

Syllabus  
**MICROBIOLOGY – BIO 332**  
**FALL, 2006**

**INSTRUCTOR:** Professor Helen Asemota  
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**OFFICE HOURS:** MW 9:30am -12:00; TTh 1:00-3:30pm; 8/17/06 to 12/8/06

**TEXTBOOK:**

Tortora, Funke, Case. 2004. Microbiology: An Introduction. The Benjamin Cummings Publishing Co, Inc.

**LABORATORY MANUAL:**

Handouts

**GENERAL DESCRIPTION:**

This course deals with the study of microorganisms with emphasis on bacteria. Techniques of sterilization, isolation, identification, and growth of microorganisms are included in the laboratory.

**SPECIFIC COMPETENCIES:**

The student should:

1. Be able to explain the basis of microbial groupings and speciation.
2. Be able to list and describe techniques used in the identification of microorganisms.
3. Be able to compare and contrast the overall cell structure of prokaryotes and eukaryotes.
4. Know the relationship between autotrophic and heterotrophic metabolism.
5. know the physical and chemical requirements for microbial growth and nutritional groupings.
6. Know the growth phases and evaluate growth by mathematical methods.
7. be able to define the following key terms related to microbial control: sterilization, disinfection, antisepsis, germicide, bacteriostasis, asepsis, degerming, and sanitation.
8. Understand the molecular biology of DNA replication, transcription, and translation.
9. Understand the theory and applications of DNA biotechnology.
10. Understand the principles of disease and mechanisms of microbial pathogenicity.
11. Be able to differentiate between nonspecific and specific immunity.
12. Be able to explain how antibodies are used to diagnose diseases.
13. Be able to describe the action of antimicrobial drugs and the theoretical basis of antimicrobial susceptibility test methods.
14. Be able to discuss the various microbial diseases with respect to:
  - a. modes of transmission;
  - b. mechanisms of pathogenicity;

- c. the nature of the immune response;
- d. clinical manifestations;
- e. laboratory diagnosis;
- f. treatment, epidemiology, and prevention.

**ASSIGNMENTS:**

Three one-hour examinations, covering the lectures, reading assignments, homework questions, and laboratory exercises will be given during the course of the semester. The specific examination date will be announced at least one week in advance. Unannounced quizzes will be given from time to time to ensure compliance with reading assignments. Laboratory reports will be due one week following the completion of the laboratory exercise.

**LECTURE OUTLINE:**

**Chapter 1**  
**Page #**

- I. Microbes in our lives.....1
  - A. Environmental relationships
  - B. Chemical industry
  - C. Food industry
  - D. Beneficial aspects
  - E. Types
  - F. Classification
  
- II. Brief history.....6
  - A. First observations
  - B. Spontaneous generation
  - C. Biogenesis
  - D. Fermentation and pasteurization
  - E. Germ theory of disease/Koch's postulates
  - F. Vaccination
  - G. Chemotherapy
  - H. Scientific disciplines
    - 1. bacteriology
    - 2. mycology
    - 3. parasitology
    - 4. immunology
    - 5. virology
    - 6. recombinant DNA technology
  
- III. Microbes and human welfare.....16
  
- V. Microbes and human disease.....18

**Chapter 4**

VI. The prokaryotic cell.....	76
A. Bacterial sizes, shapes, arrangement	
B. Structures external to the cel wall	
C. Cell wall	
1. structure	
2. functions	
D. Cytoplasmic membrane	
1. structure	
2. functions	
a. simple diffusion	
b. facilitated diffusion	
c. osmosis	
d. active transport	
e. group translocation	
3. cytoplasm	
4. nuclear area	
5. ribosomes	
6. inclusions	
7. endospores	
VII. The eukaryotic cell.....	96
A. Categories of microorganisms	
B. Presence of organelles compared with prokaryotes	

## Chapter 5

VIII. Microbial metabolism.....	111
A. Review of biochemical and enzymatic principles	
B. Carbohydrate catabolism	
1. glycolysis	
2. Krebs cycle	
3. chemiosmosis	
C. Aerobic respiration and anaerobic respiration	
D. Fermentation	
C. Photosynthesis	
F. Metabolic diversity among microorganisms	
1. photoautotrophs	
2. photoheterotrophs	
3. chemoautotrophs	
4. chemoheterotrophs	

## Chapter 6

IX. Microbial growth.....	155
A. Physical requirements	
B. Chemical requirements	
C. Cultural media	
D. Pure cultures	
E. Phases of growth	
1. lag	
2. log	
3. stationary	

- 4. death
- F. Measurement of microbial growth
  - 1. spread plates
  - 2. pour plates
  - 3. direct microscopic count
- B. Determination of generation time
  - 1. logarithmic plot
  - 2. mathematical calculation

## Chapter 7

- X. Control of microbial growth.....183

## Chapter 8

- XI. Microbial genetics.....210
  - A. DNA structure and function
  - B. Replication
  - C. Transcription
  - D. Translation
  - E. Mutations
    - 1. base substitution
    - 2. missense
    - 3. nonsense
    - 4. frameshift
    - 5. spontaneous
  - F. Identifying mutants
  - G. Identifying chemical carcinogens
  - H. Gene transfer and recombination in bacteria
    - 1. transformation
    - 2. conjugation
    - 3. transduction
  - I. Plasmids and transposons

## Chapter 9

- XII. Recombinant DNA and biotechnology.....248
  - A. Overview
  - B. Restriction enzymes and vectors
  - c. DNA cloning
  - D. DNA libraries and identifying the desired clones
  - E. Making a gene product
  - F. Research applications
  - G. Medical applications
  - H. Agricultural applications

## Chapter 14

- XIII. Principles of disease.....408
  - A. Pathology, infection, and disease
  - B. Normal flora microorganisms
  - C. Opportunistic microorganisms

- D. Koch's postulates
- E. Nosocomial infections
- F. Predisposing factors and development

## Chapter 15

- XIV. Microbial mechanisms of pathogenicity.....437
  - A. Penetration of host defenses
  - B. Direct damage
  - C. Production of toxins
  - D. Plasmids, lysogeny, and pathogenicity
  - E. Pathogenic properties of nonbacterial microorganisms

## Chapter 16

- XV. Nonspecific defenses of the host.....458
  - A. Skin and mucous membranes
  - B. Phagocytosis
  - C. Inflammation

## Chapter 17

- XVI. Specific defenses of the host.....482
  - A. B cells and humoral immunity
  - B. T cells and cell-mediated immunity

## Chapter 18

- XVII. Diagnostic immunology.....508
  - A. Precipitin reactions
  - B. Agglutination reactions
  - C. Select reactions

## Chapter 20

- XVIII. Antimicrobial drugs.....559
  - A. The action of antimicrobial drugs
  - B. Antimicrobial susceptibility test methods
    1. Diffusion
    2. Broth dilution

## Chapters 21-26

- XIX. Microorganisms and human diseases
  - A. Diseases of the skin and eyes.....590
  - B. Diseases of the nervous system.....615
  - C. Diseases of the cardiovascular system.....640

D. Diseases of the respiratory system.....	675
E. Diseases of the digestive system.....	705
F. Diseases of the urinary and reproductive systems.....	741

**EVALUATION:**

The final grade will be calculated as follows:

Two One-hour Examinations.....	40%
Homework & Assignments .....	10%
Quizzes.....	10%
Laboratory Exercise Reports.....	20%
Final Examination.....	20%

**BIBLIOGRAPHY OF SUGGESTED READINGS:**

A bibliography of suggested readings is found at the end of each chapter covered. Select readings will be assigned from time to time.