

**Common Course Number:** MCB-2013-L

**Course Title:** Microbiology laboratory

**Catalog Course Description:**

Laboratory course to accompany MCB-2013 complementing lecture topics and providing direct experience with fundamental techniques for observation, isolation, cultivation, counting, identification, and control of microbes.

This course fulfills the 4,000-word requirement of the Gordon Rule.

**Credit Hours Breakdown:** 3 lecture hours

**Prerequisite:** None

**Co requisite:** : MCB-2013

**Course Competencies:**

**Competency 1:** Microscopic Examinations

Upon successful completion of this laboratory, the student will demonstrate competence in staining and microscopic examination of microbes by:

- 1.1 Naming, identifying and giving the function of the major parts of the microscope.
- 1.2 Calculating the total magnification of each lens combination of the microscope.
- 1.3 Demonstrating the correct and safe use of the microscope.
- 1.4 Demonstrating the correct use of the oil immersion objective in viewing a slide of bacteria.
- 1.5 Defining and explaining resolving power, parfocal, working distance, and magnification.
- 1.6 Listing and explaining 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 Successfully prepare hanging drop and plain wet mount slides and to use these in the study of Protozoa as well as in determining bacterial motility.

## **Competency 2: Isolation and Culture of Microbes**

Upon successfully completing this laboratory, the student will demonstrate mastery of techniques of isolating and cultivating microbes by :

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

### **Competency 3: Anti microbial Action**

Upon successfully completing this laboratory, the student will understand the basic physical and chemical methods for inhibiting microbial growth and their modes of antimicrobial action by:

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

### **Competency 4: Parasitic Protozoans**

Upon successfully completing this laboratory, the student will demonstrate knowledge of microorganisms other than bacteria such as protozoa, fungi, viruses, algae and parasitic worms by:

- 4.1 Listing the major distinguishing characteristics of the various types of organisms studied.
- 4.2 Describing the three major types of protozoans based on their means of locomotion.
- 4.3 Describing and drawing various parasitic protozoans including their life cycles and reproductive strategies.
- 4.4 Describing mycological culture techniques.
- 4.5 Identifying the structural components of fungi including sexual and asexual spores.
- 4.6 Identifying the morphological characteristics of yeast cells.
- 4.7 Demonstrating the techniques for cultivating and enumerating bacteriophages.
- 4.8 Describing and identifying various parasitic flatworms and roundworms, both adult and larval as well as hosts important in their life cycles.
- 4.9 Discussing and listing various arthropods as vectors of disease.

### **Competency 5: Biochemical Testing /identification of Microorganisms**

Upon successfully completing this laboratory, the student will understand the use of biochemical testing procedures for the identification and differentiation of various microorganisms by:

- 5.1 Illustrating the difference in the way organisms metabolize various carbohydrates.
- 5.2 Demonstrating and explaining the use of biochemical tests that indicate an organism's ability to hydrolyze nutrients, utilize citrate, and reduce nitrate.
- 5.3 Demonstrating the tests for presence in the organism of certain enzymes, such as catalase or oxidase.
- 5.4 Explaining how these tests may be used to isolate and identify species.
- 5.5 Selecting and properly using the appropriate media for defining the metabolic activity of unknown bacteria.
- 5.6 Demonstrating gelatin liquefaction by means of appropriate media and incubation conditions.
- 5.7 Demonstrating the use of testing procedures in the identifying of an unknown bacterial species.
- 5.8 Demonstrating the use of commercial multitest tools such as Enterotube II and Oxyferm O/F in the identification of unknown bacteria.
- 5.9 Demonstrating the use of appropriate selective media and procedures in the testing of water for the presence of microbial contamination