GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3160411
Semester – VI
Industrial Biotechnology

Type of course: Professional Core

Prerequisite: Basic Knowledge of Cell Biology, Biochemistry and Microbiology

Rationale: The objectives of this subject are primarily associated with the commercial exploitation of microorganisms, and involve processes and products that are of major economic, environmental and social importance throughout the world.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
2	0	4	4	70	30	30	20	150

Contents:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	**Introduction to Fermentation process.** Fermentation: An historical perspective, component parts of a fermentation process,	3	9 %
2	**Microorganism, Media and Bioprocesses in industrial Biotechnology** Primary screening of micro organisms from environment, properties of Industrial strains, strain improvement and preservation of microorganisms. Fermentation process (Submerged, Surface, solid state), enzymatic process and transformation process. Media formulation and optimization, Inoculum Development	8	25 %
3	**Production of Primary and Secondary Metabolites:** Organic acids, Amino acids, Alcohol, Antibiotics, Production of fine chemicals, Industrial Enzymes, Therapeutic Enzymes, Production of Recombinant Proteins, Combination products.	15	48 %
4	**Characterization of Biotechnological / Biological / Biosimilar Products**	3	9 %

	Assessment of Product Characteristics, Biotechnology Product Characterization, Comparability, Release, and Stability, Selection of Analytical Methods, Analytical Method Lifecycle Issues.		
5	**Process Validation:** Introduction and Scope, General Requirements and considerations, Process Knowledge, validation of commercial process.	3	9 %

Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
05	**05**	**30**	**20**	**05**	**05**

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

Reference Books:

1. Comprehensive Biotechnology, Third Volume, By Murray Moo Young, Third Edition, 2019, Elsevier
2. Industrial Microbiology, L. E. Casida Jr., New Age International Publishers.
3. Industrial Microbiology: An Introduction, Michael J. Waites, Neil L. Morgan, by Blackwell Science Ltd
4. Fermentation Microbiology and Biotechnology by E.M.T. El-Mansi, C.F.A. Bryce, B. Dahhou, S. Sanchez, A.L. Demain, A.R. Allman, CRC press, Taylor and Francis Group.
5. Principles of Fermentation Technology by Peter Stanbury, Allan Whitaker, Stephen J Hall, An imprint of Elsevier Science.

Course Outcome:

Sr. No.	**CO Statement**	**Marks % Weightage**
CO-1	To understand chronological development of fermentation industry and a typical fermentation process.	10%

CO-2	To develop knowledge of acquisition, development and preservation of suitable production strains, design media for growth and product formation as well as analyze of various modes of fermentation process.	20%
CO-3	To apply knowledge of fermentation process in production of various primary and secondary metabolites.	50%
CO-4	To select appropriate bimolecular technologies for any given product based on the nature of the product, state of analytics currently used with similar types of products, and relevant regulatory guidance on the product parameters to be tested.	10%
CO-5	To evaluate the way process can be run consistently to deliver desired product quality attributes.	10%

LIST OF PRACTICALS:

1. Primary screening of potential microbes producing amylase, protease, lipase.
2. Fermentative production of alcohol.
3. Fermentative production of citric acid.
4. Optimization of Media using statistical tools
5. Solid state fermentation of any one metabolite.
6. Fermentative production of biomass

List of Open Source Software/learning website:

1) NPTEL

2) MIT Open course lecture