BIO-2500: MICROBIOLOGY

Cuyahoga Community College

Viewing:BIO-2500 : Microbiology

Board of Trustees:
2015-12-03

Academic Term:
2016-08-22

Subject Code
BIO - Biology

Course Number:
2500

Title:
Microbiology

Catalog Description:
The diversity of the microbial world is explored through subjects including microbial ecology and evolution, structure and function of microorganisms, metabolism and genetics, control of microorganisms, and host-microbe interactions.

Credit Hour(s):
4

Lecture Hour(s):
3

Lab Hour(s):
3

Other Hour(s):
0

Requisites

Prerequisite and Corequisite
BIO-1410 Anatomy and Physiology of Domestic Animals I; or BIO-2331 Anatomy and Physiology I; or BIO-1500 Principles of Biology I; or BIO-1050 Human Biology and BIO-105L Human Biology Laboratory and BIO-1100 Introduction to Biological Chemistry; or departmental approval: comparable knowledge or skills.

I. ACADEMIC CREDIT

Academic Credit According to the Ohio Department of Higher Education, one (1) semester hour of college credit will be awarded for each lecture hour. Students will be expected to work on out-of-class assignments on a regular basis which, over the length of the course, would normally average two hours of out-of-class study for each hour of formal class activity. For laboratory hours, one (1) credit shall be awarded for a minimum of three laboratory hours in a standard week for which little or no out-of-class study is required since three hours will be in the lab (i.e. Laboratory 03 hours). Whereas, one (1) credit shall be awarded for a minimum of two laboratory hours in a standard week, if supplemented by out-of-class assignments which would normally average one hour of out-of-class study preparing for or following up the laboratory experience (i.e. Laboratory 02 hours). Credit is also awarded for other hours such as directed practice, practicum, cooperative work experience, and field experience. The number of hours required to receive credit is listed under Other Hours on the syllabus. The number of credit hours for lecture, lab and other hours are listed at the beginning of the syllabus. Make sure you can prioritize your time accordingly. Proper planning, prioritization and dedication will enhance your success in this course.

The standard expectation for an online course is that you will spend 3 hours per week for each credit hour.

II. ACCESSIBILITY STATEMENT

If you need any special course adaptations or accommodations because of a documented disability, please notify your instructor within a reasonable length of time, preferably the first week of the term with formal notice of that need (i.e. an official letter from the Student Accessibility Services (SAS) office). Accommodations will not be made retroactively.
For specific information pertaining to ADA accommodation, please contact your campus SAS office or visit online at http://www.tri-c.edu/accessprograms/. Blackboard accessibility information is available at http://access.blackboard.com.

III. ATTENDANCE TRACKING

Regular class attendance is expected. Tri-C is required by law to verify the enrollment of students who participate in federal Title IV student aid programs and/or who receive educational benefits through other funding sources. Eligibility for federal student financial aid is based in part on enrollment status.

Students who do not attend classes for the entire term are required to withdraw from the course(s). Additionally, students who withdraw from a course or stop attending class without officially withdrawing may be required to return all or a portion of their financial aid based on the date of last attendance. Students who do not attend the full session are responsible for withdrawing from the course(s).

Tri-C is responsible for identifying students who have not attended a course before financial aid funds can be applied to students’ accounts.

Therefore, attendance is recorded in the following ways:

- For in-person and blended-learning courses, students are required to attend the course by the 15th day of the semester (or equivalent for terms shorter than five weeks) to be considered attending. Students who have not met all attendance requirements for in-person and blended courses, as described herein, within the first two weeks or equivalent, will be considered not attending.
- For online courses, students are required to login at least two times per week and submit one assignment per week for the first two weeks of the semester, or equivalent to the 15th day of the term. Students who have not met all attendance requirements for online courses, as described herein, within the first two weeks or equivalent, will be considered not attending.

At the conclusion of the first two weeks of a semester or equivalent, instructors report any registered students who have “Never Attended” a course. Those students will be administratively withdrawn from that course. However, after the time period in the previous paragraphs, if a student stops attending a class or wants or needs to withdraw, for any reason, it is the student’s responsibility to take action to withdraw from the course. Students must complete and submit the appropriate Tri-C form by the established withdrawal deadline.

Tri-C is required to ensure that students receive financial aid only for courses that they attend and complete. Students reported for not attending at least one of their registered courses will have all financial aid funds held until confirmation of attendance in registered courses has been verified. Students who fail to complete at least one course may be required to repay all or a portion of their federal financial aid funds and may be ineligible to receive future federal financial aid awards. Students who withdraw from classes prior to completing more than 60 percent of their enrolled class time may be subject to the required federal refund policy.

If illness or emergency should necessitate a brief absence from class, students should confer with instructors upon their return. Students having problems with coursework due to a prolonged absence should confer with the instructor or a counselor.

IV. LEARNING OUTCOMES ASSESSMENT

Occasionally, in addition to submitting assignments to their instructors for evaluation and a grade, students will also be asked to submit completed assignments, called ‘artifacts,’ for assessment of course and program outcomes and the College’s Essential Learning Outcomes (ELOs). The artifacts will be submitted in Blackboard or a similar technology. The level of mastery of the outcome demonstrated by the artifact DOES NOT affect the student’s grade or academic record in any way. However, some instructors require that students submit their artifact before receiving their final grade. Some artifacts will be randomly selected for assessment, which will help determine improvements and support needed to further student success. If you have any questions, please feel free to speak with your instructor or contact the Learning Outcomes Assessment office.

V. CONCEALED CARRY STATEMENT

College policy prohibits the possession of weapons on college property by students, faculty and staff, unless specifically approved in advance as a job-related requirement (i.e., Tri-C campus police officers) or, in accordance with Ohio law, secured in a parked vehicle in a designated parking area only by an individual in possession of a valid conceal carry permit.

As a Tri-C student, your behavior on campus must comply with the student code of conduct which is available on page 29 within the Tri-C student handbook, available athttp://www.tri-c.edu/student-resources/documents/studenthandbook.pdf. You must also comply with the College’s Zero Tolerance for Violence on College Property available athttp://www.tri-c.edu/policies-and-procedures/documents/3354-1-20-10-zero-tolerance-for-violence-policy.pdf.

Outcomes

Course Outcome(s):
Outcome: Microbial ecology and evolution: Classify microorganisms and describe how they have adapted to and shaped our environment.
Objective(s):
1. Identify the roles of microorganisms in the environment.
2. Classify the organisms of the microbial world.
3. Recognize the scientific contributions for the establishment of the field of microbiology.
4. Explain microbial evolution.

Course Outcome(s):
Outcome: Structure and function of microorganisms: Examine morphological and physiological characteristics of prokaryotes, eukaryotic microorganisms, and infectious particles.

Objective(s):
1. Identify microorganisms based on cellular structures.
2. Define the characteristics of microorganisms.
3. Compare and contrast prokaryotic and eukaryotic cells.
4. Explain the difference between bacteria and viruses.

Course Outcome(s):
Outcome: Microbial metabolism: Explain how microbes acquire and process nutrients, and convert them into energy and raw materials for cell growth and repair.

Objective(s):
1. Discuss and explain the various metabolic pathways of microorganisms.
2. Identify the features of microbial growth, nutrition, and the factors that impact microbial growth.

Course Outcome(s):
Outcome: Microbial genetics: Explain the mechanisms of molecular genetics as it relates to microbial function.

Objective(s):
1. Describe the structure and function of nucleic acids and differentiate between the processes of DNA replication, transcription, and translation
2. Discuss the uses of microorganisms in the field of biotechnology.

Course Outcome(s):
Outcome: Control of microorganisms: Describe the various methods of controlling the growth of microorganisms, and the possible impact of improper use of antimicrobial agents.

Objective(s):
1. Examine and discuss the physical, chemical, and mechanical control of microorganisms.
2. Define and describe the origins and uses of antimicrobial agents.
3. Explain the mechanisms and impact of antibiotic resistance in microorganisms.

Course Outcome(s):
Outcome: Host-microbe interactions: Apply the concepts of microbial structure and function to the progression of and defense against infection.

Objective(s):
1. Explain the development of the normal flora and its importance in human health.
2. Compare and contrast the different modes of transmission of disease.
3. Describe the progression of an infection.
4. Apply the principles of epidemiology to infectious diseases in populations.
5. Explain how the innate (non-specific) and acquired (specific) defenses of the human body protect against infectious diseases.
6. Describe, discuss, and classify select diseases caused by prokaryotic and eukaryotic organisms, and infectious particles.

Methods of Evaluation:
1. Examinations
2. Quizzes
3. Lab
Course Content Outline:

1. Concepts:
   a. History of microbiology
   b. Characteristics of microorganisms
   c. Microbial involvement in shaping the environment
   d. Applications of microbiology
   e. Microbial and cellular evolution
   f. Biological hierarchy and classification of microorganisms
   g. Binomial nomenclature
   h. Prokaryotic cell structure and function
      i. Comparison of Gram positive and Gram negative cells
      j. Endospore formation and germination
   k. Size, shape, and arrangement of bacteria
   l. General structure and function of eukaryotic microorganisms (fungi, protozoa, and helminths)
   m. Structure and function of infectious particles (e.g. virus, prions)
   n. Biofilms and quorum sensing
   o. Passive and active transport
   p. Binary fission, generation times, and the growth curve
   q. Physical factors that affect microbial growth (pH, temperature, gas, osmotic pressure requirements, and other miscellaneous environmental factors)
   r. Nutritional factors that affect microbial growth
   s. Classification of growth media
   t. Simple, differential, and special stains
   u. Enzyme structure and function
   v. ATP as an energy carrier
   w. Types of enzymatic reactions (synthesis, hydrolysis, and reduction-oxidation reactions)
   x. Microbial metabolism (aerobic respiration, anaerobic respiration, fermentation, photosynthesis, and biosynthesis)
   y. Structure and function of DNA and RNA
   z. Semiconservative replication of DNA
   aa. Gene expression (transcription, and translation, and the genetic code)
   bb. Mutagens and mutations
   cc. Regulation of gene expression in prokaryotes
   dd. Transformation, conjugation, and transduction
   ee. Genetically modified organisms
   ff. Virus structure and function
   gg. Virus classification
   hh. Animal virus multiplication
      ii. Animal viruses (chronic, latent, and oncogenic)
      jj. Bacteriophages (lytic and lysogenic cycles)
   kk. Cultivating and identifying viruses
      ll. Cytopathic effects
   mm. Environmental and microbial factors that affect methods of microbial control
   nn. Outcomes of antimicrobial agents (disinfection, antisepsis, sterilization, decontamination, and sanitization)
   oo. Physical, chemical, and mechanical methods of microbial control
   pp. Modes of action of antimicrobial agents
   qq. Origins of antimicrobial drugs
   rr. Modes of action of antimicrobial drugs
   ss. Characteristics of the ideal antimicrobial drug
   tt. Selection and proper use of antimicrobial drugs
uu. Selective toxicity of antimicrobial drugs
vv. Mechanisms of resistance to antimicrobial drugs
ww. Normal flora (colonization and locations)
xx. Symbiotic and non-symbiotic relationships
yy. Modes of transmission (direct and indirect)
zz. Portals of entrance and exit
aaa. Disease process of infection
bbb. Types of infection (localized, systemic, focal, mixed, acute, chronic, latent, primary and secondary, nosocomial, and opportunistic infections)
ccc. Signs and symptoms
ddd. Virulence factors
ee. Reservoirs of infection
fff. Koch's postulates
ggg. Etiology and epidemiology
hhh. Anatomical barriers
   iii. Pattern recognition receptors
   jj. Complement and interferon
   kkk. Inflammation and fever
   lll. Cytokines
mmm. Phagocytosis
   nnn. Structures and function of the lymphatic system
   ooo. Types and functions of white blood cells
   ppp. Development, maturation, and activation of B and T lymphocytes
qqq. Recognition of self and non-self (cell surface proteins)
   rrr. Characteristics of antigens
   sss. Structure and function of antibodies
   ttt. Antigen presentation
   uuu. Humoral and cell-mediated immune responses
   vvv. Primary and secondary immune responses
www. Passive and active immunity (artificial vs. natural)
xxx. Vaccine production and immunization
yyy. Immunological disorders (hypersensitivity reactions, immunodeficiencies, and autoimmune deficiencies)
zzz. Water quality

2. **Skills:**
   a. Laboratory safety
   b. Identification of microorganisms
   c. Recognize different types of colonial morphology
   d. Recognize different shapes and arrangements of bacteria
   e. Aseptic technique and inoculation procedures
   f. Use of the microscope and the oil immersion lens
   g. Perform simple, differential, and special stains
   h. Streaking for isolated colonies
   i. Evaluation of metabolic activities
   j. Serial dilution
   k. Enumeration of bacteria and viable plate count
   l. Transformation of bacteria
   m. Enzyme-linked immunosorbant assay (ELISA)
   n. Evaluation of disinfectants and antiseptic agents
   o. Evaluation of antimicrobial agents
   p. Evaluation of enriched, selective, and differential media
   q. Use of dichotomous keys for identification of unknown bacteria
   r. Evaluation of water quality
Resources


Resources Other

www.cdc.gov

www.who.org (http://www.who.org)

Instructional Services

OAN Number:

TMNS

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