

BIOL 5318 Graduate Data Analytics
Texas A&M University-San Antonio, College of Arts and Sciences
Spring 2026 Syllabus

Meeting times: T 17:30-20:15

Course location: STEM 121

Course Instructor of Records: Utpal Smart

e-mail: usmart@tamusa.edu

Office Hours: Fri 10am-12pm

Office: STEM 311B

Phone: 210-784-2676

Course objective

This course introduces biologists to the statistics programming language R. More specifically, this course will serve as an introductory treatment of data manipulation and analyses with Base-R and tidyverse (packages ggplot2, dplyr, tidy, readr, and tibble) in the RStudio integrated developing environment. Special emphasis will be placed on utilizing biologically relevant data. The course will focus on unifying concepts to make reading and writing R syntax more accessible and intuitive. In addition to data analyses, this course will also teach students how to use R to create effective data visualizations.

Course Structure

Classes will begin with a prospective quiz, testing students on the material that is going to be covered that week. Quizzes will consist of short answer, or multiple-choice questions. Every class will consist of an interactive lecture section followed by a practicum.

Retrospective take-home assignments will be provided testing students on the material covered that week and will be due on the following following class day. Take-home assignments will consist of practical coding exercises. A comprehensive final project consisting of practical exercises that will test students over all material covered during the semester will be due at the end of the semester.

Course Material

Two books will be used as primary reference material for the lecture portion of the class. The lectures will synthesize the most important information and student assessment (quizzes, assignments etc.) will be largely based on the content presented in the lecture slides, which will be made available on Blackboard. All other course materials is also available online, and the students are not required to purchase hard copies.

Ismay C., & Kim A., Y. (2024). Statistical Inference Via Data Science: A ModernDive Into R and the Tidyverse. CRC Press. Free PDF available at <https://moderndive.com/v2/getting-started.html>

Ansell B., R., E. (2019). Introduction to R – tidyverse. Free PDF available at https://bookdown.org/ansellbr/WEHI_tidyR_course_book/

Also recommended:

Grolemund, G., & Wickham, H. (2023). R for Data Science (2e). O'Reilly Media. Free PDF of earlier edition available at <https://r4ds.hadley.nz/>

Doyle, M., Chung, J., and Perreau, V. (2023). Introduction to R for Biologists. https://mbite.org/r-intro-biologists/intro_r_biologists.html

Wickham, H., Navarro, D., & Pedersen, T. L. (2020). Ggplot2: Elegant Graphics for Data Analysis (3e). Springer. Free PDF of earlier edition available at <https://ggplot2-book.org/index.html>

The following websites/blogs are also recommended:

RStudio PBC (2020). RStudio Education. <https://education.rstudio.com/learn/>

RStudio PBC (2020). RStudio Cheatsheets. <https://www.rstudio.com/resources/cheatsheets/>

Grading

Quizzes (10 of 12) = 35% of total grade

Take-home assignments (10 of 12) = 35% of total grade

Final project = 30% of total grade

Equipment and system requirements

Students will need computers (Mac or Windows) with at least 256 MB of RAM (most contemporary computers have a minimum of 8 GB), a mouse, some disk space (for recovered files, image files, etc.) and access to the internet. Make sure that you have administrative privileges to your PC to install and run R-Studio utilities. For those who do not have a laptop, desktop computers (Windows) with internet access will be available in the classroom (STEM 121).

Communication

All students are expected to access Blackboard for updates on the course and to access course materials. I am available if you need clarification on materials and assignments in this course. Email is the best way to get in touch with me.

Covid

The safety of our campus community is paramount to our ability to provide our students, faculty, and staff with a productive and secure learning and working environment. While

masks are not required, we do encourage everyone to wear a mask, particularly inside the buildings, in order to reduce the spread of covid-19. The university maintains a covid-19 web-site with current data, safety protocols, and reporting guidelines at <https://www.tamusa.edu/community-safety-together/index.html>.

Course schedule

*subject to change at the discretion of the instructor

| <u>Date</u> | <u>Lecture</u> | <u>Readings</u> |
|-------------|---|--|
| Week 1 | | |
| Jan 20 | Pre-test Getting Started with R and R Studio | ModernDive ch 1.1-1.2 Intro to R ch 1.1-1.9 |
| Week 2 | | |
| Jan 27 | Take-home assignment 1 due Quiz 1 R code basics: variables and vectors R code basics: packages | ModernDive ch 1.3-1.4 Intro to R ch 1.10-1.14 |
| Week 3 | | |
| Feb 3 | Take-home assignment 2 due Quiz 2 What is tidyverse ? Comparing tidyverse and base R | Powerpoint slides |
| Week 4 | | |
| Feb 10 | Take-home assignment 3 due Quiz 3 ggplot2: the grammar of graphics | ModernDive ch 2.1-2.2 Intro to R ch 2.1-2.5, 2.9-2.10 |
| Week 5 | | |
| Feb 17 | Take-home assignment 4 due Quiz 4 Data visualization: ggplot2 basics | ModernDive ch 2.3-2.8 |
| Week 6 | | |

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|---------|--|--|
| Feb 24 | Take-home assignment 5 Quiz 5 Data visualization: summary plots | Intro to R ch 3.1-3.4, 3.7-3.9 |
| Week 7 | | |
| Mar 3 | Take-home assignment 6 due Quiz 6 Subsetting: by position Subsetting: using conditionals | Intro to R 4.1-4.4 |
| Week 8 | | |
| Mar 10 | Spring Break (No class) | Spring Break (No class) |
| Week 9 | | |
| Mar 17 | Take-home assignment 7 due Quiz 7 Data wrangling: dplyr essentials | ModernDive ch 3.1-3.8 |
| Week 10 | | |
| Mar 24 | Take-home assignment 8 due Quiz 8 Data wrangling: importing data | ModernDive ch 4.1 Intro to R ch 6.1-6.2 |
| Week 11 | | |
| Mar 31 | Take-home assignment 9 due Quiz 9 Data wrangling: tidying data | ModernDive ch 4.2 |
| Week 12 | | |
| Apr 7 | Take-home assignment 10 due Quiz 10 Intro to modeling: Exploratory data analysis | ModernDive ch 5.1.1, 6.11 |
| Week 13 | | |
| Apr 14 | Take-home assignment 11 Quiz 11 Automating your analysis: loops Automating your analysis: vectorization | Intro to R ch 7.1-7.4 |

| Week14 | | |
|--------|--|-------------------|
| Apr 21 | Take-home assignment 12 due Quiz 12 String manipulation: regular expression basics String manipulation: stringr | Powerpoint slides |
| Week15 | | |
| Apr 28 | Post-test Final Project | |

University Email Policy and Course Communications

All correspondence between professors and students must occur via university email accounts. You must have your Jaguar email account ready and working. If it is not working, contact the help desk at helpdesk@tamusa.edu or at 210-784-HELP (4357). If you don't hear back within 48 hours, contact them again. They have many requests during the first part of the semester, so you may need to follow up with them.

Academic Accommodations for Individuals with Disabilities

Texas A&M University-San Antonio is committed to providing all students with reasonable access to learning opportunities and accommodations in accordance with The Americans with Disabilities Act, as amended, and Section 504 of the Rehabilitation Act. If you experience barriers to your education due to a disability or think you may have a disability, Disability Support Services is in the Central Academic Building, Suite 210. You can also contact us via phone at (210) 784-1335, visit us at the website or email us at dss@tamusa.edu. Disabilities may include, but are not limited to, attentional, learning, mental health, sensory, physical, or chronic health conditions. All students are encouraged to discuss their academic accommodation with Disability Support Services and their instructors as soon as possible.

Academic Learning Center

All currently enrolled students at Texas A&M University-San Antonio can utilize the Academic Learning Center for subject-area tutoring. The Academic Learning Center provides free course-based tutoring to all currently enrolled students at Texas A&M University-San Antonio. Students wishing to work with a tutor can make appointments through the Brainfuse online tutoring platform. Brainfuse can be accessed in the Tools section of Blackboard. You can contact the Academic Learning Center by emailing tutoring@tamusa.edu, calling (210) 784-1307, or visiting the Central Academic Building, room 202. Online tutoring is also available for after hours and weekend assistance. While tutoring hours may change based on tutor schedules and availability, the current tutoring hours for MATH in the ALC are as follows:

| Day of the Week | Appointments Available | Walk-in Tutoring (no appointment needed) |
|-----------------|------------------------|--|
| Monday | 8:00 AM – 6:00 PM | 9:00 AM – 5:00 PM |
| Tuesday | 8:00 AM – 6:00 PM | 9:00 AM – 5:00 PM |
| Wednesday | 8:00 AM – 6:00 PM | 9:00 AM – 5:00 PM |
| Thursday | 8:00 AM – 6:00 PM | 9:00 AM – 5:00 PM |
| Friday | 8:00 AM – 5:00 PM | 11:00 AM – 4:00 PM |

Counseling/Mental Health Resources

As a college student, there may be times when personal stressors interfere with your academic performance and negatively impact your daily functioning. If you are

experiencing emotional difficulties or mental health concerns, support is available to you through the Student Counseling Center (SCC). To schedule an appointment, visit our website, call 210-784-1331 or visit Madla 120 between the hours of 8:00 AM and 5:00 PM. All mental health services provided by the SCC are free and confidential (as the law allows). The Student Counseling Center provides brief individual and group therapy, crisis intervention, consultation, case management, and prevention services. Crisis support is available 24/7/365 by calling the SCC at 210-784-1331 or through the TELUS student support App.

The [TELUS Student Support App](#) provides a variety of mental health resources to include 24/7/365 support for in the moment distress, crisis support, an anonymous peer-to-peer support network, mental health screenings, podcasts, and articles to improve your mental wellbeing.

Emergency Preparedness

JagE Alert is Texas A&M University-San Antonio's mass notification system. In the event of an emergency, such as inclement weather, students, staff and faculty, who are registered, will have the option to receive a text message, email with instructions and updates. To register or update your information visit the [Jag E Alert System website](#). You can access more information about [Emergency Operations Plan and the Emergency Action Plan on our website](#). Download the [SafeZone App](#) for emergencies or call (210) 784-1911. Non-Emergency (210) 784-1900.

Financial Aid and Verification of Attendance

According to the following federal regulation, 34 CFR 668.21: U.S. Department of Education (DoE) Title IV regulation, a student can only receive Title IV funds based on Title IV eligibility criteria which include class attendance. If Title IV funds are disbursed to ineligible students (including students who fail to begin attendance), the institution must return these funds to the U.S. DoE within 30 days of becoming aware that the student will not or has not begun attendance. Faculty will provide the Office of Financial Aid with an electronic notification if a student has not attended by the published Census Date (the first week of class). Any student receiving federal financial aid who does not attend prior to the published Census Date (the first week of class) will have their aid terminated and returned to the DoE. Please note that any student who stops attending at any time during the semester may also need to return a portion of their federal aid.

Jaguar Writing, Language, and Digital Composing Center (WLDCC)

The Jaguar Writing Center provides writing support to graduate and undergraduate students in all three colleges as well as faculty and staff. Writing tutors work with students to develop reading skills, prepare oral presentations, plan, draft, and revise their written assignments. Our language tutors support students enrolled in Spanish courses and students composing in Spanish for any assignment. Our digital studio tutors support students working on digital projects such as e-portfolios, class presentations, or other digital multimedia projects.

The Writing Center offers face-to-face, synchronous online, and asynchronous digital appointments. Students can schedule appointments with the Writing Center in JagWire under the Student Services tab. Click on Writing, Language, and Digital Composing Center to make your appointment. Students wanting to work in real time with a tutor can schedule an Online Appointment. Students wishing to receive asynchronous, written feedback from a tutor can schedule an e-Tutoring appointment. More information about what services we offer, how to make an appointment, and how to access your appointment can be found on the [Writing Center's website](#). The Writing Center can also be reached by emailing: writingcenter@tamus.edu.

Meeting Basic Needs

Any student who has difficulty affording groceries or accessing sufficient food to eat every day or who lacks a safe and stable place to live and believes this may affect their performance in the course, is urged to [submit a CARE report for support](#). Furthermore, please notify the professor if you are comfortable in doing so. This will enable them to direct you to available resources. The [General's Store is a food pantry](#) that is available on campus as well.

Military Affairs

Veterans and active-duty military personnel are welcomed and encouraged to visit the Office of Military Affairs for any question involving federal or state VA Education Benefits. Visit the Patriots' Casa building, room 202, or to contact the Office of Military Affairs with any questions at military.va@tamus.edu or (210)784-1397.

Religious Observances

Texas A&M University-San Antonio recognizes the wide variety of faiths represented among the campus community and protects the rights of students, faculty, and staff to observe religious holidays according to their tradition. Under the policy, students are provided with an opportunity to make up any examination, study, or course work requirements that may be missed due to a religious observance provided they notify their instructors before the end of the second week of classes for regular session classes.

The Six-Drop Rule

Students are subject to the requirements of Senate Bill (SB) 1231 passed by the Texas Legislature in 2007. SB 1231 limits students to a maximum of six (6) non-punitive course drops (i.e., courses a student chooses to drop) during their undergraduate careers. A non-punitive drop does not affect the student's GPA. However, course drops that exceed the maximum allowed by SB 1231 will be treated as "F" grades and will impact the student's GPA.

Statement of Harassment and Discrimination

Texas A&M University-San Antonio is committed to the fundamental principles of academic freedom, equal opportunity, and human dignity. To fulfill its multiple missions as an institution of higher learning, A&M-San Antonio encourages a climate that values and nurtures collegiality and the uniqueness of the individual on our campus and within our state, nation, and world. All decisions and actions involving students and employees are to be based on applicable law and individual merit. Texas A&M University-San Antonio, in accordance with applicable federal and state law, prohibits discrimination, including harassment, based on race, color, sex, religion, national origin, age, disability, genetic information, veteran status, sexual orientation, or pregnancy/parenting status. Individuals who believe they have experienced harassment or discrimination prohibited by this statement are encouraged to contact the University's Civil Rights Officer at 210-784-2061 or titleix@tamusa.edu. Texas A&M University-San Antonio faculty are committed to providing a safe learning environment for all students and for the university. If you have experienced any form of sex discrimination or harassment, including sexual assault, sexual harassment, domestic or dating violence, or stalking based on sex, know that help and support are available. A&M-San Antonio's Title IX Coordinator can support those impacted by such conduct in navigating campus life, accessing health and counseling services, providing academic and housing accommodations, and more. The university strongly encourages all students to report any such incidents to the Title IX Coordinator. Please be aware that all A&M-San Antonio employees (other than those designated as confidential resources such as counselors and trained victim advocates) are required to report information about such discrimination and harassment to the university. This means that if you tell a faculty member about a situation of sexual harassment, sexual violence, or other related sex-based misconduct, the faculty member must share that information with the university's Title IX Coordinator (titleix@tamusa.edu, 210-784-2061, CAB 439K). If you wish to speak to a confidential employee who does not have this reporting requirement, you can contact the Student Counseling Center at (210) 784-1331 or visit them in Madla 120.

Pregnant/Parenting Students

Texas A&M-San Antonio does not require a pregnant or parenting student, solely because of that status or issues related to that status, to (1) take a leave of absence or withdraw from their degree or certificate program; (2) limit the student's studies; (3) participate in an alternative program; (4) change the student's major, degree, or certificate program; or (5) refrain from joining or cease participating in any course, activity, or program at the University. The university will provide reasonable accommodation for pregnant students as it would be provided to a student with a temporary medical condition that is related to the health and safety of the student and the student's unborn child. These could include maintaining a safe distance from substances, areas, and activities known to be hazardous to pregnant individuals and their unborn child; excused absences because of illness or medical appointments; modified due dates for assignments; rescheduled tests/exams; taking a leave of absence; and being provided access to instructional materials and video recordings of lectures for excused absences, if these would be provided to any other student with an excused absence. Pregnant/parenting students are encouraged to contact the Title IX Coordinator with any questions or concerns related to their status (titleix@tamusa.edu; 210-784- 2061; CAB 439K).

Texas A&M-San Antonio has also designated the Title IX Coordinator as the liaison officer for current or incoming students who are the parent or guardian of a child younger than 18 years of age. The Title IX Coordinator can provide students with information regarding support services and other resources. Young Jaguars can support parenting students with daycare if students meet this criteria: (1) must be enrolled in classes at Texas A&M-San Antonio in the current semester, (2) must be Pell eligible or a single parent, (3) child(ren) must be aged 3 to 12-years-old, and (4) child(ren) must be enrolled in Pre-K-3 through 6th grade. For more information, please contact Young Jaguars at youngjaguars@tamusa.edu or call (210) 784-2636.

Students' Rights and Responsibilities

The following statement of students' rights and responsibilities is intended to reflect the philosophical base upon which University Student Rules are built. This philosophy acknowledges the existence of both rights and responsibilities, which is inherent to an individual not only as a student at Texas A&M University-San Antonio but also as a citizen of this country.

Students' Rights

1. A student shall have the right to participate in a free exchange of ideas, and there shall be no University rule or administrative rule that in any way abridges the rights of freedom of speech, expression, petition and peaceful assembly as set forth in the U.S. Constitution.
2. Each student shall have the right to participate in all areas and activities of the University, free from any form of discrimination, including harassment, on the basis of race, color, national or ethnic origin, religion, sex, disability, age, and pregnancy/parenting or veteran status in accordance with applicable federal and state laws.
3. A student has the right to personal privacy except as otherwise provided by law, and this will be observed by students and University authorities alike.
4. Each student subject to disciplinary action arising from violations of university students' rules shall be assured a fundamentally fair process.

Students' Responsibilities

1. A student has the responsibility to respect the rights and property of others, including other students, the faculty, and administration.
2. A student has the responsibility to be fully acquainted with the published University Student Rules found in the Student Handbook, Student Code of Conduct, on our website, and University Catalog, and to comply with them, as well as with federal, state, and local laws.
3. A student has the responsibility to recognize that student actions reflect upon the individuals involved and upon the entire University community.
4. A student has the responsibility to recognize the University's obligation to provide a safe environment for learning.
5. A student has the responsibility to check their university email for any updates or official university notifications.

Students are expected to exhibit a high level of honesty and integrity in their pursuit of higher education. Students engaging in an act that violates the standards of academic integrity will find themselves facing academic and/or disciplinary sanctions. Academic misconduct is any act, or attempt, which gives an unfair advantage to the student. Additionally, any behavior specifically prohibited by a faculty member in the course syllabus or class discussion may be considered as academic misconduct. For more information on academic misconduct policies and procedures please review the [Student Code of Conduct](#) or visit the resources available in the [OSRR website](#).

Important Spring 2026 Dates

| Dates | Event |
|------------|---|
| January 13 | Tuition and Fee Payments deadline |
| January 19 | Marting Luther King Jr. Day – No Classes |
| January 20 | First Day of Class |
| February 4 | Census Date |
| March 6-23 | Midterm grading period |
| March 9-14 | Spring Break |
| April 3 | Study Day – No classes |
| April 17 | Last day to drop with an automatic withdrawal |
| May 1 | Last day to drop a course or withdraw from the university |
| May 4 | Last Day of Classes |
| May 5 | Study Day – No classes |
| May 6-12 | Final Exams |
| May 19 | Commencement |

The complete [Academic Calendar](#) as available on our website.

Artificial Intelligence Policy

No Use of Generative AI Permitted BIOL 5318

This assumes that all work submitted by students will be generated by the students themselves, working individually or in groups. Students should not have another person/entity do the writing of any portion of an assignment for them, which includes hiring a person or a company to write assignments and/or using artificial intelligence (AI) tools like ChatGPT. Use of any AI-generated content in this course qualifies as academic dishonesty and violates Texas A&M-San Antonio's standards of academic integrity.

