El Camino College

COURSE OUTLINE OF RECORD - Official

I. GENERAL COURSE INFORMATION

Subject and Number: **Microbiology 33**
Descriptive Title: **General Microbiology**

Course Disciplines: **Biological Sciences**

Division: **Natural Sciences**

Catalog Description: This course is a study of microbial anatomy and physiology, classification, microbes in water, air, soil, food, sewage, and medical aspects of microbiology. It also includes the study of fundamental techniques in the growth, culture, and identification of microorganisms. Laboratory experiments are performed by students to reinforce principles of microbiology discussed in lecture. This course is designed for students planning to pursue careers in the health sciences or other life sciences.

Conditions of Enrollment: **Prerequisite**

Biology 10 or

Biology 10H or

Anatomy 30 or

Anatomy 32 or

Anatomy and Physiology 34A or

Physiology 31
AND

Chemistry 4 or

Chemistry 4H or

Chemistry 20 or

Chemistry 1A or

Chemistry 21A
with a minimum grade of C in prerequisite
or

equivalent

Course Length: **[X] Full Term [ ] Other (Specify number of weeks):**
Hours Lecture: **3.00 hours per week [ ] TBA**
Hours Laboratory: **6.00 hours per week [ ] TBA**
Course Units: **5.00**

Grading Method: **Letter**

Credit Status	**Associate Degree Credit**
Transfer CSU:	[X] **Effective Date: Prior to July 1992**
Transfer UC:	[X] **Effective Date: Prior to July 1992**
General Education:	
El Camino College:	**1 – Natural Sciences** Term: Other: Approved
CSU GE:	**B2 - Life Science** Term: Fall 1991 Other: **B3 - Laboratory Sciences** Term: Fall 1991 Other:
IGETC:	**5B - Biological Science with a Lab** Term: Fall 1991 Other: **5C - Science Laboratory** Term: Fall 1991 Other:

II. OUTCOMES AND OBJECTIVES

A. COURSE STUDENT LEARNING OUTCOMES (The course student learning outcomes are listed below, along with a representative assessment method for each. Student learning outcomes are not subject to review, revision or approval by the College Curriculum Committee)

1. Students will be able to use language appropriate to microbiological studies and the health sciences.
2. Students will demonstrate the use of instruments to gather data.
3. Students will be able to identify microbes and explain their roles in health and disease.

The above SLOs were the most recent available SLOs at the time of course review. For the most current SLO statements, visit the El Camino College SLO webpage at http://www.elcamino.edu/academics/slo/.

B. Course Student Learning Objectives (The major learning objective for students enrolled in this course are listed below, along with a representative assessment method for each)

1. Describe the basic structure and functional characteristics of microorganisms and determine how they exist in their particular ecological niche.

   Other (specify)

   Multiple Choice, Completion, and True/False
2. Demonstrate the understanding and the ability to successfully practice aseptic techniques in the microbiology laboratory.

   Other (specify)

   Laboratory Practicum
3. Provide details of and perform various staining techniques and biochemical tests used to identify bacteria in the laboratory.

Other (specify)

Laboratory Practicum and Unknown Lab Report

4. Identify the measures and describe the procedures used to control microorganisms. This includes those that are personally carried out to halt the spread of infection and disease in the health care setting.

   Multiple Choice

5. Explain the basic elements of the human immune system and how it functions to protect us from disease.

   Other (specify)

   Short Essay, Short Answer, and Multiple Choice

6. Compare and contrast different human diseases, including those that are food-borne, air-borne, arthropod borne and those transmitted by sexual contact.

   Other (specify)

   Short Essay, Short Answer, and Multiple Choice

7. Discuss the roles microorganisms play in all aspects of human life and provide basic descriptions of what roles they play in many facets of biology including recombinant DNA research, genetic engineering, and biotechnological applications.

   Other (specify)

   Short Essay

III. OUTLINE OF SUBJECT MATTER (Topics are detailed enough to enable a qualified instructor to determine the major areas that should be covered as well as ensure consistency from instructor to instructor and semester to semester.)

Lecture or Lab	Approximate Hours	Topic Number	Major Topic
Lecture	3	I	Introduction to Microbiology A. Survey of Microorganisms B. Metric System C. History of Microbiology
Lecture	2	II	Chemical Principles and Biochemical Molecules A. Atoms, Elements, and Molecules B. Chemical Bonds and pH C. Structure and Function of Organic Macromolecules
Lecture	6.5	III	Cell A. Prokaryotic Cellular Structures and Functions B. Eukaryotic Cellular Structures and Functions C. Cell Transport D. Bacterial Taxonomy
Lecture	4	IV	Biochemistry of Cell A. DNA Replication B. RNA Synthesis C. Protein Synthesis
Lecture	3	V	Bacterial Classification A. Bergey's Manual of Systemic Bacteriology B. Criteria and Survey of Bacterial Groups
Lecture	3	VI	Bacterial Growth

			A. Growth Curve B. Physical, Chemical and Mechanical Control Methods
Lecture	3	VII	Metabolism A. Enzymes, Coenzymes, and Cofactors B. Oxidation-Reduction Reactions C. Methods of Phosphorylation
Lecture	2	VIII	Metabolic Pathways of Energy Production A. Aerobic Cellular Respiration B. Anaerobic Cellular Respiration C. Fermentation
Lecture	3	IX	Microbial Genetics A. Heredity B. Phenotype and Genotype C. Mutations D. Bacterial Recombination 1. Transformation 2. Transduction 3. Conjugation
Lecture	3	X	Fungi A. Characteristics and Classification B. Cellular Structures and Functions C. Asexual and Sexual Reproduction D. Medical Mycology
Lecture	3	XI	Protozoans and Parasitic Helminths A. Characteristics and Classification B. Cellular Structures and Functions C. Reproduction D. Diseases
Lecture	8	XII	Viruses A. Characteristics and Classification B. Diseases C. Replication D. Prions and Viroids
Lecture	4	XIII	Immunology A. Nonspecific External and Internal Immunity 1. Mechanical Defenses 2. Chemical Defenses 3. Categories of White Blood Cells 4. Phagocytosis 5. Inflammation B. Specific Immunity (Immune Response) 1. Cell Mediated Immunity a. T Lymphocytes 2. Acquired Humoral Immunity a. B Lymphocytes and Plasma Cells b. Antigens and Antibodies
Lecture	1.5	XIV	Principles of Disease A. Concepts of Infectious Disease B. Bacterial Toxins: Endotoxins, Exotoxins, and Enterotoxins C. Koch's Postulates D. Requirements for Pathogen to Cause Disease 1. Portals of Entry

			2. Dosage/Concentration 3. Tissue Affinity 4. Host Susceptibility 5. Portals of Exit
Lecture	4	XV	Bacterial Pathogens A. Modes of Transmission B. Signs and Symptoms of Disease C. Treatment D. Nosocomial Infections
Lecture	1	XVI	Microbial Ecology and Industrial Microbiology A. Symbiosis B. Roles of Microbes in Nutrient Recycling C. Carbon, Oxygen, and Nitrogen Cycles D. Industrial Applications 1. Fermentation 2. Antibiotic Synthesis 3. Bioremediation
Lab	6	XVII	Introduction A. Check-in and Safety B. Microscopes
Lab	6	XVIII	Sterilization and Techniques A. Aseptic Techniques B. Disinfection
Lab	6	XIX	Enumeration and Isolation Techniques A. Pour Plate Procedure B. Spread Procedure C. Streak Procedure D. Cultural Characteristics 1. Oxygen Requirements 2. Motility
Lab	14	XX	Stains A. Simple Stain B. Gram Stain and Unknowns C. Acid Fast Stain D. Capsule Stain E. Negative Stain F. Spore Stain G. Flagellar Stain
Lab	6	XXI	Fungi A. Molds B. Yeasts
Lab	6	XXII	Environmental Factors on Microorganisms A. Temperature B. pH C. Osmotic Pressure D. Ultraviolet Light
Lab	20	XXIII	Biochemical and Physiological Characteristics A. Oxidation and Fermentation 1. Carbohydrates Fermentation Test 2. Methyl Red Test 3. Voges-Proskauer Test 4. Citrate Test 5. Oxidase Test 6. Nitrate Reduction Test 7. Catalase Test

			B. Hydrolytic Reactions 1. Starch Hydrolysis Test 2. Casein Hydrolysis Test 3. Indole Hydrolysis Test 4. Urea Hydrolysis Test C. Multiple Test Media 1. Hydrogen Sulfide Reduction Test 2. Litmus Milk Test
Lab	12	XXIV	Microorganisms A. Protozoans B. Algae C. Cyanobacteria
Lab	9	XXV	Examination of Water A. Presumptive Test B. Confirmed Test C. Completed Test
Lab	9	XXVI	Blood A. Agglutination B. White Blood Cells
Lab	14	XXVII	Unknowns A. Stains 1. Gram Stain 2. Additional Stains B. Biochemical and Physiological Characteristics
Total Lecture Hours		54	
Total Laboratory Hours		108	
Total Hours		162	

IV. PRIMARY METHOD OF EVALUATION AND SAMPLE ASSIGNMENTS

A. **PRIMARY METHOD OF EVALUATION:**

Problem solving demonstrations (computational or non-computational)

B. **TYPICAL ASSIGNMENT USING PRIMARY METHOD OF EVALUATION:**

In the space provided, calculate the number of ATP molecules and final end-products produced from one molecule of glucose utilized by Escherichia coli, during aerobic respiration.

C. **COLLEGE-LEVEL CRITICAL THINKING ASSIGNMENTS:**

1. In the space provided, explain the following case study question:
   An infant was admitted to the hospital experiencing the following symptoms: problematic swallowing, excessive drooling, the inability to move, and difficulty breathing. What laboratory tests would you order? Explain why. What type of treatment would you prescribe? Discuss which types of microorganisms could be causing this medical problem.

2. In the space provided, explain the following case study question:

   An adult female with a gunshot wound to her abdomen was admitted to the hospital. What possible bacterial infections might she acquire from her wound and what types of antibiotics would she be given for preventative treatment?

D. **OTHER TYPICAL ASSESSMENT AND EVALUATION METHODS:**

Essay exams
Objective Exams
Quizzes
Reading reports
Written homework
Laboratory reports
Class Performance
Homework Problems
Multiple Choice
Completion
Matching Items
True/False

V. INSTRUCTIONAL METHODS

Discussion
Laboratory
Lecture

Note: In compliance with Board Policies 1600 and 3410, Title 5 California Code of Regulations, the Rehabilitation Act of 1973, and Sections 504 and 508 of the Americans with Disabilities Act, instruction delivery shall provide access, full inclusion, and effective communication for students with disabilities.

VI. WORK OUTSIDE OF CLASS

Study
Answer questions
Skill practice
Required reading
Problem solving activities
Written work

Estimated Independent Study Hours per Week: 6

VII. TEXTS AND MATERIALS

A. **UP-TO-DATE REPRESENTATIVE TEXTBOOKS**
Tortora, Funke and Case. Microbiology, An Introduction. 11th ed. Benjamin Cummings, 2013.
Brown, Alfred. Bensen's Microbiological Applications. 13th ed. McGraw-Hill, 2015.

B. **ALTERNATIVE TEXTBOOKS**

C. **REQUIRED SUPPLEMENTARY READINGS**

D. **OTHER REQUIRED MATERIALS**
colored pencils
laboratory notebook
sharpie pen

VIII. CONDITIONS OF ENROLLMENT

A. Requisites (Course and Non-Course Prerequisites and Corequisites)

Requisites	Category and Justification
Course Prerequisite Biology-10 or	Sequential
Course Prerequisite Biology-10H or	Sequential
Course Prerequisite Anatomy-30 or	Sequential
Course Prerequisite Anatomy-32 or	Sequential
Course Prerequisite Anatomy and Physiology-34A or	Sequential
Course Prerequisite Physiology-31 AND	Sequential
Course Prerequisite Chemistry-4 or	Computational/Communication Skills
Course Prerequisite Chemistry-4H or	Computational/Communication Skills
Course Prerequisite Chemistry-20 or	Computational/Communication Skills
Course Prerequisite Chemistry-1A or	Computational/Communication Skills
Course	Computational/Communication Skills

Prerequisite Chemistry-21A or	
Non-Course Prerequisite	Students who have sufficient studies of chemistry such as two years of high school chemistry will satisfy the chemistry prequisite for Microbiology 33.

B. Requisite Skills

Requisite Skills
Chemistry: Write symbols for chemical elements and know their meanings. CHEM 20 - Use chemical terminology to name inorganic chemical compounds, formulas and reactions and classify types of chemical reactions. Perform stoichiometric calculations involving chemical reactions. CHEM 1A - The student will be more proficient in a. the use of scientific terminology. b. the naming and writing of chemical formulas for inorganic compounds: binary nonmetal compounds, salts, acids and bases. c. writing and classifying chemical equations for elementary chemical reactions. d. performing stoichiometric calculations involving chemical reactions. CHEM 4 - Utilize the language of chemistry, including vocabulary, symbols, formulas, and equations. CHEM 4H - Utilize the language of chemistry, including vocabulary, symbols, formulas, and equations. CHEM 21A - Use the language of general chemistry (vocabulary, nomenclature, formulas and equations) to describe chemical systems and changes (physical and chemical) they undergo.
Have basic understanding of different reactions. CHEM 20 - Use chemical terminology to name inorganic chemical compounds, formulas and reactions and classify types of chemical reactions. Perform stoichiometric calculations involving chemical reactions. CHEM 1A - The student will be more proficient in a. the use of scientific terminology. b. the naming and writing of chemical formulas for inorganic compounds: binary nonmetal compounds, salts, acids and bases. c. writing and classifying chemical equations for elementary chemical reactions. d. performing stoichiometric calculations involving chemical reactions. CHEM 21A - Identify different types of chemical reactions (combination, decomposition, double and single replacement, and combustion). Predict products and write balanced chemical equations representing these reactions. CHEM 4 - Differentiate between five reaction types: combination, decomposition, single replacement, double replacement, and complete oxidation. Given a set of reactants, diagnose the reaction type and predict the products. CHEM 4H - Differentiate between five reactions types: combination, decomposition, single replacement, double replacement, and complete oxidation. Given a set of reactants, diagnose the reaction type and predict the products.
Have knowledge of pH. CHEM 20 - Compare and contrast Arrhenius and Bronsted-Lowry acid theories. Write acid-base reactions and determine the pH of aqueous solutions. Demonstrate an understanding of how a buffer works. CHEM 1A - Acids and bases: The student will a. compare and contrast acid-base theories b. predict acid strengths based on structure. c. write and classify acid-base reactions. CHEM 21A - Solve introductory level quantitative problems applied to chemical systems by using dimensional analysis and algebra. These problems include unit conversions, stoichiometry, gas laws, solution concentrations, and pH.CHEM 4H -

Solve problems and express answers in scientific and decimal notation with correct units and significant figures. Use logarithms to convert among pH, pOH, $[H^+]$, and $[OH^-]$.
CHEM 4 -
Solve problems and express answers in scientific and decimal notation with correct units and significant figures. Use logarithms to convert among pH, pOH, $[H^+]$, and $[OH^-]$.

Have basic understanding of different types of bonds. CHEM 1A -
Structure: The student will
a. provide a historical picture of the development of atomic theory.
b. be able to state the fundamentals of quantum theory; assign quantum numbers and construct orbital diagrams.
c. predict and explain periodic trends of elements in terms of electronic configurations.
d. describe and illustrate the structure and bonding of molecules by constructing Lewis structures, sketching and labeling the molecular geometries of a molecule, describing the hybridization of the atoms involved, and determining polarity.
e. predict and explain properties of molecules in terms of structure and bonding.
f. predict and explain properties of conductors, semiconductors and insulators in terms of structure and bonding.
CHEM 20 -
Use atomic theories to interpret the structure of an atom. Predict and explain periodic trends based on atomic structure and the periodic table. Describe and illustrate the structure and bonding for molecules using Lewis structures, molecular geometry and polarity.
CHEM 4H -
Compare and contrast ionic and covalent compounds. Evaluate bonding based on the chemical formula, and then correlate compound properties with the structure and types of bonding present.
CHEM 4 -
Compare and contrast ionic and covalent compounds. Evaluate bonding based on the chemical formula, and then correlate compound properties with the structure and types of bonding present.
CHEM 21A - Explain the difference between ionic and covalent bonding and write Lewis structures for molecules and polyatomic ions.

Biology: Demonstrate the proper use of the microscope. ANAT 30 -
Demonstrate proper use of the microscope.
ANAT 32 -
Demonstrate the proper use of the microscope and identify specimens.
APHY 34A -
Demonstrate mastery of the microscope and be able to identify the cellular structures and tissues for all the systems covered.
BIOL 10H -
Describe the anatomy of cells and relate cellular structures to their functions.
BIOL 10 - Describe the anatomy of cells and relate cellular structures to their functions.

Have knowledge of homeostatic pathways. BIOL 10H -
Describe the biochemical pathways involved in photosynthesis and cellular respiration.
BIOL 10 - Describe the biochemical pathways involved in photosynthesis and cellular respiration.PHYO 31 -
Compare and contrast the methods whereby the body maintains homeostasis.
APHY 34A -
Explain how the systems work together as a whole, and methods whereby the body maintains homeostasis.
ANAT 30 -
Demonstrate an understanding of the physiology of each system and how each system interacts to maintain homeostasis.

Have basic understanding of cellular structures and their functions. APHY 34A -
Demonstrate mastery of the microscope and be able to identify the cellular structures and tissues for all the systems covered.
ANAT 30 -
Identify cellular structures, organelles and tissue types for all human systems.
ANAT 32 -
Identify cellular structures, organelles, and tissue types for all human organ systems.

BIOL 10 - Describe the anatomy of cells and relate cellular structures to their functions.BIOL 10H - Describe the anatomy of cells and relate cellular structures to their functions.
Have basic understanding of cellular reproduction. ANAT 30 - Identify all major anatomical structures for each major system, including integumentary, skeletal, muscular, nervous, special senses, endocrine, digestive, cardiovascular, respiratory, urinary and reproductive systems. ANAT 32 - Identify the major anatomical structures for the major organ systems of the human body including integumentary, musculoskeletal, nervous, endocrine, digestive, circulatory, respiratory, urinary, and reproductive systems. BIOL 10 - Identify and describe the phases of mitosis and meiosis.BIOL 10H - Identify and describe the phases of mitosis and meiosis.

C. Recommended Preparations (Course and Non-Course)

Recommended Preparation	Category and Justification

D. Recommended Skills

Recommended Skills

E. Enrollment Limitations

Enrollment Limitations and Category	Enrollment Limitations Impact

Course created by G. E. Thompson on 01/01/1971.

BOARD APPROVAL DATE:

LAST BOARD APPROVAL DATE: 07/18/2016

Last Reviewed and/or Revised by Thanh-Thuy Bui on 02/11/2016

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