

GUJARAT TECHNOLOGICAL UNIVERSITY

FOOD PROCESSING TECHNOLOGY

BASIC FOOD MICROBIOLOGY

SUBJECT CODE: 2131407

B.E. 3RD SEMESTER

Type of Course: Food Processing Technology

Prerequisite: Nil

Rationale: Food microbiology is the study of the microorganisms that inhabit, create, or contaminate food. It includes the study of microorganisms causing food spoilage and "Good" bacteria, such as probiotics. In addition, microorganisms are essential for the production of foods such as cheese, yogurt, other fermented foods, bread, beer and wine. Another indispensable aspect of food microbiology is food safety which entails testing of foods for permissible count and type of microorganisms and presence of pathogens (disease or infection causing microorganisms)

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
			ESE (E)	PA (M)		PA (V)		PA (I)		
				PA	ALA	ESE	OEP			
3	0	2	5	70	20	10	20	10	20	150

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage (%)
1.	Introduction to Microbiology The scope and history of microbiology.	4	10
2.	Morphology and Fine Structure External and Internal structures of Bacteria, (membrane and major organelles, Appendages, Spores). Morphology and Characteristics of Fungi and Algae	5	10
3	Identification of Microbes Characterization and Identification of microorganisms (Biochemical and staining methods). Principles and types of different microscopes.	5	10
4.	Microbial Growth Bacterial Growth phases, auxotroph, bradytroph, Replica plating, Microbial Reproduction and preservation of microorganisms.	4	10
5.	Introduction to microbial genetics Microbial genome and plasmids, detection of microorganisms using molecular, serological and proteomic techniques (SDS-PAGE, Blotting techniques, hybridization, PCR, ELISA).	07	20
6.	Modification of Microbial Genome Genotype changes (acquisition of resistance markers), Bacterial	05	10

	recombination, conjugation, transformation and transduction.		
7.	Significance of Microorganisms in Foods Primary sources of microbes in food, Role of intrinsic and extrinsic parameters that effect microbial growth in foods.	05	10
8.	Fermented Foods Starter organism, Probiotics, Prebiotics, Synbiotics, functional foods, Fermented foods (dairy, traditional, meats).	05	10
9	Control of Microorganisms Control of microorganisms by Physical and Chemical agents.	05	10

Reference Books:

1. General Microbiology by Roger Y. Stanier, John L. Ingram, Mark L. Wheel and Page R. Painter. (Macmillan Press Ltd.)
2. Microbiology by M. J. Pelczar Jr., E.C.S Chan and Noel R Krieg. Tata McGraw-Hill
3. Food Microbiology, W C Frazier and D C Westhoff, McGraw Hill Book Company, NY

Course Outcomes:

At the end of this course students will be able to:

1. Identify the microorganisms based on their structural and growth characteristics
2. Identify and quantify the microorganisms using rapid techniques (molecular, immunological, proteomic)
3. Develop concept of genetic transfer mechanisms leading to multidrug resistance
4. Understand and characterize the natural microflora, starter, probiotic and pathogenic
5. Understand the methods to control microorganisms

List of Practical:

An introduction to microorganisms and bio-safety levels and lab equipments

- a. Staining techniques
 - Simple staining
 - Negative staining
 - Gram staining
 - Acid fast staining
 - Endospore staining
 - Capsule staining
- b. To determine motility of the given culture
 - Visualization of fungi
 - Preparation & sterilization of culture medium
 - Bacteriological examination of water sample by estimating Most Probable number of coliforms per 100 ml of sample (MPN TEST)
 - To determine antibiotic susceptibility of given microbial culture using disk diffusion method (Kirby-Bauer method)
 - To study the microbial growth curve
 - To study the effect of various factors on microbial growth

- Identification of enteric bacteria using biochemical tests (IMViC)
- To perform viable plate count by spread plate or pour plate method
- To study carbohydrate fermentation using Triple Sugar Iron Agar

Open Ended Problem:

The topics taught in this subject would be useful to develop insight and application based knowledge among students

Determine a substance which is antimicrobial, heat stable, small molecular peptide, produced during exponential phase. Try to develop assays to prove each characteristic. Which microorganisms produce this substance? What is the name of the substance and enlist the applications in food preservation? Prepare a product containing this substance and compare its shelf life with control sample.

Major Equipments:

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

List of Open Source Software/learning website

- http://highered.mcgraw-hill.com/sites/0072556781/student_view0/chapter13/animation_quiz_1.html
- http://highered.mcgraw-hill.com/sites/0072943696/student_view0/chapter3/animation.html
- <http://users.ugent.be/~avierstr/principles/pcrani.html>
- <http://aggie-horticulture.tamu.edu/food-technology/food-processing-entrepreneurs/microbiology-of-food/>

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.