



## **I. Course Overview:**

Upon successful completion of this course, the students should be able to complete laboratory exercises which reinforce the topics covered in MCB 2013 and require the application of fundamental techniques in the isolation, cultivation and identification of microorganisms.

## **II. Units:**

### **Unit 1. Microscopy and Staining**

#### General Outcome:

- 1.0 The students should be able to correctly use and care for the microscope and describe procedures for simple and differential staining techniques.

#### Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 1.1 Name, identify and give the function of the major parts of the microscope.
- 1.2 Calculate the total magnification of each lens combination of the microscope.
- 1.3 Demonstrate the correct and safe use of the microscope.
- 1.4 Demonstrate the correct use of the oil immersion objective in viewing a slide of bacteria.
- 1.5 Define and explain resolving power, parfocal, working distance, and magnification.
- 1.6 List and explain the various uses and types of stains
- 1.7 Demonstrate the correct procedures for simple staining and negative staining.
- 1.8 Demonstrate the correct procedures for the following differential stains: gram, acid-fast, and spore.

1.9 Discuss the basic cell morphology and how it relates to identification of species.

## Unit 2. Cultivation and Isolation of Microorganisms

### General Outcome:

2.0 The students should be able to describe various nutritional factors that influence growth and demonstrate the following: sterile technique for transfer of microorganisms, isolation of pure cultures and quantification of bacteria.

### Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 2.1 List and demonstrate the steps in the procedure for sterile transfer of microorganisms.
- 2.2 Demonstrate the proper way to make streaks for isolation or growth on agar slants and petri plates.
- 2.3 List and explain the physical and chemical methods for sterilizing materials.
- 2.4 Demonstrate the procedures for making serial dilutions.
- 2.5 Explain the use of dilution plating to determine the number of viable cells in a population.
- 2.6 Demonstrate the use of a colony counter.
- 2.7 Explain the procedures for spectrophotometer measurement of cell density.
- 2.8 Demonstrate normal flora of skin.
- 2.9 Explain what is meant by enriched, selective and differential media and how they are used.
- 2.10 Differentiate microorganisms based on their ability to use oxygen for growth.
- 2.11 Discuss the ability of bacteria to grow at various temperatures.
- 2.12 Discuss the effect of pH on the microbial growth.
- 2.13 Discuss the effect of various concentrations of NaCl on microbial growth.

### Unit 3. Methods of Controlling Microorganisms

#### General Outcome:

3.0 The students should be able to describe the basic physical and chemical methods for inhibiting microbial growth and their modes of antimicrobial action.

#### Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- \*3.1 Explain the effects of moist heat on the bacterial cell.
- \*3.2 Describe the effects of osmotic pressure on bacteria
- 3.3 Demonstrate the effect of ultraviolet light on microbial growth.
- 3.4 Explain how to evaluate the activity of various disinfectants and antiseptics.
- 3.5 Explain how to evaluate the response of an organism to various antibiotics and chemotherapeutic agents.

**\*OPTIONAL**

## Unit 4. Immunology and Bacterial Genetics

### General Outcome:

4.0 The students should be able to understand how various serological procedures can be used to identify pathogenic microorganisms.

### Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

\*4.1 Describe a bacterial screening procedure for the detection of potential carcinogens. Describe bacterial mutation as illustrated by the Ames test.

\*4.2 Demonstrate DNA analysis using gel electrophoresis.

\*4.3 Demonstrate the agglutination reaction involved in the Febrile Antibody Test.

\*4.4 Demonstrate how infectious mononucleosis antibodies are detected.

\*4.5 Demonstrate bacterial conjugation.

**\*OPTIONAL**

## Unit 5. Survey of Microorganisms Other Than Bacteria

### General Outcome:

5.0 The students should be able to distinguish among the following organisms: protozoa, algae, molds, yeasts, viruses, and parasitic worms.

### Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

5.1 List the major distinguishing characteristics of the various types of organisms studied.

5.2 Describe the three major types of protozoans based on their means of locomotion.

5.3 Describe and draw various parasitic protozoans.

5.4 Describe mycological culture techniques.

\*5.5 Visualize and identify the structural components of molds.

5.6 Identify the morphological characteristics of yeast cells.

\*5.7 Demonstrate the techniques for cultivating and enumerating bacteriophages.

5.8 Describe the various flatworms and roundworms important as human pathogens.

5.9 Discuss and list various arthropods as vectors of disease.

### **\*OPTIONAL**

## Unit 6. Biochemical Activities of Microorganisms

### General Outcome:

6.0 The students should be able to use biochemical test procedures for the identification and differentiation of various microorganisms.

### Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

6.1 Illustrate the difference in the way organisms metabolize various carbohydrates.

\*6.2 Demonstrate and explain the use of biochemical tests that indicate an organism's ability to hydrolyze nutrients, utilize citrate, and reduce nitrate.

6.3 Demonstrate the tests for presence in the organism of certain enzymes, such as catalase or oxidase.

6.4 Explain how these tests may be used to isolate and identify species.

\*6.5 Select and properly use the appropriate media for defining the metabolic activity of an unknown bacteria.

\*6.6 Demonstrate the use of testing procedures to identify an organism.

\*OPTIONAL