

JEFFERSON COLLEGE

COURSE SYLLABUS

BIO113

MICROBIOLOGY FOR THE HEALTH SCIENCES

4 Credit Hours

Prepared by:
Vivian AuBuchon

Revised date:
May 2014

Minor Revision or Update by: Fran Moore
Per Curriculum Committee Process Change: April 25, 2018

Ms. Linda Abernathy, Division Chair, Math, Science & Business
Ms. Shirley Davenport, Dean, Arts & Science Education

BIO113 Microbiology for the Health Sciences

I. CATALOG DESCRIPTION

- A. Course pre-requisites/co-requisites:
- High school Biology and Chemistry or equivalent, BIO101 (Introduction to Biology) with a grade of “C” or better within the previous 5 years of registration date
 - Reading proficiency
- B. 4 semester credit hours
- C. Microbiology for the Health Sciences explores microorganism associated with health and disease and stresses concepts associated with transmission, infection, control, and the immune system. Laboratory time is required. Students cannot apply both BIO113 and BIO215 toward graduation. (F, S, Su)
- D. Curricular Alignment:
- Fulfills AAS—Bi-level Nursing degree requirement.
 - Fulfills AAS—Veterinary Technoogy degree requirement.
 - Elective course applies toward AA or AAT degree.

II. EXPECTED LEARNING OUTCOMES/CORRESPONDING ASSESSMENT MEASURES

Expected Learning Outcomes	Assessment Measures
Explain how early historical events led to the formulation of the germ theory; summarize the early history of microbiology; analyze the germ theory and summarize its development; relate the contributions of Leeuwenhoek and other famous microbiologists to modern microbiology	Classroom lecture and discussion, homework assignments, quizzes and exams
Describe the general characteristics, structural components, shapes, sizes of Microbes; distinguish between monerans and protistans based on their differences	Classroom lecture and discussion, homework assignments, quizzes and exams.

<p>Identify the energy sources used by chemorganoheterotrophs; describe the location, components, reactants and products of the metabolic pathways of metabolism, such as glycolysis, the pentose phosphate pathway, the tricarboxylic acid cycle and the electron transport chain; differentiate between aerobic respiration and fermentation; deduce the importance of the end products of fermentation to the study of microbes; identify and describe the sugar metabolism tests, protein tests and catalase and oxidase tests on microbes; perform the sugar metabolism tests, protein tests and catalase and oxidase tests on microbes</p>	<p>Classroom lecture and discussion, homework assignments, quizzes, exams, and laboratory activities</p>
<p>Analyze growth curves; prepare microbiology aerobes and anaerobes for growth in culture; inoculate broths and solid media; cultivate bacteria, fungi, and viruses; demonstrate and explain methods for sterilization and disinfection; explain fine modes of action of antimicrobial agents; use U.V. light sterilization, disinfectants and antiseptics; discriminate between the methods used to determine microbial sensitivity to antibiotics; test antibiotics on microbes; explain antibiotic resistance and describe several mechanisms by which microbes acquire resistance to antibodies; compare specific antibiotics and explain their actions</p>	<p>Classroom lecture and discussion, homework assignments, quizzes, exams, and laboratory activities</p>
<p>Relate the role of epidemiology to the prevention of the spreading of disease and describe the key terms used by epidemiologists; evaluate the methods used to control communicable diseases; connect the role of the Centers of Disease Control (CDC) and other public health organizations to controlling communicable diseases</p>	<p>Classroom lecture and discussion, homework assignments, quizzes, exams, and laboratory activities</p>
<p>Compare and contrast key characteristics of innate, adaptive, active and passive immunity; describe the characteristics of antigens and antibodies; demonstrate how antibodies are tested for in a laboratory; explain the methods used to titer antibodies; classify the roles of T and B Cells to the immune system; summarize the types of hypersensitivities; explain the basic characteristics of allergies; describe mechanisms that microbes use to avoid the host immune system</p>	<p>Classroom lecture and discussion, homework assignments, quizzes, exams, and laboratory activities</p>

Distinguish between many of the classical diseases associated with different organ systems based on: causative agent, signs and symptoms, pathogenesis, epidemiology, methods of prevention, laboratory diagnosis and treatment; discriminate between zoonotic diseases and identify common examples; be able to express an understanding of Human Immunodeficiency Virus (HIV), its mode of transmission and be able to help educate the common public through conversation	Classroom lecture and discussion, homework assignments, quizzes, and exams
Deduce the importance of normal microbial flora to the various organ systems; differentiate between the various types of relationships microbes can have with its host	Classroom lecture and discussion, homework assignments, quizzes, and exams
Properly use a compound microscope; perform microscopy techniques such as heat fixation and gram staining. observe and illustrate the various microbiology morphology	Laboratory activities
Properly perform aseptic technique, demonstrate basic isolation procedures and laboratory methods of diagnosis for various diseases	Laboratory activities
Differentiate between selective and differential media; perform experiments using selective media to isolate microbes from the body as well as other sources; perform experiments using differential and selective media to isolate microbes	Laboratory activities
Evaluate isolation tests to identify an unknown microbe from a mixed culture; analyze their tests; produce a report summarizing their discovery of the identity of the unknown microbe	Laboratory activities

III. COURSE OUTLINE

- A. Beginnings of microbiology and the Germ Theory
 - 1. Germ Theory
 - 2. Scientists involved in disproving Germ Theory
 - 3. Importance of microorganisms to life
 - 4. Past, present, and future challenges of microbes and disease
 - 5. Size of the microbial world

- B. Survey of the microbial world
 - 1. Bacteria, archaea, and eucarya
 - 2. Nonliving members of the microbial world
 - 3. Structure and chemistry of the cytoplasmic membrane
 - 4. Permeability of the cytoplasmic membrane
 - 5. Bacterial cell wall structure and function

6. Morphology and arrangement
7. Structure and function of flagella & pili
8. Structure and function of capsules and slime layers
9. Structure and function of chromosome and plasmids
10. Gene transfer
11. Structure and function of ribosomes
12. Structure and function of storage granules and gas vesicles
13. Endospore structure and function
14. Structure and function of eukaryotic organelles

C. Microbial metabolism

1. Chemical reactions and bonding
2. Properties of water
3. pH
4. Structure and functions of proteins
5. Structure and function of carbohydrates
6. Structure and function of lipids
7. Structure and function of nucleic acids
8. Differentiate between catabolism and anabolism
9. Enzymes, ATP, and electron carriers
10. Glycolysis
11. Pentose phosphate pathway
12. Tricarboxylic acid cycle
13. Electron transport chain
14. Aerobic respiration
15. Fermentation

D. Growth and controlling growth

1. Viral replication
2. Binary fission
3. DNA replication
4. Transcription
5. Translation
6. Bacterial genetics
7. Mutagens
8. Mutations outcomes
9. Biofilms
10. Growth curve
11. Temperature, oxygen, pH, and water requirements
12. Reactive oxygen species
13. Describe the various approaches to sterilization and disinfection
14. Describe how an appropriate antimicrobial procedure is chosen
15. Antibacterial drug targets
16. Kirby-Bauer disk diffusion test
17. Mechanisms of antimicrobial resistance
18. Slowing and decreasing the spread of antimicrobial resistance
19. Antiviral drug targets
20. Antifungal drug targets
21. Antiprotozoan, antihelminthic drugs

- E. Epidemiology
 - 1. Common epidemiological terminology
 - 2. Common methods of disease transmission
 - 3. Pathogen and host factors that influence disease
 - 4. Epidemiological studies
 - 5. Disease surveillance
 - 6. Emerging infectious disease
 - 7. Healthcare associated and nosocomial infections

- F. The immune system
 - 1. Antigens
 - 2. Antibodies
 - 3. Innate immune system
 - 4. First line of defense
 - 5. Cells of the immune system
 - 6. Cytokines
 - 7. Pattern recognition receptors
 - 8. Complement system
 - 9. Phagocytosis
 - 10. Inflammatory response
 - 11. Adaptive immune system
 - 12. Lymphatic system
 - 13. Antigens/antibody protective outcomes
 - 14. B-lymphocytes
 - 15. Humoral response
 - 16. T-lymphocytes
 - 17. Cell-mediated response
 - 18. Primary and secondary responses
 - 19. Active and passive immunity
 - 20. Hypersensitivities
 - 21. Autoimmune disease
 - 22. Immunodeficiency

- G. Infectious diseases
 - 1. Causitive agent
 - 2. Signs and symptoms
 - 3. Pathogenesis
 - 4. Epidemiology
 - 5. Treatment and prevention
 - 6. Laboratory diagnosis
 - 7. Describe and distinguish zoonotic diseases
 - 8. HIV

- H. Normal microbiota
 - 1. Symbiotic relationships
 - 2. Protective role of normal microbiotia
 - 3. Koch's Postulates and Molecular Koch's Postulates

- I. Microscopy techniques
 - 1. Common microscopy terminology
 - 2. Basic knowledge of light and electron microscopes
 - 3. Properly use a compound microscope
 - 4. Stain techniques

- J. Aseptic technique
 - 1. Properly preform Aseptic Technique
 - 2. Obtain a pure culture
 - 3. Streak plate

- K. Selective and differential media
 - 1. Distinguish between selective and differential media
 - 2. Analyze and interpret results from the use of the media

- L. Identification of an Unknown
 - 1. Apply techniques acquired throughout the semester
 - 2. Create a pure culture from a mixture
 - 3. Create a Gram stain
 - 4. Analyze metabolic tests
 - 5. Construct a report of discovery of the unknown

IV. METHODS OF INSTRUCTION

- A. Lecture
- B. PowerPoint presentations
- C. Textbook assignments
- D. Class discussions
- E. Laboratory exercises
- F. Research paper

V. REQUIRED TEXTBOOK

Nester, E. W. *Microbiology: a human perspective* (current edition.). New York: McGraw-Hill.

VI. REQUIRED MATERIALS

No materials required

VII. SUPPLEMENTAL REFERENCES

No supplemental references required

VIII. METHODS OF EVALUATION

A. Distribution of final grade

Students are evaluated by quizzes, five hourly exams, a comprehensive final exam, laboratory practicum.

B. Assignment of final letter grades

90-100% = A

80-89% = B

70-79% = C

60-69% = D

Below 60% = F

C. Attendance policy

Student attendance is mandatory. There are no excused absences. If a student misses more than 15% of the total time (including lecture and laboratory) that the class meets in a semester, the student may be prohibited from attending the class by the instructor. In such cases, the student must officially withdraw from the course by the designated withdrawal date in order to reduce the possibility of receiving a grade of "F" for the course.

No make-up exams are given, however students are allowed to drop their lowest grade on one of the hourly tests. This means, if they are absent on a test day, the missed test is automatically dropped. Students arriving more than 10 minutes late will not be allowed to take the test and that test grade will be dropped. Any additional missed tests/late arrivals will result in a grade of zero and the test grade will not be dropped. The final exam is mandatory and cannot be made up.

Students arriving late to lab will not be allowed to participate in the laboratory activity and will receive a grade of zero. Students that leave lab before the successful completion of the lab will also receive a grade of zero. Laboratory exercises cannot be made up.

IX. ADA AA STATEMENT

Any student requiring special accommodations should inform the instructor and the Coordinator of Disability Support Services (Library phone 636-481-3169)

X. ACADEMIC HONESTY STATEMENT

All students are responsible for complying with campus policies as stated in the Student Handbook (see College Website, <http://www.jeffco.edu>).

XI. ATTENDANCE STATEMENT

Regular and punctual attendance is expected of all students. Any one of these four options may result in the student being removed from the class and an administrative withdrawal being processed: (1) Student fails to begin class; (2) Student ceases participation for at least two consecutive weeks; (3) Student misses 15 percent or more of the coursework; and/or (4) Student misses 15 percent or more of the course as defined by the instructor. Students earn their financial aid by regularly attending and actively participating in their coursework. If a student does not actively participate, he/she may have to return financial aid funds. Consult the College Catalog or a Student Financial Services representative for more details.

XII. OUTSIDE OF CLASS ACADEMICALLY RELATED ACTIVITIES

The U.S. Department of Education mandates that students be made aware of expectations regarding coursework to be completed outside the classroom. Students are expected to spend substantial time outside of class meetings engaging in academically related activities such as reading, studying, and completing assignments. Specifically, time spent on academically related activities outside of class combined with time spent in class meetings is expected to be a minimum of 37.5 hours over the duration of the term for each credit hour.