BIOL G210: GENERAL MICROBIOLOGY

Item	Value
Curriculum Committee Approval Date	11/02/2021
Top Code	040300 - MicroBiology
Units	5 Total Units
Hours	162 Total Hours (Lecture Hours 54; Lab Hours 108)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	Yes
Basic Skills	Not Basic Skills (N)
Repeatable	No
Open Entry/Open Exit	No
Grading Policy	Standard Letter (S)
Local General Education (GE)	• Area 5 Natural Sciences (GB1)
California General Education Transfer Curriculum (Cal-GETC)	• Cal-GETC 5B Biological Sciences (5B) • Cal-GETC 5C Laboratory Activity (5C)
Intersegmental General Education Transfer Curriculum (IGETC)	• IGETC 5B Biological Sciences (5B) • IGETC 5C Laboratory Activity (5C)
California State University General Education Breadth (CSU GE-Breadth)	• CSU B2 Life Science (B2) • CSU B3 Laboratory Activity (B3)

Course Description

This course discusses major concepts of general microbiology, including prokaryotic and eukaryotic cell types, structural organization of cells, cellular metabolism, regulation of metabolism, genetics, host-parasite relationships, microorganisms in human health and disease, immunology and serology, recombinant DNA technology, growth of microbial cells, and controlling growth by chemical and physical means. Bacteria, fungi, algae, protozoa, and viruses are studied. Laboratory skills include microscopy, staining techniques cultivation techniques, and aseptic techniques. PREREQUISITE: BIOL G100 or BIOL G180 or BIOL G220 or BIOL G225. ADVISORY: Eligible for college level English and Math. Transfer Credit: CSU; UC.

Course Level Student Learning Outcome(s)

1. Course Outcomes
2. Use aseptic technique in laboratory manipulations using microorganisms.
3. Separate mixed cultures of bacteria through specific techniques.
4. Identify unknown microorganisms through specific techniques.
5. Describe the role of microorganisms related to public health and disease.

Course Objectives

- 1. Differentiate between eukaryotic and prokaryotic cell structures.
- 2. Discuss various physical and chemical methods of control.
- 3. Describe the general life cycles of bacteria, fungi, protozoa, and viruses.
- 4. Describe characteristics of the innate versus the adaptive immune system.
- 5. List the correct steps to focus a slide underneath the microscope.

Lecture Content

Introduction to Microbiology Role of Microorganisms Types of Microorganisms Prokaryotes Bacteria Archaea Eukaryotes Fungi Algae Protozoa Helminths Acellular Forms Viruses Viroids Prions Classification of Lifeforms Five Kingdom System Three Domain System History and Prominent Figures of Microbiology The Microscope Spontaneous Generation vs. Biogenesis Golden Age of Microbiology Germ Theory of Disease Vaccination Chemotherapy Chemistry Review Structure of Atoms Isotopes and Ions Chemical Bonds Ionic Covalent Hydrogen Chemical Reactions Synthesis Decomposition Exchange Water pH Acids Bases Salts Biomolecules Carbohydrates Lipids Proteins Nucleic Acids Functional Anatomy of Prokaryotes and Eukaryotes Prokaryotes External appendages Glycocalyx Flagella Axial Filaments Fimbriae Pili Cell wall Gram Positive Gram Negative Plasma membrane Internal structures Cytoplasm Nucleoid Ribosomes Plasmids Inclusions Endospores Eukaryotes External appendages Flagella Cilia Cell wall Plasma membrane Internal structures Ribosomes Nucleus Endoplasmic Reticulum Golgi Complex Lysosomes Mitochondria Chloroplasts Peroxisomes Microbial Metabolism Metabolism Anabolism Catabolism Enzymes Structure Function Types Simple Holoenzymes Inducible Constitutive Endoenzymes Exoenzymes Classifications Factors Influencing Activity Energy Production ATP Carbohydrate Catabolism Aerobic Respiration Glycolysis Transition Reaction Krebs Cycle Electron Transport Chain Anaerobic Respiration Fermentation Lactic acid Alcohol Microbial Growth Physical Requirements Temperature pH Osmotic Pressure Chemical Requirements Carbon Nitrogen Sulfur Phosphorus Trace elements Organic growth factors Oxygen Classification Culturing Microbes Media Anaerobic Growth Methods Bacterial Growth Curve Unusual Bacteria Chlamydiae Rickettsia Measurement of Growth Control of Microbial Growth Physical Methods of Control Heat Cold Filtration Desiccation Radiation Chemical Methods of Control Phenol and Phenolics Biguanides Aldehydes Ethylene oxide Halogens Alcohols Heavy metals Peroxide s Surface-active agents Antimicrobial Drugs Modes of Actions Inhibition of Cell Wall Synthesis Inhibition of Protein Synthesis Injury to the Plasma Membrane Inhibition of Nucleic Acid Synthesis Inhibition of Synthesis of Essential Metabolites Drug examples for each mode of action Microbial Genetics Structure of Genetic Material DNA RNA DNA Replication Protein Synthesis Transcription Translation Operons DNA Transfer Conjugation Transformation Transduction Mutations Substitution Insertion Deletion Genetic Engineering Recombinant DNA Procedures Gene Silencing Fungi General Characteristics Types Yeast Mold Structures General Life Cycles Mycoses Superficial Cutaneous Subcutaneous Systemic Opportunistic Protozoa General Characteristics Structures General Life Cycles Cyst Trophozoite Classification Sarcomastigophora Sarcodina Mastigophora Ciliophora Apicomplexa Viruses General Characteristics Structures Cultivation of Viruses General Life Cycles Lytic Lysogenic Types Principles of Disease Types of Disease Occurrence of Diseases Severity/Duration of Diseas es Pattern of Infection Incubation Period Prodromal Period Period of Illness Period of Decline Period of Convalescence Disease examples either

by: Body Systems Approach Organismal Approach Immunology Innate Immunity First Line of Defense Skin Mucous Membranes Body Secretions Second Line of Defense Phagocytes Inflammation Fever Antimicrobial Substances Adaptive Immunity Third Line of Defense B cell Response T cell Response Antibodies Structure Function Classes Active vs. Passive Immunity Artificial vs. Natural Immunity Vaccines

Lab Content

Lab Safety Aseptic Technique Handwashing Experiments Soaps Hand Sanitizers Dental Caries Experiment Snyder Agar Environmental Culture Sampling Microscopy Parts of the Microscope Focusing Slides Staining Smear Prep Direct Stain Negative Stain Differential Stains Gram Stain Acid-Fast Stain Endospore Stain Capsule Stain Isolation Methods Quadrant Streak Plate Standard Plate Count (Pour Plate) Motility Wet Mount Hanging Drop Semi-Solid Agar Culturing Anaerobes Anaerobic Jar Candle Jar Reducing Medium Culture Environments Temperature pH Osmotic Pressure Physical Methods of Control Heat Ultraviolet Light Chemical Methods of Control Disk Diffusion with Disinfectants Kirby-Bauer Test Fungi Tape Mount Microscopic Identification Biochemical Tests for Identifying Bacteria Selective Media PEA MSA EMB MAC BAP Starch Agar Catalase Test Oxidase Test Sugar Fermentation Test IMViC Tests ONPG Test Kligler Iron Agar Test Gelatin Hydrolysis Test Lysine Decarboxylase Test Nitrate Reduction Test Staph Tests Coagulase Test Bacitracin Susceptibility Test Novobiocin Susceptibility Test Nasal Culture Strep Tests BHI+6.5% NaCl Tes t Bile Esculin test SXT Susceptibility Test Bacitracin Susceptibility Test CAMP Test Throat Culture Bacteriophage Cultivation Enumeration Transformation Protozoa Microscopic Identification Blood Blood Smear Differential Counts Blood Typing Unknown Organism Identification

Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)
- DE Online Lecture (02X)
- Lab (04)
- DE Live Online Lab (04S)
- DE Online Lab (04X)

Reading Assignments

Textbook assignments Laboratory manual assignments and reports

Writing Assignments

1. Examinations and quizzes are short answer and essay format. 2. A project is to be completed and then reported in writing, and in an oral presentation to the class. 3. Laboratory work involves the identification of the species name of a bacterium by conducting suitable laboratory tests. 4. Record-keeping of laboratory work in the students lab manual is evaluated for completeness and accuracy. 5. Purify and separate mixed cultures of bacteria.

Out-of-class Assignments

Readings in journal articles and magazines of current publication selected for their up-to-date information on course topics.

Demonstration of Critical Thinking

1. The process of testing, analyzing results, and identifying an unknown bacterial species employs laboratory skills and reasoning skills to identify the bacterium. 2. Correctly using laboratory test procedures and equipment to complete lab assignments utilizes reasoning skills and physical skills. 3. Students will be provided with a variety of clinical scenarios with different signs and symptoms. Based on the information provided, they will need to decide an approriate course of action and likely identification of the microorganism causing the disease.

Required Writing, Problem Solving, Skills Demonstration

1. Examinations and quizzes are short answer and essay format. 2. A project is to be completed and then reported in writing, and in an oral presentation to the class. 3. Laboratory work involves the identification of the species name of a bacterium by conducting suitable laboratory tests. 4. Record-keeping of laboratory work in the students lab manual is evaluated for completeness and accuracy. 5. Purify and separate mixed cultures of bacteria.

Eligible Disciplines

Biological sciences: Master's degree in any biological science OR bachelor's degree in any biological science AND master's degree in biochemistry, biophysics, or marine science OR the equivalent. Master's degree required.

Textbooks Resources

1. Required Kelly, D.E.. General Microbiology Lab Manual, 8th ed. ., 2021 2. Required Talaro, K.. Foundations in Microbiology, 10th ed. ., 2018 3. Required Tortora, Funke and Case. Microbiology, An Introduction, 13th ed. ., 2019

Other Resources

1. Instructor prepared materials.