

JEFFERSON COLLEGE

COURSE SYLLABUS

BIO215

GENERAL MICROBIOLOGY

5 Credit Hours

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**Revised Date: November 2005
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BIO215 GENERAL MICROBIOLOGY

I. CATALOGUE DESCRIPTION

Prerequisite: High school biology and chemistry, or equivalent
5 semester hours credit

General Microbiology examines fundamental concepts concerning microorganisms. General Microbiology encompasses a wide variety of topics which illustrate the impact that microbes have on human life. General Microbiology involves three hours of lecture and four hours of laboratory a week. (F)

II. GENERAL COURSE OBJECTIVES

Upon completion of this course the student will be able to:

- A. Describe the scope of microbiology and its role in modern technology.
- B. Summarize the early history of microbiology.
- C. Cite major events in the development of infectious disease, immunology, chemotherapeutics and microbial biotechnology.
- D. Understand basic features of various types of microscopy.
- E. Describe characteristics, structure, function and of classifications of viruses, bacteria, archea, protozoa, algae and fungi.
- F. Understand basic mechanisms of enzyme action, control and formation.
- G. Understand fundamentals of microbial metabolism.
- H. Explain microbial growth, cultivation and methods of control.
- I. Understand basic microbial genetics.
- J. Understand basic concepts of immunology and epidemiology.
- K. List and characterize the microbiology of common microbial diseases.

III. COURSE OUTLINE (COURSE CONTENT WILL BE DRAWN FROM THIS)

- A. History and Scope of Microbiology
- B. Prokaryotic and Eukaryotic Microbes

- C. Microbial Metabolism
- D. Molecular Microbiology
- E. Cultivation of Microbes
- F. Microbial Control
- G. Taxonomy
- H. Immunology and Epidemiology
- I. Microbial Diseases
- J. Environmental Microbiology
- K. Applied Microbiology

IV. UNIT OBJECTIVES

- A. History and Scope of Microbiology
 1. Describe the scope of microbiology, the variety of microbes and the kinds of work that microbiologists do.
 2. Summarize the early history of microbiology, especially the development of the microscope.
 3. Cite major events in the development of immunology and the germ theory.
- B. Prokaryotic and Eukaryotic Microbes
 1. List the characteristics of prokaryotic and eukaryotic cells.
 2. Describe the structure and function of microbial cell components.
 3. List representative examples of microbes that make-up these two groups.
- C. Microbial Metabolism
 1. List and describe characteristics of enzymes.
 2. List the basic steps of glycolysis and the Krebs cycle.
 3. List several characteristics of fermentation.
 4. Describe beta oxidation.
 5. Describe how microbes metabolize protein for energy.
 6. Explain the step of protein synthesis.
 7. Explain mechanisms of control at both the enzyme level and the gene level.
- D. Molecular Microbiology
 1. Explain how nucleic acids function in storage and transfer of information.
 2. Summarize the steps of DNA and RNA replication.
 3. Explain the role of plasmids and rescue experiments in genetic engineering.

4. Describe de nova synthesis.
5. Explain the process of restriction endonucleases in genetic engineering.
6. Describe the process of chromatography, electrophoresis and ultracentrifugation for purification.

E. Cultivation of Microbes

1. List and describe the four phases of the growth curve.
2. List and describe three methods for measuring bacterial growth.
3. List several types of culture media and explain how they provide microbial nutritional requirements for growth.
4. Explain the importance of selective and differential media.
5. Describe how a pure culture could be obtained in a laboratory from a mixed sample.

F. Microbial Control

1. Describe how dry heat, moist heat and pasteurization are used to control microorganisms.
2. List common disinfectants and antiseptics.
3. Discuss mechanisms of antibiotic activity.
4. List common antibiotics and tell how they work.
5. Describe mechanisms of antibiotic resistances and the role of transposons and plasmids.

G. Taxonomy

1. Discuss how and why microorganisms are named.
2. Describe how a dichotomous key is used.
3. List the five kingdoms and give at least two characteristics of each.
4. Explain the significance of *Bergy's Manuals*.
5. Give major structure of viruses and tell how they are characterized and cultured.
6. Give major structure, function, characteristics and importance of: bacteria, rickettsial, protozoa, algae and fungi.

H. Immunology and Epidemiology

1. Define the following: immune, immunity, susceptibility, non-specific immunity, specific immunity, immunology, and immune system.
2. List properties of antigens and antibodies.
3. Describe how recognition of self specificity, and memory functions in the immune system.
4. Describe the role of B and T cells.

5. Describe how cell-mediated immunity differs from humoral immunity.
6. Explain differences between delayed and immediate hypersensitivity.
7. Discuss how and why organ transplants are sometimes rejected.
8. Describe how antigens and antibodies can be detected and measured.
9. Define the following: epidemiology, incidence, prevalence, CDC, and carrier.
10. Describe several methods used in the prevention of disease and nosocomial infections.

I. Microbial Disease

1. List the most important pathogens and explain characteristics, microbe, epidemiology, prevention and treatment of diseases associated with the:
 - a. skin
 - b. respiratory system
 - c. gastrointestinal system
 - d. blood and lymphatic system
 - e. nervous system
 - f. urogenital system

J. Environmental Microbiology

1. Describe the importance of recycling, and note how water and carbon are recycled.
2. Describe the kinds of microbes found in air.
3. Describe how water pollution and waterborne pathogens affect humans.
4. Describe how water is tested for sewage contamination and how it is purified.

K. Applied Microbiology

1. Describe how food spoilage can be prevented.
2. Describe how microbes can be used as foods.
3. Explain how microbes are used making beer and wine.
4. Describe how microbes can be used in biotechnology.

V. METHOD(S) OF INSTRUCTION

- A. Lectures
- B. Video Tapes and Laser Disc
- C. Class Discussion
- D. Classroom Demonstrations
- E. Laboratory Exercises

VI. REQUIRED TEXTBOOK(S) WITH PUBLICATION INFORMATION

Nester, Eugene W. et. al. 2004. Microbiology: A Human Perspective. 4th ed. New York: McGraw-Hill.

VII. REQUIRED MATERIALS (STUDENT)

None.

VIII. SUPPLEMENTAL REFERENCES

Bergy's Manuals (Library Reserve Desk)

IX. METHOD OF EVALUATION (STUDENT)

- A. Written Exams
- B. Laboratory Exams
- C. Identification of Microbial Unknown
- D. Laboratory Research Project