EASTERN ARIZONA COLLEGE
Microbiology
Course Design
2015-2016

Course Information
Division                Science
Course Number           BIO 205 (SUN# BIO 2205)
Title                  Microbiology
Credits                4
Developed by           Ed Butler/Revised by Willis Haws
Lecture/Lab Ratio      3 Lecture/3 Lab
Transfer Status        ASU: MIC 205 (3) Natural Science - General (SG) &
                        NAU: MIC 205L --and--
                        UA: BIO 205 --and--
                        MIC 205A
                        MIC 206 (1) & Natural Science - General (SG)
                        BIO 205L also satisfies: Lab Science [LAB]

Activity Course        No
CIP Code               26.0400
Assessment Mode        Pre/Post Test (50 Questions/100 Points)
Semester Taught        Fall and Spring
GE Category            Lab Science
Separate Lab           Yes
Awareness Course       No
Intensive Writing Course No

Prerequisites
BIO 100 or BIO 160 or BIO 181 or BIO 201 or CHM 130 or CHM 138 or CHM 151

Educational Value
Students with a general biology and/or chemistry background who are interested in a health related field

Description
Study of microorganisms and their relationship to health, ecology, and related fields.

Supplies
Disposable lab coat
Competencies and Performance Standards

1. Acquaint self with the scope of microbiology and microorganisms.

Learning objectives
What you will learn as you master the competency:

a. State the accomplishments of the scientific pioneers of microbiology.
b. Describe the three domains and five kingdoms used to classify all living things.
c. Compare prokaryotic cells to eukaryotic cells in regard to nuclear membrane, presence of organelles, mechanism of reproduction, ribosome size and complexity of cell wall.
d. Apply the scientific rules of binomial nomenclature.
e. Describe the composition and function of the parts of a bacterial cell.
f. Compare the cell wall of the gram positive and gram negative bacteria.
g. Discuss the phases of a typical growth curve.
h. Acquire common terminology used in microbiology.

Performance Standards

Competence will be demonstrated:

- in completion of course assignments
- in completion of written exams
- in completion of laboratory practicals

Criteria – Performance will be satisfactory when:

- learner can participate in general class discussions and activities
- learner can participate in laboratory exercises
- learner can complete reading assignment

2. Analyze methods used to cultivate and identify microorganisms.

Learning objectives
What you will learn as you master the competency:

a. Describe the necessary components of serological testing.
b. Discuss the functions of the gram stain reagents.
c. Explain the differences between simple, differential and special stains.
d. Explain the difference between acidic and basic dyes.
e. Describe the shapes and arrangements of bacteria.
f. Classify bacteria based on temperature, oxygen, pH requirements and energy/carbon sources.
g. Differentiate between the types of media used to isolate bacteria.
h. Recognize the essential macronutrients required for bacterial growth.
i. Explain the effects of a hypotonic or a hypertonic solution on a bacterial cell.
j. Demonstrate proper safety habits and use of tools in the laboratory.
k. Discuss the criteria used to identify bacteria in the laboratory.
l. Determine identification of bacteria using proper laboratory tests.

Performance Standards

Competence will be demonstrated:

- in completion of course assignments
3. **Compare methods used to control the growth of microorganisms.**

*Learning objectives*

*What you will learn as you master the competency:*

a. List the types of organisms that have a high, moderate and low resistance to physical and chemical methods of growth control.

b. Demonstrate the effectiveness of antibiotics on bacteria.

c. Demonstrate thermal death time for a variety of organisms.

d. Describe the effects of chemicals on bacterial growth.

e. Discuss the practical importance of a growth curve of a bacterial population.

f. Discuss the physical methods used to control the growth of bacteria.

g. Compare different chemical methods used to control the growth of bacteria.

h. Describe the various antimicrobial agents used to control bacterial growth within a host.

i. Discuss factors that affect the death rate of microbes.

*Performance Standards*

*Competence will be demonstrated:*

- in completion of course assignment
- in completion of written exams
- in completion of laboratory practicals

*Criteria – Performance will be satisfactory when:*

- learner can participate in general class discussions and activities
- learner can participate in laboratory exercises
- learner can complete reading assignment

4. **Explore the trends in microbiology with regard to biotechnology.**

*Learning objectives*

*What you will learn as you master the competency:*

a. Discuss genetic transfer methods that allow bacteria to convey information from one to another.

b. Discuss the elements and applications of genetic engineering.

c. Examine the tools and techniques of genetic engineering.

d. Explore the consequences of genetically altered products.

e. Investigate the causes of multiple drug resistance in bacteria.

*Performance Standards*

*Competence will be demonstrated:*

- in completion of course assignments
5. Examine the methods microorganisms use to cause disease.

Learning objectives
What you will learn as you master the competency:

a. Describe bacterial resistance mechanisms that allow bacteria to survive in the presence of antimicrobial agents.
b. Explain the terms relating to the host-parasite relationship of bacteria and humans.
c. Describe the microbiota located on a human host.
d. Discuss the mechanisms of pathogenicity of bacteria.
e. Describe the transmission of infection from one host to another.

Performance Standards

Competence will be demonstrated:

- in completion of course assignments
- in completion of written exams
- in completion of laboratory practicals

Criteria – Performance will be satisfactory when:

- learner can participate in general class discussions and activities
- learner can participate in laboratory exercises
- learner can complete reading assignment

6. Develop an understanding of the immune system and its interaction with disease.

Learning objectives
What you will learn as you master the competency:

a. Describe host defense mechanisms that provide humans with nonspecific immunity.
b. Explain terms relating to host specific immunity.
c. Explain how vaccines prevent disease.
d. Identify blood components that act as part of the immune system.
e. Explain terms relating to epidemiology.

Performance Standards

Competence will be demonstrated:

- in completion of course assignments
- in completion of written exams
- in completion of laboratory practicals

Criteria – Performance will be satisfactory when:

- learner can participate in general class discussions and activities
- learner can participate in laboratory exercises
- learner can complete reading assignment
7. Investigate the characteristics, habitat and diseases caused by medically significant gram positive organisms.

Learning objectives
What you will learn as you master the competency:

a. Employ laboratory methods and bacterial characteristics to identify gram positive bacterial isolates.

b. Describe the diseases caused by medically significant gram positive bacteria such as *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Enterococcus*, Group A and Group B Streptococcus.

c. Name the complications that may occur due to certain gram positive bacterial infections such as Group A Streptococcus.

d. Associate the bacteria responsible for diseases such as diphtheria, food poisoning, anthrax, and listeriosis.

Performance Standards
Competence will be demonstrated:

- in completion of course assignments
- in completion of written exams
- in completion of laboratory practicals

Criteria – Performance will be satisfactory when:

- learner can participate in general class discussions and activities
- learner can participate in laboratory exercises
- learner can complete reading assignment

8. Investigate the characteristics, habitat, and diseases caused by the medically important gram negative organisms.

Learning objectives
What you will learn as you master the competency:

a. Discuss the characteristics and diseases caused by *Neisseria gonorrhoeae* and *N. meningitidis*.

b. Recognize the organisms responsible and the diseases caused by the Enterobacteriaceae.

c. Describe the symptoms and etiologic agents of whooping cough and Legionnaire's disease

d. Describe the diseases caused by the curved negative rods such as *Campylobacter*, *Vibrio* and *Helicobacter*.

e. Employ laboratory methods and bacterial characteristics to identify gram negative bacterial isolates.

Performance Standards
Competence will be demonstrated:

- in completion of course assignments
- in completion of written exams
- in completion of laboratory practicals
9. Examine the characteristics, habitat, and diseases caused by unusual microbes.

Learning objectives
What you will learn as you master the competency:

a. Discuss the symptoms and the spirochetes responsible for Lyme disease, relapsing fever and syphilis.
b. Describe the symptoms and organisms responsible for tetanus, gangrene and botulism.
c. Discuss identification criteria of mycoplasma, chlamydia and rickettsia.
d. Describe the diseases caused by mycoplasma, chlamydia and rickettsia.

Performance Standards
Competition will be demonstrated:

- in completion of course assignments
- in completion of written exams
- in completion of laboratory practicals

Criteria – Performance will be satisfactory when:

- learner can participate in general class discussions and activities
- learner can participate in laboratory exercises
- learner can complete reading assignment

10. Examine the classification, characteristics, and diseases caused by DNA and RNA viruses.

Learning objectives
What you will learn as you master the competency:

a. Describe the parts of a viral particle.
b. Explain the steps of viral replication.
c. Describe cytopathic effect and other ways used to identify viral infections.
d. Recognize the common names and routes of transmission of the more common DNA and RNA viral diseases.

Performance Standards
Competition will be demonstrated:

- in completion of course assignments
- in completion of written exams
- in completion of laboratory practicals

Criteria – Performance will be satisfactory when:

- learner can participate in general class discussions and activities
- learner can participate in laboratory exercises
- learner can complete reading assignment
11. **Investigate the characteristics, practical classification, and diseases caused by fungus.**

*Learning objectives*

*What you will learn as you master the competency:*

a. Explain the difference in morphology of yeast and molds.

b. Discuss the growth requirements of fungi.

c. Classify fungi according to the diseases it can produce.

d. List the fungi that are classified as dermatophytes.

e. Describe the symptoms of cutaneous, subcutaneous, and systemic fungal infections.

f. Employ laboratory methods and fungal characteristics to identify fungal isolates.

*Performance Standards*

*Competence will be demonstrated:*

- in completion of course assignments
- in completion of written exams
- in completion of laboratory practicals

*Criteria – Performance will be satisfactory when:*

- learner can participate in general class discussions and activities
- learner can participate in laboratory exercises
- learner can complete reading assignment

12. **Examine the various kinds of parasites and their associated diseases.**

*Learning objectives*

*What you will learn as you master the competency:*

a. Describe the three classifications of parasites.

b. Describe the four categories of protozoa.

c. State the developmental stages of helminthes.

d. Differentiate between a cyst and trophozoite of a protozoan.

e. Discuss the disease, route of transmission and life cycle of parasites such as *Entamoeba histolytica*, *Giardia*, *Trichomonas*, *Trypanosoma*, *Plasmodium*, *Cryptosporidium*, *Toxoplasma*, tapeworm, pinworm, scabies and lice.

f. Employ laboratory methods and morphologic characteristics to identify parasites.

*Performance Standards*

*Competence will be demonstrated:*

- in completion of course assignments
- in completion of written exams
- in completion of laboratory practicals

*Criteria – Performance will be satisfactory when:*

- learner can participate in general class discussions and activities
- learner can participate in laboratory exercises
- learner can complete reading assignment
13. **Explore the importance of microorganisms in public health, environment and industry.**

**Learning objectives**

*What you will learn as you master the competency:*

a. Investigate emerging pathogens and current trends in microbiology.
b. Explore scientific web sites on the Internet.
c. Present researched information in an understandable format.

**Performance Standards**

*Competence will be demonstrated:*

- in completion of course assignments
- in completion of written exams
- in completion of laboratory practicals

*Criteria – Performance will be satisfactory when:*

- learner can participate in general class discussions and activities
- learner can participate in laboratory exercises
- learner can complete reading assignment

**Types of Instruction**

Classroom presentation

On campus laboratory

**Grading Information**

**Grading Rationale**

<table>
<thead>
<tr>
<th>Lecture Points:</th>
<th>Written Exams (6 at 100 points each) = 50%</th>
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<tbody>
<tr>
<td></td>
<td>Post Test</td>
</tr>
<tr>
<td></td>
<td>= 10%</td>
</tr>
<tr>
<td>Lab Points:</td>
<td>Lab Exams (2 at 50 points each) = 10%</td>
</tr>
<tr>
<td></td>
<td>Unknown identification project (100 points) = 5%</td>
</tr>
<tr>
<td></td>
<td>Exercise assignments (16 at 10 points each) = 15%</td>
</tr>
<tr>
<td></td>
<td>Lab Quizzes (15 at 10 points each) = 10%</td>
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A pretest will be administered at the beginning of the course, which will not count as part of the final grade.

**Grading Scale**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>90 - 100%</td>
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<tr>
<td>B</td>
<td>80 - 89%</td>
</tr>
<tr>
<td>C</td>
<td>70 - 79%</td>
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<tr>
<td>D</td>
<td>60 - 69%</td>
</tr>
<tr>
<td>F</td>
<td>0 - 59%</td>
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