

HIBBING COMMUNITY COLLEGE COURSE OUTLINE

COURSE NUMBER & TITLE: BIOL 1120: Microbiology

CREDITS: 3 (Lecture 2 / Lab 1)

PREREQUISITES: Previous course work in biology strongly recommended.

CATALOG DESCRIPTION:

Microbiology includes the classification, structure, and function of bacteria and other microorganisms. Pathogenic organisms and the application of sterilization and disinfection are included. Basic laboratory techniques involved in microbiology, the structure and function of the cell, the preparation and sterilization of nutrient material, identification of microbes, and other tests with microorganisms are also included. Microbiology is intended for anyone interested in further life science or health science studies as well as liberal arts studies.

MNTC goal areas: (3) Natural Science.

OUTLINE OF MAJOR CONTENT AREAS:

- I. Foundations of microbiology
 - A. Cell theory
 - B. Germ theory
 - C. Contributions of selected individuals
 - D. Pertinent biochemistry
 1. Carbohydrates
 2. Proteins
 3. Fats and steroids
- II. Classification of microorganisms
 - A. Prokaryotes and eukaryotes
 - B. Bacteria, rickettsias, chlamydias, mycoplasmas, viruses
- III. Characteristics of prokaryotic organisms
 - A. Prokaryotic cellular components
 - B. Gram positive and Gram negative organisms
 - C. Psychrophiles, mesophiles and thermophiles
 - D. Aerobic, anaerobic and facultative organisms
 - E. Endospores
 - F. Cocci, bacilli, and spirilli
- IV. Microbial energy utilization
 - A. Aerobic respiration
 1. Electron transport
 2. Krebs cycle
 3. Molecular products
 - B. Glycolysis
 - C. Fermentation

- D. Anaerobic respiration
- E. Photosynthesis
- V. Cultivation of microorganisms
 - A. Media types
 - B. Counting methods
 - C. Pure culturing
 - D. Aseptic techniques
- VI. Control of microorganisms
 - A. Physical
 - 1. Heat
 - 2. Ultra-violet light
 - 3. Desiccation
 - B. Chemical
 - 1. Disinfectants
 - 2. Antiseptics
 - 3. Therapeutic index
 - C. Antibiotics
- VII. Microorganisms and human disease
 - A. Exotoxins
 - B. Endotoxins
 - C. Microbial growth and reproduction
 - 1. Conjugation
 - 2. Mutation
 - 3. Phage conversion
 - 4. Transduction
 - D. Virus
 - 1. Viral morphology
 - 2. Lytic-lysogenic activity
 - E. Virulence
- VIII. Nonspecific defenses
- IX. Specific defenses - the immune system
 - A. Leukocyte activity
 - B. Interferons
 - C. Complement
 - D. Vaccines
 - E. Serums
 - F. Allergic reactions
- X. Transmission of disease
 - A. Infectious disease
 - B. Communicable disease
 - C. Contagious disease
 - D. Vectors
- XI. Eukaryotic organisms
 - A. Selected Algae
 - B. Selected Mycota
 - C. Selected Protozoans

- D. Selected Helminths
- XII. Genetic engineering
 - A. Use of restriction enzymes and DNA (deoxyribonucleic) ligases
 - B. Recombinant DNA techniques
 - C. Benefits versus ethical issues

COURSE GOALS/OBJECTIVES/OUTCOMES:

Students will

1. name the contribution of each of the selected historical microbiologists.
2. evaluate the difficulties associated with proving the germ theory at the time in which it was done.
3. list and describe the functions of each prokaryotic cell component.
4. explain the differences between eukaryotic and prokaryotic cells and how these relate to possible antimicrobial methods.
5. explain why viruses are not considered to be living cells.
6. list several ways in which microorganisms will contribute to solving human problems in the future.
7. describe the chemical composition of carbohydrates, proteins, and fats.
8. state the properties of enzymes and how they work.
9. describe the types of various microbes as they relate to staining, temperature preference, metabolism, and respiratory and reproductive characteristics.
10. diagram the chemical events that occur during aerobic and anaerobic respiration, fermentation, and photosynthesis.
11. correlate the various metabolic and reproductive characteristics of microbes with resultant effects upon human health and toxicity of the environment.
12. explain the differences in prokaryotic ribosomes that make them a target for certain antibiotics.
13. describe the mode of action of penicillin and why it is selective against bacteria.
14. design scientifically valid experiments.
15. be able to culture, isolate, and identify common microbes based on their characteristics.
16. demonstrate proficiency in the use of oil immersion microscopy.
17. demonstrate proper and safe microbial culturing techniques.
18. explain the effective mechanisms of the various antimicrobial methods.
19. diagram the cellular events that occur during antigenic invasion and the immune response.
20. correlate the mechanisms of acquired immunity through use of vaccines and serums with the immune response.
21. describe the various vectors for disease.
22. outline the structure of DNA and the types of RNA.
23. list the steps in the synthesis of a protein molecule.
24. describe the ways in which the genotype of an organism can be altered.

25. explain the mechanisms by which DNA can be transferred between bacteria.
26. diagram and explain the steps involved in recombinant DNA technologies.
27. match the list of selected microbes, including bacteria, viruses, protozoans, fungi, and parasitic worms with the disease caused by each and describe the nature of each disease.
28. apply microbiological knowledge to proper procedures in health science fields and daily life.

MNTC GOALS AND COMPETENCIES MET:

Natural Sciences

HCC COMPETENCIES MET:

Working Productively and Cooperatively
Communicating Clearly and Effectively
Thinking Creatively and Critically

STUDENT CONTRIBUTIONS:

Students are expected to attend all lecture and laboratory sessions, participate in and contribute to class discussions, complete all assignments on time, and request assistance when needed. Attendance is critical for the successful completion of this course. Students must confine laboratory activities to only those assigned and are required to follow all safety rules. Protective equipment will be provided.

STUDENT ASSESSMENT SHALL TAKE PLACE USING INSTRUMENTS SELECTED/DEVELOPED BY THE COURSE INSTRUCTOR.

SPECIAL INFORMATION: (SPECIAL FEES, DIRECTIVES ON HAZARDOUS MATERIALS, ETC.)

Students will be working with potentially pathogenic organisms, will be exposed to various chemical reagents, and will be working with open flames. All students will be expected to abide by all laboratory safety procedures, as distributed to students prior to the initial laboratory session.

AASC APPROVAL DATE: May 13, 2014

REVIEW DATE: May 2019

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