

Course Description**MCB2010L | Microbiology Laboratory | 2.00 credits**

This laboratory course to accompany MCB2010 complements lecture topics. Students will learn and have direct experience with fundamental techniques for observation, isolation, cultivation, counting, identification, and control of microbes. Prerequisites: BSC2010/2010L or BSC2085/2085L CHM1033/1033L or CHM1045/1045L; corequisite MCB2010.

Course Competencies:

Competency 1: The student will differentiate among groups of eukaryotic microorganisms employing microscopy techniques by:

1. Distinguishing the significant characteristics of the various types of eukaryotic microorganisms
2. Identifying common protozoans, including amoebae, flagellates, ciliates, and sporozoans
3. Identifying fungi's morphology and structural components, including asexual and sexual spores

Competency 2: The student will demonstrate competence in staining and examining microorganisms by:

1. Identifying the major parts and functions of the microscope
2. Calculating total magnification for each of the lenses of the microscope
3. Demonstrating the correct and safe use of the microscope
4. Demonstrating the correct use of the oil immersion objective
5. Explaining resolving power, parfocal, working distance, size, and depth of viewing field
6. Explaining the various types of stains and their uses
7. Demonstrating the correct procedures for the following stains: simple, Gram, acid-fast, endospore and negative stain
8. Preparing slides for studying living microorganisms and their motility

Competency 3: The student will learn the techniques for isolating and culturing microorganisms by:

1. Demonstrating aseptic techniques for transferring bacterial cultures
2. Demonstrating techniques for the isolation of pure cultures
3. Explaining methods for sterilizing materials
4. Explaining procedures for making serial dilutions
5. Performing serial dilution for plating and counting viable cells
6. Demonstrating the use of a colony counter
7. Demonstrating the use of a spectrophotometer to measure bacterial growth
8. Demonstrating the use of selective, differential, and enrichment media
9. Differentiating microorganisms based on their ability to use oxygen for growth
10. Demonstrating the effects of temperature on bacterial growth

Competency 4: The student will learn the basic physical and chemical methods for microbial growth control by:

1. Explaining the effect of heat on the control of bacterial growth
2. Demonstrating the effect of ultraviolet irradiation on bacterial growth
3. Evaluating the activity of various disinfectants and antiseptics on microbial growth
4. Evaluating the effects of various antibiotics and chemotherapeutic agents on microbial growth

Competency 5: The student will learn various biochemical testing procedures for identification of bacteria by:

1. Demonstrating differences in carbohydrate metabolism of microorganisms
2. Demonstrating the use of biochemical tests to assess the presence of enzymes and metabolic pathways in bacteria
3. Explaining the use of different media to test the metabolic activity of unknown bacteria
4. Demonstrating the use of commercial rapid test tools for the identification of unknown bacteria

5. Demonstrating the use of selective media and procedures for testing microbial contamination of food or water

Competency 6: The student will demonstrate the presence of microorganisms in the environment and their use in industry by:

1. Demonstrating the presence of microorganisms in various environments
2. Demonstrating the usefulness of hand scrubbing to control bacterial concentration on skin surfaces
3. Demonstrating using serial dilutions and standard plate count to enumerate viable bacteria in food or soil samples
4. Demonstrating the principle and practice of food production using microbial fermentation

Learning Outcomes:

- Use quantitative analytical skills to evaluate and process numerical data
- Solve problems using critical and creative thinking and scientific reasoning
- Use computer and emerging technologies effectively
- Describe how natural systems function and recognize the impact of humans on the environment