GAVILAN COLLEGE
5055 Santa Teresa Blvd
Gilroy, CA 95023

Course Outline

COURSE: BIO 8 DIVISION: 10 ALSO LISTED AS: AH 8

TERM EFFECTIVE: Fall 2021 CURRICULUM APPROVAL DATE: 11/9/2021

SHORT TITLE: MICROBIOLOGY L/L

LONG TITLE: General Microbiology

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

Out of Class Hrs:	144.00
Total Learning Hrs:	270.00

COURSE DESCRIPTION:

An introduction to microbiology with an emphasis on bacteriology. Includes the study of morphology, physiology and classification of microorganisms, a survey of infectious disease, immunology and techniques for culture and control of microorganisms. This course is also listed as AH 8. PREREQUISITE: BIO 10 or 15 with a grade of credit or 'C' or better. ADVISORY: Chemistry 30A; high school-level reading and writing skills; skills equivalent to those of an Elementary Algebra course.

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.

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
03 - Lecture/Laboratory
04 - Laboratory/Studio/Activity
04B - Laboratory - LEH 0.75
05 - Hybrid
71 - Dist. Ed Internet Simultaneous
72 - Dist. Ed Internet Delayed
73 - Dist. Ed Internet Delayed LAB
73B - Dist. Ed Internet LAB-LEH 0.75

STUDENT LEARNING OUTCOMES:

By the end of this course, a student should:

1. Apply knowledge of basic principles of microbiology to practical situations.
2. Apply knowledge of chemistry to understanding microorganisms.
3. Explain basic biological principles as they occur in microorganisms.
4. Describe the role of microorganisms in health, disease and the environment.
5. Describe basic concepts of immunology and explain the role immunology plays in human health and disease.
6. Discuss molecular genetics and biotechnology and their applications.
7. Demonstrate basic laboratory skills which will be applied to conduct experiments with microorganisms.

COURSE OBJECTIVES:

1. Explain the relationship between atomic structure and chemical bonds.
2. Describe the four major groups of biomolecules and explain their importance.
3. Describe the light microscope, its parts and functions.
4. Describe staining techniques used in microscopy.
5. Compare and contrast eukaryotes and prokaryotes.
6. Compare and contrast Gram positive and gram negative cell walls and other differentiating features.
7. Compare and contrast aerobic and anaerobic respiration.
8. Describe the basic physical and chemical requirements of microorganisms.
9. Describe and provide examples of different types of media used to culture microbes.
10. Describe and discuss conditions affecting microbial control, mechanisms of microbial control, pattern of microbial death.
11. Describe the processes of DNA replication, transcription, and translation.
12. Differentiate between deletion, addition and point mutations.
13. Describe the applications of biotechnology.
14. Demonstrate basic techniques of genetic transformation and conjugation.
15. Discuss criteria used to classify microorganisms.
16. Discuss the relationship between host and normal flora.
17. Describe the unique characteristics of and the basis for classification of fungi, protozoans, algae, lichens, slime molds, and helminths.
18. Discuss basic principles of epidemiology.
19. Discuss the relationship between innate and adaptive immunity.
20. Discuss disorders of the immune system.
21. Discuss basic mechanisms of action for antimicrobics, and factors that affect the action for antimicrobics.

COURSE CONTENT:

Curriculum Approval Date: 11/9/2021

LECTURE CONTENT:

2 LEC HOUR

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.

Assignments: Read text. Answer homework questions.

4 LEC HOURS

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 HOURS

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 various types of microscopy.
5. Describe staining techniques used in microscopy.

Assignments: Read text. Answer homework questions.

6 LEC HOURS

CELL STRUCTURE AND TRANSPORT

Objectives:

1. Differentiate between eukaryotes and prokaryotes, emphasizing those differences which are important to antimicrobic therapy.
2. List and describe structures of prokaryotic and eukarotic 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.

COURSE CONTENT(CONTINUED):

LECTURE CONTENT(CONTINUED):

6 LEC HOURS

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-Duordoroff 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.

4 LEC HOURS

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.

COURSE CONTENT(CONTINUED):

LECTURE CONTENT(CONTINUED):

4 LEC HOURS

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.

Assignments: Read text. Answer homework questions.

6 LEC HOURS

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 prokayotes and eukaryotes.

15. Discuss the development of antimicrobial resistance in bacteria.

Assignments: Read text. Answer homework questions.

4 LEC HOURS

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.

COURSE CONTENT(CONTINUED):
LECTURE CONTENT(CONTINUED):
4 LEC HOURS
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.
4 LEC HOURS
BACTERIAL DIVERSITY AND CLASSIFICATION
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.
4 LEC HOURS
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.
11. Demonstrate techniques used in culture and identification of fungi.
Assignments: Read text. Answer homework questions.
4 LEC HOURS
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.
Assignments: Read text. Answer homework questions.

COURSE CONTENT(CONTINUED):
LECTURE CONTENT(CONTINUED):
4 LEC HOURS
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.
Assignments: Read text. Answer homework questions.
4 LEC HOURS
ADAPTIVE 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 T cells.
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.
Assignments: Read text. Answer homework questions.
4 LEC HOURS
IMMUNOLOGY IN PRACTICE, IMMUNE SYSTEM DISORDERS
1. Describe the basic preparation of vaccines.
2. Describe hypersensitivity reactions.
3. Discuss pathogenesis and control of AIDS.
4. Discuss other disorders of the immune system.
5. Discuss blood types and transfusion reactions.
6. Discuss transplant rejection and possible treatments.
7. List and discuss autoimmune diseases.
Assignments: Read text. Answer homework questions.
4 LEC HOURS
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 antimicrobic resistance develops.
8. Demonstrate the test used to determine antimicrobic sensitivity and resistance.
9. Interpret antimicrobic sensitivity tests to determine the appropriate antimicrobic agent to use to treat an infection.
Assignments: Read text. Answer homework questions.
2 LEC HOURS
Final exam

COURSE CONTENT(CONTINUED):

LAB CONTENT:

3 LAB HOURS

INTRODUCTION

Objectives:

1. Describe the scientific method.

2. Discuss rules of basic lab safety.

3. Identify potential sources of microbial contamination.

Assignments: Read lab manual. Answer lab report questions.

3 LAB HOURS

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 of various types of microscopy.

5. Describe staining techniques used in microscopy.

Assignments: Read lab manual. Answer lab report questions.

3 LAB HOURS

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: Read lab manual. Answer lab report questions.

3 LAB HOURS

SMEAR PREPARATION, SIMPLE AND GRAM STAINING

Objectives:

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

Assignments: Read lab manual. Answer lab report questions.

3 LAB HOURS

STERILE 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 lab manual. Answer lab report questions.

3 LAB HOURS

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: Read lab manual. Answer lab report questions.

COURSE CONTENT(CONTINUED):

LAB CONTENT(CONTINUED):

3 LAB HOURS

ANAEROBIC CULTIVATION AND 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 lab manual. Answer lab report questions.

3 LAB HOURS

MICROBIAL GENETICS

Objectives:

1. Discuss different methods of genetic recombination in bacteria.

2. Discuss plasmids and transposons and their roles in bacterial genetics.

3. Describe methods of gene regulation in prokaryotes.

4. Compare and contrast gene regulation in prokayotes and eukaryotes.

5. Discuss the development of antimicrobial resistance in bacteria.

Assignments: Read lab manual. Answer lab report questions.

6 LAB HOURS

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 lab manual. Answer lab report questions.

3 LAB HOURS

IDENTIFICATION OF GRAM-POSITIVE BACTERIA

Objectives:

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

Assignments: Read lab manual. Answer lab report questions.

3 LAB HOURS

IDENTIFICATION OF GRAM-NEGATIVE BACTERIA

Objectives:

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

Assignments: Read lab manual. Answer lab report questions.

12 LAB HOURS

IDENTIFICATION OF UNKNOWN BACTERIA

Objectives:

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

Assignments: Read lab manual. Answer lab report questions. Write lab report.

COURSE CONTENT(CONTINUED):

LAB CONTENT(CONTINUED):

3 LAB HOURS

ANTIMICROBIAL DRUGS

Objectives:

1. Describe how antimicrobic resistance develops.

2. Demonstrate the test used to determine antimicrobic sensitivity and resistance.

3. Interpret antimicrobic sensitivity tests to determine the appropriate antimicrobic agent to use to treat an infection.

Assignments: Read lab manual. Answer lab report questions.

3 LAB HOURS

ENTEROTUBE

Objectives:

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

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/practicums, lecture midterms, and a course final will assess learning and aide instruction.

METHODS OF EVALUATION:
Writing assignments
Evaluation Percent 25
Evaluation Description
Percent range of total grade: 20 % to 35 %
Written Homework
Lab Reports
Essay Exams

Problem-solving assignments
Evaluation Percent 20
Evaluation Description
Percent range of total grade: 20 % to 30 %
Homework Problems
Lab Reports
Quizzes
Exams
Other

Objective examinations
Evaluation Percent 50
Evaluation Description
Percent range of total grade: 35 % to 60 %
Multiple Choice
True/False
Matching Items
Completion
Other: short answer

Skill demonstrations
Evaluation Percent 5
Evaluation Description
Percent range of total grade: 5 % to 10 %
Lab techniques

REPRESENTATIVE TEXTBOOKS:
Microbiology: An Introduction, 13th ed., Tortora, Funke, and Case, Pearson / Benjamin Cummings, 2018.
ISBN: ISBN: 978-0134605180
Reading level of text, Grade: 17+ Grade Verified by: Verified by: G. Curtis
McKenna and Yuh. Microbiology Lab Manual. Revised annually.

ARTICULATION and CERTIFICATE INFORMATION

Associate Degree:

GAV B2, effective 202530

GAV B3, effective 202530

GAV Area 4 = Social & Behavior, effective 202530

CSU GE:

CSU B2, effective 202530

CSU B3, effective 202530

IGETC:

IGETC 5B, effective 202530

IGETC 5C, effective 202530

CSU TRANSFER:

Transferable CSU, effective 202530

Not Transferable

UC TRANSFER:

Transferable UC, effective 202530

Not Transferable

SUPPLEMENTAL DATA:

Basic Skills: N
Classification: Y
Noncredit Category: Y
Cooperative Education:
Program Status: 1 Program Applicable
Special Class Status: N
CAN: BIOL14
CAN Sequence: XXXXXXXX
CSU Crosswalk Course Department:
CSU Crosswalk Course Number:
Prior to College Level: Y
Non Credit Enhanced Funding: N
Funding Agency Code: Y
In-Service: N
Occupational Course: E
Maximum Hours:
Minimum Hours:
Course Control Number: CCC000165479
Sports/Physical Education Course: N
Taxonomy of Program: 040300