



# GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering  
Subject Code: 3161408

## FOOD FERMENTATION TECHNOLOGY VI<sup>th</sup> SEMESTER

**Type of course:** Open elective course

**Prerequisite:** Nil

**Rationale:**

- a) Food Fermentation Technology involves concepts pertaining to preparation of microorganisms for large scale fermentation, and preparation of biomass, enzymes, starter culture, metabolites, alcohols and spirits
- b) It also helps in developing understanding to optimize the fermenter design and type

**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)	
2	0	2	3	70	30	30	20	150

**Content:**

Sr. No.	Content	Total Hrs	% Weightage
1	<b>Preparation of inoculum for large scale propagation:</b> Types of Fermentations, Media- composition, Strain improvement.	5	20
2	<b>Microbial biomass and metabolites:</b> Microbial Production of enzymes, therapeutics, acids, starter culture, Beer, oriental foods. Genetic regulation of metabolites, concept of operon (Lac, Trp)	6	20
3	<b>Design of a fermenter:</b> Design of a Fermenter, Temperature controls, Aeration and agitation systems, Baffles, Valves and steam traps, concept of K <sub>la</sub>	5	22
4	<b>Sterilization:</b> Sterilization: Calculation of del factor, Calculation of holding time at constant temperature, Scale up of batch sterilization.	5	20
5	<b>Wine Production:</b> Classification, Details of processes like Maceration, Primary Fermentation, Secondary fermentation, Aging/Maturation	8	18

**Suggested Specification table with Marks (Theory):**

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	30	20	20	10	



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**Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels**

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. Principles of Fermentation Technology By P.F. Stanbury, A. Whitaker, and S.J. Hall
2. Industrial Microbiology by A.H. Patel.
3. Biochemical Engineering fundamentals by Jones E. bailey and David F. Ollis Mac Grawhill.

### Course Outcomes:

Sr. No.	CO statement	Weightage (%)
CO-1	Scale-up and optimize the microbial fermentation condition	25
CO-2	Application and improvement of particular strains for production of metabolites during fermentation	25
CO-3	Understand the significance and processes involved in production of microbial biomass and metabolites (alcohols, therapeutics, enzymes) of industrial and therapeutic application	30
CO-4	Evaluate and apply various steps for upstreaming and down streaming involved in fermentation	20

### List of Experiments:

1. To determine amount of gas produced by yeast during fermentation
2. To determine the type of gas produced by yeast during fermentation
3. To prepare cabbage based traditionally fermented food: Sauerkraut
4. To study the effect of agitation on microbial growth in batch fermentation
5. To study the sugar utilization patterns by microorganisms
6. To evaluate exopolysaccharide production by microorganisms
7. To screen starch hydrolytic microorganisms from given sample
8. To determine  $\beta$ -galactosidase activity of microorganisms
9. To study given culture for its starter activity
10. To prepare fermented vegetable pickle

### Major Equipment:

1. Laminar air flow cabinet
2. Autoclave
3. Microscope
4. Rotatory Shaker
5. Biological /BOD incubator
6. Refrigerator



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**List of Open Source Software/learning website:**

- a. <http://foodscience.uark.edu/>
- b. [http://highered.mcgraw-hill.com/sites/0072556781/student\\_view0/chapter12/animation\\_quiz\\_4.html](http://highered.mcgraw-hill.com/sites/0072556781/student_view0/chapter12/animation_quiz_4.html)
- c. <http://bio-alive.com/animations/biology.htm>
- d. [http://www.bluffton.edu/courses/TLC/MontelA/Montel/Alternative\\_Energy\\_Website/biomass.htm](http://www.bluffton.edu/courses/TLC/MontelA/Montel/Alternative_Energy_Website/biomass.htm)