Biology 2320 Spring 2024 Introduction to Microbiology

Last day to withdraw: March 25, 2024

Materials: no purchased textbook
All will be provided by instructor

Professor: Dr. Stephanie Daugherty
sdaugherty@uttyler.edu office: BEP107
Office Hours: In person: MW1-2 pm, & as arranged
Professor: Dr. Tanya Brown
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Office Hours: TBD, will be arranged first day of class

This course will be hybrid; all activities are required in person; some lectures will be online only, some with optional online. See printed calendar for plan.

Note: this semester this class is designated as hybrid. Some classes will be in person lectures, some will be online lectures, with required in person activities during both lecture and occasionally lab time. Please prioritize lectures or online videos, quizzes, and attendance for activities.
An online textbook is provided, with recommendations for a printed book.

This course will introduce non-Biology-major, health-professions focused students to the principles of microbiology. **Co-registration in BIOL 2120**

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

Objectives:

1. Students will learn how genes control protein expression, and be able to explain how information flows from genes to mRNA to proteins.
2. Students will learn how enzymes control metabolism and traits in a cell, and be able to explain how different traits indicate the presence of different genes.
3. Students will learn characteristics of prokaryotic and eukaryotic cells, and explain how differences can be targeted for treatments in bacterial infections, fungal infections, and parasitic infections.
4. Students will learn characteristics of viruses, and explain how stages of the viral cycle can be targeted with inhibitors.
5. Students will learn basics of the immune system, especially the functions of fever and cytokines. Students will be able to explain how vaccines work with antibodies, memory cells, and cytotoxic cells to protect a patient, and how herd immunity works to protect a population.
6. Students will demonstrate understanding of antibiotic resistance, selection, vaccination, and immune response by composing explanations to patients of how their treatments will work in a scaffolded activity and writing assignment.
7. Students will learn the difference between scientific method and diagnostic thinking, and will demonstrate understanding by completing case studies involving differential diagnosis activities applying learned concepts.

Class Policies in short:

Attendance at lecture activities is required*

Follow all safety rules

Respect your colleagues & instructors

Zero-Tolerance for Cheating & Plagiarism

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 rules & wear PPE as determined by the instructor.
Students are expected to participate; keep track of, and complete assignments by due date, and attend required classes/zooms (send documentation of excused absences ahead of class to instructor).
Students are expected to follow University Policy and Academic Conduct requirements, including doing students' own work, not cheating, not plagiarizing, and citing sources appropriately.
If you have an accommodation, email professor during the first week of class to check in.

Materials:

Required: a free online microbiology book will be provided to you by your instructor.

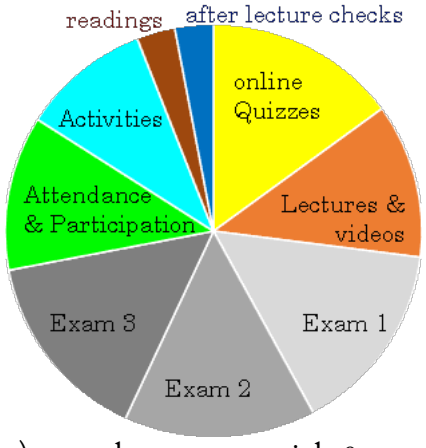
Online systems: Canvas (provided through University); Jupiter (provided through instructor as a free system we can use as a clicker/etc); Instant feedback program (provided through instructor for activities)

If you prefer an additional online book: Microbiology by OpenStax: https://openstax.org/details/books/microbiology

If you prefer an old-school hard copy resource to have for additional reading: Microbiology Basic & Clinical Principles, by Lourdes Normal-McKay. Do NOT purchase any additional online learning packages from publisher. There will be no assignments from publisher packages.

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

Full list of assignments available on course calendar.



Lecture Videos: recorded by instructor, provided on online system, include questions scattered throughout. Questions & completion result in lecture video grades (12% of final grade).

After Lecture Checks: fill out & upload after watching lectures (3% of final grade).

Online quizzes: over lecture material, open book, open slides, open notes, open for 1 week prior to due date. Completed on online system (15% of final grade).

Exams (3 of them): given in class (or online if safety requires), over lecture materials & activities. Reviews will occur over required zooms or in lab. Printed review flashcards will be provided during review session. Exams will be given on online system, attendance required for in person online exams. (15% each for total of 45% of grade)

Activities: graded group activities to explore & synthesize concepts & practice essay answers for exams, some during lab time, some during lecture meetings. (12% of final grade)

Attendance & Participation: attendance & participation credit in required in person lectures, lecture activities & reviews (some during lab time, some during lecture time) (10%)

Lecture Readings: supplemental readings by instructor, provided on online system, include questions throughout which give lecture reading grade (3% 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

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; 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, 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 required activities & reviews during lab time for lecture credit. These are posted on the calendar students receive at the beginning of the semester, and students are expected to make arrangements to attend all labs. Having to work is not an excused absence.

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.

Late Work & Make-Up Work: A single missed assignment may be made up by any student for full credit by submitting a 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 2 days. A third missed assignment may be made up for a maximum of 60% within 2 days. For uploaded documents or projects, late penalty is -10% every 24 hours for a maximum of 3 days, after which a score of zero will be given.

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.

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, and the amount of time elapsed since material was missed. Missing assignments 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 zoom meetings, 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:

- Download slides for lecture videos before watching videos. Slides are in the Slides Page, with a link to the dropbox folder..
- Keep up with **Lecture Videos,** you will answer questions as you watch them & at the end to receive credit for the videos. They will be reopened after being graded (look for them at the end of the semester) so you can review as you need to.
- Fill out **After Lecture Checks** during or after watching Lecture Videos; exam questions are often pulled from these After Lecture Checks.
- **Online 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 graded based on course materials)
- Attend required lab times and in person lectures to complete **activities** and **reviews,** which will be crucial for exams as well as counting for credit. (See calendar for required activities)
- **Lecture Readings** do count for credit (4%) but could be considered supplemental if you are short on time. These will be "due" on the day on the calendar, but will be reopened for you to read later if needed, although points won't be counted after the due date.

READING IS NOT ENOUGH. PRACTICE TESTING IS CRITICAL. Our Review Materials are specifically designed to make self-testing or study-groups extremely easy. WE PRACTICE LONG ANSWERS for exams together in the activities or talk about them in videos, so be sure and pay attention to those!

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. Mark Crislip, MD. (Books on amazon, blog on Medscape: http://boards.medscape.com/.29f3af03/)
The Great Influenza, by John M Barry.

Lecture Objective	Student Learning Goals
Pandemic control & updates	Latest info on Covid-19 pandemic and our protocols will be covered, including receptor targets of the virus & current best practices.
Factors of Molecular Interaction	Molecules interact, and their interactions are governed by their charge, hydrophobicity/hydrophilicity, and 3-dimensional shape
Information flow	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.
Enzymes	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.
Building Blocks of Cells	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.
Metabolism	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
Growth & Culture	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.
Cells	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).
Antibiotics & Resistance	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.
Genetics	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.
Viruses & Antivirals	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 Coronavirus, 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.
Prions	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 paradigm is discussed. (See additional information in Germicides and Sterilization)
Fungi and Parasites, Antifungals and Antiparasitics	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!). Antiparasitic 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).
Diseases & Systems	Disease patterns are introduced, with infectious dose, attachment, and incubation times included. The importance of contagiousness and virulence is explained. Mechanisms by which many diseases cause symptoms due to inflammation & immune system reactions are covered with emphasis on meningitis, Guillain-Barre, rheumatic fever, and sepsis.
Epidemiology	Epidemiology and the process of human disease are discussed. Koch's Postulates is introduced as a type of epidemiological study, and its ability to establish causation is emphasized. Types of epidemiological studies and how to interpret data are given in an activity. Prevalence vs. incidence graphs and morbidity and mortality data are introduced. Propagation of disease is discussed, and how disease spread is controlled. The current COVID-19 outbreak will be discussed.
Immune System	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.
Vaccines	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 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, and how various vaccine types work. A vaccine project is assigned to be completed in stages, with the final project submitted during finals week.
At this point the class switches from concept-based format to specific disease format, utilizing critical thinking skills.	Differential Diagnosis as separate from scientific method is reviewed, and preparations made for Diagnostic Activities at end of semester with the following review topics:
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. Microbiomes are introduced as important to the normal function of the immune system.
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 vs 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.

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

UT Tyler Honor Code
Every member of the UT Tyler community joins together to embrace: Honor and integrity that will not allow me to lie, cheat, or steal, nor to accept the actions of those who do.

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/rightsresponsibilities.php

- **Withdrawing from Class** - Students you are allowed to withdrawLinks to an external site. (drop) from this course through the University's Withdrawal PortalLinks to an external

site.. Texas law prohibits students 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 other 2-year or 4-year Texas public colleges and universities. Make sure to consider the impact withdrawing from this class has on your academic progress as well as the financial implications. We encourage you to consult your advisor(s) and financial aid for additional guidance. CAUTION #1: Withdrawing before census day does not mean you get a full refund. Please see the Tuition and Fee Refund ScheduleLinks to an external site.. CAUTION #2: All international students must check with the Office of International ProgramsLinks to an external site. before withdrawing. All international students are required to enroll full-time for fall and spring terms.

- **Final Exam Policy**: Final examinations are administered as scheduled. If unusual circumstances require that special arrangements be made for an individual student or class, the dean of the appropriate college, after consultation with the faculty member involved, may authorize an exception to the schedule. Faculty members are required to maintain student final examination papers for a minimum of three months following the examination date.
- **Incomplete Grade Policy**: If a student, because of extenuating circumstances, is unable to complete all of the requirements for a course by the end of the semester, then the instructor may recommend an Incomplete (I) for the course. The "I" may be assigned in lieu of a grade only when all of the following conditions are met: (a) the student has been making satisfactory progress in the course; (b) the student is unable to complete all course work or final exam due to unusual circumstances that are beyond personal control and are acceptable to the instructor; and (c) the student presents these reasons prior to the time that the final grade roster is due. The semester credit hours for an Incomplete will not be used to calculate the grade point average for a student.
  The student and the instructor must submit an Incomplete Form detailing the work required and the time by which the work must be completed to their respective department chair or college dean for approval. The time limit established must not exceed one year. Should the student fail to complete all of the work for the course within the time limit, then the instructor may assign zeros to the unfinished work, compute the course average for the student, and assign the appropriate grade. If a grade has not been assigned within one year, then the Incomplete will be changed to an F, or to NC if the course was originally taken under the CR/NC grading basis.
- **Grade Appeal Policy:** - UT Tyler's Grade Appeal policy requires the completion of a Grade Appeal form for this action to take place. The grade appeal begins with the instructor of your course. If you do not agree with the decision of the instructor, you may then move your appeal to the department chair/school director for that course. If you are still dissatisfied with the decision of the chair/director, you may move the appeal to the Dean of the College offering that course who has the final decision. Grade appeals must be initiated within sixty (60) days from the date of receiving the final course grade. The Grade Appeal form is found on the Registrar's Form Library.Links to an external site.
- **Disability/Accessibility Services**: The University of Texas at Tyler has a continuing commitment to providing reasonable accommodations for students with documented disabilities. Students with disabilities who may need accommodation(s) in order to fully participate in this class are urged to contact the Student Accessibility and Resources Office (SAR) as soon as possible to explore what arrangements need to be made to ensure access.

If you have a disability, you are encouraged to visit the SAR PortalLinks to an external site. (https://hood.accessiblelearning.com/UTTyler/Links to an external site.) and complete the New Student Application. For more information, please visit the SAR wepageLinks to an external site. or call 903.566.7079.

- **Military Affiliated Students**: UT Tyler honors the service and sacrifices of our military affiliated students. If you are a student who is a veteran, on active duty, in the reserves or National Guard, or a military spouse or dependent, please stay in contact with me if any aspect of your present or prior service or family situation makes it difficult for you to fulfill the requirements of a course or creates disruption in your academic progress. It is important to make me aware of any complications as far in advance as possible. I am willing to work with you and, if needed, put you in contact with university staff who are trained to assist you. Campus resources for military affiliated students are in the Military and Veterans Success Center (MVSCLinks to an external site.). The MVSC can be reached at MVSC@uttyler.edu, or via phone at 903.565.5972.
- **Academic Honesty and Academic Misconduct:** The UT Tyler community comes together to pledge that "Honor and integrity will not allow me to lie, cheat, or steal, nor to accept the actions of those who do." Therefore, we enforce the Student Conduct and Discipline policyLinks to an external site. in the Student Manual Of Operating Procedures (Section 8).
- **FERPA** - UT Tyler follows the Family Educational Rights and Privacy Act (FERPA) as noted in University Policy 5.2.3Links to an external site.. The course instructor will follow all requirements in protecting your confidential information.
  - **COVID Guidance**
    - *Information for Classrooms and Laboratories:* It is important to take the necessary precautions to ensure a healthy and successful year. UT Tyler continues to urge you to protect yourselves against the flu, COVID and any new threats that may be developing. Be diligent about preventive measures such as washing hands, covering sneezes/coughs, social distancing and vaccinations, which have proven to be successful in slowing the spread of viruses. Encourage those who don't feel well to stay home, and if they show symptoms, ask them to get tested for the flu or COVID. Self-isolation is important to reduce exposure (CDC quarantine/isolation guidelinesLinks to an external site.). Please work with your faculty members to maintain coursework and please consult existing campus resources for support.Links to an external site.
    - *Recording of Class Sessions:* Class sessions may be recorded by the instructor for use by students enrolled in this course. Recordings that contain personally identifiable information or other information subject to FERPA shall not be shared with individuals not enrolled in this course unless appropriate consent is obtained from all relevant students. Class recordings are reserved only for the use of students enrolled in the course and only for educational purposes. Course recordings should not be shared outside of the course in any form without express permission.
- **Absence for Official University Events or Activities**: This course follows the practices related to approved absences as noted by the Student Manual of Operating Procedures (Sec. 1 -501Links to an external site.).

- **Absence for Religious Holidays:** Students who anticipate being absent from class due to a religious holiday are requested to inform the instructor by the second class meeting of the semester.
- **Campus Carry:** We respect the right and privacy of students who are duly licensed to carry concealed weapons in this class. License holders are expected to behave responsibly and keep a handgun secure and concealed. More information is available at http://www.uttyler.edu/about/campus-carry/index.php.

Resources to assist you in this course

- UT Tyler Student Accessibility and Resource (SAR) Office (Links to an external site.) (provides needed accommodations to students with document needs related to access and learning)
- UT Tyler Writing Center (Links to an external site.)
- The Mathematics Learning Center (Links to an external site.)
- UT Tyler PASS Tutoring Center (Links to an external site.)
- UT Tyler Supplemental Instruction (Links to an external site.)
- Upswing (24/7 online tutoring) - covers nearly all undergraduate course areas (Links to an external site.)
- Robert Muntz Library (Links to an external site.) and Library Liaison (Links to an external site.)
- Canvas 101 (Links to an external site.) (learn to use Canvas, proctoring, Unicheck, and other software)
- Digital Support Toolkit (for supported courses only. Students are automatically enrolled in the toolkit for supported courses)
- LIB 422 -- Computer Lab where students can take a proctored exam
- The Career Success Center (Links to an external site.)
- UT Tyler Testing Center (Links to an external site.)
- Office of Research & Scholarship Design and Data Analysis Lab (Links to an external site.)

Resources available to UT Tyler Students

- UT Tyler Counseling Center (Links to an external site.)(available to all students)
- TAO Online Support Center (Links to an external site.)(online self-help modules related to mental & emotional health)
- Military and Veterans Success Center (Links to an external site.)(supports for all of our military affiliated students)
- UT Tyler Patriot Food Pantry (Links to an external site.)
- UT Tyler Financial Aid and Scholarships (Links to an external site.)
- UT Tyler Registrar's Office (Links to an external site.)
- Office of International Programs (Links to an external site.)
- Title IX Reporting (Links to an external site.)
- Patriots Engage (Links to an external site.) (available to all students. Get engaged at UT Tyler.)