STATE UNIVERSITY OF NEW YORK
COLLEGE OF TECHNOLOGY
CANTON, NEW YORK

COURSE OUTLINE

BIOL 209 - MICROBIOLOGY

PREPARED BY: William P. Rivers

SCHOOL OF SCIENCE, HEALTH, AND PROFESSIONAL STUDIES
SCIENCE DEPARTMENT
April 2015

BIOL 209 - MICROBIOLOGY

A. **TITLE:** Microbiology

B. **COURSE NUMBER:** BIOL 209

C. **CREDIT HOURS:** 4

D. **WRITING INTENSIVE COURSE (OPTIONAL):** No

E. **COURSE LENGTH:** 15 weeks

F. **SEMESTER(S) OFFERED:** Fall, Spring, Summer

G. **HOURS OF LECTURE , LABORATORY, RECITATION, TUTORIAL, ACTIVITY:** Three 50 minute lectures per week, one two-hour laboratory per week

H. **CATALOG DESCRIPTION:**
A study of the basic characteristics of microbes, with an emphasis on disease-causing organisms. The course includes morphology, growth, physiology, and control. Laboratory techniques including microscopy, staining, aseptic techniques, culture media, isolation, and identification of microbes.

I. **PRE-REQUISITES**: Introduction to Biology (BIOL 101) or Introduction to Human Biology (BIOL 102), College Biology I (BIOL 150) or Human Anatomy (BIOL 207), or permission of the instructor.

J. **GOALS (STUDENT LEARNING OUTCOMES):**

By the end of this course, the student will:

Course Objective	*Institutional SLO*
1. Describe the types of microbes and their basic characteristics, the history of their discovery, and techniques used to study them.	3.Professional competence
2. Demonstrate understanding of bacteria morphology, physiology and requirements for growth.	3.Professional competence
3. Describe prokaryote reproduction, DNA replication, transcription, translation, gene expression, methods for controlling bacterial growth, and techniques used in biotechnology.	2.Critical thinking 3.Professional competence
4. Differentiate between the major phyla of microbes, their evolution, the diseases they cause, and the methods used to identify them.	2.Critical thinking

5. Define and give examples of the major branches of epidemiology, pathogenicity of microbes, and the action of antimicrobial agents.	3.Professional competence
6. Apply the scientific method to laboratory exercises involving microbial culture methods; demonstrate aseptic technique; correctly identify Gram-stained bacteria and mold cultures.	2.Critical thinking 3.Professional competence

K. TEXTS:

Microbiology: An Introduction, Tortora, Funke, Case, 11th Edition, Benjamin Cummings, ISBN 978-0-321-73360-3

Lab Manual: *Laboratory Exercises in Microbiology*, by Michael M. Peebles and William P. Rivers ISBN 1-61731-400-5

L. REFERENCES: Texts in library, office, and laboratory

M. EQUIPMENT: Supplied

N. GRADING METHOD: A - F, per college policy, using the + system

O. MEASUREMENT CRITERIA/METHODS:

Lecture 50% Final 20%
Laboratory 30%

I. Laboratory reports
II. Laboratory practicums
III. Quizzes
IV. Written exams
V. Comprehensive final

P. GENERAL TOPICAL OUTLINE:

I. Introduction to Microbiology

II. Characteristics of Bacteria

III. Microorganisms Other Than Bacteria

IV. Control of Microorganisms

V. Microorganisms and Disease

VI. Microbiology and Public Health

Q. DETAILED TOPICAL OUTLINE:

I. Introduction to Microbiology

A. The Scope of Microbiology
1. Microbiology and Biology
2. The Place of Microorganisms in the Living World
3. Groups of Microorganisms
4. Distribution of Microorganisms in Nature
5. Applied Areas of Microbiology

B. The Evolution of Microbiology
1. The Microscope
2. Spontaneous Generation vs. Biogenesis
3. Germ Theory of Disease
4. Pure-Culture Concept
5. Immunization
6. Microbiology and Society

C. Characteristics and Classification of Microorganisms
1. Major Characteristics of Microbes
2. Microbial Taxonomy, Nomenclature, and Classification

D. Microscopic Observations of Microorganisms
1. Microscopes and Microscopy
2. Preparations for Light-Microscopic Examination

II. Characteristics of Bacteria

A. Morphology of Bacteria
1. Size, Shape, and Arrangement of Bacterial Cells
2. Bacterial Structures
3. Structures External to the Cell Wall
4. The Cell Wall
5. Structures Internal to the Cell Wall
6. Endospores

B. The Cultivation of Bacteria
    1. Nutritional Requirements
    2. Nutritional Types of Bacteria
    3. Bacteriological Media
    4. Physical Conditions Required for Growth
    5. Choice of Media and Conditions of Incubation

C. Reproduction and Growth
    1. Reproduction - Cell Division
    2. Growth - Growth Curve
    3. Quantitative Measurement of Bacterial Growth

D. Pure Cultures and Cultural Characteristics
    1. Natural Microbial Populations
    2. Pure Cultures
    3. Maintenance and Preservation of Pure Cultures
    4. Cultural Characteristics

E. Bacterial Enzymes

F. Microbial Genetics

G. Bacterial Nomenclature and Taxonomy

III. Microorganisms Other Than Bacteria

A. Fungi: Molds
    1. Importance of Fungi
    2. Distinguishing Characteristics
    3. Physiology and Nutrition of Molds
    4. Cultivation
    5. Morphological Examination
    6. Some Molds of Microbiological Interest

B. Fungi: The Yeasts
    1. Yeasts and Humans
    2. Ecology of Yeasts
    3. Morphology
    4. Cultural Characteristics
    5. Reproduction

C. Algae
    1. Occurrence
    2. Characteristics

3. Economic Importance

D. Protozoa
   1. Ecology
   2. Significance

E. Viruses: General Characteristics
   1. History
   2. Classification and Characteristics
   3. Replication
   4. Isolation and Identification
   5. Cultivation
   6. Bacterial Viruses
   7. Animal Viruses

IV. Control of Microorganisms

A. Fundamentals of Control
   1. Importance of Control
   2. Terms
   3. Patterns (and Rate) of Bacterial Death
   4. Conditions Influencing Antimicrobial Action
   5. Mode of Action of Antimicrobial Agents

B. Control by Physical Agents
   1. Temperature
   2. High and Low Temperature
   3. Desiccation
   4. Osmotic Pressure
   5. Radiations
   6. Other Physical Forces

C. Control by Chemical Agents
   1. Characteristics of an Ideal Disinfectant
   2. Selection of Antimicrobial Chemical Agents
   3. Major Groups of Chemical Antimicrobial Agents
   4. Evaluation of Disinfectants and Antiseptics

D. Antibiotics and Other Chemotherapeutic Agents
   1. History
   2. Types
   3. Mode of Action
   4. Resistance to Antibiotics

5. Microbial Susceptibility
6. Non-Medical Uses of Antibiotics

V. Microorganisms and Disease

A. Host-Microbe Interactions
1. Pathogenicity and Virulence
2. Virulence Factors
3. Normal Flora of the Human Host
4. Factors Influencing Infection

B. Resistance and Immunity
1. Natural Resistance
2. Internal Defense Mechanisms
3. Immune Responses

C. Airborne Infections
1. Control of Respiratory Diseases
2. Diphtheria
3. Hemolytic Streptococcal Infections
4. Scarlet Fever
5. Tuberculosis
6. Pneumonia
7. Viral Respiratory Diseases

D. Food and Waterborne Human Infections
1. Carriers
2. Salmonellosis
3. Typhoid Fever
4. Brucellosis
5. Botulism
6. *Staphylococcus aureus*
7. Amebiasis

E. Human Contact Diseases
1. Sexually Transmitted Diseases
2. Diseases Contracted Through Wounds or Abrasions
3. Diseases Transmitted by Arthropods

VI. Microbiology and Public Health

A. Microbiology of Domestic Water
1. Water Purification
2. Determining Sanitary Quality

3. Swimming Pools

B. Microbiology of Sewage
   1. Treatment and Disposal
   2. The Pollution Problem

S. LABORATORY OUTLINE:

Lab No.	Experiment Number and Title
1	Laboratory Techniques and Regulations Ex. 1 - The Use of the Microscope
2	Ex. 2 and 3 - Microorganisms in the Environment and Microscopic Examination of Microorganisms
3	Ex. 4 - The Simple Stain
4	Ex. 5 - The Gram Stain
5	Ex. 6 - Negative Stain and Gram Stain Unknowns (Lab Practicum)
6	Ex. 7 and 8 - The Acid-Fast Stain and the Spore Stain
7	Ex. 10 - Bactericidal Effect of Ultraviolet Radiations and Ex. 9 - Selective, Differential, and Enriched Media and Demonstration on Media Preparation
8	Ex. 11 and 12 - The Streak-Plate Method for Isolation of Pure Cultures and the Pour-Plate Method for Isolation of Pure Cultures
9	Ex. 13 - Anaerobic Culture Methods and Gram Stains from Previous Exercises
10	Ex. 14, 15, 16 - Hydrolysis of Polysaccharide, Protein, and Lipid, Fermentation of Carbohydrates and Hydrogen Sulfide Production. Bring in Antimicrobial Chemical Agents for next lab.
11	Ex. 19 and 20 - Comparative Evaluation of Antimicrobial Chemical Agents and Antibiotics
12	Ex. 21 and 22 - Bacterial Agglutination Tests (slide test) and Coagulase Test

13	Ex. 17 and 18 - Morphological and Cultural Characteristics of Molds and Morphology of Yeasts (Lab Practicum)
14	Continuation of Lab No. 13 - Mold and Yeast