BIOL 2320

INTRO TO MICROBIOLOGY

Instructor/Professor: Dr. Stephanie Daugherty
Office: BEP 107 Office phone: 903-566-7013
Office Hours: M&W 8 to 8:30am, or by appointment (email me)
Email: sdaugherty@uttyler.edu

Scheduled meeting times: Monday & Wednesday 2:30-3:50

Course Description:
This course will introduce non-Biology-major, health professions focused students to the principles of Microbiology. Pre-requisites: Completion of or concurrent enrollment in Intro to Chemistry is recommended, but not required. **Co-registration in BIOL 2120 Intro to Microbiology Lab IS REQUIRED.**

Course Objectives:
1. Students will learn how genes control protein expression in living cells, and how information flows from genes to mRNA to proteins.
2. Students will learn how enzymes function in the cell, and how enzymes control metabolism and other traits in microbes.
3. Students will learn the cellular characteristics of prokaryotes and eukaryotes, and will study viral infections, bacterial infections, fungal infections, and parasitic infections.
4. Students will learn how antibiotics work to target specifically prokaryotes, and also how enzymes in bacteria can confer resistance to antibiotics.
5. Students will learn basics of the immune system, including the functions of fever, antibodies, memory cells, and cytotoxic cells. Students will understand how vaccines work to immunize individuals, and how herd immunity works to protect an entire population.
6. Students will develop critical thinking skills, writing skills and discussion skills as they do group discussions in class, and prepare essay answers using a scaffolded learning system directed by the professor.

Course Textbook:
**Required:** A Free Online Microbiology Book will be provided to you by your instructor.
**Recommended if you prefer an additional online book:** Microbiology by OpenStax
Free Textbooks: [https://openstax.org/details/books/microbiology](https://openstax.org/details/books/microbiology)
**If you really prefer a hard copy:** Microbiology Basic & Clinical Principles, by Lourdes Norman-McKay is a good hard copy resource if you have to have a hard copy of something. Do NOT purchase additional “online learning” packages from publisher.

Other Resources: online resources and links to research papers will be distributed via Canvas, Jupiter, or dropbox.
Students are expected to attend all lectures and discussions. Points are awarded for attendance and participation in mandatory lectures, reviews, and discussions.

Points may or may not be awarded for a make up quiz for an unexcused absence at the professor’s discretion, with consideration that quizzes are open for one week and therefore illness on the due date is not truly an issue about an absence. Medical absences or hardship absences extending over more than 2 quizzes (even if not consecutive) mean no further make ups past the due date will be offered, unless the problem has been documented through the university Student Accessibility Resources office. Policy for entire semester is, if student misses an assignment and wants the opportunity to make it up, student must create a semester planner with all due dates entered for the semester, and show it to the professor (it may be electronic or on paper). Once professor verifies planner, assignment will be reopened. This offer is only valid for one assignment.

If a student misses a class or exam due to a documented emergency, a make up assignment or exam will be determined by consultation with the professor. A make up exam, if scheduled, will occur within one week of the student’s return to class. If a student misses a class or exam without contacting the professor ahead of the start time of the exam, no make up assignment or exam need be offered.

Examinations & Coursework:

- Three exams will be given; each exam is worth 20% of the final grade.
- Quizzes will be given online, for a total of 18% of the final grade.
- A vaccine video project will be completed for a total of 10% of the final grade.
- Small group diagnosis activities will be completed for 8% of the final grade.
- Attendance, Teamwork & Reviews are worth 4% of the final grade.

If a student misses a class or exam due to a documented emergency, a make up assignment or exam will be determined by consultation with the professor. It a student misses a class or exam without contacting the professor ahead of the start time of the exam, no make up assignment or exam need be offered.

Rules for exams: exams are given online, but in class (you must attend class to take the exam), on either a laptop or an ipad tablet. The device on which you take the exam is the only device that may be in the student’s possession (please put phones or other devices in your bag). Smartwatches & headphones are not allowed during exams. Hats and hoods will be removed during exams. If these rules are not followed, student will be given a zero for the exam.

Canvas, Dropbox, and other online tools:
Digital information exchanges for this course will take place on the university Canvas system and on additional online tools. The first day of class will introduce you to these tools and how to access them.
Grading:
Grading will be performed consistent with UT Tyler policy.
Percentage of total possible points  Letter grade
  89.5-100%  A
  79.5-89.4%  B
  69.5-79.4%  C
  59.5-69.4%  D
  00-59.4%    F

Make-Ups, Withdrawals & Incompletes
No make-up exams will be given for unexcused absences. If you must be absent for an exam, please email the professor AHEAD OF TIME. The time-stamp on the email MUST BE BEFORE THE EXAM BEGINS. If you have a medical emergency, a note from a doctor is required to schedule a make-up exam. Only one make-up exam will be scheduled; if you miss the make-up, or miss another exam later, no new make-up exam will be scheduled, unless the problem is documented through the Student Accessibility Resource office. The make-up exam may be a version of the original exam, or may be an essay version of the exam, at the professor’s discretion.

Make-up material will be provided at the professor’s discretion, dependent upon the type of assignment, attendance in lecture, completed assignments, and the amount of time elapsed since material was missed. Please email the professor to obtain make-up material, after checking on Canvas and with colleagues to determine what is needed. Please follow up the email with personal contact if an answer has not been received within 1 week.

It is the student’s responsibility to consult with the professor, Canvas, and peers/colleagues in a timely manner to obtain missed material. Materials may not be provided after 3 weeks, or after an exam is given, depending upon whether materials are pertinent to next exam.

The last day to withdraw from the course and receive a “W” on your transcript is March 30th. Please contact the registrar’s office for paperwork to formally withdraw. A professor’s signature is required. If you fail to get a withdrawal form submitted on time, you will receive an “F” in the course. You are NOT automatically withdrawn, even if you stop attending classes. You must file the form.

Expectations
Students are expected to participate in the course, including keeping track of and completing assignments on time (online quizzes and homeworks included). Students are expected to attend the “mandatory lectures” in person, unless they have a documented and accepted excuse. Multiple absences for discussions require documentation through the Student Accessibility Resource office. Students are expected to behave in accordance with University Policy and with safety regulations dictated by the laboratory setting. Tobacco and e-cigarettes pose a distraction and potential medical risk to other students, and will not be used in class or in lab. Students are expected to behave professionally and not create a disruptive learning environment for fellow students. Students are expected to abide by the University Academic Honesty policy. Student dishonesty in this course includes, but is not limited to: Plagiarism, and use of automated programs to reword copied-and-pasted text to “avoid plagiarism”; signing in another student to attendance records; using or possessing in lap or hand an unauthorized (or not-in-lockdown) device during an exam; or otherwise cheating on an assignment or exam. Any occurrence of student dishonesty can result in a score of zero on an assignment or failure of a course, as determined by the instructor.

**Extra Credit**

**NO, NO, NO, I repeat, NO Extra Credit will be offered at the end of the course.** Extra credit assignments MAY be offered to the entire class as a bonus assignment during the course, at the professor’s discretion. They will not be offered at the end of the course to adjust your grade, and they will NOT be offered on an individual basis.

**Best Practices and Hints**

Read textbook chapters assigned BEFORE due date, and before coming to class. Familiarize yourself with the terms, pictures, and overall outlines. Even just 20-30 minutes of effort before coming to class will benefit you in terms of what you can understand and take notes on during lecture.

Print lecture outline slides and bring them to class, or bring them on an electronic device via dropbox (see “Tech Tools for the Course” addendum). Take notes where you find the professor has filled in slides, provided explanations, or is giving hints about important topics. Use keywords, rather than full sentences.

Lecture slides with the professor’s notes will be posted online one week before the exam. (Enough time to fill in blanks, if you’ve missed something, but not enough time to rely on them rather than coming to class).

Your professor is a neuroscientist and specifically studied learning and memory. Three key points to remember:

1. Reading is not enough. **PRACTICE TESTING IS CRITICAL.** Find a study group, or use flashcards to self-test. Only then will you know whether you have true command of the material.
2. Sleep is when memory is consolidated from short term to long term memory. Study right before sleeping, if possible. For exams, STUDY and then SLEEP....
3. I am a firm believer in “whole brain” recall, rather than memorization. For long answer questions & group discussions, I will give cues to multiple brain lobes (pictures, root words, reading material, memory cues, and reasoning). I want you to be able to reason through a problem, not memorize an answer. Use group discussion activities as a guide both in what to study, and how to think about problems.

Other Resources:

I highly recommend two websites: scientificamerican.com and sciencedaily.com, which are brilliant for keeping up with science happenings on a daily basis.

There are several online microbiology resources that will help you if you need extra information.
Online Textook of Bacteriology: http://www.textbookofbacteriology.net/index.html
Medical Microbiology online: http://www.ncbi.nlm.nih.gov/books/NBK7627/
Microbiology & Immunology online: http://pathmicro.med.sc.edu/book/welcome.htm
Flashcards: for a $19.95 fee, you may view and use flashcards created by other students. For our textbook, search tags: microbiology, at the flashcard exchange website: http://www.flashcardexchange.com/membership

If you have an accommodation, please see the professor during the first week of class, and follow up with an email, so that we may arrange appropriate accommodations.
<table>
<thead>
<tr>
<th>Lecture Objective</th>
<th>Student Learning Goals</th>
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<tbody>
<tr>
<td>3 factors of molecular interaction</td>
<td>Molecules interact, and their interactions are governed by their charge, hydrophobicity/hydrophilicity, and 3 dimensional shape</td>
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<td>Information flow</td>
<td>Information in a cell is stored in DNA, in units known as genes. This information is passed to messenger RNA, and from there it is used to make proteins.</td>
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<td>Enzymes</td>
<td>Enzymes (and to some degree, ribozymes) do much of the “work” in the cell, in terms of metabolism, growth, and reproduction. Which enzymes a cell has determines its characteristics, as we will see in lab tests.</td>
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<td>Building Blocks of Cells</td>
<td>Carbohydrates, Lipids, Proteins, and Nucleic Acids are the main building blocks of cells, and are built by linking atoms together into molecules, and molecules together into macromolecules.</td>
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<td>Metabolism</td>
<td>Life is dependent upon the ability to store and harvest energy. Molecules can store energy in high energy bonds, and then release energy when those bonds are broken. Specific processes (photosynthesis, aerobic respiration, anaerobic respiration, and fermentation) are used by cells to store and release energy from molecules. One of the main chemical “batteries” of the cell is the molecule ATP</td>
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<td>Growth &amp; Culture</td>
<td>Cells have specific processes to grow and reproduce themselves. Environmental conditions can affect enzyme function, which in turn will affect bacterial growth rates and metabolism.</td>
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<td>Cells</td>
<td>Humans are eukaryotes, with nuclei and other membrane bound organelles, a complex genome, and mitochondria for aerobic respiration. Bacteria are prokaryotes, with no membrane bound organelles, no nuclei, a shorter genome, and aerobic respiration occurs at their outer membrane. Most bacteria have cell walls composed of peptidoglycan, and the differences in bacterial cell structure can be used to classify bacteria in the lab. Differences between bacteria cells and human cells can be targeted by antibiotic drugs to selectively inhibit the growth of bacteria, while leaving the eukaryotic hosts unharmed (usually).</td>
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<td>Antibiotics &amp; Resistance</td>
<td>Antibiotics are drugs which are used to selectively inhibit the growth of bacteria. There are multiple possible targets and mechanisms of action. Antibiotic resistance occurs when a bacterial cell is able to circumvent the activity of antibiotics, either through an enzyme that stops antibiotic action, or a mutation that alters the target of an antibiotic. Resistance can be caused by random mutation or by selection. Education of patients as to why following instructions when prescribed antibiotics is critical is emphasized.</td>
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<td>Genetics</td>
<td>Review of information flow. Mutations occur as changes in the sequence of DNA, which thereby alters sequence of mRNA, which can then alter protein structure and function. Students are expected to explain how a single gene mutation (examples: sickle-cell anemia, cystic fibrosis, etc) can cause disease. Epigenetics (and effect on multiple generations) is briefly introduced. p53 and DNA repair is introduced, along with the ability of some viruses, such as HPV, to disable p53 and thereby predispose to dysregulated cell growth and potentiate cancer development.</td>
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<td>Viruses &amp; Antivirals</td>
<td>Viruses are introduced as distinct from cells. Classification according to structure and nucleic acid is introduced. Stages of viral infection in a cell are delineated, and special properties of retroviruses (reverse transcriptase, integrase) are emphasized. We will discuss the “functional cure” of HIV positive babies and why it is called a “functional cure” rather than a cure. The flu virus is emphasized, and the differences between seasonal flu viruses and the bird flu virus is explored. The term cytokine storm is introduced and explained. Timely virus topics are explored, including CHIKV, Ebola, Dengue, and West Nile. Antivirals are discussed in terms of their action and their severe limitations. Comparison is drawn between antibiotic resistance and selection for antiviral resistant strains. Laurie Garrett’s talks on limited usefulness of Tamiflu are utilized in class for discussion.</td>
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<td>Prions</td>
<td>Prions are introduced as non-viral, non-cellular, proteinaceous infectious particles. Mechanism of prions and their effect on the nervous system is introduced. Story of how difficult it was to get medical community to accept completely new</td>
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<td>Paradigm is discussed. (See additional information in Germicides and Sterilization)</td>
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<td><strong>Fungi and Parasites, Antifungals and Antiparasitics</strong></td>
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<td>Opportunistic fungal pathogens are introduced, as well as secondary infections resulting from antibiotic use. Parasitical pathogens are introduced. Malaria is used as example parasite life cycle, with directions to CDC sites for life cycles of any other parasites of interest. Antifungal medicines briefly mentioned and general mechanism of action explained (not in detail!). Antiparasitical medicines briefly mentioned and general mechanism of action explained (not in detail). Emphasis is placed on fungi and parasites being eukaryotic, so therapeutic index trickier.</td>
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<td><strong>Koch’s Postulates</strong></td>
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<td>Scientific Method is emphasized here with a detailed explanation of how “cause of disease” is determined and validated. Aspects of a disease that might make fulfilling Koch’s Postulates difficult are explored (long incubation time, difficult to culture pathogen, etc). Story of HIV and of Helicobacter Pylori are discussed to emphasize points. This lecture is carried over into a lab activity where students are given epidemiological information and must hypothesize causative pathogen and describe scientific method to test using Koch’s postulates.</td>
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<td><strong>Epidemiology &amp; Disease</strong></td>
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<td>Epidemiology and the process of human disease are discussed. Types of epidemiological studies and how to interpret data are given in an exercise. Portals of entry, incubation times, prevalence vs. incidence graphs and morbidity and mortality data are introduced. Propagation of disease is discussed, and how disease spread is controlled, with example of SARS outbreak.</td>
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<td><strong>Immune System</strong></td>
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<td>The immune system is introduced, beginning with first line defenses. Second line defenses are introduced and the process of eliciting a fever response are learned as though students must explain them to a patient. Emphasis is placed on fever being beneficial up to 104 degrees, and why. Inflammation is introduced, but detailed mechanism not explored. 3rd line of defense (adaptive immune response) is introduced, from antigen presentation to humoral and cytotoxic response. Effects of suppressor T cells and memory cells discussed.</td>
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<td><strong>Vaccines</strong></td>
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<td>What vaccines are and how they work is explored to the point where students can explain this to patients. Examples of first developed vaccine by naturally</td>
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attenuated virus (smallpox) given, to development of artificially attenuated virus (polio), to genetically engineered acellular vaccines. Herd immunity introduced. Problems with whooping cough vaccine are explored to the point of students being able to explain why reduced protection with modern TDaP to patients. Discussion ends with evidence why autism is not caused by vaccines.

| At this point the class switches from concept based format to specific disease format |
| Systemic Diseases of: |
| Immune System | Autoimmune disease and immune deficiency are differentiated, with students expected to be able to explain the difference. Examples of each are given, along with causative pathogens. |
| TORCHZ | Diseases which can infect pregnant mothers and are associated with fetal problems are introduced, focusing on Toxoplasmosis, congenital Rubella, Cytomegalovirus, Herpesviruses, and Zika. The differences between pathogens acquired as an adult and congenital syndromes causing permanent damage in utero are emphasized, including congenital rubella and congenital syphilis. |
| Childhood Diseases | Diseases classically associated with childhood are introduced, including newborn meningitis and its prevention, ophthalmia, candida, scalded-skin syndrome, otitis media, RSV, pertussis, measles, mumps, varicella-zoster, group A strep infections, trachoma, river-blindness, pinworm, and acne. |
| Viral vs Bacterial Infections | This concluding section compares viral vs bacterial infections which commonly infect the cardiac system, respiratory system, GI system, nervous system, and urogenital tract. The format of comparing viral vs bacterial illnesses is used to help with differential diagnosis techniques. |
UT Tyler Policies:

Academic Honesty

UT Tyler maintains strict standards of academic integrity. All forms of subtle or overt dishonesty, including (but not limited to) copying another student’s work, plagiarism of published literature (including internet content), and using notes during an exam will not be tolerated. All instances will result in the student FAILING THE ENTIRE COURSE and will be reported to the College of Arts and Sciences, the student’s major department, and the Dean.

Students Rights and Responsibilities

To know and understand the policies that affect your rights and responsibilities as a student at UT Tyler, please follow this link:
http://www.uttyler.edu/wellness/StudentRightsandResponsibilities.html

Grade Replacement/Forgiveness

Students repeating a course for grade forgiveness (grade replacement) must file a Grade Replacement Contract with the Enrollment Services Center (ADM 230) on or before the Census Date of the semester in which the course will be repeated. Grade Replacement Contracts are available in the Enrollment Services Center or at http://www.uttyler.edu/registrar. Each semester’s Census Date can be found on the Contract itself, on the Academic Calendar, or in the information pamphlets published each semester by the Office of the Registrar.

Failure to file a Grade Replacement Contract will result in both the original and repeated grade being used to calculate your overall grade point average. Undergraduates are eligible to exercise grade replacement for only three course repeats during their career at UT Tyler; graduates are eligible for two grade replacements. Full policy details are printed on each Grade Replacement Contract.

The Census Date is the deadline for many forms and enrollment actions that students need to be aware of. These include:

· Submitting Grade Replacement Contracts, Transient Forms, requests to withhold directory information, approvals for taking courses as Audit, Pass/Fail or Credit/No Credit.
· Receiving 100% refunds for partial withdrawals. (There is no refund for these after the Census Date)
· Schedule adjustments (section changes, adding a new class, dropping without a “W” grade)
· Being reinstated or re-enrolled in classes after being dropped for non-payment
· Completing the process for tuition exemptions or waivers through Financial Aid

State Mandated Course Drop Policy

Texas law prohibits a student who began college for the first time in Fall 2007 or thereafter from dropping more than six courses during their entire undergraduate career. This includes courses dropped at another 2 year or 4 year Texas public college or university. For purposes of this rule, a dropped course is any course that is dropped after the 12th day of class (See Schedule of Classes for the specific date). Exceptions to the 6 drop rule may be found in the catalog. Petitions for exemptions must be submitted to the Registrar’s Office and must be accompanied by documentation of the extenuating circumstance.

Please contact the Registrar's Office if you have any questions.
Disability Services

Disability/Accessibility Services: In accordance with Section 504 of the Rehabilitation Act, Americans with Disabilities Act (ADA) and the ADA Amendments Act (ADAAA) the University of Texas at Tyler offers accommodations to students with learning, physical and/or psychological disabilities. If you have a disability, including non-visible diagnosis such as a learning disorder, chronic illness, TBI, PTSD, ADHD, or you have a history of modifications or accommodations in a previous educational environment, you are encouraged to visit https://hood.accessiblelearning.com/UTTyler and fill out the New Student application. The Student Accessibility and Resources (SAR) office will contact you when your application has been submitted and an appointment with Cynthia Lowery, Assistant Director Student Services/ADA Coordinator. For more information, including filling out an application for services, please visit the SAR webpage at http://www.uttyler.edu/disabilityservices, the SAR office located in the University Center, # 3150 or call 903.566.7079.

UT Tyler is a Tobacco-Free University

All forms of tobacco will not be permitted on the UT Tyler main campus, branch campuses, and any property owned by UT Tyler. This applies to all members of the University community, including students, faculty, staff, University affiliates, contractors, and visitors. Forms of tobacco not permitted include cigarettes, cigars, pipes, water pipes (hookah), bidis, kreteks, electronic cigarettes, smokeless tobacco, snuff, chewing tobacco, and all other tobacco products. There are several cessation programs available to students looking to quit smoking, including counseling, quitlines, and group support. For more information on cessation programs please visit www.uttyler.edu/tobacco-free.

Student Absence due to Religious Observance

Students who anticipate being absent from class due to a religious observance are requested to inform the professor of such absences by the second class meeting of the semester.

Student Absence for University-Sponsored Events and Activities

If you intend to be absent for a university-sponsored event or activity, you (or the event sponsor) must notify the professor at least two weeks prior to the date of the planned absence. At that time the professor will set a date and time when make-up assignments will be completed.

Social Security and FERPA Statement:

It is the policy of The University of Texas at Tyler to protect the confidential nature of social security numbers. The University has changed its computer programming so that all students have an identification number. The electronic transmission of grades (e.g., via e-mail) risks violation of the Family Educational Rights and Privacy Act; grades will not be transmitted electronically.

Emergency Exits and Evacuation:
Everyone is required to exit the building when a fire alarm goes off. Follow your professor’s directions regarding the appropriate exit. If you require assistance during an evacuation, inform your professor in the first week of class. Do not re-enter the building unless given permission by University Police, Fire department, or Fire Prevention Services.