Broward Community College
Course Outline

STATUS: A

COMMON COURSE NUMBER: MCB 2010

COURSE TITLE: Microbiology

CREDIT HOURS: 3

CONTACT HOURS BREAKDOWN:

Lecture/Discussion	48
Lab	
Other	
Contact Hours/Week	3

CATALOG COURSE DESCRIPTION:

Prerequisite: Four hours of coursework in the biological sciences, including laboratory, and three hours of chemistry, with a minimum grade of "C".

Corequisite: MCB 2013L

An introduction to microbiology emphasizing principles of basic morphology, physiology, modes of transmission, biochemistry, and genetic mechanisms. It will include a survey of representative types of microorganisms and the role of pathogenic organisms in causing diseases and infections. Terms I, II, III

General Education Requirements - Associate of Arts Degree, meets Area(s):
General Education Requirements - Associate in Science Degree, meets Area(s):

UNIT TITLES:

1. Introduction to Microbiology: Methods of Studying and Classifying Bacteria
2. Bacterial Morphology, Metabolism, and Genetics
3. Microbial Control: Chemical, Physical, and Chemotherapeutic Means
4. Introduction to Immunology
5. Viral and Eukaryotic Microorganisms
6. Epidemiology and Bacterial Infectious Diseases

I. Course Overview:

Upon successful completion of this course, the students should be able to explain the importance of microorganisms, how they cause disease, how they can be controlled, and their beneficial role in nature.

II. Units:

Unit 1. Introduction to Microbiology: Methods of Studying and Classifying Bacteria

General Outcome:

1.0 The students should be able to describe the historical origins of microbiology, describe techniques for studying microorganisms, and classify microorganisms into their appropriate taxonomic categories.

Specific Learning Outcomes:

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

1.1 List and explain the important discoveries made by Leeuwenhoek, Koch, Pasteur, and others to the development of microbiology.

1.2 Differentiate between eukaryotic and prokaryotic cells.

1.3 Discuss the cell theory, germ theory, and concept of spontaneous generation.

1.4 List and explain the functions all cells must perform.

1.5 Discuss the use of the principles of taxonomy in classifying various types of microorganisms.

1.6 Categorize various life forms into the appropriate kingdoms.

1.7 List the similarities and differences of each of the following microbes: bacteria, protozoa, fungi, algae, and viruses.

1.8 List several ways in which microorganisms can contribute to solving some important human problems in the future.

1.9 Explain the function of each part of the microscope.

1.10 Explain magnification, resolution, and the path of light through a microscope.

1.11 Compare and contrast the various light microscopes with the various electron microscopes.

1.12 Explain how simple staining procedures differ from differential staining methods.

1.13 List the steps in the Gram and acid-fast stains, the functions and principles involved in each step, and the diagnostic values of each procedure.

1.14 Define the concept "species." Compare the concept of species as applied to bacteria with its application to higher organisms.

1.15 Describe recent developments in the methods of classification such as comparison of DNA bases and amino acid composition.

*1.16 Explain the differences between ionic, covalent and hydrogen bonding with examples of each.

*1.17 Explain the importance of pH and buffer systems as they relate to microorganisms.

*1.18 Describe the four classes of organic compounds: carbohydrates, lipids, proteins and nucleic acids.

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Unit 2. Bacterial Morphology, Metabolism, and Genetics

General Outcome:

2.0 The students should be able to discuss bacterial characteristics, factors influencing microbial growth, energy production, variability, and mechanisms of inheritance.

Specific Learning Outcomes:

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

2.1 Describe the basic morphological types of bacteria and give examples of each.

2.2 List the major parts of a typical prokaryotic (bacterial) cell and the functions of each.

2.3 List the characteristics of Gram + and Gram - bacteria.

2.4 Distinguish between the following groups of bacteria:

- 2.4.1 Aerobic, facultative, and anaerobic bacteria.
- 2.4.2 Photosynthetic, nonphotosynthetic, autotrophic, and heterotrophic bacteria.
- 2.4.3 Endospore-forming and nonspore-forming rods.

2.5 Define the following terms: pure culture, isolation, colony, agar, broth, and medium.

2.6 Explain the importance of pure culture techniques in the field of microbiology.

2.7 Explain the process of cell division as it occurs in bacteria.

2.8 Discuss the nutritional requirements of living organisms and explain how these requirements are used to group different nutritional types of bacteria.

2.9 Explain and list the physical conditions required for bacterial growth.

2.10 Describe the differences between defined and enriched media.

2.11 Discuss the four stages of bacterial growth as illustrated by the phases of a growth curve.

2.12 Discuss bacteriological media in terms of variety, preparation, and application.

2.13 Describe the general characteristics of enzymes, list their chemical and physical properties, and explain the mechanism of enzyme action.

2.14 Explain the principle processes which occur during glycolysis, the Kreb's cycle, and the electron transport system.

2.15 Compare anaerobic respiration, aerobic respiration, and fermentation in terms of end products and available energy for cell use.

*2.16 Explain the process of photosynthesis as it occurs in certain bacteria.

2.17 Explain how proteins, fats, and carbohydrates may be converted to one another in cells.

2.18 Describe the operon hypothesis in relation to microbial metabolism.

2.19 Describe the chemical structure of a molecule of DNA and explain how the two strands of DNA relate to one another in the double helix.

2.20 Compare and contrast the chemical structures of RNA and DNA.

2.21 Discuss the process of DNA replication.

2.22 Describe the steps in protein synthesis and give the function of DNA and RNA in this process.

2.23 Differentiate between genotype and phenotype.

2.24 Discuss the nature of genotypic changes and the concept of mutation.

2.25 Describe the various types of mutations and explain how they arise and how damage to DNA may be repaired.

2.26 Discuss the events that occur at the chromosomal level during bacterial recombination and define the three types of gene transfer.

2.27 Compare transformation, transduction, and conjugation regarding kinds of bacteria involved and effects.

2.28 Discuss the application of recombinant DNA technology.

2.29 Explain the different types of microbial symbiosis and give specific examples of each.

*** OPTIONAL**

Unit 3. Microbial Control: Chemical, Physical, and Chemotherapeutic Means

General Outcome:

3.0 The students should be able to explain principles and basic techniques of controlling microorganisms by chemical, physical, and chemotherapeutic means.

Specific Learning Outcomes:

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

3.1 Define and illustrate how the following terms are used in controlling microorganisms: pasteurization, sterilization, disinfection, stasis, asepsis, sanitation, germicide, aseptic technique.

3.2 Explain the pattern of death in vegetative cells and endospores.

3.3 Discuss the time-temperature relationship with reference to the susceptibility of various microorganisms and spores to heat.

3.4 Describe the nature and application of moist and dry heat.

3.5 Explain the uses and limitations of each of the following methods: incineration, boiling, autoclaving, dessication, filtration, hot air oven, ethylene oxide, radiation, live steam, and ultra-sound.

3.6 List and explain the physical and chemical factors influencing antimicrobial action.

3.7 Discuss the criteria which determine the selection of an antimicrobial chemical agent.

3.8 Explain the chemical properties, mode of action, and practical application of each of the following antimicrobial chemical agents: alcohols, chlorine, iodine, formaldehyde, phenolics, quarternary ammonium compounds, mercury, and other heavy metals.

3.9 Explain how the effectiveness of antimicrobial agents is evaluated.

3.10 List the characteristics of effective chemotherapeutic agents.

3.11 List the principle sources of antibiotics.

3.12 Explain how bacterial resistance to antibiotics develops and specify the ways in which its occurrence may be prevented.

3.13 Explain why so few chemotheraputic agents are available to treat viral infections.

3.14 Explain the principal mode of action of the following chemotherapeutic agents: sulfa drugs, penicillins, tetracyclines, aminoglycosides, chloramphenicol, erythromycin, and others.

Unit 4. Introduction to Immunology

General Outcome:

4.0 The students should be able to discuss the immune system, its principles, and the interaction of its components.

Specific Learning Outcomes:

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

4.1 List the characteristics of antigens and antibodies.

4.2 Describe and contrast specific and nonspecific immunity.

4.3 Discuss the difference between active and passive immunity and how both forms of immunity are induced.

4.4 Discuss the biochemical properties and functions of each of the five classes of immunoglobulins.

4.5 Describe how the antibody-antigen interactions are used in the diagnosis of disease.

4.6 Discuss the mechanisms of allergy.

4.7 List and explain the components and functions of the complement system.

4.8 List the types of cells that produce antibodies and explain how they are produced.

4.9 Describe the functions of humoral and cellular immunity.

4.10 Explain and contrast the primary and secondary immune response to antigenic stimulation.

4.11 Differentiate between the following types of antibody reactions: opsonization, neutralization, complement-fixation, precipitation, and agglutination.

4.12 Differentiate between immediate and delayed-type hypersensitivity. Site clinical examples to study hypersensitivity.

4.13 Describe the role of immunity in the rejection of tissue transplants and in immune responses to tumors.

Unit 5. Viral and Eukaryotic Microorganisms

General Outcome:

5.0 The students should be able to detail the morphology, physiology, and epidemiology of viruses, fungi, algae, protozoans, and helminths.

Specific Learning Outcomes:

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

5.1 Differentiate between the four classes of Protozoa.

5.2 Discuss methods of acquiring nutrients in the protozoa with those of the algae, fungi and helminths.

5.3 Explain the economic importance of fungi.

5.4 Describe the major components and structure of viruses.

5.5 Explain the mode of replication of viruses.

5.6 Compare the lytic and lysogenic relationships of phages and bacteria.

5.7 Compare the methods used in classifying viruses with those used in classifying eukaryotic organisms.

5.8 List the major difficulties encountered in culturing and studying viruses.

5.9 Discuss the major types of fungal diseases that affect the human body.

5.10 Discuss the pathogenic mechanism of bacterial, viral, fungal and parasitic infections.

5.11 Briefly discuss the etiology, specific vector, and host-parasite-arthropod interrelationship of the common protozoan and viral arthropod-borne diseases.

5.12 Discuss the AIDS epidemic in terms of transmission, effect on the human body, treatment and prevention.

Unit 6. Epidemiology and Bacterial Infectious Diseases

General Outcome:

6.0 The students should be able to discuss the modes of transmission of infectious diseases, factors that influence development of infection, and methods that are used to impede the spread of disease.

Specific Learning Outcomes:

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

6.1 Describe the characteristics of various organisms involved with respiratory infections.

6.2 State the practical measures that may be taken to control water and foodborne diseases.

6.3 Describe the pertinent biological, medical, and epidemiological details of salmonellosis, botulism, and staphylococcal and perfringens food poisoning.

6.4 Differentiate between the different groups of chlamidial and Rickettsial diseases.

6.5 Explain what is meant by the term "reservoir".

6.6 Describe the factors that influence the occurrence and distribution of nosocomial disease in the hospital environment.

6.7 Explain the meaning and importance of arthropods as biological vectors.

6.8 Give an account of the following diseases: plague, malaria, viral hepatitis and tuberculosis.

6.9 Discuss the pathogenesis, epidemiology, and prevention of gonorrhea and syphilis, as well as describe the laboratory diagnosis of the etiologic agents of these infections.

*6.10 Discuss the pathogenesis and epidemiology of other selected bacterial diseases.

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