BIO 201 General Microbiology

Spring 2020
Course Coordinator: Professor D.N. Hilker
Hilkerd@mccc.edu  609-570-3367  Office: MS 122
Course Website: http://www.mccc.edu/~hilkerd

4 Credit Hours  3 Lecture Hours  3 Laboratory Hours

Required Texts/Laboratory Items:

1. Microbiology, by Tortora, et.al.
   ISBN  9780134605180

2. BIO201 General Microbiology Lecture Notes, by D.N. Hilker
   MCCC Book Store, Fourth Edition

3. Laboratory Experiments in General Microbiology, by D.N. Hilker

4. Print laboratory lecture notes before each lab. Notes can be found on the course
   website located at http://www.mccc.edu/~hilkerd/ OR can be purchased under
   Optional Texts.

5. Disposable gloves (laboratory requirement). Closed-toed shoes in lab are highly
   recommended.

Optional Texts:

1. BIO201 General Microbiology Laboratory: Laboratory Experiment Lecture Notes,
   by Prof. Hilker (5/2019) or they can be printed from the website (refer to #4 above)

Catalog Description:
The study of the morphology, taxonomy and metabolism of microbes with emphasis on fungi,
protozoa, helminths, viruses and bacteria. Review of role of microbes in nature and their industrial
application and medical importance. Laboratory exercises permit development of skill in
 techniques, reinforce certain lecture material and introduce concepts and material not presented in
lecture. The laboratory portion of the course stands alone and is essentially a complete and separate
course by itself and will include mini-lectures when necessary and appropriate.

Prerequisites: Successful completion of BIO 101 or BIO 103 (grade of C or better) or consent of
instructor

Note: Participation in Biology laboratory courses is permitted provided the student has completed
the required prerequisites, is a minimum of 16 years of age or by permission of the instructor and
the Dean of the division.
Grading:

Lecture: 75% of total course grade

1. There will be a total of 5 exams (4 exams and a cumulative final exam) given in the course. **There will be NO make up exams!!!** Exams will count 70%.

2. Students will be divided into teams of three to four. Ten in-class assignments will be given throughout the semester that counts 10 points each. **These assignments are timed so you and your team members must work together and be prepared.** A maximum of 100 points can be obtained. There are no make-up assignments if absent. This team assignment will count 5% of your grade.

Laboratory: 25% of total course grade

1. There will be a total of 11 laboratory quizzes (10 points each) given at the beginning of the class that will make up 90% of your laboratory grade. The best 10 quiz grades will be computed in determining your laboratory grade. **There are no make-up quizzes if you miss a laboratory or come late to laboratory.**

2. Each student will be given an unknown microorganism that he/she will try to identify. Correct identification (written laboratory report required) will result in an additional 10 points and will count 10% of your laboratory grade. Failure in attempting the unknown will result in a zero for the entire laboratory portion of the course. The students' performance will also be constantly evaluated by the laboratory instructor.

3. An optional **EXTRA CREDIT report** may be done and will be calculated into the laboratory grade as described on page 9.

**Absence from more than 2 lab classes will result in the instructor withdrawing a student from the course or failing the course if it occurs after the withdrawal deadline for the semester.**

**Final Course Grade**

In summary, the computation of the final course grade is as follows:

Lecture: 1. Sum of 5 exams x 70%
   
   \[ \frac{\text{5}}{\text{1}} \]

2. Sum of 10 assignments x 5%

Laboratory:

a) Sum of 10 best lab quizzes x 90% \} x 25%

b) Additional 10 pts. if unknown identified \}

**For example:**

Lecture: 1. Sum of 5 exams = 400 pts.
   2. Sum of 10 assignments = 96 pts. (100 pts. max)
Laboratory:  Sum of 10 best lab quizzes  =  80 pts. x .90 = 72 pts.
Unknown identified = 10 pts.
- 400 pts. x .70 = 56 pts.
5
- 96 pts. x 0.05 = 4.8 pts.
- (72 pts. + 10 pts.) x .25 = 20.5 pts.
Total = 81.3 pts. = B-

Course Grading:

A = 93-100  C+ = 77-79
A- = 90-92  C = 70-76
B+ = 87-89  D = 60-69
B = 83-86  F = 0-59
B- = 80-82

Microbiology Laboratory: The laboratory involves students working with microorganisms using proper safety precautions. Students should assume that these microbes have the potential to cause disease if they are not handled properly or if the student is immunocompromised. If you have a predisposing medical condition, please consult with your physician about taking this class. A list of microbes used in the laboratory can be provided upon request.

Attendance: I expect students to attend class unless you are ill or have some other important reason for not attending. If you are unable to attend please inform me of your absence. An attendance sheet will be circulated in lecture. Please print your name and only your name.

Mercer’s Academic Integrity Policy

Any student who: a) knowingly represents work of others as his/her own; b) uses or obtains unauthorized assistance in the execution of any academic work; or c) gives fraudulent assistance to another student is guilty of cheating. Violators will be penalized in accordance with established college policies and procedures and be given a zero grade for that assignment (quiz, test, extra-credit report).

Your examination should reflect your work and knowledge alone. You may not use any outside help, written or oral. You may not use notes of any sort; nor exchange papers, comments or gestures with classmates. Such an exchange of information constitutes cheating. You are just as guilty of cheating giving information to a person as is the person receiving it. Any observed instance of cheating is punishable by confiscation of the examination papers and being assigned a grade of zero for the examination. This applies equally to the giver and receiver of information. Cheating may result in a student being removed from the course and/or being reported to the Academic Standards Committee for possible academic probation or dismissal. Be careful not to give the appearance of cheating. Keep your eyes to yourself. Keep your papers right in front of you so they cannot be seen by the people to either side of you or the person behind you. If you have a question, raise your hand and consult with a proctor.

Note: I reserve the right to conduct an additional evaluation (e.g. oral or written exam) if any particular test score is dramatically inconsistent with other exam results or classroom performance. My goal is to make an accurate and fair assessment of a student’s performance in this course.
Course Objectives
Upon satisfactory completion of this course, students should be able to:
1. Highlight the historical events associated with the field of microbiology and immunology. (GE 1, 7; CS A, D, E, F)
2. Distinguish between prokaryotic and eukaryotic cells and understand the evolutionary relatedness of organisms. (GE 1, 3, 4; CS A, B, D, E, F)
3. Develop a thorough understanding of the molecular structure, growth requirements and metabolic processes of various microorganisms. (GE 1, 3, 4; CS A, B, D, E, F)
4. Describe the impact of microbes in nature and society, the role of microbes in an ecosystem and human impact on the evolution of microorganisms. (GE 1, 3, 4, 9; CS A, B, C, D, E, F)
5. Analyze the various immunological methods that hosts utilize to defend themselves from microorganisms and how these organisms can impact human homeostasis. (GE 1, 3, 4; CS A, B, D, E, F)
6. Describe the methods available in controlling, preventing and treating infectious disease. (GE 1, 3, 4, 7; CS A, B, D, E, F)
7. Develop microbiological laboratory skills in applying the scientific method of inquiry to gather and use information for the purposes of critical thinking, information analysis and problem solving in a microbiology laboratory. (GE 1, 2, 3, 4, 9; CS A, B, C, D, E, F)

Course-specific General Education Knowledge Goals and Core Skills.

General Education (GE) Knowledge Goals
- **Goal 1. Communication.** Students will communicate effectively in both speech and writing.
- **Goal 2. Mathematics.** Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.
- **Goal 3. Science.** Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.
- **Goal 4. Technology.** Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.
- **Goal 7. Historical Perspective.** Students will understand historical events and movements in World, Western, non-Western or American societies and assess their subsequent significance.
- **Goal 9. Ethical Reasoning and Action.** Students will understand ethical issues and situations.

MCCC Core Skills (CS)
- **Goal A. Written and Oral Communication in English.** Students will communicate effectively in speech and writing, and demonstrate proficiency in reading.
- **Goal B. Critical Thinking and Problem-solving.** Students will use critical thinking and problem solving skills in analyzing information.
- **Goal C. Ethical Decision-Making.** Students will recognize, analyze and assess ethical issues and situations.
- **Goal D. Information Literacy.** Students will recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.
- **Goal E. Computer Literacy.** Students will use computers to access, analyze or present information, solve problems, and communicate with others.
- **Goal F. Collaboration and Cooperation.** Students will develop the interpersonal skills required for effective performance in group situations.

Units of study in detail

**Unit 1: Introduction to Microbiology**

**Learning Objectives**
The student will be able to...
- Explain the benefits of microorganisms to the environment and society
- Identify individuals who have contributed to the field of microbiology and immunology
- Classify living organisms based on their molecular and cellular characteristics
- Explore the various methods used to observe bacteria microscopically

**Unit 2: Mycology**

**Learning Objectives**
The student will be able to...
- Characterize the organisms that make up the Fungi Kingdom and discuss their benefits to society
- Compare and contrast fungi to other types of microbes
- Understand the structural composition and growth requirements of yeast and molds
- Understand the effects of mycoses on the human body
Unit 3: Animal Parasites

Learning Objectives
The student will be able to...
- Understand the characteristics of protozoa and their interactions with arthropod vectors
- Compare and contrast protozoa and helminths to other types of microbes
- Explain the features of parasitic helminths
- Understand the effects of protozoa and helminthic infections on the human body

Unit 4: Bacterial Structure and Physiology

Learning Objectives
The student will be able to...
- Compare and contrast eukaryotic and prokaryotic cells
- Describe the morphological appearance of bacteria
- Explain the physical and chemical growth requirements of bacteria
- Demonstrate knowledge of binary fission and bacterial growth phases
- Compare and contrast methods by which bacteria can exchange genetic information

Unit 5: Virology

Learning Objectives
The student will be able to...
- Explain the characteristics and requirements of viruses
- Compare and contrast bacteriophages with animal viruses
- Classify animal viruses based on their nucleic acid
- Describe prions and compare them to other organisms
- Explain the relationship between viruses and cancer

Unit 6: Bacterial Groups

Learning Objectives
The student will be able to...
- Explain how bacteria are grouped based on their metabolic processes, biochemical characteristics and structural and morphological appearances
- Understand the benefits and detrimental effects of bacteria to the environment and society
- Explain their importance in various ecosystems

Unit 7: Applied Microbiology

Learning Objectives
The student will be able to...
- Explore food preservation methods in preventing microbial spoilage
- Describe the use of microbes in the food industry and their industrial uses
- Examine the use of microbes in energy production
- Explain the role of microbes in genetic engineering and give examples of their applications in the medical and agricultural fields

Unit 8: Infection and Disease—An Introduction to Microbial Pathogenesis

Learning Objectives
The student will be able to...
- Understand the terms that are used to describe the types, occurrences and duration of infectious disease
- Investigate the methods infectious diseases are spread and their host-parasite relationships
- Describe a microbe’s physiological features and metabolic reactions, including exoenzymes and toxins, that enables them to alter their pathogenicity

Unit 9: Resistance to Infection—Cellular Defenses

Learning Objectives
The student will be able to...
- Describe a host’s first line of defense when combating an infection including both non-aggressive and aggressive measures
- Describe a host’s second line of defense and differentiate between the various types of phagocytic cells
- Analyze the steps of an inflammatory response when combating an infection and the role of various proteins and cells in the body
Unit 10: Immunology-Antibodies and Humoral Defense

Learning Objectives
The student will be able to…
- Compare and contrast cellular and humoral defenses
- Understand the difference between antigens and antibodies
- Characterize the five types of immunoglobulins and explain their molecular structure
- Analyze T and B lymphocytes and explain their role in immunological development
- Understand immunological disorders and the role of antibodies in tissue transplants and hypersensitivity reactions

Unit 11: Methods of Microbial Control-Preventing and Controlling Microbial Infections

Learning Objectives
The student will be able to…
- Understand the various physical and chemical methods of microbial control
- Differentiate between antiseptics vs. disinfectants
- Explain the general principles of microbial chemotherapy and historical events surrounding antibiotic discoveries
- Describe the various mechanisms of action that anti-bacterial antibiotics exert on bacteria and the side effects of antibiotics
- Understand the general mechanisms of action that anti-fungal, anti-protozoan, anti-helminthic and anti-viral drugs exert on microbes
- Describe how drug resistance occurs and the dangers of antibiotic abuse globally

Unit 12: Microbial Diseases of the Skin, Eyes and Respiratory Tract

Learning Objectives
The student will be able to…
- Understand the anatomy and the normal flora of the skin, eyes and upper/lower respiratory tract
- Describe the various bacterial, viral, fungal, and protozoan diseases of these areas and the methods used to treat and identify them

Unit 13: Microbial Diseases of the Digestive System

Learning Objectives
The student will be able to…
- Understand the anatomy and normal flora of the digestive system
- Differentiate between an intoxication and infection
- Describe the various bacterial, viral, fungal, protozoan and helminthic diseases of this area and the methods used to treat and identify them

Unit 14: Microbial Diseases of the Urinary and Reproductive Systems

Learning Objectives
The student will be able to…
- Understand the anatomy and normal flora of the urinary and reproductive systems
- Describe the various bacterial, viral, fungal, and protozoan diseases associated with the urinary and reproductive systems and the methods used to treat and identify them
- Describe other sexually transmitted diseases including AIDS

Unit 15: Microbial Diseases of the Nervous and Cardiovascular Systems

Learning Objectives
The student will be able to…
- Understand the anatomy of the nervous and cardiovascular systems
- Describe the various bacterial, viral, fungal, protozoan and helminthic diseases associated with these systems and the methods used to treat and identify them

Laboratory Component:

Learning Objectives
The student will be able to…
- Conduct experiments independently as well as with others in the laboratory
- Master the necessary microbiological laboratory skills when applying the scientific method of inquiry
- Use critical thinking skills when gathering and analyzing information and problem solving in a microbiology laboratory
- Identify an unknown microorganism and present their finding orally and written
# Spring 2020
## BIO201 Lecture Schedule

<table>
<thead>
<tr>
<th>Unit #</th>
<th>Week of:</th>
<th>Chapter(s)</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1/21</td>
<td>1, 3, 10, 14</td>
<td>Introduction to Microbiology</td>
</tr>
<tr>
<td>2</td>
<td>1/28</td>
<td>12, 21, 22, 24, 25, 26</td>
<td>Mycology</td>
</tr>
<tr>
<td>3</td>
<td>2/4</td>
<td>12, 22 through 26</td>
<td>Animal Parasites: Protozoa and Helminths</td>
</tr>
<tr>
<td>4</td>
<td>2/11</td>
<td>2, 4, 5, 6, 8</td>
<td>Bacterial Physiology, Structure &amp; Genetics</td>
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<tr>
<td>5</td>
<td>2/18</td>
<td>13, 21 through 26</td>
<td>Virology</td>
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<tr>
<td>6</td>
<td>3/3</td>
<td>11 and 27; Appendix E</td>
<td>Bacterial Groups</td>
</tr>
<tr>
<td>7</td>
<td>3/10</td>
<td>9 and 28</td>
<td>Applied Microbiology and Biotechnology</td>
</tr>
<tr>
<td>8</td>
<td>3/10</td>
<td>14, 15</td>
<td>Infection &amp; Disease</td>
</tr>
<tr>
<td>9</td>
<td>*3/24</td>
<td>16</td>
<td>Cellular Defenses (1st &amp; 2nd Lines of Defense)</td>
</tr>
<tr>
<td>10</td>
<td>3/31</td>
<td>17, 18, 19</td>
<td>Immunity: Humoral Defenses (3rd Line of Defense), Hypersensitivity and Serology</td>
</tr>
<tr>
<td>11</td>
<td>4/7</td>
<td>7, 20</td>
<td>Control of Microbes</td>
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<tr>
<td>12</td>
<td>4/14</td>
<td>21, 24</td>
<td>Diseases of the Skin, Eyes, &amp; Respiratory System</td>
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<tr>
<td>13</td>
<td>4/14</td>
<td>25</td>
<td>Diseases of the GI Tract</td>
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</tbody>
</table>

Withdrawal Deadline: Friday, April 3, 2020

*Recess-Spring Break: Monday 3/16-Sunday 3/22/2020*
<table>
<thead>
<tr>
<th>Unit #</th>
<th>Day</th>
<th>Chapter(s)</th>
<th>Subject</th>
</tr>
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<tbody>
<tr>
<td>14</td>
<td>4/21</td>
<td>26</td>
<td>Diseases of the Urinary &amp; Reproductive Systems</td>
</tr>
<tr>
<td>15</td>
<td>4/28</td>
<td>22, 23</td>
<td>Diseases of the Nervous &amp; Cardiovascular Systems</td>
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</tbody>
</table>

**MCCC Classes end: 5/4/2020**  
**In-Class Final Examination Period: 5/5-5/11/2020**  
**Note:** Schedule is subject to change at the discretion of the instructor

**Mastering Microbiology Website: Optional**  
The textbook publisher has a comprehensive tutorial and review tool that provides students with a wide variety of activities for every chapter in the textbook. These activities are **not required** for the course. The access code for this site is included with the new edition of the text. If it’s not included or if you have an older version of the text and would like to purchase access to the site go to [http://www.masteringmicrobiology.com/](http://www.masteringmicrobiology.com/).

**Microbiology Resources**  
The following websites might be of interest to you: [www.sciencenews.org](http://www.sciencenews.org), [www.sciencedaily.com](http://www.sciencedaily.com), [www.cdc.gov](http://www.cdc.gov) (Centers for Disease Control), and [www.asm.org](http://www.asm.org) (American Society of Microbiology; podcasts available)

**Lecture Exam Dates**  
Lecture exams will be **given in class or in the WWC Testing Center.** It is your responsibility to check the times of the Testing Center and to have a valid MCCC student ID. When exams are given in the Testing Center they will be scheduled outside of the normal classroom time. **There are no make-up exams.** The cumulative final exam (Exam 5) will be given in class during the Final Examination Period (5/5-5/11/2020). Refer to the course website [http://www.mccc.edu/~hilkerd](http://www.mccc.edu/~hilkerd) for exact final exam dates for each lecture section.

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<tr>
<th>Exam #</th>
<th>Units</th>
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<tbody>
<tr>
<td>#1</td>
<td>1,2,3</td>
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<tr>
<td>#2</td>
<td>4,5,6</td>
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<tr>
<td>#3</td>
<td>7,8,9,10 (I, II, III)</td>
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<tr>
<td>#4</td>
<td>Units 10 (IV on), 11,12,13</td>
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<tr>
<td>#5</td>
<td>Units 14, 15 and 1 through 13</td>
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</table>

The days that these exams will be given will be announced in class.

**Accessibility and Academic Accommodations**  
A student who has special needs because of a disability is entitled to receive accommodations (Americans with Disabilities Act and Section 504 of the Rehabilitation Act of 1973). Students are to give the accommodation form to the instructor at the start of the semester and to discuss how to best implement accommodations. For more information, contact Arlene Stinson, Director of the Center for Inclusion, Transition and Accessibility, LB 217, 570-3525, stinsona@mccc.edu
BIO 201 Microbiology – Extra Credit Report

Report

Collect 10 short articles from local newspapers, magazines, journals or articles from the internet on the field of microbiology. These articles should indicate their source and date. The articles should be written from January 2017 to present. For each article, write a ½ page (minimum of ten sentences) essay in your own words either summarizing the article or giving your opinion of the article. The essays should be typed double-spaced, a font size no greater than 12 and in a paragraph form. Short non-sentence statements are not acceptable. The final report should consist of hard copies of the 10 articles and 10 essays. Online submission of the report will NOT be accepted.

Any reports that are plagiarized (copied and pasted) will receive a 0 grade for the entire report and reported to the college’s Academic Integrity Committee.

Grading

The report will be graded on its scientific content, accuracy, expression and following the directions. And yes, spelling, sentence structure and proper use of the English language counts!

Points will be added to your laboratory grade, prior to multiplying your total numerical laboratory grade by 25%. The points are as follows:

A = 5 points  
B = 4 points  
C = 3 points  
D/F = 0 points

Date Due

Monday Lectures: On or before Monday March 9, 2020 (Office MS 122) before 9:00pm.  
Tuesday Lectures: On or before Tuesday March 10, 2020 (Office MS 122) before 4:00pm.

Library Resources

The Mercer County Community College library has a number of books pertaining to various areas of microbiology, virology, mycology, immunology, parasitology, chemotherapy and etc. The following are a partial listing of periodicals that may prove useful that you can access on the college’s Online Database Search: American Journal of Clinical Pathology, Bioscience, Human Biology, Journal of Bacteriology, Journal of Experimental Biology, Journal of American Medical Association (JAMA), American Journal of Epidemiology, Journal of Medical Technology, American Journal of Nursing, Health, Journal of Parasitology, Laboratory Medicine, Perspectives in Biology and Medicine, American Journal of Public Health, New England Journal of Medicine, Microbe, Clinical Microbiology Reviews, Emerging Infectious Diseases, and Microbiology and Molecular Biology (MMBR).
**NOTE:** DISPOSABLE GLOVES MUST BE BROUGHT TO ALL LABORATORIES. CLOSED-TOED SHOES ARE HIGHLY RECOMMENDED.

<table>
<thead>
<tr>
<th>Week of</th>
<th>Laboratory</th>
<th>Experiments</th>
<th>Topic</th>
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<tbody>
<tr>
<td>1/21</td>
<td>1</td>
<td>1, 2, 3</td>
<td>Introduction to Light Microscopes Survey of Microbes Collecting Microbes</td>
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<tr>
<td>1/28</td>
<td>2</td>
<td>3</td>
<td>Mold Identification Isolation Techniques</td>
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<td>2/4</td>
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<td>4</td>
<td>Staining Techniques</td>
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<td>2/11</td>
<td>4</td>
<td>5</td>
<td>Culture Media Pour Plate Techniques</td>
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<td>2/18</td>
<td>5</td>
<td>7</td>
<td>Temp. vs. Growth Temp. vs. Survival</td>
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<td>pH Osmotic Pressure Ultraviolet Light Anaerobic Techniques</td>
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<td>3/3</td>
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<td>23</td>
<td>Transformation Latex Agglutination Parasitology</td>
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<td>3/10</td>
<td>8</td>
<td>13</td>
<td>Antimicrobial Agents Antibiotics Skin Microbes Throat Cultures</td>
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<td>*3/24</td>
<td>9</td>
<td>17-18</td>
<td>ID Skin &amp; Throat Microbes Water Analysis for Contamination Water Microbes</td>
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*Recess-Spring Break: Monday 3/16-Sunday 3/22/2020*
Week of:  
Laboratory Experiments Topic  
3/31 10 15 Biochemical Reactions  

4/7 11 15 16 Biochemical Reactions Unknown Identification  

4/14 12 16 Unknown Identification  

4/21 13 16 Unknown Identification  

Laboratory classes will end on Friday April 24, 2020

Students may keep track of their progress in this class by recording their results on this page.  

Lecture:  
Exam #1:  
Exam #2:  
Exam #3:  
Exam #4:  
Exam #5:  

Laboratory:  
Quiz #1:  
Quiz #2:  
Quiz #3:  
Quiz #4:  
Quiz #5:  
Quiz #6:  
Quiz #7:  
Quiz #8:  
Quiz #9:  
Quiz #10:  
Quiz #11:  

**Extra Credit Reports are due on or before:**  
Monday Lectures:  On or before Monday March 9, 2020 (Office MS 122) before 9:00pm.  
Tuesday Lectures:  On or before Tuesday March 10, 2020 (Office MS 122) before 4:00pm.  

In-Class Team Assignment:  Maximum of 100 points can be obtained.  
#1  
#2  
#3  
#4  
#5  
#6  
#7  
#8  
#9  

Withdrawal Deadline:  Friday April 3, 2020