2020

General Microbiology

North Carolina Agricultural and Technical State University

NORTH CAROLINA AGRICULTURAL AND TECHNICAL STATE UNIVERSITY

COURSE SYLLABUS

College Name: College of Science and Technology

Department Name: Biology

Course Name: General Microbiology

COURSE INFORMATION

- Course Number/Section: BIOL 221
- Term:
- Semester Credit Hours: 4
- Times and Days:
- Class Location:

INSTRUCTOR CONTACT INFORMATION

- Instructor:
- Office Location:
- Office Phone:
- Email Address:

Faculty must notify students of the approximate time and method they can expect to receive an answer to all communications (e.g., email, phone, course messages). Excluding holidays, the response should be provided within 48 hours.

If there's a graduate teaching assistant assigned to work with this course, please include their names also.

STUDENT HOURS

These are times students may visit the professor without an appointment to request the assistance they need.

NOTE: Students are responsible for reading, understanding, and following the syllabus.

: AM ☐ / PM ☐ – : AM ☐ / PM ☐

Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐

COURSE PREREQUISITES

BIOL 100 or 101, CHEM 104 or 106

COURSE DESCRIPTION

This is an introduction to the basic principles of microbiology. Microbial ultrastructure, growth, metabolism, molecular genetics, diversity, infectious diseases, and immunology will be discussed. The laboratory introduces students to the principles of microscopy, specimen preparation for light microscopy, aseptic techniques, cultivation techniques, and the biochemical activities of microorganisms. This course will also emphasize increasing your independence as a scientist, while also developing you, the student, into a critical and independent thinker. Critical Thinking is the focus of NCAT's Quality Enhancement Plan (QEP) and therefore students in BIOL221 will be participating in the Small World Initiative (SWI) in order to accomplish this at A&T. You need to be familiar with this plan (see A&T's home web page).

STUDENT LEARNING OBJECTIVES/OUTCOMES (SLO)

Learning outcomes should be specific, measurable, and focused on the content knowledge the students are expected to master and not what the faculty will teach.

If the course is a General Education Course, the SLO should be listed and labeled as "General Education."

SLO1: Effectively employ critical thinking skills in written and oral communication involving general concepts and principles of the microbiological disciplines.
SLO2: Demonstrate the ability to utilize critical thinking skills and microbiological principles in written responses to short answer questions on assignments and examinations. Students will also exhibit the ability to answer in class lecture questions verbally.
SLO3: Demonstrate mastery of key concepts applicable to lectures and laboratories.
SLO4: Demonstrate the ability to use ideas and concepts from biology, chemistry, and mathematics to solve problems as well as questions on examinations, quizzes and essay questions.
SLO5: Demonstrate basic skills applicable to handling, cultivation, and biochemical identification of bacterial cultures.
SLO6: Display microbiological laboratory skills by performing experiments designed to familiarize them with techniques; followed by oral and written evaluations.

REQUIRED TEXTBOOKS AND MATERIALS

Any course-level subscriptions and tools linked in Blackboard Learn learning management system (LMS) should be listed here. The Blackboard LMS must have links to their student data privacy statement.

REQUIRED TEXTS:

Parker, N., Schneegurt, M., Tu, A.-H. T., Lister, P., & Forster, B. M. (2020). *Microbiology*. OpenStax.

REQUIRED MATERIALS:

N/A

SUGGESTED COURSE MATERIALS

SUGGESTED READINGS/TEXTS:

Blaser, M.J. (2014). *Missing microbes: How the overuse of antibiotics is fueling our modern plagues.* Henry Holt & Co.

SUGGESTED MATERIALS:

N/A

GRADING POLICY

ASSIGNMENTS AND GRADING POLICY

94% and above	A		76% - 74%	C
93% - 90%	A-		73% - 70%	C-
89% - 87%	B+		69% - 67%	D+
86% - 84%	B		66% - 64%	D
83% - 80%	B-		63% - 0%	F
79% - 77%	C+			

For GRADUATE COURSES: See 2019-2020 Graduate Catalog p.38 for graduate grading scale and Non-Graded Courses

GRADING ALLOCATION

Course grades are based on a weighted grading scale of 100%. The breakdown for the course is as follows: *[Faculty, please adjust according to your course.]*

Category	# of Activities	Percentage Grade Weight
Discussion Boards	1	0
Microbes in the Media Blog	7	10
Prelecture Homework	13	10
Case Studies	7	10
Lecture Exams	3	30
Lab Exams	1	5
Lab Assignments & Virtual Lab Activities	11	20
Video/Audio Presentation	1	5
Paper	1	10

Category	# of Activities	Percentage Grade Weight
Total	28	100%

COURSE POLICIES

USE OF BLACKBOARD AS THE LEARNING MANAGEMENT SYSTEM

Blackboard is the primary online instructional and course communications platform. Students can access the course syllabus, assignments, grades, and learner support resources. Students are encouraged to protect their login credentials, complete a Blackboard orientation, and log in daily to the course.

Note: Uploading assignments through Blackboard presents a challenge for Chromebook users in locating the files for submission. If you use a Chromebook, please be sure you also have access to a Mac computer or Windows computer so you can fully participate in your Blackboard class. For more information about student computer recommendations, please visit https://hub.ncat.edu/administration/its/computer-recommendations.php.

MAKE-UP EXAMS

See << Update Academic Year >>*Undergraduate Bulletin:*

https://www.ncat.edu/provost/academic-affairs/bulletins/index.php

For GRADUATE STUDENTS: See 2019-20 Graduate Catalog p. 54

EXTRA CREDIT

LATE WORK

SPECIAL ASSIGNMENTS

For GRADUATE STUDENTS: FAILING TO MEET COURSE REQUIREMENTS (Graduate Catalog p.40)

For GRADUATE STUDENTS: CLASS ATTENDANCE (see 2019-20 Graduate Catalog p. 53-54)

Students are expected to attend class and participate on a regular basis in order to successfully achieve course learning outcomes and meet federal financial aid requirements (34 CFR 668.22). Class attendance in online courses is defined as active participation in academically-related course activities. Active participation may consist of course interactions with the content, classmates, and/or the instructor. Examples of academically-related course activities include, but are not limited to:

- Completing and submitting assignments, quizzes, exams, and other activities within Blackboard or through Blackboard (3rd-party products).

- Participating in course-related synchronous online chats, discussions, or meeting platforms such as Blackboard Collaborate in which participation is tracked.

CLASSROOM CITIZENSHIP

Courtesy, civility and respect must be the hallmark of your interactions.

COMPLIANCE WITH THE AMERICANS WITH DISABILITIES ACT

North Carolina A&T State University is committed to following the requirements of the Americans with Disabilities Act Amendments Act (ADAAA) and Section 504 of the Rehabilitation Act. If you need an academic accommodation based on the impact of a disability, you must initiate the request with the Office of Accessibility Resources (OARS) and provide documentation in accordance with the Documentation Guidelines at N.C. A&T. Once documentation is received, it will be reviewed. Once approved, you must attend a comprehensive meeting to receive appropriate and reasonable accommodations. If you are a student registered with OARS, you must complete the Accommodation Request Form to have accommodations sent to faculty.

OARS is located in Murphy Hall, Suite 01. We can be reached at 336-334-7765, or by email at accessibilityresources@ncat.edu. Additional information and forms can be found on the web at https://www.ncat.edu/provost/academic-affairs/accessibility-resources/index.php.

Please note: Accommodations are not retroactive and begin once the Disability Verification Form is provided to faculty.

TITLE IX

North Carolina A&T State University is committed to providing a safe learning environment for all students—free of all forms of discrimination and harassment. Sexual misconduct and relationship violence in any form are inconsistent with the university's mission and core values, violate university policies, and may also violate federal and state law. Faculty members are considered "Responsible Employees" and are required to report incidents of sexual misconduct and relationship violence to the Title IX Coordinator. If you or someone you know has been impacted by sexual harassment, sexual assault, dating or domestic violence, or stalking, please visit the Title IX website to access information about university support and resources. If you would like to speak with someone confidentially, please contact the Counseling Services 336-334-7727 or the Student Health Center 336-334-7880.

TECHNICAL SUPPORT

If you experience any problems with your A&T account, you may call Client Technology Services (formerly Aggie Tech Support and Help Desk) at 336-334-7195, or visit https://hub.ncat.edu/administration/its/dept/ats/index.php.

FIELD TRIP POLICIES / OFF-CAMPUS INSTRUCTION AND COURSE ACTIVITIES

If applicable:

Off-campus, out-of-state and foreign instruction and activities are subject to state law and university policies and procedures regarding travel and risk-related activities. Information regarding these rules and regulations may be found at https://www.ncat.edu/campus-life/student-affairs/index.php.

STUDENT HANDBOOK

https://www.ncat.edu/campus-life/student-affairs/departments/dean-of-students/student-handbook.php

STUDENT TRAVEL PROCEDURES AND STUDENT TRAVEL ACTIVITY WAIVER

https://hub.ncat.edu/administration/student-affairs/staff-resources/studen_activity_travel_waiver.pdf

OTHER POLICIES *(e.g., Copyright Guidelines, Confidentiality, etc.)*

STUDENT HANDBOOK

https://www.ncat.edu/campus-life/student-affairs/departments/dean-of-students/student-handbook.php

Graduate Catalog

SEXUAL MISCONDUCT POLICY

https://www.ncat.edu/legal/title-ix/sexual-harassment-and-misconduct-policies/index.php

FAMILY EDUCATIONAL RIGHTS AND PRIVACY ACT (FERPA)

https://www.ncat.edu/registrar/ferpa.php

STUDENT COMPLAINT PROCEDURES

https://www.ncat.edu/current-students/student-complaint-form.php

STUDENT CONDUCT AND DISCIPLINE

North Carolina A&T State University has rules and regulations that govern student conduct and discipline meant to ensure the orderly and efficient conduct of the educational enterprise. It is the responsibility of each student to be knowledgeable about these rules and regulations.

Please consult the following about specific policies such as academic dishonesty, cell phones, change of grade, disability services, disruptive behavior, general class attendance, grade appeal, incomplete grades, make up work, student grievance procedures, withdrawal, etc.:

- Undergraduate Bulletin
  https://www.ncat.edu/provost/academic-affairs/bulletins/index.php
- Graduate Catalog
  https://www.ncat.edu/tgc/graduate-catalog/index.php
- Student Handbook
  https://www.ncat.edu/campus-life/student-affairs/departments/dean-of-students/student-handbook.php

ACADEMIC DISHONESTY POLICY

Academic dishonesty includes but is not limited to the following:

1. Cheating or knowingly assisting another student in committing an act of cheating or other academic dishonesty;
2. Plagiarism (unauthorized use of another's words or ideas as one's own), which includes but is not limited to submitting exams, theses, reports, drawings, laboratory notes or other materials as one's own work when such work has been prepared by or copied from another person;
3. Unauthorized possession of exams or reserved library materials; destroying or hiding source, library or laboratory materials or experiments or any other similar actions;
4. Unauthorized changing of grades, or marking on an exam or in an instructor's grade book or such change of any grade record;
5. Aiding or abetting in the infraction of any of the provisions anticipated under the general standards of student conduct;
6. Hacking into a computer and gaining access to a test or answer key prior to the test being given. A&T reserves the right to search the emails and computers of any student suspected of such computer hacking if a police report of the suspected hacking was submitted prior to the search; and
7. Assisting another student in violating any of the above rules.

A student who has committed an act of academic dishonesty has failed to meet a basic requirement of satisfactory academic performance. Thus, academic dishonesty is not only a basis for disciplinary action but may also affect the evaluation of a student's level of performance. Any student who commits an act of academic dishonesty is subject to disciplinary action.

In instances where a student has clearly been identified as having committed an act of academic dishonesty, an instructor may take appropriate disciplinary action, including a loss of credit for an assignment, exam or project; or awarding a grade of "F" for the course, **subject to review and endorsement by the chairperson and dean**.

For GRADUATE STUDENTS: Reference for academic dishonesty – 2010-2020 Graduate Catalog, p.58-59

For GRADUATE STUDENTS: STUDENT RELIGIOUS OBSEDRVANCE (see Graduate Catalog, p.55)

ASSIGNMENTS AND ACADEMIC CALENDAR

Include topics, reading assignments, due dates, exam dates, withdrawal dates, pre-registration and registration dates, all holidays and convocations.*

MONTH	DAY	SUBJECT	READING IN TEXT, ACTIVITY, HOMEWORK, EXAM
	Unit 1: Course Introduction	ULO1: List several ways in which microbes affect our lives. (SLO 1-6) ULO2: Define microbiome, normal microbiota, and transient microbiota (SLO 1-6) ULO3: Recognize the system of scientific nomenclature that uses two names: a genus and a specific epithet. (SLO 1-6) ULO4: Differentiate the major characteristics of each group of microorganisms. (SLO 1-6)	**1. Read Textbook:** Parker, N., Schneegurt, M., Tu, A.-H. T., Lister, P., & Forster, B. M. (2020). *Microbiology*. OpenStax. a. Chapter 1: An Invisible World

		ULO5: List the three domains (SLO 1-6)	**2**.**Complete**:Discussion #1(ULO 3-5) **3**.**Complete**: Microbes in the Media Blog # 1 (ULO 1-2)
	Unit 2: Bacterial Planet	ULO1: List the units used to measure microorganisms. (SLO 1-6) ULO2: Diagram the path of light through a compound microscope. (SLO 1-6) ULO3: Define total magnification and resolution. ULO4: Identify a use for darkfield, phase-contrast, differential interference contrast, fluorescence, confocal, two-photon, and scanning acoustic microscopy, and compare each with brightfield illumination. (SLO 1-6) ULO5: Explain how electron microscopy differs from light microscopy. (SLO 1-6) ULO6: Identify uses for the transmission electron microscope (TEM), scanning electron microscope (SEM), and scanned-probe microscopes. (SLO 1-6)	**1. Read Textbook:** Parker, N., Schneegurt, M., Tu, A.-H. T., Lister, P., & Forster, B. M. (2020). *Microbiology*. OpenStax. a. Chapter 1: An Invisible World **2**.**Complete**: Pre-lecture Homework #1 (ULO 1-5) **3**.**Complete**: Case Study #1: Rabbit Island (ULO N/A) **4. Complete:** Lab Assignments & Virtual Lab Activities #1: Microscopy (ULO N/A)
	Unit 3: The Cell	ULO1: Differentiate an acidic dye from a basic dye (SLO 1-6) ULO2: Explain the purpose of simple staining. (SLO 1-6) ULO3: List Gram stain steps, and describe the appearance of gram-positive and gram-negative cells after each step. (SLO 1-6) ULO4: Compare and contrast the Gram stain and the acid-fast stain. (SLO 1-6) ULO5: Explain why each of the following is used: capsule stain, endospore stain, flagella stain. (SLO 1-6)	**1. Read Textbook:** Parker, N., Schneegurt, M., Tu, A.-H. T., Lister, P., & Forster, B. M. (2020). *Microbiology*. OpenStax. a. Chapter 3: The Cell **2**.**Complete**: Microbes in the Media Blog #2 (ULO 1-5) **3**.**Complete**: Prelecture Homework #2 (ULO 1-5) **4. Complete:** Lab Assignments & Virtual Lab Activities #2: Pipetting (ULO N/A)
	Unit 4: Cultures & Colonies	ULO1: Compare the cell structure of prokaryotes and eukaryotes. (SLO 1-6) ULO2: Identify the three basic shapes of bacteria. (SLO 1-6) ULO3: Describe the structure and function of the glycocalyx. (SLO 1-6) ULO4: Differentiate flagella, axial filaments, fimbriae, and pili. (SLO 1-6) ULO5: Compare and contrast the cell walls of gram-positive bacteria, gram-negative bacteria, acid-fast bacteria, archaea, and mycoplasmas. (SLO 1-6)	**1. Read Textbook:** Parker, N., Schneegurt, M., Tu, A.-H. T., Lister, P., & Forster, B. M. (2020). *Microbiology*. OpenStax. a. Chapter 4: Cultures & Colonies **2.Complete:** Pre-lecture Homework #3 (ULO 1-15)

		ULO6: Compare and contrast archaea and mycoplasmas. (SLO 1-6) ULO7: Differentiate protoplast, spheroplast, and L form. (SLO 1-6) ULO8: Describe the structure, chemistry, and functions of the prokaryotic plasma membrane. (SLO 1-6) ULO9: Define simple diffusion, facilitated diffusion, osmosis, active transport, and group translocation. (SLO 1-6) ULO10: Identify the functions of the nucleoid and ribosomes. (SLO 1-6) ULO11: Describe the functions of endospores, sporulation, and endospore germination. (SLO 1-6) ULO12: Differentiate prokaryotic and eukaryotic flagella. (SLO 1-6) ULO13: Define organelle. (SLO 1-6) ULO14: Describe the functions of the nucleus, endoplasmic reticulum, Golgi complex, lysosomes, vacuoles, mitochondria, chloroplasts, peroxisomes, and centrosomes. (SLO 1-6) ULO15: Discuss evidence that supports the endosymbiotic theory of eukaryotic evolution. (SLO 1-6)	**3.Complete:** Case Study #2: Antibiotic Crisis (ULO N/A) **4. Complete:** Lab Assignments & Virtual Lab Activities #3: Serial Dilutions (ULO N/A)
	Unit 5: Microbiome	ULO1: Classify microbes into five groups on the basis of preferred temperature range. (SLO 1-6) ULO2: Identify how and why the pH of culture media is controlled. (SLO 1-6) ULO3: Explain the importance of osmotic pressure to microbial growth. (SLO 1-6) ULO4: Name a use for each of the four elements (carbon, nitrogen, sulfur, and phosphorus) needed in large amounts for microbial growth. (SLO 1-6) ULO5: Explain how microbes are classified on the basis of oxygen requirements. (SLO 1-6) ULO6: Identify ways in which aerobes avoid damage by toxic forms of oxygen. (SLO 1-6) ULO7: Describe the formation of biofilms and their potential for causing infection. (SLO 1-6) ULO8: Explain how microorganisms are preserved by deep-freezing and lyophilization (freeze-drying). (SLO 1-6)	**1. Read Textbook:** Parker, N., Schneegurt, M., Tu, A.-H. T., Lister, P., & Forster, B. M. (2020). *Microbiology*. OpenStax. a. Chapter 6: Acellular Pathogens **2.Complete:** Pre-lecture Homework #4 (ULO 1-8) **3.Complete:** Microbes in the Media Blog #3 (ULO 1-8) **4. Complete:** Lab Assignments & Virtual Lab Activities #3: Serial Dilutions (ULO N/A) **5. Complete:** Lecture Exam #1 (ULO N/A)
	Unit 06: Re-culturing and Isolating our Producers	ULO1: Define the following key terms related to microbial control: sterilization, disinfection, antisepsis, degerming, sanitization, biocide, germicide, bacteriostasis, and asepsis. (SLO 1-6)	**1. Read Textbook:** Parker, N., Schneegurt, M., Tu, A.-H. T., Lister, P., & Forster, B. M. (2020). *Microbiology*. OpenStax.

		ULO2: Describe the patterns of microbial death caused by treatments with microbial control agents. (SLO 1-6) ULO3: Describe the effects of microbial control agents on cellular structures. (SLO 1-6) ULO4: Compare the effectiveness of moist heat (boiling, autoclaving, pasteurization) and dry heat. (SLO 1-6) ULO5: Describe how filtration, low temperatures, high pressure, desiccation, and osmotic pressure suppress microbial growth. (SLO 1-6) ULO6: Explain how radiation kills cells. ULO7: List the factors related to effective disinfection. (SLO 1-6) ULO8: Interpret the results of use-dilution tests and the disk diffusion method. (SLO 1-6) ULO9: Identify the methods of action and preferred uses of chemical disinfectants. (SLO 1-6) ULO10: Differentiate halogens used as antiseptics from halogens used as disinfectants. (SLO 1-6) ULO11: Identify the appropriate uses for surface-active agents. (SLO 1-6) ULO12: List the advantages of glutaraldehyde over other chemical disinfectants. (SLO 1-6) ULO13: Identify chemical sterilizers. (SLO 1-6) ULO14: Explain how the type of microbe affects the control of microbial growth. (SLO 1-6)	a. Chapter 7: Microbial Biochemistry **2. Complete:** Prelecture Homework #5 (ULO 1-14) **3. Complete:** Case Study #3: Take 2 (ULO N/A) **4. Complete:** Lab Assignments & Virtual Lab Activities #5: Streak Plating (ULO N/A)
	Unit 07: Microbial Growth	ULO1: Define genetics, genome, chromosome, gene, genetic code, genotype, phenotype, and genomics. (SLO 1-6) ULO2: Describe how DNA serves as genetic information. (SLO 1-6) ULO3: Describe the process of DNA replication. (SLO 1-6) ULO4: Describe protein synthesis, including transcription, RNA processing, and translation. ULO5: Compare protein synthesis in prokaryotes and eukaryotes. (SLO 1-6) ULO6: Define operon. (SLO 1-6) ULO7: Explain pre-transcriptional regulation of gene expression in bacteria. (SLO 1-6) ULO8: Explain post-transcriptional regulation of gene expression. (SLO 1-6) ULO9: Classify mutations by type. (SLO 1-6) ULO10: Describe two ways mutations can be repaired. (SLO 1-6) ULO11: Describe the effect of mutagens on the mutation rate. (SLO 1-6)	**1. Read Textbook:** Parker, N., Schneegurt, M., Tu, A.-H. T., Lister, P., & Forster, B. M. (2020). *Microbiology*. OpenStax. a. Chapter 8: Microbial Metabolism **2. Complete:** Microbes in the Media Blog #4 (ULO 1-16) **3. Complete:** Prelecture Homework #6 (ULO 1-16) **4. Complete:** Lab Assignments & Virtual Lab Activities #6 (ULO N/A) **5. Complete:** Lab Exam #1 (ULO N/A)

		ULO12: Outline the methods of direct and indirect selection of mutants. (SLO 1-6) ULO13: Identify the purpose of and outline the procedure for the Ames test. (SLO 1-6) ULO14: Describe the functions of plasmids and transposons. (SLO 1-6) ULO15: Differentiate horizontal and vertical gene transfer. (SLO 1-6) ULO16: Compare the mechanisms of genetic recombination in bacteria. (SLO 1-6)	
	Unit 08: Antimicrobial Drugs	ULO1: Differentiate the alpha proteobacteria described in this chapter by drawing a dichotomous key. (SLO 1-6) ULO2: Differentiate the betaproteobacteria described in this chapter by drawing a dichotomous key. (SLO 1-6) ULO3: Differentiate the gamma proteobacteria described in this chapter by drawing a dichotomous key. (SLO 1-6) ULO4: Differentiate the deltaproteobacteria described in this chapter by drawing a dichotomous key. (SLO 1-6) ULO5: Differentiate the epsilonproteobacteria described in this chapter by drawing a dichotomous key. (SLO 1-6) ULO6: Differentiate planctomycetes, chlamydias, Bacteroidetes, Cytophaga, and Fusobacteria by drawing a dichotomous key. (SLO 1-6) ULO7: Compare and contrast purple and green photosynthetic bacteria with the cyanobacteria. (SLO 1-6) ULO8: Describe the features of spirochetes and Deinococcus. (SLO 1-6) ULO9: Differentiate the genera of firmicutes and tenericutes described in this chapter by drawing a dichotomous key. (SLO 1-6) ULO10: Differentiate the actinobacteria described in this chapter by drawing a dichotomous key. (SLO 1-6)	**1. Read Textbook:** Parker, N., Schneegurt, M., Tu, A.-H. T., Lister, P., & Forster, B. M. (2020). *Microbiology*. OpenStax. a. Chapter 11: Mechanisms of Microbial Genetics **2. Complete:** Prelecture Homework #7 (ULO 1-10) **3. Complete:** Case Study #4: We Are Not Alone (ULO N/A) **4. Complete:** Lab Assignments & Virtual Lab Activities #7: Gram Staining (ULO N/A)
	Unit 09: Lab Practical	ULO1: List the defining characteristics of fungi. (SLO 1-6) ULO2: Differentiate asexual from sexual reproduction, and describe each of these processes in fungi. (SLO 1-6) ULO3: List defining characteristics of the four phyla of fungi. (SLO 1-6) ULO4: Identify two beneficial and two harmful effects of fungi. (SLO 1-6)	**1. Read Textbook:** Parker, N., Schneegurt, M., Tu, A.-H. T., Lister, P., & Forster, B. M. (2020). *Microbiology*. OpenStax. a. Chapter 12: Modern Applications of Microbial Genetics

		ULO5: List the distinguishing characteristics of lichens, and describe their nutritional needs. (SLO 1-6) ULO6: Describe the roles of the fungus and the alga in a lichen. (SLO 1-6) ULO7: List the defining characteristics of algae. (SLO 1-6) ULO8: List the outstanding characteristics of the five phyla of algae discussed in this chapter. (SLO 1-6) ULO9: Identify two beneficial and two harmful effects of algae. (SLO 1-6) ULO10: List the defining characteristics of protozoa. (SLO 1-6) ULO11: Describe the outstanding characteristics of the seven phyla of protozoa discussed in this chapter, and give an example of each. (SLO 1-6) ULO12: Differentiate an intermediate host from a definitive host. (SLO 1-6) ULO13: List the distinguishing characteristics of parasitic helminths. (SLO 1-6) ULO14: Provide a rationale for the elaborate life cycle of parasitic worms. (SLO 1-6) ULO15: List the characteristics of the two classes of parasitic platyhelminths, and give an example of each. (SLO 1-6) ULO16: Describe a parasitic infection in which humans serve as a definitive host, as an intermediate host, and as both. (SLO 1-6) ULO17: List the characteristics of parasitic nematodes, and give an example of infective eggs and infective larvae. (SLO 1-6) ULO18: Compare and contrast platyhelminths and nematodes. (SLO 1-6) ULO19: Define arthropod vector. (SLO 1-6) ULO20: Differentiate a tick from a mosquito, and name a disease transmitted by each. (SLO 1-6)	**2. Complete:** Microbes in the Media Blog #5 (ULO 1-20) **3. Complete:** Prelecture Homework #8 (ULO 1-20) **4. Complete:** Lab Assignments & Virtual Lab Activities #8: Antimicrobial Susceptibility (ULO N/A)
	Unit 10: Microbial Mechanisms of Pathogenicity	ULO1: Differentiate a virus from a bacterium. ULO2: Describe the chemical and physical structure of both an enveloped and a nonenveloped virus. (SLO 1-6) ULO3: Define viral species. ULO4: Give an example of a family, genus, and common name for a virus. (SLO 1-6) ULO5: Describe how bacteriophages are cultured. (SLO 1-6) ULO6: Describe how animal viruses are cultured. (SLO 1-6) ULO7: List three techniques used to identify viruses. (SLO 1-6)	**1. Read Textbook:** Parker, N., Schneegurt, M., Tu, A.-H. T., Lister, P., & Forster, B. M. (2020). *Microbiology*. OpenStax. a. Chapter 13: Control of Microbial Growth **2. Complete:** Prelecture Homework #9 (ULO 1-16)

		ULO8: Describe the lytic cycle of T-even bacteriophages. (SLO 1-6) ULO9: Describe the lysogenic cycle of bacteriophage lambda. (SLO 1-6) ULO10: Compare and contrast the multiplication cycle of DNA- and RNA-containing animal viruses. (SLO 1-6) ULO11: Define oncogene and transformed cell. (SLO 1-6) ULO12: Discuss the relationship between DNA- and RNA-containing viruses and cancer. ULO13: Provide an example of a latent viral infection. (SLO 1-6) ULO14:Differentiate persistent viral infections from latent viral infections. (SLO 1-6) ULO15: Differentiate between virus, viroid, and prion. (SLO 1-6) ULO16: Describe the lytic cycle for a plant virus. (SLO 1-6)	**3. Complete:** Case Study #5: Resistance is Futile … or Is it? (ULO N/A) **4. Complete:** Lecture Exam #2 (ULO N/A) **5. Complete:** Lab Assignments & Virtual Lab Activities #9: Streak Plating (ULO N/A)
	Unit 11: Disease and Epidemiology	ULO1: Identify the contributions of Paul Ehrlich and Alexander Fleming to chemotherapy. (SLO 1-6) ULO2: Name the microbes that produce most antibiotics. (SLO 1-6) ULO3: Describe the problems of chemotherapy for viral, fungal, protozoan, and helminthic infections. (SLO 1-6) ULO4: Define the following terms: spectrum of activity, broad-spectrum antibiotic, superinfection. (SLO 1-6) ULO5: Identify five modes of action of antimicrobial drugs. (SLO 1-6) ULO6: Explain why drugs in this section are bacteria-specific. (SLO 1-6) ULO7: List the advantages of each of the following over penicillin: semisynthetic penicillins, cephalosporins, and vancomycin. (SLO 1-6) ULO8: Explain why isoniazid and ethambutol are antimycobacterial agents. (SLO 1-6) ULO9: Describe how each of the following inhibits protein synthesis: aminoglycosides, tetracyclines, chloramphenicol, macrolides. ULO10: Compare polymyxin B, bacitracin, and neomycin in their modes of action. ULO11: Describe how rifamycins and quinolones kill bacteria. (SLO 1-6) ULO12: Describe how sulfa drugs inhibit microbial growth. (SLO 1-6) ULO13: Explain modes of action of current antifungal drugs. (SLO 1-6)	**1. Read Textbook:** Parker, N., Schneegurt, M., Tu, A.-H. T., Lister, P., & Forster, B. M. (2020). *Microbiology*. OpenStax. a. Chapter 20:Laboratory Analysis of the Immune Response **2. Complete:** Microbes in the Media Blog #6 (ULO 1-19) **3. Complete:** Prelecture Homework #10 (ULO 1-19) **4. Complete:** Lab Assignments & Virtual Lab Activities #10: Differential and Selective Media (ULO N/A)

		ULO14: Explain modes of action of current antiviral drugs. (SLO 1-6) ULO15: Explain modes of action of current antiprotozoan and antihelminthic drugs. (SLO 1-6) ULO16: Describe two tests for microbial susceptibility to chemotherapeutic agents. ULO17: Describe the mechanisms of drug resistance. (SLO 1-6) ULO18: Compare and contrast synergism and antagonism. (SLO 1-6) ULO19: Name three areas of research on new chemotherapeutic agents. (SLO 1-6)	
	Unit 12: Host Defenses	ULO1: Define pathology, etiology, infection, and disease. (SLO 1-6) ULO2: Describe how the human microbiome is acquired. (SLO 1-6) ULO3: Compare commensalism, mutualism, and parasitism, and give an example of each. (SLO 1-6) ULO4: Contrast normal microbiota and transient microbiota with opportunistic microorganisms. ULO5: List Koch's postulates. (SLO 1-6) ULO6: Differentiate a communicable disease from a noncommunicable disease. (SLO 1-6) ULO7: Categorize diseases according to frequency of occurrence. (SLO 1-6) ULO8: Categorize diseases according to severity. (SLO 1-6) ULO9: Define herd immunity. (SLO 1-6) ULO10: Identify four predisposing factors for disease. (SLO 1-6) ULO11: Put the following in proper sequence, according to the pattern of disease: period of decline, period of convalescence, period of illness, prodromal period, incubation period. (SLO 1-6) ULO12: Define reservoir of infection. (SLO 1-6) ULO13: Contrast human, animal, and nonliving reservoirs, and give one example of each. (SLO 1-6) ULO14: Explain three methods of disease transmission. (SLO 1-6) ULO15: Define healthcare-associated infections, and explain their importance. (SLO 1-6) ULO16: Define compromised host. (SLO 1-6) ULO17: List several methods of disease transmission in hospitals. (SLO 1-6) ULO18: Explain how healthcare-associated infections can be prevented. (SLO 1-6)	**1. Read Textbook:** Parker, N., Schneegurt, M., Tu, A.-H. T., Lister, P., & Forster, B. M. (2020). *Microbiology*. OpenStax. a. Chapter 14: Antimicrobial Drugs **2. Complete:** Prelecture Homework #11 (ULO 1-22) **3. Complete:** Case Study #6: Sarah's Sickness (ULO N/A) **4. Complete:** Lab Assignments & Virtual Lab Activities #11: Biochemical Tests (ULO N/A)

		ULO19: List several probable reasons for emerging infectious diseases, and name one example for each reason. (SLO 1-6) ULO20: Define epidemiology, and describe three types of epidemiologic investigations. (SLO 1-6) ULO21: Identify the function of the CDC. (SLO 1-6) ULO22: Define the following terms: morbidity, mortality, and notifiable infectious diseases. (SLO 1-6)	
	Unit 13: Adaptive Immunity	ULO1: Identify the principal portals of entry. ULO2: Define ID50 and LD50. (SLO 1-6) ULO3: Using examples, explain how microbes adhere to host cells. (SLO 1-6) ULO4: Explain how capsules and cell wall components contribute to pathogenicity. (SLO 1-6) ULO5: Compare the effects of coagulases, kinases, hyaluronidase, and collagenase. ULO6: Define and give an example of antigenic variation. (SLO 1-6) ULO7: Describe how bacteria use the host cell's cytoskeleton to enter the cell. ULO8: Identify six mechanisms of avoiding destruction by phagocytosis. (SLO 1-6) ULO9: Describe the function of siderophores. ULO10: Provide an example of direct damage, and compare this to toxin production. (SLO 1-6) ULO11: Contrast the nature and effects of exotoxins and endotoxins. (SLO 1-6) ULO12: Outline the mechanisms of action of A-B toxins, membrane-disrupting toxins, superantigens, and genotoxins. (SLO 1-6) ULO13: Identify the importance of the LAL assay. (SLO 1-6) ULO14: Using examples, describe the roles of plasmids and lysogeny in pathogenicity. ULO15: List nine cytopathic effects of viral infections. (SLO 1-6) ULO16: Discuss the causes of symptoms in fungal, protozoan, helminthic, and algal diseases. (SLO 1-6) ULO17: Differentiate between portal of entry and portal of exit. (SLO 1-6)	**1. Read Textbook:** Parker, N., Schneegurt, M., Tu, A.-H. T., Lister, P., & Forster, B. M. (2020). *Microbiology*. OpenStax. a. Chapter 15: Microbial Mechanisms of Pathogenicity **2. Complete:** Microbes in the Media Blog #7 (ULO 1-17) **3. Complete:** Prelecture Homework #12 (ULO 1-17)
	Unit 14: Adaptive Defenses	ULO1: Differentiate between innate and adaptive immunity. (SLO 1-6) ULO2: Define Toll-like receptors. ULO3: Describe the role of the skin and mucous membranes in innate immunity. (SLO 1-6)	**1. Read Textbook:** Parker, N., Schneegurt, M., Tu, A.-H. T., Lister, P., & Forster, B. M. (2020). *Microbiology*. OpenStax.

		ULO4: Differentiate physical from chemical factors, and list five examples of each. (SLO 1-6) ULO5: Describe the role of normal microbiota in innate immunity. (SLO 1-6) ULO6: Classify leukocytes, and describe the roles of granulocytes and monocytes. (SLO 1-6) ULO7: Describe the eight different types of WBCs, and name a function for each type. (SLO 1-6) ULO8: Differentiate between the lymphatic and blood circulatory systems. (SLO 1-6) ULO9: Define phagocyte and phagocytosis. (SLO 1-6) ULO10: Describe the process of phagocytosis, and include the stages of adherence and ingestion. (SLO 1-6) ULO11: List the stages of inflammation. (SLO 1-6) ULO12: Describe the roles of vasodilation, kinins, prostaglandins, and leukotrienes in inflammation. (SLO 1-6) ULO13: Describe phagocyte migration. ULO14: Describe the cause and effects of fever. (SLO 1-6) ULO15: List the major components of the complement system. (SLO 1-6) ULO16: Describe three pathways of activating complement. (SLO 1-6) ULO17: Describe three consequences of complement activation. (SLO 1-6) ULO18: Define interferons. (SLO 1-6) ULO19: Compare and contrast the actions of IFN-α and IFN-β with IFN-γ. (SLO 1-6) ULO20: Describe the role of iron-binding proteins in innate immunity. (SLO 1-6) ULO21: Describe the role of antimicrobial peptides in innate immunity. (SLO 1-6)	a. Chapter 16: Disease and Epidemiology **2. Complete:** Prelecture Homework #13 (ULO 1-21) **3. Complete:** Case Study #7: Disease Along the River (ULO N/A) **4. Complete:** Video/Audio Presentation #1 (ULO N/A) **5. Complete:** Paper #1 (ULO N/A)
	Unit 15: Exam #3	ULO1: Compare and contrast adaptive and innate immunity. **(SLO 1-6)** ULO2: Differentiate humoral from cellular immunity. **(SLO 1-6)** ULO3: Identify at least one function of each of the following: cytokines, interleukins, chemokines, interferons, TNF, and hematopoietic cytokines. **(SLO 1-6)** ULO4: Define antigen, epitope, and hapten. ULO5: Explain antibody function, and describe the structural and chemical characteristics of antibodies. **(SLO 1-6)** ULO6: Name one function for each of the five classes of antibodies. **(SLO 1-6)**	**1. Read Textbook:** Parker, N., Schneegurt, M., Tu, A.-H. T., Lister, P., & Forster, B. M. (2020). *Microbiology*. OpenStax. a. Chapter 17: Innate Nonspecific Host Defenses **2. Complete:** Lecture Exam #3 (ULO N/A)

		ULO7: Compare and contrast T-dependent and T-independent antigens. **(SLO 1-6)** ULO8: Differentiate plasma cell from memory cell. **(SLO 1-6)** ULO9: Describe clonal selection. ULO10: Describe how a human can produce different antibodies. **(SLO 1-6)** ULO11: Describe four outcomes of an antigen–antibody reaction. **(SLO 1-6)** ULO12: Describe at least one function of each of the following: M cells, TH cells, CTLs, Treg cells, NK cells. **(SLO 1-6)** ULO13: Differentiate between T helper, T cytotoxic, and T regulatory cells. ULO14: Differentiate between TH1, TH2, and TH17 cells. **(SLO 1-6)** ULO15: Define apoptosis. **(SLO 1-6)** ULO16: Define antigen-presenting cell. **(SLO 1-6)** ULO17: Describe the function of natural killer cells. **(SLO 1-6)** ULO18: Describe the role of antibodies and natural killer cells in antibody-dependent cell-mediated cytotoxicity. **(SLO 1-6)** ULO19: Distinguish a primary from a secondary immune response. **(SLO 1-6)** ULO20: Contrast the four types of adaptive immunity. **(SLO 1-6)**	

** These descriptions and timelines are subject to change at the discretion of the instructor.*