Modesto Junior College
Course Outline of Record
MICRO 101

I. OVERVIEW
The following information will appear in the 2010 - 2011 catalog

MICRO 101 Microbiology 4 Units
Prerequisite: Satisfactory completion of BIO 116 or BIO 101 or BIO 111 and CHEM 143.

Includes the study of microbial metabolism, genetics, and varieties; immunity, infections, and antimicrobials. Intended mainly for student entering the health professions.
Field trips might be required. (A-F or P/NP - Student choice) Lecture /Lab
Transfer: (CSU, UC) General Education: (MJC-GE: A ) (CSU-GE: B2, B3 ) (IGETC: 5B )

II. LEARNING CONTEXT
Given the following learning context, the student who satisfactorily completes this course should be able to achieve the goals specified in Section III, Desired Learning:

A. COURSE CONTENT

1. Required Content:
   a. The Chemistry of Life
      i. Inorganic Basics
      ii. Organic Basis of Life
   b. Basic Concepts in Microbiology
      i. History of Microbiology
      ii. Scope of Microbiology
   c. Visualizing Microorganisms
      i. Microscopy
      ii. Staining Techniques
   d. Anatomy of Bacteria
      i. Procaryotic Cells
      ii. Eucaryotic Cells
   e. Bacterial Metabolism
      i. Enzymes
      ii. Anaerobic Metabolism
      iii. Aerobic Metabolism
iv. Anabolism

f. Bacterial Growth
   i. Growth and the Factors Affecting Growth
   ii. Culturing and Counting Bacteria

g. Bacterial Genetics
   i. DNA Structure and Replication
   ii. Protein Synthesis
   iii. Regulating Metabolism
   iv. Mutations and Their Repair; Ames Test

h. Gene Transfer and Manipulation
   i. Transformation, Transduction, and Conjugation
   ii. Plasmids and Transposons
   iii. Genetic Engineering

i. The Varieties of Microorganisms
   i. Classification Systems
   ii. Taxonomy
   iii. The 5 Kingdom System
   iv. The 3 Domain System

j. Virus Classification
   i. Bacterial Taxonomy and Nomenclature

k. Viruses, Viroids, Prions
   i. Characteristics and Classification
   ii. Viral Replication
   iii. Viruses and Cancer

l. Eucaryotic Parasites
   i. Protista
   ii. Fungi
   iii. Helminths
   iv. Arthropods
m. Killing/Inhibiting Microorganisms
   i. Chemical Antimicrobial Agents
   ii. Physical Antimicrobial Agents

n. Antimicrobials
   i. General Properties
   ii. Culture and Sensitivity of Bacteria
   iii. Antimicrobial Agents and their Actions

o. The Normal Microbiota and Pathogenicity
   i. Symbiotic Relationships
   ii. Koch's Postulates
   iii. Types of Diseases
   iv. The Disease Process

p. Epidemiology/Nosocomial Diseases

q. Nonspecific Host Defenses
   i. Physical Barriers to Infection
   ii. Cellular Defenses
   iii. Inflammation, Fever, Interferon, and Complement

r. Immune System
   i. Types of Immunity
   ii. Antibodies and Antigens
   iii. Humoral Immunity
   iv. Cellular Immunity
   v. Immunizations

s. Immune Mistakes and Tests
   i. Types of Hypersensitivity
      a. Immediate
      b. Cytotoxic
      c. Immune Complex
      d. Cell-Mediated
ii. Autoimmune Disorders
iii. Immune Deficiencies
iv. Immunological Tests

t. Skin and Eye Infections
   i. Anatomical Defenses
   ii. Skin Infections
   iii. Eye Infections
   iv. Bite and Wound Infections

u. Respiratory System Infections
   i. Respiratory System Components
   ii. Upper Respiratory Tract Infections
   iii. Lower Respiratory Tract Infections

v. Digestive System Infections
   i. Digestive System Components
   ii. Oral Cavity Infections
   iii. Lower Digestive System Infections

w. Cardiovascular/Lymphatic Infections
   i. Cardiovascular System Components
   ii. Cardiovascular System Infections
   iii. Systemic Infections

x. Nervous System Infections
   i. Nervous System Components
   ii. Nervous System Infections

y. Urogenital Infections
   i. Urogenital System Components
   ii. Non-sexually Transmitted Urogenital Infections
   iii. Sexually Transmitted Urogenital Infections

a`. Environmental Microbiology
   i. Water and Mineral Cycles
2. **Required Lab Content:**

   a. Learn Microbiology Lab Techniques
      i. Gram staining

      (There will be more lab goals added when we submit this class for the regular review)

B. **ENROLLMENT RESTRICTIONS**

1. **Prerequisites**

   Satisfactory completion of BIO 116 or BIO 101 or BIO 111 and CHEM 143.

2. **Requisite Skills**

   *Before entering the course, the student will be able to:*

   a. Apply the principles of dimensional analysis to unit conversions.

   b. Differentiate between physical and chemical properties and changes.

   c. Define subatomic particles, cations, anions and isotopes.

   d. Identify atomic number and mass of an element on the periodic table.

   e. Apply Avogadro’s number to mole and mass measurements.

   f. Calculate molar mass.

   g. Write balanced chemical equations and identify types of equations.

   h. Use molar ratios to calculate moles (or mass) of chemicals consumed or produced as well as percent yield taking into account limiting reagents.

   i. Differentiate between ionic, covalent and polar covalent bonds.

   j. Describe and identify intermolecular bonding.

   k. Predict the effect of changing pressure, volume, temperature or number of moles on a gaseous system holding one or more of these variables constant.

   l. Calculate an unknown variable in a gas law.

   m. Define vapor pressure, surface tension and boiling point of surfaces.

   n. Calculate mass percent, mass/volume percent and volume percent of a solution.

   o. Differentiate between strong and weak acids; strong and weak bases.

   p. Calculate pH and (H+).

   q. Identify oxidized and reduced elements in a single replacement reaction.

   r. Identify families of organic compounds.

   s. Explain the fundamental principles and generalizations of biology.

   t. Use the scientific method in problem solving.
u. Describe chemical and physical reactions as they relate to biology.

v. Use binocular dissecting and compound microscopes.

w. Make a scientific drawing and correctly label the drawing including the appropriate scale of the object drawn.

x. Explain the hierarchical structure and function of organisms and communities from the atom to the biosphere.

y. Diagram various common types of inheritance.

a`. Relate cell structures to their cell functions.

aa. Identify and locate the ten organ systems of the human body.

ab. Define the overall function of each organ system.

C. **HOURS AND UNITS**

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<thead>
<tr>
<th>INST METHOD</th>
<th>TERM HOURS</th>
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<td>3.00</td>
</tr>
<tr>
<td>Lab</td>
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D. **METHODS OF INSTRUCTION (TYPICAL)**

Instructors of the course might conduct the course using the following method:

1. Subject material will be presented through class lecture and reaffirmed in laboratory experiences.

2. Photographic slides, microscope slides, films, living and preserved specimens as well as handouts will be used to supplement lecture material.

3. Case studies and collaborative learning experiences.

4. Field trip to a medical laboratory.

5. Computer projection and other technological presentations.

6. Write up and evaluate standard laboratory experiments.

7. Analyze and derive conclusions from provided experimental data.

8. Design, execute, and analyze an independent experiment.

9. Identify an unknown bacterium.

10. Analyze case studies.

E. **ASSIGNMENTS (TYPICAL)**

1. **EVIDENCE OF APPROPRIATE WORKLOAD FOR COURSE UNITS**

   *Time spent on coursework in addition to hours of instruction (lecture hours)*

   a. Writing research paper.

   b. Cell activity - correctly draw, label and describe the differences between a prokaryotic and eukaryotic cell. Once per semester.
c. One or two case studies per semester.

d. Weekly text reading.

2. **EVIDENCE OF CRITICAL THINKING**  
   *Assignments require the appropriate level of critical thinking*

   Example of Lecture Question  
   1. Compare and contrast mutualism, commensalism, and parasitism.

   Example of Lab Question  
   1. On a gram staining slide, you observed both purple cocci and pink rods. What do you conclude and why?

F. **TEXTS AND OTHER READINGS (TYPICAL)**


   2. **Other:** Protective eyewear will be available for use during experiments.

III. **DESIRED LEARNING**

A. **COURSE GOAL**  
   *As a result of satisfactory completion of this course, the student should be prepared to:*

   name and describe members of the principle groups of microbes such as viruses, bacteria, protozoan parasites and fungi. Students shall describe how microbes are detected, identified, characterized and killed and explain the importance and mechanisms of bacterial regulation of gene expression, mutation and DNA exchange.

B. **STUDENT LEARNING GOALS**  
   *Mastery of the following learning goals will enable the student to achieve the overall course goal.*

   1. **Required Learning Goals**  
      *Upon satisfactory completion of this course, the student will be able to:*

      a. demonstrate skills using aseptic techniques.

      b. use laboratory procedures and equipment for the isolation, culture and identification of microorganisms including an unknown bacterium.

      c. identify sources of contamination in the laboratory and the environment, and utilize appropriate disinfection methods.

      d. utilize the scientific method to answer a microbiological question.

      e. insert foreign DNA into bacteria in the laboratory.

      f. analyze the interaction of discoveries that led to the germ theory of disease.

      g. compare and contrast the characteristics of microorganisms.

      h. compare and contrast procaryotic and eucaryotic cells, and indicate how their differences may be used in treating infections.

      i. outline the processes involved when microorganisms utilize energy sources to produce ATP, both in the absence and presence of oxygen.

      j. list physical and chemical factors needed for microbial growth, then explain how such factors...
relate to the control of microorganisms.

k. explain the principles of sterilization, the use of disinfectants and antibiotics, and other methods used in the control of microorganisms from both clinical and public health standpoints.

l. discuss examples of human dependence on microorganisms, in several human cultures.*

m. analyze host microorganism’s interactions in symbiotic relationships.

n. distinguish between pathogenic and beneficial microorganisms.

o. access the public health measures employed in our society, and contrast these with public health practices in other countries.*

p. outline the basic processes involved in genetic engineering of microorganisms, and give examples of how genetic engineering impacts our lives.

q. correlate specific microorganisms with treatment and prophylactic measures.

r. determine a probable cause of an infection when presented with a case study or vignette.

s. analyze the interactions between cells of the immune system and relate these interactions to vaccination.

t. explain how derangement of one’s immune processes may result in autoimmune disease or cancer.

u. describe the etiologic agent, pathogenesis, treatment, and prevention of important infectious diseases of human body systems.

v. compare and contrast the processing of drinking water and sewage, and indicate their importance in public health.

w. identify microorganisms and biochemical processes used in food production and related industries.

2. Lab Learning Goals

Upon satisfactory completion of the lab portion of this course, the student will be able to:

a. correctly carry out a gram stain procedure and streak plate technique.

(There will be more lab goals added when we submit this class for the regular review cycle. We are just trying to change prerequisites now.)

IV. METHODS OF ASSESSMENT (TYPICAL)

A. FORMATIVE ASSESSMENT

1. Concept questions at the end of each lab.

2. Quizzes

B. SUMMATIVE ASSESSMENT

1. Case studies

2. Identifying an unknown bacterium

3. Midterm comprehensive
4. Final comprehensive exam