Course Number and Title: BIO 250 Principles of Microbiology

Campus Location:
Georgetown, Dover, Stanton, Wilmington

Effective Date:
2018-51

Prerequisite:
BIO 120 or BIO 150 or VET 102) and (CHM 100 or CHM 110 or CHM 150)

Co-Requisites:
None

Course Credits and Hours:
4.00 credits
3.00 lecture hours/week
3.00 lab hours/week

Course Description:
This course covers microbial structure, metabolism, growth, and control. Microbial genetics, virology, and fundamentals of the immune system are also included. Laboratory experiments are an integral part of this course.

Required Text(s):
Obtain current textbook information by viewing the campus bookstore - https://www.dtcc.edu/bookstores online or visit a campus bookstore. Check your course schedule for the course number and section.

Additional Materials:
None

Schedule Type:
Classroom Course
Hybrid Course

Disclaimer:
None

Core Course Performance Objectives (CCPOs):

1. Analyze microbial biology as it relates to the structure, function, growth, and metabolism of prokaryotes, eukaryotes, and viruses. (CCC 2, 6)
2. Examine microbial genetics and the current applications of biotechnology. (CCC 2,6)
3. Explain the importance of microorganisms to humans. (CCC 2,6)
4. Examine the chemical and physical requirements for cultivation and control of microbial growth. (CCC 2,7)
5. Demonstrate proper scientific classification and nomenclature. (CCC 1,6)
6. Differentiate among various terms and tools used in microbiology. (CCC 2,6)
7. Differentiate among various terms and tools used in genetic engineering/biotechnology. (CCC 2,6)
8. Examine the relationship between microbial virulence and human defense mechanisms. (CCC, 2,6)
9. Safely perform and analyze various microbiology lab activities using aseptic technique.

See Core Curriculum Competencies and Program Graduate Competencies at the end of the syllabus. CCPOs are linked to every competency they develop.

Measurable Performance Objectives (MPOs):
Upon completion of this course, the student will:

1. Analyze microbial biology as it relates to the structure, function, growth, and metabolism of prokaryotes, eukaryotes, and viruses.
    1. Describe the various types of organisms studied in microbiology.
    2. Compare the differences between procaryotic cells and eucaryotic cells.
    3. List which microorganisms are classified as procaryotes and eucaryotes.
    4. Compare and contrast gram-positive and gram-negative cell walls as to chemical composition and function, and describe unique characteristics of each.
    5. Explain the mechanism of the gram stain.
    6. Discuss non-typical cell walls.
    7. Describe the composition and functions of cellular structures.
    8. Discuss bacteria with unusual characteristics.

9. Describe the traits of Archaea.
10. Discuss microbial ecology.
11. Differentiate between biochemical processes within cells.
12. Discuss the role of enzymes in controlling biochemical reactions.
13. Describe various reactions involved in adenosine triphosphate (ATP) production and consumption.
14. Describe the characteristics, general structure, and components of viruses.
15. Discuss the stages of viral life cycles and their medical significance.
16. Discuss replication of double stranded deoxyribonucleic acid (DNA) and positive- sense single-strand ribonucleic acid (RNA) viruses.
17. List the series of events leading to infection.

2. Examine microbial genetics and the current applications of biotechnology.
    1. Review the structure, function, and replication of nucleic acids.
    2. Explain the relevance of the deoxyribonucleic acid (DNA) code.
    3. Compare the steps associated with transcription and translation of prokaryotes and eukaryotes.
    4. Explain gene regulation.
    5. List causes and categories of mutations.
    6. Explain and compare the three methods of DNA transfer: transformation, transduction, and conjugation.
    7. Compare and contrast various techniques of DNA manipulation.
    8. Discuss various roles microbes play in industry.
    9. List industrial products produced as a result of microbial metabolism.
    10. Explain the methods that microorganisms use to resist chemotherapeutic agents.
3. Explain the importance of microorganisms to humans.
    1. Discuss the role various microorganisms play in the environment, industry, and medical field.
    2. List industrial products produced as a result of microbial metabolism.
    3. Discuss methods and tools used to increase metabolite production.
    4. List general steps in mass production of organic substances.
    5. Explain the relationships among normal flora, hosts, and potential pathogens.
    6. List the portals of entry and exit of the human body.
4. Examine the chemical and physical requirements for cultivation and control of microbial growth.
    1. List the techniques used to cultivate microbes in the laboratory.
    2. Discuss the chemical, physical, and functional properties of media.
    3. Explain the differences among and uses for general purpose, selective, differential, and enriched media.
    4. List the steps in binary fission.
    5. Describe the phases of a microbial growth curve and their relation to binary fission.
    6. List methods for analyzing population growth.
    7. List nutritional categories of microbes based on their carbon and energy source.
    8. Explain the important chemical and physical requirements for microbial growth.
    9. Categorize microbes according to their physical growth requirements.
    10. List the techniques used to cultivate and measure animal viruses in the laboratory.
    11. Describe the modes of action of microbial control agents on vital cellular structures and functions.
    12. Compare and contrast physical methods of microbial control.
    13. Compare the modes of action and preferred uses for the chemical disinfectants.
5. Demonstrate proper scientific classification and nomenclature.
    1. Discuss the system of scientific nomenclature that uses genus and species.
    2. Review the classification systems of microorganisms.
    3. Discuss taxonomy and the means of classifying organisms.
6. Differentiate among various terms and tools used in microbiology.
    1. Define inoculum, culture, culture medium, subculture, pure, and mixed culture.
    2. Discuss the operation of the compound light microscope.
    3. Identify a use for darkfield, phase-contrast, fluorescence, and electron microscopy.
    4. Discuss the procedures used to prepare specimens for microscopy.
    5. Differentiate between an acidic and basic dye.
    6. Compare simple, differential, and special stains.
    7. Differentiate among sterilization, disinfection, antiseptics, disinfectants, microbicidal, and microbistasis.
    8. Define pathogenicity and virulence.
    9. Discuss the purpose and general features of immunology tests.
    10. Differentiate among immunologic techniques used to diagnose microbial infections.
7. Differentiate among various terms and tools used in genetic engineering/biotechnology.
    1. Define clone, recombinant DNA, vector, and host.
    2. List desirable features of vectors and cloning hosts.
    3. Compare and contrast various techniques of DNA manipulation.
    4. Recognize acquired traits of genetically modified organisms.
    5. Discuss techniques used to identify genes.
    6. List practical applications for recombinant DNA technology.
    7. Summarize the steps in recombinant DNA, gene cloning, and product retrieval.
8. Examine the relationship between microbial virulence and human defense mechanisms.
    1. Discuss microbial virulence factors infectious dose.

2. List the stages of clinical infection.
3. Summarize methods of transmission of infectious agents.
4. Discuss the anatomical barriers and chemical secretions of the first line of defense.
5. Explain the chemical and processes involved in the second line of defense.
6. Discuss cellular surveillance, recognition and immune response.
7. Differentiate between the humoral and cell-mediated immune branches and their products.
8. Define primary response to antigen and immunologic memory.
9. List the five classes of antibody and their functions.
10. Classify the four types of acquired immunity.

9. Safely perform and analyze various microbiology lab activities using aseptic technique.
    1. Identify and describe the parts of a light microscope.
    2. Identify several types of microorganisms using the Gram staining procedure.
    3. Compare and contrast bacterial growth using general use, differential, selective, and enriched media.
    4. Compare and contrast several means of physical and chemical means of microbiological control.

Evaluation Criteria/Policies:
Students must demonstrate proficiency on all CCPOs at a minimal 75 percent level to successfully complete the course. The grade will be determined using the Delaware Tech grading system:

92	–	100	=	A
83	–	91	=	B
75	–	82	=	C
0	–	74	=	F

Students should refer to the Student Handbook - https://www.dtcc.edu/handbook for information on the Academic Standing Policy, the Academic Integrity Policy, Student Rights and Responsibilities, and other policies relevant to their academic progress.

Core Curriculum Competencies (CCCs are the competencies every graduate will develop):

1. Apply clear and effective communication skills.
2. Use critical thinking to solve problems.
3. Collaborate to achieve a common goal.
4. Demonstrate professional and ethical conduct.
5. Use information literacy for effective vocational and/or academic research.
6. Apply quantitative reasoning and/or scientific inquiry to solve practical problems.

Program Graduate Competencies (PGCs are the competencies every graduate will develop specific to his or her major):
None

Disabilities Support Statement:
The College is committed to providing reasonable accommodations for students with disabilities. Students are encouraged to schedule an appointment with the campus Disabilities Support Counselor to request an accommodation needed due to a disability. A listing of campus Disabilities Support Counselors and contact information can be found at the disabilities services - https://www.dtcc.edu/disabilitysupport web page or visit the campus Advising Center.