SEWARD COUNTY COMMUNITY COLLEGE
COURSE SYLLABUS

I. TITLE OF COURSE: BI2705- Microbiology

II. COURSE DESCRIPTION: 5 credit hours
3 **credit hours of lecture and** 2 **credit hours of lab per week.**

An introduction to the study of bacteria, viruses, protozoa, fungi, and helminthes with focus on those responsible for human disease. Evolution is the unifying principle used to investigate the interaction of microbe, human, and the environment. General microbiological concepts such as microbial structure, growth, metabolism, genetics, and ecology are applied to such medically related topics as control and pathogenicity of microorganisms as well as to body defense mechanisms and the immune responses. The lab exercises stress basic clinical laboratory techniques such as staining, aseptic technique, and the biochemical and serological testing for microorganisms. Biotechnology applications are also utilized. Both laboratory and lecture relate core microbiological principles to the understanding of infectious disease.

EduKan course number: BI280

For each unit of credit, a minimum of three hours per week with one of the hours for class and two hours for studying/preparation outside of class is expected.

Pre-requisite: Successful completion of BI1305 - Principles of Biology, CH1505 - College Chemistry I, and MA1173 - College Algebra or higher is strongly recommended prior to enrollment in this course. Refer to placement matrix.

III. PROGRAM AND/OR DEPARTMENT MISSION STATEMENT:

The Science Program at Seward County Community College provides opportunities to improve and enhance each student's understanding and comprehension of the natural world through a variety of courses and experience to develop a scientifically literate citizen

IV. TEXTBOOK AND MATERIALS:

1. Microbiology from OpenStax, ISBN 1-947172-23-9
2. Student Laboratory Notebook, ISBN 1-55581-358-5.

V. SCCC OUTCOMES

Students who successfully complete this course will demonstrate the ability to do the following SCCC Outcomes.

1: Read with comprehension, be critical of what they read, and apply knowledge gained to real life
2: Communicate ideas clearly and proficiently in writing, appropriately adjusting content and arrangement for varying audiences, purposes, and situations.

5: Demonstrate the ability to think critically by gathering facts, generating insights, analyzing data, and evaluating information
6: Exhibit skills in information and technological literacy

9: Exhibit workplace skills that include respect for others, teamwork competence,

attendance/punctuality, decision making, conflict resolution, truthfulness/honesty, positive attitude, judgment, and responsibility

VI. COURSE OUTCOMES:

Expected learning outcomes of this course are in alignment with the learning objectives established by the Statewide Core Competencies. In order to successfully fulfill the general course outcomes and meet the course goals, the student should be able to:

1. Use the language and concepts of science appropriately and effectively in written and oral communication.
2. Use the methodologies and models of science to select, define, solve and evaluate problems independently and collaboratively.
3. Adequately design, conduct, communicate, and evaluate relatively basic but meaningful experiments.
4. Make scientifically based decisions and solve problems drawing on concepts and experiences from relevant areas.
5. Evaluate critically; evidence, interpretations, results and solutions related to the course content within a real life context.
6. Explain scientifically related knowledge claims as products of a scientific inquiry process that, while diverse in scope, conforms to the principles of logical reasoning.
7. Demonstrate research skills necessary to access needed data to support scientific inquiry.
8. Ask meaningful questions about real world scientific issues including problems that lack satisfactory answers.
9. Formulate questions
10. Plan experiments
11. Make systematic observations
12. Organize and interpret data
13. Draw conclusions
14. Communicate
15. Use scientific inquiry processes
16. Acquire information
17. Process information
18. Test understanding
19. Use interpersonal skills
20. Argue logically
21. Synthesize information. Relate two or more ideas/pieces of information.
22. Identify a problem. Identify an issue and state the issue in a form that requires a decision or solution.
23. Identify dimensions of the problem. Identify scientific, political, ethical, cultural, and technological dimensions of the issue.
24. Gather information about dimensions of the problem
25. Generate a list of alternative solutions. Develop a list of alternative solutions that address all dimensions of the issue.
26. Evaluate each solution. Evaluate each proposed solution in light of its scientific, technological, political, ethical, and cultural impact.
27. Select solution(s)
28. Use decision-making processes. Demonstrate the ability to integrate the skills above by selecting an issue of personal, community, national, or global significance to them and using the decision-making processes above to seek effective solutions.
29. Have an appreciation for life
30. Value knowledge as having beneficial applications
31. Respect science as a way of knowing
32. Respect others. Appreciate the value of a diversity of perspectives in addressing problems and issues.
33. Accept responsibility
34. Have an open mind
35. Be persistent Exhibit self-direction and motivation in completion of both group and independent tasks.

36. Reflect. Value rethinking, revising, and evaluating of ones own understanding of scientific concepts and processes for accuracy and effectiveness.
37. Value honesty. Value truthful reporting of methods and findings.
38. Upon completion of this course the student should be able to demonstrate an understanding and application of the following core content areas:
39. Use a bright field light microscope to view and interpret slides, including
40. Properly prepare slides for microbiological examination, including
41. Properly use aseptic techniques for the transfer and handling of microorganisms and instruments, including
42. Use appropriate microbiological media and test systems, including
43. Estimate the number of microbes in a sample using serial dilution techniques, including
44. Use standard microbiology laboratory equipment correctly

VII. COURSE OUTLINE:

1. Bacteria and Fungi
2. Basic Groups of Microbes
3. Cellular Organization: Prokaryotic and Eukaryotic Cells
4. Classification of Microorganisms
5. The Prokaryotic Cell: Bacteria
6. Sizes, Shapes, and Arrangements of Bacteria
7. Composition and Functions of Bacterial Structures
8. Bacterial Pathogenicity
9. Normal Flora and Nosocomial Infection
10. Control of Bacteria by Using Antibiotics and Disinfectants
11. Selected Atypical Pathogenic Bacteria
12. The Eukaryotic Cell
13. The Fungi
14. Introduction
15. Yeasts
16. Molds
17. Fungal Virulence
18. Chemotherapeutic Control of Fungi
19. Protozoa and Viruses
20. Protozoa
21. Characteristics of Protozoa Including Algae
22. Medically Important Protozoa
23. Viruses
24. General Characteristics of Viruses
25. Sizes and Shapes of Viruses
26. Viral Structure
27. Animal Virus Life Cycles
28. Bacteriophage Life Cycles
29. Virus-Induced Alteration of Infected Animal Cells
30. Bacteriophage-Induced Alteration of Bacteria
31. Control of Viruses
32. Viral Infections of Humans
33. Genetics and Metabolism
34. Microbial Genetics
35. Genetics of Prokaryotic Bacteria: DNA, RNA, Protein Synthesis, Mutation, Genetic Recombination, Recombinant DNA Technology
36. Biotechnology Applications
37. Genetics of Eukaryotic Cells
38. Genetics of Viruses, Gene Therapy
39. Human Genome Project and Bioethics
40. Bacterial Growth and Factors Influencing Growth
41. Bacterial Metabolism

42. Enzymes
43. Energy Production in Bacteria
44. Cyanobacteria and Chemosynthetics
45. Microbial Ecology
46. Industrial Microbiology
47. The Immune Responses
48. Introduction
49. Antigens
50. Major Cells and Key Cell-Surface Molecules Involved in the Immune Responses
51. An Overview of the Steps Involved in the Immune Responses
52. Nonspecific Body Defenses
53. Anatomical Barriers and Mechanical Removal
54. Bacterial Antagonism by Normal Flora
55. Antigen-Nonspecific Body Defense Chemicals
56. Phagocytosis and Cells Involved in Body Defenses
57. Inflammation
58. Nutritional Immunity
59. Fever
60. Humoral Immunity
61. Antibodies (Immunoglobulins): Structure, Production, Anamnestic Response
62. The Complement Pathways
63. Ways in Which Antibodies Help to Defend the Body
64. Active and Passive Immunity: Naturally and Artificially Acquired
65. Monoclonal Antibodies
66. Cell-Mediated Immunity
67. The Mechanism for Cell-Mediated Immunity
68. How Cell-Mediated Immunity Protects the Body
69. NK Cells and Antibody-Dependent Cellular Cytotoxicity
70. Adoptive Immunotherapy
71. Immunodeficiency
72. Primary Immunodeficiencies
73. Secondary Immunodeficiencies and AIDS
74. Hypersensitivity
75. Immediate Hypersensitivities
76. Delayed Hypersensitivities
77. Superantigens

VIII. INSTRUCTIONAL METHODS:

1. Laboratory Experiences: Activities in which students investigate a question in microbiology using materials in a laboratory setting.
2. Data Analysis: Students examine data collected by themselves or other investigators.
3. Student-directed Investigations: Investigations in which the students study something new to them which may involve cooperative group work or individual work.
4. Personal and Societal Decision-Making: Students study a microbiologically related issue to develop an understanding of the scientific, personal, societal economic, environmental, and technological aspects of the problem. Students apply their knowledge to a real-life situation.
5. Cooperative Learning: Students work cooperatively in a team to accomplish a common goal.
6. Listening: Students listen and critically evaluate explanations presented by their peers, the instructor, or guest speakers, or experts on videotape/interactive video.
7. Reading: Students are encouraged to read about microbiological concepts from a variety of sources.
8. Communication: Students select and organize information relevant to a topic and communicate information in their own words using various formats.
9. Debates: Students choose or are assigned alternative perspectives on personal or societal issues related to a microbiological problem.

10. Discussion: Instructor or students facilitate discussion of concepts or ideas which may involve a collaborative effort with consensus building.
11. Field Experiences: Activities in which students investigate a question in microbiology using materials in a managed or natural ecosystem.
12. Interactive Audiovisual: Programs that are stopped at appropriate points with questions for discussion interjected by instructor.
13. Computer Technology: Students use the internet, simulations, digital imaging, word processing, data bases, spreadsheets and modeling programs appropriate to biological inquiry.
14. Lecture: Used to provide alternative explanations, examples, clarification, and conceptual organization of a topic.
15. Demonstrations: For observations that would be difficult for all students to complete during regular class time.

IX. INSTRUCTIONAL AND RESOURCE MATERIALS:

1. Commercially prepared slides
2. Student prepared slides
3. Computer projected graphics
4. Charts
5. Models
6. Microscopes
7. Reference materials
8. Living microorganisms
9. Culturing apparatus for microbes
10. Videos/DVDs
11. Culture media
12. Antibiotics, drugs, and chemicals
13. Water bath
14. Incubators and refrigerators
15. Sterilizing apparatus

X. METHODS OF ASSESSMENT:

Methods of assessing the general course outcomes include:
SCCC Outcome #1 will be assessed and measured by multiple choice questions; essay questions that allow the student to illustrate knowledge, depth of understanding, and creativity; problem-based learning for assessment of thinking and decision-making skills, values, and attitudes. This could include critical analysis and web-based projects for assessment of acquiring, processing, and evaluation of information.
SCCC Outcome #2 will be assessed and measured by essay questions that allow the student to illustrate knowledge, depth of understanding, and creativity; long-term investigations to assess inquiry and decision-making skills, experimental design, communication and understanding of the scientific process; problem-based learning for assessment of thinking and decision-making skills, values, and attitudes (this could include critical analysis and web-based projects for assessment of acquiring, processing,and evaluation of information); peer performance assessment for project evaluation and ability to work with others.
SCCC Outcome #5 will be assessed and measured by laboratory procedures for demonstrating the use of lab skills to answer questions; and long-term investigations to assess inquiry and decision-making skills, experimental design, communication and understanding of the scientific process.
SCCC Outcome #6 will be assessed and measured laboratory procedures for demonstrating the use of lab skills to answer questions; and long-term investigations to assess inquiry and decision-making skills, experimental design, communication and understanding of the scientific process.
SCCC Outcome #9 will be assessed and measured by laboratory procedures for demonstrating the use of lab skills; observation of how students interact and assist one another in lab; and

long-term investigations to assess inquiry and decision-making skills, experimental design, communication and understanding of the scientific.

XI. ADA STATEMENT:

Under the Americans with Disabilities Act, Seward County Community College will make reasonable accommodations for students with documented disabilities. If you need support or assistance because of a disability, you may be eligible for academic accommodations. Students should identify themselves to the Dean of Students at 620-417-1106 or going to the Student Success Center in the Hobble Academic building, room 149 A.

Syllabus Reviewed: 10/28/2021