

Biology 2120

Spring 2025



Lab: Introduction to Microbiology

Last day to withdraw:
March 31, 2025

Professor: Dr. Stephanie Daugherty
sdaugherty@uttyler.edu BEP107

Office Hours: TTh 9:50-10:50, W 3:50-5 & appointments.

TAs: Kingsley Amoateng, James Campbell
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Scheduled meeting times: M and W (times vary by section); T
Th 8:30-9:50 (section 7)

Office Hrs for TAs: To Be Announced

Materials: Lab Manual printed by department,
cost: \$35.00 first day of class
(cash or check)

1 pack colored pencils (not expensive, should
include pink and purple)

*This is an in person lab course; attendance
in lab is required each lab day.*

*Note that intro to micro labs meet two days
a week (M and W sections 1-6, T and TH
section 7)*

*Lab course requires reading/demo videos to
be completed online ahead of lab.*

This course will introduce non-Biology-major, health-
professions focused students to the principles of microbiology
lab work. **Co-registration in BIOL 2320 is required.**
(Intro to Micro Lecture) is required!

Grades are earned by students based on student mastery of learning objectives,
via assignments, experiments, participation, and assessments.

Objectives:

1. Students will learn basic micro lab techniques including sterile technique, inoculations, microscopy, and staining. Lab safety and PPE will be a priority.
2. Students will learn about aerobic respiration, anaerobic respiration, and fermentation, learn how to detect each in test media in the laboratory, and be able to explain the results
3. Students will learn how enzymes control metabolism and traits in a cell, be able to test for traits in the laboratory with specialized selective & differential media, and be able to explain the results.
4. Students will learn how antibiotics work to target prokaryotes specifically, and how enzymes can confer resistance to antibiotics. Students will conduct an antibiotic sensitivity test and be able to explain the results.
5. Students will learn how antibodies can be used as tools in a diagnostic microbiology lab, and will be able to conduct an antigen detection test and be able to explain the results.
6. Students will learn how pathogen genetic testing is done.
7. Students will develop critical thinking skills, teamwork & communication skills as they complete group work & lab work
8. Students will build a dichotomous key/testing plan for G+ and G- bacteria using lab tests they learn in lab.
9. Students will perform in person or virtual bacterial identifications on simulated clinical samples and produce a clinical report and paragraph defending their identification using their lab test results.

Class Policies in short:

Follow all safety rules

Respect your colleagues &
instructors

Zero-Tolerance for Cheating &
Plagiarism

Attendance is expected; if
instructor is notified at least 2
hours before online flexibility
can be granted for one lab*

Late work policy for uploaded
documents: -10% each day for
maximum 3 days

Late work policy for quizzes,
videos, readings that close at
certain time: email to ask for
reopening; first one submit
planner; rest penalized:

Max score 75% - 2nd

Max score 60% - 3rd ... rest 0%

Expectations of Students:

Students are expected to follow all safety rules & wear PPE as determined by the instructor. Students are expected to participate; keep track of, and complete assignments by due date, attend required labs, and complete required online labs. (send documentation of excused absences ahead of lab). Lab Data Sheets submitted without attending the corresponding lab or permission of professor will be graded zero and flagged as plagiarism, with report to Office of Judicial Affairs. Students are expected to follow University Policy and Academic Conduct requirements, including doing students' own work, not cheating, not plagiarizing, and citing sources appropriately.

Materials:

Required: *Introduction to Microbiology Lab Manual*, by S Fischer, will be available in lab on the first day for \$35.00 (cash or check). It is pre-printed by the department and sold just for printing costs to students. Colored pencil set (cheap) that includes pink, purple, yellow, etc.

Online systems: Canvas (provided through University); Jupiter (provided through instructor as a free system we can use as a clicker/ etc); Instant feedback program (provided through instructor for activities). **Calendar** is provided on first day as paper & download

Coursework: (grade weights may be adjusted during semester if unforeseen circumstances require)

Full list of assignments available on course calendar.

Data Sheets: where experimental or virtual results are recorded and questions about experiment are answered. Then uploaded to online system to be graded. (8% of final grade). There are multiple days to ask questions about these; turning in with habitual (>3 DSheets) blank answers may cause DS to be graded at maximum 50%.

Lab Readings: done online ahead of lab, and answer questions to receive credit (same text is provided in hard copy if needed). (9% of final grade)

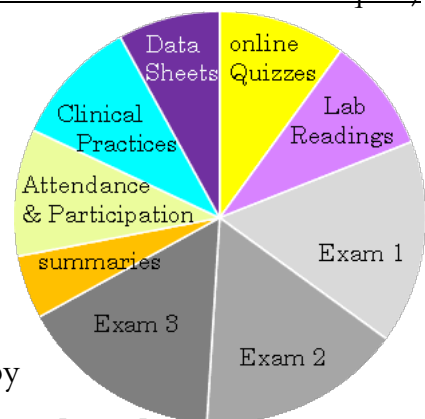
Online lab quizzes: over lab readings & videos, open book, open slides, open notes, open for 1 week prior to due date. Completed on online system (10% of final grade).

Exams (3 of them): given in class (or online if safety requires), over lab readings, videos/slides, & data sheets. Reviews will be posted online. Exams will be given on online system, whether in person or not. (16% each for total of 48% of grade)

Summaries & reviews: exam reviews will include summaries that will be completed by the student and turned in, and the start of review flashcards to be completed by students, and dichotomous keys to be completed by students (5% of final grade)

Clinical Practices: at end of semester, multiple simulated patient samples will be given, and students will use learned lab tests to identify them, fill out data sheets, fill out a report page, and write a summary paragraph which will then be uploaded. (10% of final grade)

Attendance & Participation: required attendance in lab (10% of final grade).



UT Tyler grading policy (rounding 0.50 to next percent):

00-59.49% = F 59.5-69.49% = D 69.5-79.49% = C 79.5-89.49% = B 89.5-100% = A

NO EXTRA CREDIT will be offered at the end of semester as a grade adjustment, or to individual students.

Extra credit assignments may be given to entire class during the semester, or may be offered for following safety protocols or clean up protocols. Attendance boost may be applied to students within 0.5% of next letter grade, if students attended all lab sessions.

Academic Integrity Policy: Student dishonesty in this class includes, but is not limited to: plagiarism or failure to cite sources, using another's words/ideas and claiming as one's own; use of automated programs to write or reword copied-and-pasted text to "avoid plagiarism"; turning in another person's work as one's own, no matter where it was obtained; copying another student's work or providing course materials to other students (including from past semesters); signing in another student to attendance records; using or possessing, in lap or hand, an unauthorized (not-in-lockdown) device during an exam; otherwise cheating on an assignment or exam.

Any occurrence of academic dishonesty can result in a score of zero on an assignment, nullification of all extra credit done by the student, failure of the course, and reporting to the Office of Judicial Affairs.

Comportment: Students are expected to behave in accordance with University Policy and with safety regulations dictated by the instructor; and behave professionally to not create a disruptive learning environment for fellow students. Tobacco and nicotine products, including e-cigarettes, or other types of cigarettes or vapes, pose a distraction and potential medical risk to other students, and will not be used in lecture or in lab.

Absence Policies:

Students are expected to attend all labs in person. These are posted on the calendar students receive at the beginning of the semester, and students are expected to make arrangements to attend every lab class.

In the case of an excused absence, students must submit documentation and let the instructor know as soon as possible prior to the scheduled class.

Multiple absences require documentation through the Student Accessibility Resource office at saroffice@uttyler.edu (903-566-7079) for a plan to accommodate absences and prepare alternative work.

Missed Exams: students who notify the professor with an excused absence ahead of an exam day, complete with required documentation, may be accommodated ONCE with a make-up exam within one week of the absence, which may or may not be in the same format as the scheduled exam (at the instructor's discretion). If a student misses a class or exam without contacting the instructor ahead of the start of the class or exam, no make up exam or assignment need be offered.

Arriving late for exams: habitually arriving late for class and being late for an exam may result in the student not being allowed to take the exam, or being penalized points on that exam, or the exam being offered in a different format (such as essay format).

Late Work & Make-Up Work: A single missed online or virtual assignment may be made up by any student for full credit by submitting a full semester planner that includes both due dates & planned times for working on assignments to the instructor by email (see example in lab book). A second missed assignment may be made up for a maximum of 75% by contacting the instructor within 5 days. A third missed assignment may be made up for a maximum of 60% within 5 days. Further missed assignments may not be made up. For uploaded documents, data sheets, or projects, late penalty is -10% every 24 hours for a

maximum of 3 days, after which a score of zero will be given. **There are no make-up lab sessions for in person labs.**

Artificial Intelligence Policy: *UT Tyler is committed to exploring and using artificial intelligence (AI) tools as appropriate for the discipline and task undertaken. We encourage discussing AI tools' ethical, societal, philosophical, and disciplinary implications. All uses of AI should be acknowledged as this aligns with our commitment to honor and integrity, as noted in UT Tyler's Honor Code. Faculty and students must not use protected information, data, or copyrighted materials when using any AI tool. Additionally, users should be aware that AI tools rely on predictive models to generate content that may appear correct but is sometimes shown to be incomplete, inaccurate, taken without attribution from other sources, and/or biased. Consequently, an AI tool should not be considered a substitute for traditional approaches to research. You are ultimately responsible for the quality and content of the information you submit. Misusing AI tools that violate the guidelines specified for this course (see below) is considered a breach of academic integrity. The student will be subject to disciplinary actions as outlined in UT Tyler's Academic Integrity Policy.*

For this course, the work submitted by students in this course will be generated by themselves. This includes all process work, drafts, brainstorming artifacts, editing, and final products, including lab data sheets and identification keys. This extends to group assignments where students must collaboratively create the project, complete a project, or answer questions. Any instance of the following constitutes a violation of UT Tyler's Honor Code: a student has another person/entity do any portion of a graded assignment, which includes purchasing work from a company, hiring a person or company to complete an assignment or exam, using a previously submitted assignment, and/or using AI tools (such as ChatGPT). Current students and previous students providing materials for students to copy from will be reported to the Office for Judicial Affairs for violations of Academic Integrity Policy, as will the students copying the materials.

Withdrawals & Incompletes: Make up assignments are provided at the instructor's discretion, dependent upon the type of assignment, attendance, previous completed assignments, the student's diligence about contacting the instructor quickly & ahead of the scheduled lab session, and the amount of time elapsed since material was missed. Missing assignment credit may not be provided after 3 weeks or after an exam is given, depending upon whether materials are pertinent to the next exam. Please email the instructor as soon as possible regarding missed assignments, missed classes, or required quarantines. Please follow up the email if an answer has not been received within 1 week.

If circumstances force a withdrawal from the class, please contact the registrar's office to formally withdraw from the course by the required date and email your instructor to let them know. If you fail to submit the form on time, you will receive an F in the course. You are not automatically withdrawn if you stop attending classes; you must file the form.

Best Practices & Hints:

- Keep up with **online Lab Readings**, answer questions as you watch them & at the end to receive credit. These are done ahead of lab for needed instructions and safety information; you may not be allowed to do the lab if they are not complete.
- Online **Lab Quizzes** are open for at least one week; open them early and review the questions, then use class slides, notes, videos & class readings to answer (answers are based on class materials, not outside sources).
- **Attend required Labs** to complete experiments which will be crucial for exams as well as counting for credit. In case of forced absence, notification of the professor ahead of the lab by email is required, with accompanying documentation, for the opening of a virtual lab activity.
- **Lab Slides** will be presented by the professor, and copies will be posted in the Materials section of Jupiter for students to review and use to answer questions.
- **Lab Data Sheets** are to be completed by the student from lab experiment results and answering questions from lab reading and lab slides. Students should do their own work to complete the Lab Data Sheets. **Photos of student results** are required to be submitted with Data Sheets, and grading includes result consistency with photos.
- **Clinical Practices** will be introduced, explained, and completed at the end of the semester, using all students have learned to identify pathogens in prepared “patient samples”

READING IS NOT ENOUGH. PRACTICE TESTING IS CRITICAL. Our Review Materials are specifically designed to make self-testing or study-groups extremely easy.

INTERESTED IN MORE?

Medical Microbiology text online: <http://www.ncbi.nlm.nih.gov/books/NBK7627/>

Blog & Book: [Puswhisperer: a year in the life of an infectious disease doctor](http://boards.medscape.com/29f3af03/). Mark Crislip, MD. (Books on amazon, blog on Medscape:

<http://boards.medscape.com/29f3af03/>)

[The Great Influenza](#), by John M Barry.

Lab Objective	Student Learning Goals
3 factors of molecular interaction	Molecules interact, and their interactions are governed by their charge, hydrophobicity/hydrophilicity, and 3-dimensional shape. Students work as directed with magnets, hydrophobic and hydrophilic powders in water, and puzzle pieces and lego to explore this topic, and learn how to fill in lab data sheets appropriately.
Micro Tools & Labeling	Students learn names of microbiology tools & how to label materials properly
Streak for Isolation, Inoculations	Students learn what it means to get an “isolated colony”, and learn to streak for isolation from a plate and a “mystery mix” broth. They learn to inoculate broths and keep tools sterile using Bunsen burner.
Ubiquity	Students culture from common lab locations as well as personal equipment, learn the importance of taking care in a BSL II lab, of not eating or drinking in lab, and also of the dose difference between 1 or 2 bacteria on their pencil, and 1 or 2 million of the same bacteria on a culture plate. Students learn how to dispose of lab materials safely.

Metabolism & Fermentation	Students will observe signs of metabolic processes and waste products produced, in preparation for differential media tests used later in the semester.
Colony Morphology	Students learn vocabulary and how to classify isolated colonies based upon their morphology and culture conditions.
Microscopy	Students familiarize themselves with the microscopes and learn how to use them appropriately, how to use immersion oil, and why we use immersion oil.
Smears & Stains	Students learn to prepare a wet smear and then heat-fix it, and apply a simple stain, and differentiate between bacterial morphologies of their simple stains on the microscope.
Gram Stains	Students learn to prepare a wet smear and then heat-fix it, and do Gram Staining. They must be able to explain what bacterial characteristics determine the result of the Gram Stain, and do several repeatable Gram Stains. They also learn about, but do not do: capsule stains, negative stains, acid-fast stains, and endospore stains.
Catalase, Coagulase Tests	Students are introduced to direct enzyme tests, in which a substrate is provided and an end product looked for to determine directly whether a specific enzyme is present. Students perform catalase tests and coagulase tests, and are expected to be able to explain the value of both to a patient.
Gram Positive Tests: MSA BE, Hemolysis Bacitracin Resistance	Students learn that once a bacterium is Gram Stained, the Gram Staining characteristic can help determine what further tests should be done. They explore the MSA plate as a differential and selective plate, Bile Esculin, hemolysis, and bacitracin resistance to help determine identify of an unknown Gram Positive bacteria.
Gram Negative Tests: EMB HE	Students learn that once a bacterium is Gram Stained, the Gram Staining characteristic can help determine what further tests should be done. They explore the EMB & HE plates as differential and selective plates, and are given "hypothetical" situations to decide which plates to use for food poisoning, sewage leaks, etc.
Other Metabolic Tests: Phenol Red Citrate Oxidation/Fermentation	Students are now familiar with the idea of differentiation tests, and different metabolic processes. These example tests explore the different possibilities to detect enzymatic and metabolic differences between bacterial species.
Lysis Tests	Urea Lysis are utilized here to exemplify hydrolysis tests for bacterial identification. The urea lysis test is important for determining the causative pathogen of prospective UTIs.
Semi-Solid Tests	SIM and Motility tests are utilized here to show how bacterial motility can be assessed, along with indole production and sulfur reduction in the SIM test.
Antibodies as Tools	Students are introduced to the idea of using antibodies as tools in the laboratory. Students read about using antibody tests to diagnose virus exposure, bacterial exposure, and virus titer. Rapid Antigen Tests are used to demonstrate the use of Antibodies as Tools in the lab
Genetic Tools	Students are introduced to the idea of using genetic methods as tools in the laboratory. Students read about using genetic tests to identify pathogens such as viruses, bacteria, and parasites. A PCR test is used to demonstrate the use of Genetic tools in the lab.

Clinical Practices:	
CP 1 and CP 2	Students are given 2 simulated patient samples in each CP (for a total of 4) from a group of clinical practices simulating lung infection, urinary tract infection, throat infection, blood infection, or wound infection. Students must use the lab techniques and tests they have learned over the semester to isolate the bacteria and identify likely species of bacterial cause (in person or virtually, depending on the semester). Students will record results on data sheets, then summarize the results in a report table form, and write a summary paragraph based on the report.
4 Mixed Unknowns	Students are given 4 virtual unknowns with accompanying test results and a characteristic key to work through to the likely identity of the virtual bacteria using their lab book and flashcards.
Exam Summaries & Flashcards	Exam summary tables are provided in the lab book for students to fill out in preparation for exam studying. Some flashcards are provided, and others recommended with templates for how to build them.

UNIVERSITY POLICIES AND ADDITIONAL INFORMATION THAT MUST APPEAR IN EACH COURSE SYLLABUS

Student Resources Link: <https://uttyler.instructure.com/courses/39397/pages/student-resources>

University Policies & Information Link:
<https://uttyler.instructure.com/courses/39397/pages/university-policies-and-information>