

GUJARAT TECHNOLOGICAL UNIVERSITY

FOOD PROCESSING & TECHNOLOGY (14)

FOOD FERMENTATION TECHNOLOGY

SUBJECT CODE: 2161408

B.E. 6th SEMESTER

Type of course: Food Processing Technology

Prerequisite: Nil

Rationale:

- a) Food Fermentation Technology involves concepts pertaining to preparation of microorganisms for large scale fermentation, and preparation of alcohols and spirits
- b) It also helps in developing understanding to optimize the fermentor 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)		
				ESE	PA	ALA	ESE		OEP	
4	0	2	6	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Preparation of inoculum for large scale propagation: Microbiology in fermentation: Industrially important cultures, Media- composition, Types of Raw Material, Inoculums Development for industrial fermentations, Criteria for transfer of Inoculums.	8	18
2	Microbial enzymes: Microbial Production of enzymes: Fundamentals and Techniques.	5	12
3	Design of a fermentor: Design of a Fermentor: Body construction: construction material, Temperature controls, Aeration and agitation systems, Stirrer glands and bearings, Baffles, Valves and steam traps, Pressure-control valves.	8	14
4	Sterilization: Sterilization: Calculation of del factor, Calculation of holding time at constant temperature, Scale up of batch sterilization.	6	12
5	Aeration & Agitation: Aeration & Agitation: Oxygen requirement, Oxygen supply, determination of K _{la} values & factors affecting it.	6	14
6	Alcoholic beverages: Alcoholic Beverages: Definition, Types, wines, whisky, Champagne, etc. Industrial process for wine production.	6	14
7	Spirits: Spirits: Basics of distillation, steps of distillation, two styles of spirits, types of stills. Brandy, rum, vodka, gin, liquor etc.	6	16

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
18	20	19	21	22	0

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. 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 Outcome:

At the end of this module, the student will be able to:

- a. Understand the preparation of inoculum for fermentation
- b. Understand and optimize the microbial fermentation condition
- c. Processes involved in production of alcohols and spirits

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 β -galactosidase activity of microorganisms
9. To study given culture for its starter activity
10. To prepare fermented vegetable pickle

Design based Problems (DP)/Open Ended Problem:

The topics taught in this subject would be useful to develop insight and application based knowledge among students. For instance, the student might be able to develop an experimental setup to:

Screen microorganisms for their potential to produce an enzyme example β -galactosidase. What procedure should be adopted to specifically purify this enzyme? After selecting the isolate, prepare a large scale inoculum to develop a fermented dairy product for lactose intolerant people

Major Equipments & Instruments:

- a. Laminar air flow cabinet
- b. Autoclave

- c. Microscope
- d. Colony counter
- e. Biological /BOD incubator
- f. Refrigerator

List of Open Source Software/learning website: <http://foodscience.uark.edu/>

- a. http://highered.mcgraw-hill.com/sites/0072556781/student_view0/chapter12/animation_quiz_4.html
- b. <http://bio-alive.com/animations/biology.htm>
- c. http://www.bluffton.edu/courses/TLC/MontelA/Montel/Alternative_Energy_Website/biomass.htm

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.