Douglas College

EFFECTIVE: SEPTEMBER 2007
CURRICULUM GUIDELINES

A. Division: **Education** Effective Date: **September 2007**

B. Department / Program Area: **Science and Technology**
Biology

Revision [ ] New Course [X]

If Revision, Section(s) Revised:
Date of Previous Revision:
Date of Current Revision:

C: BIOL 2400 **D: General Microbiology** **E: 4**

Subject & Course No.	Descriptive Title	Semester Credits

F: Calendar Description:

A survey of the biology of microorganisms with an emphasis on bacteria. Topics include prokaryotic diversity, bacterial cell structure and metabolism, microbial growth and reproduction, microbial genetics and ecology, introductory virology and immunology, epidemiology and public health, and selected topics in applied microbiology. Laboratory activities introduce a wide variety of techniques in microbiology and immunology.

G: Allocation of Contact Hours to Type of Instruction / Learning Settings

Primary Methods of Instructional Delivery and/or Learning Settings:

Lecture / Laboratory

Number of Contact Hours: (per week / semester for each descriptor)

4 hours lecture / 3 hours laboratory

Number of Weeks per Semester:

15

H: Course Prerequisites:

BIOL 1210 & CHEM 1110
(BIOL 2321 recommended)

I: Course Corequisites:

none

J: Course for which this Course is a Prerequisite

none

K: Maximum Class Size:

27

L: PLEASE INDICATE**:**

[ ] Non-Credit
[ ] College Credit Non-Transfer
[X] College Credit Transfer:

SEE BC TRANSFER GUIDE FOR TRANSFER DETAILS (www.bctransferguide.ca)

M: Course Objectives / Learning Outcomes

Upon completion of this course, students will:

1. Understand the range of prokaryotic and eukaryotic organisms that are considered to be microorganisms and understand the historical context of microbiological science.

2. Be able to explain the chemical components and cellular structure of bacterial cells.

3. Understand the principles of classification as they are applied to prokaryotic organisms and be able to explain the classification of bacteria in the context of phylogeny.

4. Understand the principles of bacterial nutrition and be able to explain the roles of catabolic and anabolic pathways in bacterial metabolism as well as mechanisms of regulation of metabolism.

5. Be able to explain the process of bacterial cell division and relate it to the growth of bacterial populations and the control of bacterial growth.

6. Be able to explain the structure and function of bacterial genomes including mechanisms of gene expression and regulation.

7. Be able to explain mechanisms of genetic recombination in bacteria (*e.g.* transformation, transduction, conjugation, etc.) and the evolution of antibiotic resistance in bacterial populations.

8. Understand the taxonomy of viruses, virus replication, the role of viruses in cancer, and the nature and importance of virus-like organisms like viroids and prions.

9. Be able to explain the difference between innate and acquired immunity to disease in humans and how they are affected by humoral and cell-mediated responses.

10. Understand the role of cell-membrane receptors in immune recognition of self and non-self and be able to explain the concept of immunization.

11. Understand the range of habitats in which bacteria are found, the dynamics of bacterial populations, the role of bacteria in biological communities, and the range of symbiotic relationships involving bacteria (*e.g.* mutualism, parasitism, etc.).

12. Be able to explain the modes of transmission and mechanisms of infection by human bacterial diseases and strategies for management of transmission and infection in the context of public health.

13. Understand the importance and use of microorganisms in production of human food and/or human industrial activity and/or forensic investigations and/or bioremediation of contaminated industrial sites and/or other human applications.

14. Be familiar and competent with a wide variety of microbiological laboratory techniques including transfer, culture and isolation techniques, characterization of colony and cell morphology, differential staining, determination of bacterial growth rates, and methods associated with bacterial transformation, bacteriophages, macrophages & phagocytosis, antibody-antigen reactions, and identification of unknown microorganisms.

N: Course Content:

The topics in the course include the following:

1. INTRODUCTION
   - 1.1. Introduction to microorganisms
   - 1.2. Historical overview of microbiology
   - 1.3. Prokaryotic and eukaryotic microorganisms
   - 1.4. Introduction to bacteria

2. CELLULAR BIOCHEMISTRY
   - 2.1. Chemical components of cells
   - 2.2. Bacterial cell structure

3. PROKARYOTIC DIVERSITY
   - 3.1. Principles of classification
   - 3.2. Phylogeny of bacteria

4. BACTERIAL METABOLISM
   - 4.1. Principles of nutrition
   - 4.2. Major catabolic and anabolic pathways
   - 4.3. Regulation of metabolism

5. MICROBIAL GROWTH AND REPRODUCTION
   - 5.1. Bacterial cell division
   - 5.2. Growth of bacterial populations
   - 5.3. Control of bacterial growth

6. MICROBIAL GENETICS
   - 6.1. Bacterial genomes
   - 6.2. Gene expression and regulation
   - 6.3. Transformation and recombination
   - 6.4. Drug resistance
   - 6.5. Genetic engineering

7. INTRODUCTION TO VIROLOGY
   - 7.1. Taxonomy of viruses
   - 7.2. Viral replication
   - 7.3. Viruses and cancer
   - 7.4. Viroids and prions

8. IMMUNOLOGY
   - 8.1. Innate and acquired immunity
   - 8.2. Humoral and cell-mediated responses
   - 8.3. Receptors and immune recognition
   - 8.4. Immunization

9. MICROBIAL ECOLOGY
   - 9.1. Populations and communities
   - 9.2. Microbial habitats
   - 9.3. Symbiosis

10. EPIDEMIOLOGY AND PUBLIC HEALTH
    - 10.1. Transmission and infection
    - 10.2. Disease case histories
    - 10.3. Disease management

11. TOPICS IN APPLIED MICROBIOLOGY
    - 11.1. Examples: food microbiology, industrial microbiology, forensic microbiology, environmental bioremediation

12. LABORATORY TOPICS

12.1. Basic Techniques in Microbiology
- 12.1.1. Laboratory operations and safety
- 12.1.2. Laboratory reporting techniques
- 12.1.3. Microscopy

12.2. Bacteria: Transfer, culture and isolation techniques
- 12.2.1. Aseptic techniques
  - 12.2.1.1. Preparation of media and plates
  - 12.2.1.2. Tube transfers
  - 12.2.1.3. Streak plate and spread plate techniques

12.3. Colony and Cellular Morphology
- 12.3.1. Agar plate colonial characteristic and agar slant growth
- 12.3.2. Individual cell characteristics (coccus, bacillus and spirillum microscopic recognition)

12.4. Differential Staining
- 12.4.1. Negative staining
- 12.4.2. Gram Stain
- 12.4.3. Acid fast staining

12.5. Bacterial Growth
- 12.5.1. Serial dilution
- 12.5.2. Growth rate determination (direct/plate counts)

12.6. Bacterial Transformation
- 12.6.1. Introduction of plasmid with antibiotic resistance
- 12.6.2. Plating and isolation of antibiotic resistant bacteria

12.7. Bacteriophages
- 12.7.1. Serial dilutions of bacteriophage inoculum
- 12.7.2. Inoculation and infection of bacterial lawns with bacteriophage lambda
- 12.7.3. Quantification of bacteriophage by plaque counts

12.8. Macrophages and Phagocytosis
- 12.8.1. Stimulation of macrophages with zymosan particles
- 12.8.2. Determination of kinetics of phagocytosis of zymosan by macrophages

12.9. Antibody-Antigen reactions
- 12.9.1. Agglutination reactions
- 12.9.2. Immunoprecipitation in agar plates
- 12.9.3. Determination of epitope identity using spur characteristics on agar plates

12.10. Practical Case Study
- 12.10.1. Characterization and possible identification of a microorganism using the techniques learned throughout the laboratories, as well as the information given in the theory lectures.

O: Methods of Instruction

This course involves four hours of lecture per week and three hours of laboratory work. The content of lectures is integrated with laboratory experiments, and readings in the textbook and scientific journal articles.

P: Textbooks and Materials to be Purchased by Students

M.T. Madigan & J.M. Martinko (2005) Brock Biology of Microorganisms or a comparable current microbiology textbook.

Q: Means of Assessment

Class tests and assignments	15-20%
Laboratory	15-20%
Exams	
- Term exam(s)	15-30%
- Final exam	35%
TOTAL	100%

R: Prior Learning Assessment and Recognition: specify whether course is open for PLAR

There is no provision for PLAR, other than by examining transcripts of biology courses taken within the last 5 years and comparing them to the course content of BIOL 2400.

Course Designer(s)

Education Council / Curriculum Committee Representative

Dean / Director

Registrar