



GUJARAT TECHNOLOGICAL UNIVERSITY
Master of Engineering, Chemical (Computer Aided Process Design)
Subject Code - 3721601
Semester II
Subject Name: Industrial Biotechnology

Type of course: Program Elective – III

Prerequisite: Biological Processes

Rationale: This subject deals with the biotechnology and its application. The first part deals with introduction to biotechnology and microorganisms involved. The all steps of fermentation technology have been covered. The types of bioreactors and their working is also included. The second part is based on application; the industrial production processes and introduction to other important applications have been introduced.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	0	3	70	30	0	0	100

Syllabus Content:

Sr. No.	Content	Total Hrs
1	General Introduction to Biotechnology and Microorganisms Introduction, Overview and brief history, Major Biotechnological Techniques, Applications of biotechnology Introduction and Classification of Microorganisms, Nutrition and Metabolism, Environment factors influencing the growth of microorganisms, Microbial Growth kinetics with batch, continuous and Fed batch culture	7
2	Fermentation Basis and development of Industrial Fermentation Processes like Screening cultures, media, inoculum, sterilization, scale-up	13
3	Bioreactors Requirements of Bioreactors, Modes of Bioreactor operations, Types of Bioreactors like stirred tank, Packed bed, Fluidized bed, Bubble driven bioreactors, Solid state bioreactors, Animal cell bioreactors	10
4	Industrial applications Microbial production of Antibiotics; Alcohols like wine, beer; Enzymes like Amylase, Protease; Organic acids; Amino acids; Vitamins; Biopolymers; Microbial polysaccharides.	11
5	Introduction to other Industrial Applications Bioplastics, Biosurfactants, Bioinsecticides, Pigments and flavors with their Microbial leaching, Bio-transformation, Bio-degradation, Food production involving microorganisms and their products, Safety aspects of industrial processes.	10



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Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	15	20	5	5	5

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

- 1) Stanbury, P.F., and Whitaker, A., Principles of Fermentation Technology, 2nd Edition, Pergamon Press, Oxford, 2005
- 2) Casida, J.R., L.E., Industrial Microbiology, Willey Eastern Ltd, New Delhi, 1st Edition, 2006
- 3) Mahuriya A. S., Industrial Biotechnology, Ane books Pvt. Ltd., 2009
- 4) Lee S. Y., J. Nielsen, G. Stephanopolous, Industrial Biotechnology, Products and Processes, Vol 4, Wiley – VCH.
- 5) Young, M.Y., Comprehensive Biotechnology Vol. 1-4, Pergamon Press, Oxford, 1st Edition, 1985
- 6) Prescott and Dunn, Industrial Microbiology, CBS Publishers, New Delhi, 4th Edition, 1987

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Understand the term biotechnology and industrial biotechnology	10
CO-2	Understand about microorganism and growth kinetics	10
CO-3	Comprehend about fermentation technology and its steps	20
CO-4	Estimate the performance of various bioreactors	10
CO-5	Familiarize with various application of industrial biotechnology	20

Major Equipment:

Fermenter
Autoclave

List of Open Source Software/learning website:

NPTEL open source