

SEMESTER 2nd
MAJOR COURSE

MBY222J: MICROBIOLOGY (MICROBIOLOGICAL TECHNIQUES)

CREDITS: THEORY: 4; PRACTICAL: 2

COURSE OBJECTIVES:

- *This course is framed to acquaint students with different culture media and important techniques involved in the culturing, purification and preservation of microbes.*
- *Course will make students familiar with principles and procedures involved in sterilization, staining and microscopy.*

THEORY (4 CREDITS)

UNIT-1: CULTURE MEDIA

- 1a. Culture media: Classification, composition, preparation and utility
- 1b. Ingredients of media, natural and synthetic media, chemically defined media, complex media, selective, differential, indicator, enriched and enrichment media, anaerobic media (with examples)
- 1c. Microbial nutrient requirements (micro and macro), factors affecting microbial growth
- 1d. Classification of microorganisms based on nutritional requirements.
- 1e. Bacterial growth curve and application

UNIT-2: STERILIZATION AND PRESERVATION TECHNIQUES

- 2a. Sterilization: Principles and methods of physical sterilization (moist heat, dry heat, filtration, tyndallization, radiations); Pasteurization
- 2b. Principles and methods of chemical sterilization (alcohols, aldehydes, phenols, halogens and hypochlorites)
- 2b. Preservation and maintenance methods of microbial cultures (slant culture, stab culture, soil culture, mineral oil overlaying, refrigeration, glycerol preservation, cryopreservation, lyophilization)
- 2c. Different biosafety levels in a microbiology laboratory
- 2d. National and international Culture Collection Centers

UNIT-3 CULTURE TECHNIQUES

- 3a. Collection of samples, processing of samples, serial dilution
- 3b. Isolation methods: Spread plate method, streak plate method, pour plate method, swab culture
- 3c. Enumeration methods of microorganisms: CFU, optical density, MacFarlands scale, Total viable count, Direct microscopic count
- 3d. Observation of morphological characteristics of microbial colonies.
- 3e. Safety measures undertaken during culturing of microorganisms.

UNIT-4: MICROSCOPY AND STAINING TECHNIQUES

- 4a. Microscope and their classification
- 4b. Working principle, construction and operation of simple and compound microscopes.
- 4c. Stains, staining and their mechanism
- 4d. Staining methods: Introduction and principle - Simple, Differential-Gram staining, acid fast staining, capsule staining, endospore and flagella staining.
- 4e. Principle and working of electron microscope (elementary idea)

LEARNING OUTCOMES:

- *Students will be well equipped with the microbiological techniques including sterilization, culturing, microscopy, staining and microbial culture preservation techniques.*
- *At the end of the course students will own significant familiarity about biosafety and biosafety levels in microbiology laboratory*

RECOMMENDED BOOKS:

1. Prescott's Microbiology by Joanne Willey, Linda Sherwood and Christopher J. Woolverton, 11th edition, McGraw Hill Publisher Companies, Inc.
2. Microbiology by Michael J. Pelczar JR, E.C. S. Chan, Noel R. Krieg, 5th edition, McGraw Hill Publisher Companies, Inc.
3. Brock Biology of Microorganisms by Madigan and Martinko, 14th edition, Pearson Education International
4. A Textbook of Microbiology by Dubey, R.C. and Maheshwari, D.K. S, 4th edition, Chand & Company Ltd
5. Text book of Microbiology by Ananthanarayan and Paniker's, 12th edition, Reba Kanungo, Universities Press.

LABORATORY COURSE (CREDITS: 2)

COURSE OBJECTIVES

- *This course shall deal with microscopic examination of bacteria and fungi as well as gram staining*
- *This course is framed to familiarize students with isolation of yeast and mold from food samples*
- *Students will also have hands on different biochemical tests, protease assay and antibiotic sensitivity assay*

1. Microscopic examination of bacteria
2. Microscopic examination of fungi
3. Performing gram staining of bacteria
4. Perform biochemical tests: catalase, oxidase and urease test
5. Isolation of yeast and mold from food samples
6. Antibiotic sensitivity assay
7. Qualitative assay of amylase

LEARNING OUTCOME:

- Students will be able to perform isolation, morphological and biochemical characterization of bacteria and fungi
- Students can perform Antibiotic sensitivity assay and qualitative amylase assay

RECOMMENDED BOOKS:

1. Microbiology: A Laboratory Manual by James Cappuccino and Chad T. Welsh 11th Global Edition, Pearson Benjamin Cummings Publishers.
2. Practical Microbiology by D K Maheshwari and R C Dubey, 3rd edition, S Chand & Company Publishers.
3. Laboratory Fundamentals of Microbiology by Jeffrey C. Pommerville 12th edition, Jones and Bartlett Publishers.