

MERCER COUNTY COMMUNITY COLLEGE
BUSINESS, SCIENCE, TECHNOLOGY, ENGINEERING AND MATH DIVISION
COURSE OUTLINE

BIO 201 General Microbiology: Remote Lecture and Laboratory

Summer 2020

Course Coordinator: Professor D.N. Hilker

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Course Website: <http://www.mccc.edu/~hilkerd>

<u>4</u>	<u>3</u>	<u>3</u>
Credit Hours	Lecture Hours	Laboratory Hour

Required Texts/Laboratory Items:

1. Microbiology, by Tortora, et.al.
Benjamin Cummings Publishing Co., 13th Edition, 2019
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
Stipes Publishing Co., 6th Edition. Only carried by MCCC Bookstore
4. Print laboratory lecture notes before each lab **OR** view on Black Board Lab Lessons (includes specific details on remote experimentation). Notes can be found on the course website located at <http://www.mccc.edu/~hilkerd/> **OR** can be purchased under Optional Texts.

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)

Remote Instruction: Taking the course online requires a reliable desktop or laptop computer. Mobile devices can be used to view course material but Mercer Online highly recommends using a desktop or laptop to complete assignments. You will need a reliable high speed internet connection in order to work online. **Exam testing requires a Webcam, government issued photo ID and Google Chrome as the web browser.**

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. **The virtual laboratory exercises permit an understanding of 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 given in the course. **There will be NO make up exams!!!** Exams will count 70%.
2. **Class Assignments:** There will be 10 Class Assignments given in class with each worth 10 pts (100 points total). They are to be submitted individually without collaboration with fellow classmates. Use your notes from the lecture Power Point presentations. Don't use outside resources; use your lecture notes. **Answers that have come from outside resources will not receive any credit.** All of the answers are found in your lecture notes. Use them! There are no make-up assignments if not completed by the designated date. Class Assignments count 5% of your grade.

Virtual Laboratory: 25% of total course grade

1. There will be a total of **11 laboratory quizzes (10 points each)** counting **90%** of your laboratory grade. The lowest quiz will be dropped and the best 10 quiz grades will be counted in your laboratory grade. **There are no make-up quizzes if you miss a laboratory quiz.**
2. In place of an Unknown Identification, students will be viewing and writing a summary for two Microbiology Videos from a list of videos the instructor will provide. Directions will be provided to the students regarding the requirements and grading rubric. Each summary is 5 pts for a total of 10 possible points. The summaries will count **10% of your laboratory grade**. Failure in completing both summaries by the due date will result in a zero for the entire laboratory portion of the course. **Any submissions that are plagiarized or comparable to another student's work will receive a 0 grade for the entire assignment and reported to the college's Academic Integrity Committee.**

Not completing (including quizzes) more than 2 lab lessons 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 /5 x 70%

2. Sum of 10 Class Assignments x 5%

Laboratory:

1. Sum of 10 best lab quizzes x 90% } x 25%

2. Possible 10 pts. Video Summaries }

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.
 Video Summaries = 10 pts.
- $\frac{400 \text{ pts.}}{5} \times .70 = 56 \text{ pts.}$
 - $96 \text{ pts.} \times 0.05 = 4.8 \text{ pts.}$
 - $(72 \text{ pts.} + 10 \text{ pts.}) \times .25 = 20.5 \text{ pts.}$
- 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	

Virtual Microbiology Laboratory: The virtual laboratory exercises permit an understanding of techniques, reinforce certain lecture material and introduce concepts and material not presented in lecture. **This remote taught virtual laboratory course won't allow students to perform hands-on laboratory experiments.**

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 roll 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: The virtual laboratory exercises permit an understanding of techniques, reinforce certain lecture material and introduce concepts and material not presented in lecture. **This remote taught virtual laboratory course won't allow students to perform hands-on laboratory experiments.**

Learning Objectives if face to face lab experience

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

**Summer 2020
BIO201 Lecture Schedule**

<u>Unit #</u>	<u>Day</u>	<u>Chapter(s)</u>	<u>Subject</u>
1	7/1	1, 3, 10, 14	Introduction to Microbiology <i>Class Assignment #1: Unit 1</i>
2	*7/6	12, 21,22,24-26	Mycology <i>Class Assignment #2: Unit 2</i>
3	7/8	12, 22- 26	Animal Parasites: Protozoa and Helminths <i>Class Assignment #3: Unit 3</i>
4	7/10	2, 4, 5, 6, 8	Bacterial Physiology, Structure & Genetics <i>Class Assignment #4: Unit 4</i>
5	7/13 & 7/15	13, 21-26	Virology <i>Class Assign. #5: Unit 5 (7/15)</i>
6	7/17	11 and 27; Appendix E	Bacterial Groups <i>Class Assignment #6: Unit 6</i>
7	7/20	9 and 28	Applied Microbiology and Biotechnology <i>No Class Assignment</i>
8	7/20	14, 15	Infection & Disease <i>No Class Assignment</i>
9	7/20	16	Cellular Defenses (1 st & 2 nd Lines of Defense) <i>No Class Assignment</i>
10	7/22	17, 18, 19	Immunity: Humoral Defense (3 rd Line of Defense), Hyper- sensitivity and Serology <i>Class Assignment #7: Unit 10 (I, II, III)</i>
11	7/24	7, 20	Control of Microbes <i>No Class Assignment</i>
12	7/26	21, 24	Diseases of the Skin, Eyes, & Respiratory System <i>Class Assignment 8: Units 11/12</i>

***Fri. 7/3/2020-College closed in observance of Independence Day. No online classes**
Withdrawal Deadline: Friday, July 24, 2020

<u>Unit #</u>	<u>Day</u>	<u>Chapter(s)</u>	<u>Subject</u>
13	7/29	25	Diseases of the GI Tract
14	7/29 & 7/31	26	Diseases of the Urinary & Reproductive Systems <i>Class Assignment 9: Units 13/14</i>
15	8/3	22, 23	Diseases of the Nervous & Cardiovascular Systems <i>Class Assignment 10: Unit 15</i>

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/>.

Microbiology Resources:

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

Lecture Exam Dates: Tentative Dates

Honor Lock will be used for lecture exams. Honor Lock's artificial intelligence-based system monitors you during your exam. **A Webcam, government issued photo ID and Google Chrome for your web browser is required.** It may alert a live proctor to pop in if it detects any potential violations and a certified proctor will review the recording of your exam after you are done. I will receive a report of any flagged incidents and a video of your exam session to review if necessary. You will get specific directions regarding this once you have access to Black Board for this course. **If you do not have access to all of these, you will not be able to take this course.**

Exam #1	Units 1,2,3-Fri. 7/10/20
Exam #2	Units 4,5,6-Mon. 7/20/20
Exam #3	Units 7,8,9,10 (I, II, III)-Fri. 7/24/20
Exam #4	Units 10 (IV on),11,12-Wed. 7/29/20
Exam #5	Units 13, 14, 15-Wed. 8/5/20

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

Summer 2020
BIO 201 LABORATORY SCHEDULE-Virtual

<u>Day:</u>	<u>Laboratory</u>	<u>Experiments</u>	<u>Topic</u>
7/1	1	1, 2, 3	Introduction to Light Microscopes Survey of Microbes Collecting Microbes <i>No Quiz</i>
*7/6	2	3	Mold Identification Isolation Techniques <i>Quiz 1: Exps. 1 & 2</i>
7/8	3	4	Staining Techniques <i>Quiz 2: Exp. 3</i>
7/10	4	5 6	Culture Media Pour Plate Techniques <i>Quiz 3: Exp. 4</i>
7/13	5	7 8	Temp. vs. Growth Temp. vs. Survival <i>Quiz 4: Exp. 5</i>
7/15	6	9 10 11 12	pH Osmotic Pressure Ultraviolet Light Anaerobic Techniques <i>Quiz 5: Exp. 6</i>
7/17	7	23 24 25	Transformation Latex Agglutination Parasitology <i>Quiz 6: Exps. 7 & 8</i>
7/20	8	13 14 17 18	Antimicrobial Agents Antibiotics Skin Microbes Throat Cultures <i>Quiz 7: Exps. 9-12</i>
7/22	9	17-18 19 20	ID Skin & Throat Microbes Water Analysis for Contamination Water Microbes <i>Quiz 8: Exps. 23-25</i>

***Fri. 7/3/2020-College closed in observance of Independence Day. No online classes**

<u>Day:</u>	<u>Laboratory</u>	<u>Experiments</u>	<u>Topic</u>
7/24	10	15	Biochemical Reactions <i>Quiz 9: Exps. 13, 14, 17,18</i>
7/27	11	15	Biochemical Reactions <i>Quiz 10: Exp. 19 & 20</i>
7/29	12		<i>Quiz 11: Exp. 15</i>
7/31	13		<i>2 Video Summaries Due</i>

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#7: _____
 Quiz #2: _____ Quiz#8: _____ Video Summaries: _____
 Quiz #3: _____ Quiz#9: _____
 Quiz #4: _____ Quiz#10: _____
 Quiz #5: _____ Quiz#11: _____
 Quiz #6: _____

Class Assignments: Maximum of 100 points

#1 _____ #4 _____ #7 _____ #10 _____
 #2 _____ #5 _____ #8 _____
 #3 _____ #6 _____ #9 _____

Withdrawal Deadline: Friday July 24, 2020