagnostic applications, production of vaccines. Production of monoclonal antibodies. Products of plant and animal cell culture.	13

List of Practical:

1. To perform the screening of commercially potent microbial strain.
2. To perform the screening of amylase producing potent microbial strain.
3. To perform the screening of rennin producing potent microbial strains.
4. To perform the screening of protease producing potent microbial strains.
5. To perform the screening of lipase producing potent microbial strains.
6. To perform the screening of citric acid producing potent fungi.
7. To isolate antibiotic producing potent microbial strains.
8. To carryout fermentative production of citric acid using *Aspergillus niger*.
9. Fermentative production of alcohol by potent yeast strains.
10. To carryout fermentative production of Gluconic acid using *A.niger*.
11. To carryout fermentative production of amylase using *Bacillus* spp.

Text Book:

1. Murrey Moo & Young, "Comprehensive Biotechnology", Vol III Pergamon.

Reference Books:

1. Casida Jr, L.E., "Industrial Microbiology", New Age International (P) Ltd.
2. Prescott, Dunn, "Industrial Microbiology", Agrobios (India).
3. Stanbury and Whitaker., "Principles of Fermentation Technology", Butterworth – Heinemann.
4. Wang D. I. C., Cooney C. L., Demain A. L., Dunnill P., Humphrey A. E., Lilly M. D., Fermentation and Enzyme Technology, John Wiles and Sons., 1980.
5. Zubay G., Biochemistry, Macmillan Publishers, 1989.
6. Prave p., U.Faust, Sitting w., D.A. Sukatsch, Fundamentals of Biotechnology, Panima Publication, First Indian reprint