GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering (Food Processing Technology)
Subject Code: 3141402
Food and Industrial Microbiology
4th SEMESTER

Type of course : Basic Science

Prerequisite: Nil

Rationale: Food and industrial microbiology is the study of the microorganisms that play pivotal role in preparation of foods at small and large scale. It includes the propagation and preservation of microorganisms at large scale. In addition, concept of use of high & low temperature, chemicals and radiation for improvement of shelf life of food is essential part of this subject. Another indispensable aspect of food and industrial microbiology is screening of microorganisms for desirable characteristic essential at industrial level (example: metabolite, and enzyme production), separation and purification of particular bio-substance using chromatography, blotting, centrifugation, precipitation etc.

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)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Topics	Teaching Hrs.
1	**Role of microorganisms in spoilage of vegetables and fruit juices:** Microbiology of Fruits and Vegetables, Fruit juices, Beverages and Carbonated drinks: Sources, incidence and types of microbes, microbial spoilage and methods of control	**4**
2	**Role of microorganisms in spoilage of dairy products:** Microbiology of Milk and Milk Products: Normal and abnormal flora of milk, sources of contamination, pasteurization of milk and defects in milk and milk products.	**3**
3	**Role of microorganisms in spoilage of canned foods:** Microbiology of Canned Foods Causes of spoilage, types of aerobic and anaerobic microbial spoilage.	**3**
4	**Prevention of microbial food spoilage by chemicals and radiation:** Food Preservation by use of Chemicals and Radiation: Types of chemical preservatives, mode of action and industrial applications.	**2**
5	**Prevention of microbial food spoilage by use of high and low temperature:** Food Preservation by use of Low Temperature, High temperature and Drying: Types of low temperature preservation	**4**
6	**Food Borne Diseases and Food Poisoning:** Food borne pathogens, Food infections and Food Intoxications. Mechanism of toxin (endotoxin and AB type) action	**4**
7	**Isolation and Screening of microorganisms:** Isolation techniques, screening methods for industrial applications (Exopolysaccharide, amylase and beta-galactosidase).	**2**
8	**Strain improvement and preservation:** Improvement and Preservation of Industrial cultures: Importance, development of strains, Preservation methods.	**2**
9	**Industrial Fermenter**: Important parts and their functions. Batch, fed batch and continuous fermentation.	**4**
10	**Recovery and purification of microbial metabolite:** Procedure and techniques for	**5**

	recovery and purification of fermentation products based on their size, polarity, solubility, and binding. 1-D and 2-D electrophoresis.	
11	**Microbial growth kinetics:** microbial growth kinetics and inoculum preparation.	**3**
12	**Metabolite and biomass production:** Production details of Ethyl Alcohol, Citric acid, Single Cell Protein, glutamic acid	**3**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
18	**19**	**22**	**22**	**19**	

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. Modern Food Microbiology, James M. Jay, CBS Publishers & Distributors, Delhi.
2. Food Microbiology, W C Frazier and D C Westhoff, McGraw Hill Book Company, NY.
3. Industrial Microbiology, S C Prescott and C G Dunn, McGraw Hill Book Co.
4. Industrial Microbiology, A H Patel Mac Millan Press

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Understand the role of microorganisms in reducing shelf life of foods	15
CO-2	Understand and optimize the storage and processing treatment of foods to reduce the microbial load	20
CO-3	Mechanism and types of foodborne diseases	15
CO-4	Isolate and screen microorganism with potential to produce particular metabolite	15
CO-5	Enhance the efficiency of microorganisms to produce particular metabolite and produce the same at largescale.	15
CO-6	Processes involved in production of microbial metabolite	20

List of Experiments:

1. To determine quality of milk by methylene blue reduction test
2. Microbiological examination of foods
3. Preparation of Sauerkraut
4. Sterilization of microbial growth media using different methods

5. To identify the fungal contamination in given food sample
6. To study the sugar utilization patterns by microorganisms
7. To determine starch hydrolytic activity of microorganisms
8. To determine β-galactosidase activity of microorganisms
9. To determine thermal death point of microorganisms
10. To determine thermal death time of microorganisms

Open Ended Problems:

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 Equipment:

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

List of Open Source Software/learning website:

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