



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Vocation

Level: Under Graduate

Branch: Food Processing and Quality Control

Subject Code: BV01009061

Subject Name: Basic Microbiology Lab

w. e. f. Academic Year:	2024-25
Semester:	1
Category of the Course:	Core Courses

Prerequisite:	NA
Rationale:	This practical course in microbiology is designed to introduce students to essential laboratory techniques for studying microorganisms, including bacteria and fungi. Students will gain hands-on experience with biosafety protocols, media preparation, and various staining techniques critical for observing microbial morphology and differentiating between microbial types. These skills are fundamental for identifying and controlling microorganisms in food quality and safety, helping students apply microbiological techniques in real-world food processing and quality control settings.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes
01	Identify the microorganisms based on their structural and growth characteristics
02	Identify and quantify the microorganisms using rapid techniques (molecular, immunological, proteomic)
03	Implement quality control measures to ensure food safety and quality.
04	Understand and apply food safety regulations and standards.

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR		C	Theory		Tutorial / Practical	
			ESE (E)		PA / CA (M)	PA/CA (I)	ESE (V)	
0	0	2	1	0	0	20	30	50



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Course Content:

Exp. No.	Content	No. of Hours	% of Weightage
1.	<p>Introduction to Biosafety Levels and Lab Equipment</p> <p>a) Laminar Air Flow/Biosafety Cabinets</p> <ol style="list-style-type: none">1. Operation and Maintenance of Laminar Air Flow: Learn how to operate, clean, and maintain laminar air flow cabinets.2. Use of Bio safety Cabinets: Understanding the differences between Class I, II, and III bio safety cabinets and their specific uses. <p>b) Autoclave</p> <ol style="list-style-type: none">3. Sterilization Techniques Using Autoclave: Procedure for sterilizing different types of lab equipment and media.4. Validation of Autoclave Performance: Methods for validating and ensuring the effectiveness of autoclave sterilization. <p>c) Microscope</p> <ol style="list-style-type: none">5. Microscope Calibration and Maintenance: Procedures for calibrating and maintaining different types of microscopes (light, phase-contrast, and electron microscopes).6. Advanced Microscopy Techniques: Introduction to fluorescence microscopy and confocal microscopy.	6	20



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2.	<p>Preparation of Growth Media for Microorganisms</p> <p>1. Preparation and Sterilization of Agar Plates: Techniques for preparing, pouring, and sterilizing agar plates for microbial growth.</p> <p>2. Preparation of Liquid Broth Media: Preparation, sterilization, and inoculation of liquid broth media</p>	6	20
3.	<p>Simple Staining for Visualization of Bacteria</p> <p>a) Simple/Monochromatic Staining</p> <p>Simple Staining Procedure: Step-by-step process for simple staining and visualization of bacterial morphology.</p> <p>b) Negative Staining</p> <p>Negative Staining Technique: Procedure for negative staining to observe bacterial capsules and cell shapes.</p>	6	20
4.	<p>Differential Staining for Visualization of Bacteria (Gram Staining)</p> <p>Gram Staining Procedure: Detailed steps for Gram staining to differentiate between Gram-positive and Gram-negative bacteria.</p>	6	20
5.	<p>Staining for Visualization of Fungi</p> <p>Lactophenol Cotton Blue Staining: Procedure for staining fungal specimens using lactophenol cotton blue</p>	6	20
Total		30	100

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	20	15	15	15	15



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Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

Open-source software and website:

1. **National Center for Biotechnology Information (NCBI)** - <https://www.ncbi.nlm.nih.gov/>
A comprehensive resource offering access to databases on microbial genetics, taxonomy, and research articles.
2. **OpenWetWare** - <https://openwetware.org/>
An open platform that provides protocols and resources for microbiology and molecular biology labs, useful for experiments involving media preparation and staining techniques.
3. **RDP (Ribosomal Database Project)** - <https://rdp.cme.msu.edu/>
An open-access database useful for microbial taxonomy and identification, particularly for bacteria and fungi relevant to food microbiology.
4. **CDC Biosafety in Microbiological and Biomedical Laboratories (BMBL)** - <https://www.cdc.gov/biosafety/publications/bmb15/>
Offers guidelines on biosafety levels and lab practices, which are essential for ensuring safe laboratory environments.
5. **ImageJ** - <https://imagej.nih.gov/ij/>
An open-source software for image analysis that can be used for analyzing microbial colony structures and stained images obtained from microscopy.

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