Salem Community College Course Syllabus

Course Title: Principles of Microbiology

Course Code: BIO 211

Lecture Hours: 2
Laboratory Hours: 4
Credits: 4

Course Description:
This course explores the world of microorganisms, including bacteria, viruses, fungi, protistans and other microbes, and it discusses immunology. Emphasis is on the nature and behavior of these microorganisms and their interrelationship with the human body in health and disease. The principles of prevention and control of infectious diseases will be presented. Laboratory experience will develop techniques in the preparation, handling, identification, and control of a variety of microbial cultures. This is a state approved General Education Science course.

Prerequisite:
BIO 101 or BIO 220

Co-requisite:
None

Place in College Curriculum:
Requirement for Associate Degree nursing students and biology majors. A 4 credit science elective for any student.

Section II

Course Content Outline:

Unit I. Fundamentals of Microbiology

A. The Microbial World and You
B. Observing Microbes through the Microscope
C. Anatomy of Procaryotes and Eucaryotes
D. Microbial Metabolism
E. Microbial Growth
F. Control of Microbial Growth
G. Microbial Genetics

Unit II. Survey of Microbial World

A. Classification
B. Bacteria
C. Fungi, Algae, Protozoans and Other Parasites
D. Viruses

Unit III. Interaction between Microorganism and Host

A. Principles of Disease and Epidemiology
B. Mechanisms of Pathogenicity
C. Nonspecific Defense Mechanisms
D. The Immune Response
E. Applied Immunology
F. Immune System Disorders
G. Antimicrobial Drugs

Unit IV. Microbes and Human Disease

A. Microbial Diseases of the Skin and Eyes
B. Microbial Diseases of the Nervous System
C. Microbial Diseases of the Cardiovascular System
D. Microbial Diseases of the Respiratory System
E. Microbial Diseases of the Digestive System
F. Microbial Diseases of the Urogenital System

Section III

Course Performance Objectives: Course

Course Performance Objective #1:
Describe the role of microorganisms in nature; including their unique structure, metabolic processes, growth characteristics, treatments devised against them, and their inheritance patterns.

A. The Microbial World and You
Learning Outcomes:

1. Identify the microbiological contributions of: Van Leeuwenhoek, Hooke, Pasteur, Koch, Lister, Ehrlich, Fleming and Jenner
2. List major groups of organisms studied in microbiology

B. Microscopic Observation
Learning Outcomes:

1. Identify parts of the microscope
2. Explain how the EM works
3. Compare simple, differential and special stains
4. Describe Gram staining procedures

C. Anatomy of Prokaryotic and Eukaryotic Cells
Learning Outcomes:

1. Identify the 3 basic bacterial shapes and the bacterial cell arrangements
2. Differentiate cell walls of Prokaryotes and Eukaryotes
3. Define simple diffusion, osmosis, facilitated diffusion, and active transport
4. Describe structures external and internal to the cell wall/membrane

D. Microbial Metabolism
Learning Outcomes:

1. Define metabolism; differentiate between anabolism and catabolism
2. Describe enzymatic activity
3. Explain the kinds of phosphorylation reactions
4. Explain glycolysis
5. Explain Krebs's cycle and the electron transport chain
6. Categorize the various nutritional patterns among microorganisms
7. List 4 biosynthetic pathways of energy utilization

E. Microbial Growth
Learning Outcomes:

1. Define binary fission
2. List chemical and physical requirements for growth
3. Justify the use of:
   -selective and differential media
   -anaerobic techniques
   -living host cells
4. Describe the streak plate technique
5. Compare microbial growth phases and their relationship to generation time
6. Describe several direct and indirect measurements of microbial growth

F. Control of Microbial Growth

Learning Outcomes:

1. Define sterilization, disinfection, antisepsis, germicide, bacteriostasis, asepsis, & sanitization
2. Describe the physical and chemical methods of microbial control

G. Microbial Genetics

Learning Outcomes:

1. Describe how DNA serves as genetic information
2. Describe DNA replication
3. Define genetics, chromosomes, gene, genetic code, genotype, phenotype, mutagen and genetic recombination
4. Explain the regulation of gene expression in bacteria by induction, repression and attenuation
5. Classify the types of mutations
6. Compare and contrast transformation, transduction, and conjugation
7. Describe the function of transposons and plasmids

Course Performance Objective #2:

Distinguish among the various roles in nature and characteristics of each of the following microorganisms: bacteria, fungi, algae, protozoans, viruses, and other human parasites.

A. Classification of Microorganisms

Learning Outcomes:

1. Define taxonomy and binomial nomenclature
2. List and characterize the five kingdoms
3. Review Bergey's Manual
4. Describe several methods of classification and identification of microbes

B. Bacteria (Chapter 11)

Learning Outcomes:

1. List several characteristics used to classify and identify bacteria
2. Name major bacterial groups and their characteristics

C. Fungi, Algae, Protozoans, and Parasites

Learning Outcomes:

1. Differentiate between asexual and sexual reproduction
2. Characterize the Fungi as to their vegetative and reproductive structures and nutritional adaptations
3. Describe characteristics and give examples of members of the medically important phyla of fungi
4. Describe the roles of algae in nature
5. List the medically important protozoan phyla and give their differential characteristics
6. List the groups of parasitic helminths and give their differential characteristics
7. Define intermediate and definitive host and vector

D. Viruses

Learning Outcomes:

1. Describe the composition of a typical virus

2. List criteria used to classify viruses
3. Explain how viruses are cultured
4. Describe the lytic cycle of T-even bacteriophages
5. Compare and contrast the multiplication cycle of DNA and RNA animal viruses
6. Differentiate between slow and latent viral infections
7. List the effects (CPE) of animal virus infection on host cells
8. Explain what a tumor is. Differentiate between malignant and benign tumors

Course Performance Objective #3:
Describe the potential interactions between microorganisms and their hosts; including possible diseases, mechanisms of pathogenicity, specific and nonspecific host defenses and disorders associated with these responses, as well as drug treatments that target certain microorganisms.

A. Principles of Disease and Epidemiology
Learning Outcomes:

1. Define normal flora
2. Compare commensalism, mutualism & parasitism and give examples of each
3. List Koch's postulates
4. Define a reservoir of infection
5. Define nosocomial infections
6. Explain methods of disease transmission
7. Define epidemiology
8. Differentiate between communicable and noncommunicable disease
9. Identify predisposing factors for disease
10. Define pathogen, etiology, infection, host, disease, acute, chronic, subacute and latent phases of disease
11. Differentiate between morbidity and mortality
12. Describe the typical pattern of a disease

B. Mechanism of Pathogenicity
Learning Outcomes:

1. Define and list portals of entry and exit. Give examples of organisms that enter and leave the human body by these routes.
2. Define pathogenicity, virulence and LD_{50}
3. Explain how adherence, capsules, cell wall components, and enzymes contribute to pathogenicity
4. Compare the effects of hemolysins, leukocidins coagulase, kinases, hyaluronidase, and collagenases
5. Contrast the nature and effects of exotoxins and endotoxins
6. Outline the mechanisms of action of diphtherotoxin, botulism toxin, and tetanus toxin
7. Review CPE of viruses
8. Discuss the causes of symptoms in fungal infections.

C. Nonspecific Host Defenses
Learning Outcomes:

1. Define resistance and susceptibility
2. Define nonspecific resistance
3. Describe mechanical and chemical factors of the skin and mucous membranes

4. Define phagocytosis, classify phagocytic cells and describe the roles of WBC in the phagocytic process
5. Define and describe the stages of inflammation
6. Define and describe the roles of fever, interferon and complement in nonspecific host defense

D. Specific Host Defenses: The Immune System

Learning Outcomes:

1. Contrast the types of acquired immunity
2. Define immunity, antigen, anamnestic response, lumphokines, and monoclonal antibodies
3. Discuss antibodies
   -structure and chemical characteristics
   -five classes of Ig's and their functions
4. Compare and contrast humoral and cell mediated immunity
5. Differentiate among the types of T-cells

E. Disorders Associated with the Immune System

Learning Outcomes:

1. Define the types of hypersensitivity reactions
2. Describe anaphylaxis and contact dermatitis
3. Define hypersensitivity, histocompatibility, antigens, desensitization, HLA, and immunologic tolerance
4. Discuss the human blood groups and transfusions
5. Explain transplant rejection
6. Discuss the major immune deficiencies
7. Describe the origin of AIDS, its effect on the immune system, mode of transmission, stages and treatments

F. Antimicrobial Drugs

Learning Outcomes:

1. Define chemotherapeutic agent, distinguish between a synthetic drug and an antibiotic
2. List 5 mechanisms of action of antimicrobial agents
3. Explain the mechanisms of action of antiviral drugs
4. Explain the mechanisms of action of antifungal drugs
5. Explain the mechanism of action of antiprotozoan drugs
6. Describe tests for microbial susceptibility to chemotherapeutic agents
7. Describe mechanisms of drug resistance

Course Performance Objective #4:

Describe the cause and effect of microbial diseases involving the skin, eyes, nervous system, cardiovascular system, respiratory system, digestive system, and genitourinary system.

A. Microbial Diseases of the Skin and Eyes

Learning Outcomes:

1. Describe skin structure and susceptibility to pathogen invasion
2. List normal skin flora
3. List skin infections caused by staph and strep
4. List agent, transmission mode, and symptoms of acne, warts, smallpox, chickenpox, measles, rubella, cold sores

B. Microbial Diseases of the Nervous System

Learning Outcomes:

1. Briefly describe the anatomy of the brain and spinal cord
2. Know the causative agents of: meningitis, cryptococcosis, listeriosis, tetanus, botulism, poliomyelitis, rabies, encephalitis, leprosy, trypanosomiasis and slow viral diseases

C. Microbial Diseases of the Cardiovascular System

Learning Outcomes:

Briefly discuss the anatomy & physiology of the cardiovascular system

Identify the causative agents of puerperal sepsis, bacterial endocarditis, myocarditis, Burkett's lymphoma, rheumatic fever, infectious mononucleosis, tularemia, brucellosis, anthrax, gas gangrene, plague, relapsing fever, Lyme disease, typhus, yellow fever, dengue, toxoplasmosis, chagas disease, malaria and schistosomiasis

D. Microbial Diseases of the Respiratory System

Learning Outcomes:

1. Briefly describe the structure and function of the respiratory system
2. Identify how infections of the respiratory system are transmitted
3. Review the normal flora of the upper and lower respiratory systems
4. List the causative agents of the following: pharyngitis, scarlet fever, diphtheria, otitis media, common cold, pertussis, TB, sinusitis, pneumonia, psittacosis, Q fever, influenza, Legionellosis, histoplasmosis, coccidioidomycosis, blastomycosis and aspergillosis

E. Microbial Diseases of the Digestive System

Learning Outcomes:

1. Briefly discuss the structure and function of the digestive system
2. Describe the antimicrobial features of the GI tract
3. Discuss microbes that cause dental carries and periodontal disease
4. List the causative agent symptoms and suspect foods of
   - -staphylococcus enterotoxicosis
   - -salmonellosis
   - -typhoid fever
   - -bacillary dysentery (shigellosis)
   - -cholera
   - -gastroenteritis
5. List the etiologic agents of gastritis, mumps, CMV inclusion disease, hepatitis (A,B,C,D,& E), giardiasis, balantidiasis, ameobic dysentery, tapeworm and various nematode infestations

F. Microbial Diseases of the Genitourinary System

Learning Outcomes:

1. Briefly describe the structure and function of the urogenital system
5. Review the normal flora of the urinary and reproductive systems and their habitats
3. Describe the modes of transmission for urinary and reproductive system infections
4. Identify the etiologic agents of cystitis, pyelonephritis, glomerulonephritis, leptospirosis, gonorrhea, syphilis, LVG, vaginitis, genital herpes, warts, candidiasis, and trichomoniasis

Section IV

General Education Requirements:

Section V

Outcomes Assessment:
A college-wide outcomes assessment program has been put into place to enhance the quality and effectiveness of the curriculum and programs at Salem Community College. As part of this assessment program, the learning outcomes for this course will be assessed. Assessment methods may include tests, quizzes, papers, reports, projects and other instruments. Copies of all outcomes assessments are available in an electronic assessment bank maintained by the Institutional Research and Planning Office.

Section V

Course Activities:

Course Requirements and Means of Evaluation:
Please refer to the instructor's syllabus addendum (to be distributed in class) for specific information regarding the course requirements and means of evaluation.

Attendance Policy:
Regular and prompt attendance in all classes is expected of students. Students absent from class for any reason are responsible for making up any missed work. Faculty members establish an attendance policy for each course and it is the student's responsibility to honor and comply with that policy.

Academic Honesty Policy:
Students found to have committed an act of academic dishonesty may be subject to failure of this course, academic probation, and / or suspension from the college. See the Student Handbook for additional details.

ADA Statement:
If you have a 504 Accommodation Plan, please discuss it with your instructor. If you have any disability but have not documented it with the Disability Support coordinator at Salem Community college, you must do so to be eligible for accommodations. To contact the Disability Support Coordinator, call 856-351-2773, or email disabilitysupport@salemcc.edu to set up an appointment. To find out more information about disability support services at Salem Community College, visit www.salemcc.edu/students/student-success-programs/disability-support.

Section VII

Materials / Supplies*:* None.

Additional Costs: None.