

### Course Outline

**COURSE:** AH 8                      **DIVISION:** 50                      **ALSO LISTED AS:** BIO 8

**TERM EFFECTIVE:** Fall 2016                      **CURRICULUM APPROVAL DATE:** 11/23/2015

**SHORT TITLE:** MICROBIOLOGY L/L

**LONG TITLE:** General Microbiology

<u>Units</u>	<u>Number of Weeks</u>	<u>Type</u>	<u>Contact Hours/Week</u>	<u>Total Contact Hours</u>
5	18	Lecture:	4	72
		Lab:	3	54
		Other:	0	0
		Total:	7	126

#### **COURSE DESCRIPTION:**

An introduction to microbiology with an emphasis on bacteriology. Includes the study of morphology and physiology of microorganisms, a survey of infectious diseases, immunology and techniques for culture and control of microorganisms. This course is also listed as BIO 8. **PREREQUISITE:** Biological Science 10 or 15 with a grade of credit or C or better. **ADVISORY:** Chemistry 30A and Chemistry 30B; eligible for English 250, 260 and Mathematics 205.

#### **PREREQUISITES:**

Completion of BIO 10, as UG, with a grade of C or better.

OR

(Completion of BIO 15, as UG, with a grade of C or better.

OR

Completion of AH 15, as UG, with a grade of C or better.)

#### **COREQUISITES:**

**CREDIT STATUS:** D - Credit - Degree Applicable

#### **GRADING MODES**

L - Standard Letter Grade

**REPEATABILITY:** N - Course may not be repeated

#### **SCHEDULE TYPES:**

02 - Lecture and/or discussion

04 - Laboratory/Studio/Activity

**STUDENT LEARNING OUTCOMES:**

1. Apply knowledge of basic principles of microbiology to practical situations.

Measure: written exam, lab report

PLO: 6, 7

ILO: 2.2, 2.3, 2.6, 4.2

GE-LO: B1, B4, B5, B8

Year assessed or anticipated year of assessment: 2015

2. Apply knowledge of chemistry to understanding microorganisms.

Measure: written exam, homework

PLO: 3, 6

ILO: 2.2, 2.3, 2.6

GE-LO: B1

Year assessed or anticipated year of assessment: 2015

3. Explain basic biological principles as they occur in microorganisms.

Measure: written exam, homework

PLO: 3, 5, 6

ILO: 2.2, 2.6

GE-LO: B1, B2

Year assessed or anticipated year of assessment: 2015

4. Describe the role of microorganisms in health, disease and the environment.

Measure: written exam, homework

PLO: 3, 5, 6

ILO: 2.2, 2.3

GE-LO: B1, B2, B6, B9

Year assessed or anticipated year of assessment: 2015

5. Describe basic concepts of immunology and explain the role immunology plays in human health and disease.

Measure: written exam, homework

PLO: 3, 5, 6

ILO: 2.2, 2.3

GE-LO: B1, B2, B6, B9

Year assessed or anticipated year of assessment: 2015

6. Discuss molecular genetics and biotechnology and their applications.

Measure: written exam, homework

PLO: 3, 7

ILO: 2.2, 2.3, 3.1

GE-LO: B1, B2, B5, B6, B9

Year assessed or anticipated year of assessment: 2015

7. Demonstrate basic laboratory skills which will be applied to conduct experiments with microorganisms.

Measure: written exam, demonstration

PLO: 1, 7

ILO: 2.1, 2.2, 2.3, 2.5, 2.6, 4.2

GE-LO: B2, B3, B4, B8

Year assessed or anticipated year of assessment: 2015

#### PROGRAM LEARNING OUTCOMES:

Is this course part of a program (degree or certificate)? If yes, copy and paste the appropriate Program Learning Outcomes and number them. Enter the PLOs by

1. Use raw experimental data to conduct statistical analysis, and present conclusions in a graphical and narrative form.
2. Find, select, and evaluate various types of scientific information including primary research articles, mass media sources and world-wide web information.
3. Effectively communicate scientific concepts in both written and oral formats.
4. Identify the evolutionary processes that lead to adaptation and biological diversity.
5. Describe the relationship between life forms and their environment and ecosystems.
6. Explain the basic structures and fundamental processes of life at molecular, cellular, and organismal levels.
7. Demonstrate the correct operating procedures in the use of common lab equipment such as compound microscopes, spectrophotometer, pH meter, electrophoresis gel apparatus, micropipettes, and centrifuges.

#### CONTENT, STUDENT PERFORMANCE OBJECTIVES, OUT-OF-CLASS ASSIGNMENTS

Curriculum Approval Date: 11/23/2015

1 lec, 3 lab

Introduction

Objectives: 1. Identify significant events of and contributors to the science of Microbiology. 2. Discuss the major criteria used in classification of microorganisms. 3. Compare and contrast eukaryotes and prokaryotes. 4. Describe the scientific method. 5. Discuss rules of basic lab safety. 6. Identify potential sources of microbial contamination.

Assignments: Read text. Answer homework questions. Answer lab report questions.

3 lec

Chemistry

Objectives: 1. Define and discuss: atom, molecule, compound, isotope, atomic mass. 2. Describe atomic structure. explain the relationship between atomic structure and chemical bonds. 3. Describe the three types of chemical bonding. 4. Describe synthesis, decomposition and exchange reactions. 5. Differentiate between organic and inorganic compounds. 6. Describe the four major groups of organic compounds and explain their importance. 7. Define and discuss: acid, base, neutral, pH scale, dissociation.

Assignments: Read text. Answer homework questions.

2 lec, 1.5 lab

Microscope

Objectives: 1. List and define units of measurement used to describe microorganisms. 2. Describe the light microscope, its parts and functions. 3. Define resolution and discuss how it limits the useful magnification of a microscope. 4. Describe and discuss the uses and

limitations of phase contrast, darkfield, fluorescence, differential interference, transmission electron, scanning electron, and other types of microscopy. 5. Describe staining techniques used in microscopy. Assignments: Read text. Answer homework questions. Answer lab report questions.

4 lec

Cell structure and cell transport

Objectives: 1. Differentiate between eukaryotes and prokaryotes, emphasizing those differences which are important to antimicrobial therapy. 2. List and describe structures of prokaryotic and eukaryotic cells and their functions. 3. Compare and contrast Gram positive and gram negative cell walls and other differentiating features. 4.

Describe mechanisms of cellular transport.

Assignments: Read text. Answer homework questions.

1.5 lab

Handwashing techniques and experimental design

Objectives: 1. Discuss different techniques for handwashing and their relative effectiveness. 2. Apply knowledge of the scientific method to design an experiment to test the effectiveness of different methods of handwashing.

Assignments: Answer lab report questions.

6 lec

Metabolism

Objectives: 1. Define anabolism, catabolism, metabolism. 2. Discuss enzymes, their chemical composition, action, and factors affecting action. 3. Define and discuss redox reactions and their importance to metabolic reactions. 4. Describe the Laws of thermodynamics and apply them to an understanding of metabolism. 5. Describe and discuss modes of ATP generation. 6. Define and describe the classes of nutritional patterns among organisms. 7. Compare and contrast fermentation and respiration and list examples of each type of pathway. 8. Discuss electron donors and electron acceptors in metabolic pathways. 9. Define and discuss gaseous requirements. 10. Describe, compare and contrast glycolysis, Entner-Duodoroff pathway, pentose phosphate pathway, Krebs cycle and oxidative phosphorylation. 11. Compare and contrast aerobic and anaerobic respiration. 12. Discuss and diagram the use of proteins and lipids in metabolic pathways. Compare in terms of relative ATP production. 13. Discuss major uses of energy by cells. 14. Define biosynthesis and describe the major concepts of biosynthesis. 15. Describe the synthesis of carbohydrates, proteins, lipids and nucleic acids by cells. 16. Describe and diagram the integration of major metabolic pathways.

Assignments: Read text. Answer homework questions.

3 lab

Smear preparation, Simple staining and Gram staining

Objectives: 1. Demonstrate techniques of smear prep, simple staining and the Gram stain.

Assignment: Answer lab report questions.

3 lab

Isolation and transfer technique

Objectives: 1. Demonstrate correct aseptic handling of bacterial cultures. 2. Demonstrate the techniques for isolation of bacteria on an agar plate.

Assignments: Read text. Answer homework questions. Answer lab report questions.

4 lec

Microbial Growth

Objectives: 1. Classify organisms according to their temperature requirements. 2. Discuss the importance of pH and osmotic pressure on microbial growth. 3. Discuss the basic chemical requirements of microorganisms. 4. Classify microorganisms according to their gaseous requirements. 5. Define growth factors and list examples. Define prototroph, auxotroph. 6. Discuss how the different requirements of microorganisms may be met using different incubators and media. 7. Describe and provide examples of different types of media. 8. Describe and discuss different isolation techniques. 9. Describe and discuss different preservation techniques. 10. Discuss generation time and its significance. 11. Define and diagram different growth phases of bacteria and viruses. 12. Be able to describe different counting methods for microorganisms.

Assignments: Read text. Answer homework questions. Answer lab report questions.

3 lab

Selective and Differential Media

Objectives: 1. Explain the terms selective and differential media and list examples. 2. Apply knowledge of metabolic processes and end products to the concept of differential media.

Assignments: Answer lab report questions.

4 lec

Control of Microbial Growth

Objectives: 1. Define terms pertaining to control of microorganisms including but not limited to sterilization, disinfection, antisepsis, thermal death time, thermal death point, decimal reduction time. 2. Describe and discuss conditions affecting microbial control, mechanisms of microbial control, pattern of microbial death. 3. List, describe and discuss uses of different methods of microbial control. 4. Discuss methods of evaluating the effectiveness of methods of microbial control.

3 lab

Techniques for Anaerobe Cultivation; Acid fast Staining

Objectives: 1. Demonstrate use of appropriate techniques for cultivation of anaerobes. 2. Determine gaseous requirements of various microorganisms by applying knowledge of media and growth patterns. 3. Demonstrate the acid fast stain and discuss its significance.

Assignments: Read text. Answer homework questions. Answer lab report questions.

4 lec, 3 lab

#### Microbial Genetics

Objectives: 1. Describe DNA, RNA 2. Discuss the importance of complementary base pairing to DNA replication and protein synthesis. 3. Define: gene, chromosome, genotype, phenotype, mutation. 4. Describe the processes of DNA replication and protein synthesis. 5. Interpret the genetic code. 6. Differentiate between deletion, addition and point mutations. 7. Describe different types of physical and chemical mutagens and their actions. 8. Discuss spontaneous mutation and its significance. 9. Describe methods for identification of mutations. 10. Describe and discuss the Ames test. 11. Discuss different methods of genetic recombination in bacteria. 12. Discuss plasmids and transposons and their roles in bacterial genetics. 13. Describe methods of gene regulation in prokaryotes. 14. Compare and contrast gene regulation in prokaryotes and eukaryotes. 15. Discuss the development of antimicrobial resistance in bacteria.

Assignments: Read text. Answer homework questions. Answer lab report questions.

4 lec, 6 lab

#### Biotechnology

Objectives: 1. Describe the applications of biotechnology. 2. Define and describe the roles of a vector and a clone. 3. Define and discuss the uses of restriction enzymes and restriction fragments. 4. Discuss how foreign DNA can be inserted into a cell. 5. Define the following terms and discuss their uses: gene library, synthetic DNA, DNA probe. 6. Discuss the following and why they are important: intron, exon, cDNA. 7. Explain the following and discuss their uses: Southern blot, DNA fingerprinting, PCR, gene therapy. 8. Demonstrate basic techniques of genetic transformation and conjugation.

Assignments: Read text. Answer homework questions. Answer lab report questions.

4 lec

#### Classification of Microorganisms

Objectives: 1. Discuss the criteria used to establish domains and kingdoms. 2. Discuss how recent research using biotechnology has changed classification. 3. Compare determinative and systematic classification of microorganisms. 4. Discuss criteria used to classify microorganisms.

Assignments: Read text. Answer homework questions.

3 lab

#### Media used in identification of Gram positive bacteria

Objectives: 1. Demonstrate use of media commonly used to assist in the identification of Gram positive bacteria

4 lec

#### Bacterial Diversity and Classification; Soil and Water microbiology

Objectives: 1. Discuss Bergey's Manual and its importance to bacterial classification. 2. Describe outstanding characteristics and importance of selected types of bacteria. 3. Describe the roles of soil and water

microflora such as decomposition, nitrogen and carbon cycling. 4. Describe tests for water purity: indicator organisms, multiple tube fermentations, membrane filter method.

Assignments: Read text. Answer homework questions.

3 lab

Media and tests used in Identification of Gram Negative Bacteria

Objectives: 1. Demonstrate use of media and tests commonly used in the identification of Gram negative bacteria.

Assignments: Answer lab report questions.

4 lec

Fungi, Protozoans, Algae and Helminths

Objectives: 1. Describe the unique characteristics of the fungi. 2.

Describe the basis for the classification of fungi. 3. Describe the vegetative and reproductive structures of fungi. 4. Discuss selected diseases caused by fungi. 5. Describe the unique characteristics of the protozoans. 6. Discuss classification of protozoa. 7. Discuss selected diseases caused by protozoa. 8. Describe general characteristics of algae, lichens, slime molds. 9. Describe characteristics of helminths. 10. Describe selected helminths and the diseases they cause. 10. Demonstrate techniques used in culture and identification of fungi.

3 lab

Identification of Unknown Bacteria

Objectives: 1. Apply knowledge of microscopic technique, staining, media and tests to identify an unknown bacterial culture.

Assignments: Read text. Complete unknown report form.

6 lab

Viruses

Objectives: 1. Describe the unique characteristics of viruses. 2.

Discuss the basis for classification of viruses. 3. Describe means of isolating and cultivating viruses. 4. Describe how DNA and RNA viruses multiply. 5. Discuss prions and viroids. 6. Discuss effects of viruses on cells and tissues. 7. Discuss selected viral diseases. 8. Discuss latent and persistent viral infections. 9. Compare and contrast lytic and lysogenic bacteriophage.

Assignments: Read text. Answer homework questions.

4 lec

Host Parasite Interactions

Objectives: 1. Define pathology, infection, disease. 2. Discuss the relationship between host and normal microbiota. 3. Discuss Koch's postulates. 4. Discuss how infectious diseases are classified. 5. Define: sporadic, endemic, epidemic, pandemic. 6. Describe phases of disease development and pre-disposing factors. 7. Discuss reservoirs for infectious disease and how infectious disease is transmitted. 8. Discuss basic principles of epidemiology. 9. Define and discuss: emerging infectious disease and nosocomial infection.

4 lec

Innate Immune Response

Objectives: 1. List and describe non-specific resistance factors. 2.

Differentiate between innate and adapted immune response. 3.

Discuss the relationship between innate and adapted immunity.

2 lec

Adapted Immune Response

Objectives: 1. Discuss the cells, tissues and organs involved in the adapted immune response 2. Differentiate between passive vs. active and naturally vs. artificially acquired immunity. 3. Define: antigen, antibody, hapten. 4. Compare and contrast B cells and Tcells. 5. Be able to trace a specific immune response from the point of introduction of antigen. 6. Differentiate between a primary and secondary immune response. 7. Describe lab tests based on antigen-antibody interaction. 8. Describe the basic preparation of vaccines. 9. Describe hypersensitivity reactions. 10. Discuss pathogenesis and control of  
4 lec

AIDS. 11. Discuss other disorders of the immune system. 12. Discuss blood types and transfusion reactions. 13. Discuss transplant rejection and possible treatments. 14. List and discuss autoimmune diseases.  
3 lab

Use of multimedia systems: Enterotube

Objectives: 1. Demonstrate the use of commercially available systems that incorporate multiple media.

4 lec, 3 lab

Antimicrobial Drugs

Objectives: 1. Define terms pertaining to antimicrobics, antibiotics. 2. Discuss basic mechanisms of action for antimicrobics. 3. Discuss factors affecting the action of antimicrobics. 4. Describe the criteria used in developing and selecting antimicrobics. 5. Discuss interactions of antimicrobics. 6. Discuss qualities and uses of selected antimicrobics. 7. Describe how antimicrobial resistance develops. 8. Demonstrate the test used to determine antimicrobial sensitivity and resistance. 9. Interpret antimicrobial sensitivity tests to determine the appropriate antimicrobial agent to use to treat an infection.

Assignments: Read text. Answer homework questions. Answer lab report questions.

WEEK 18 2 hours

Final exam.

### **METHODS OF INSTRUCTION:**

The method of instruction will include a traditional lecture presentation as well as laboratory exposure to practical applications. The use of the internet, video, document camera, board notes, discussion, and guest speakers from select professionals in the field will also facilitate instruction. A variety of techniques that include homework problems, laboratory reports, lab quizzes/practicum's, lecture midterms, and a course final will assess learning and aide instruction.

### **METHODS OF EVALUATION:**

CATEGORY 1 - The types of writing assignments required:

Percent range of total grade: 20 % to 35 %

Written Homework

Lab Reports

Essay Exams



CATEGORY 2 -The problem-solving assignments required:

Percent range of total grade: 20 % to 30 %

Homework Problems

Lab Reports

Quizzes

Exams

Other: Unknown identification

CATEGORY 3 -The types of skill demonstrations required:

Percent range of total grade: 0%

CATEGORY 4 - The types of objective examinations used in the course:

Percent range of total grade: 35 % to 60 %

Multiple Choice

True/False

Matching Items

Completion

Other: short answer

### **REPRESENTATIVE TEXTBOOKS:**

Required:

Tortora, Funke, and Case. Microbiology: An Introduction, 11th ed.. San Francisco, CA: Pearson / Benjamin Cummings, 2012. Or other appropriate college level text.

ISBN: 10:0-321-73360-6

Reading level of text, Grade: 17+ Verified by: G. Curtis

Other textbooks or materials to be purchased by the student: McKenna and Yuh. Microbiology Lab Manual. Revised annually.

### **ARTICULATION and CERTIFICATE INFORMATION**

Associate Degree:

GAV B2, effective 201070

GAV B3, effective 201070

CSU GE:

CSU B2, effective 201070

CSU B3, effective 201070

IGETC:

IGETC 5B, effective 201070

IGETC 5C, effective 201070

CSU TRANSFER:

Transferable CSU, effective 201070

UC TRANSFER:

Transferable UC, effective 201070

### **SUPPLEMENTAL DATA:**

Basic Skills: N

Classification: Y

Noncredit Category: Y  
Cooperative Education:  
Program Status: 1 Program Applicable  
Special Class Status: N  
CAN: BIO14  
CAN Sequence: XXXXXXXX  
CSU Crosswalk Course Department: AH  
CSU Crosswalk Course Number: 8  
Prior to College Level: Y  
Non Credit Enhanced Funding: N  
Funding Agency Code: Y  
In-Service: N  
Occupational Course: B  
Maximum Hours:  
Minimum Hours:  
Course Control Number: CCC000456057  
Sports/Physical Education Course: N  
Taxonomy of Program: 123010