

Introduction to Biometry

BIO 4480/5480

Lecture: MWF 11:00-11:50 (CAV 031)

Lab: M 2:00-3:50 (CAV 031)

Instructor Information

Dr. Nicholas J. Negovetich

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Office Hours: MW 9:00-10:45am; T 8:00-8:45 and 10:00-10:45am; R 8:00-10:45am; F 10:00-10:45am;
other times by appointment

Course Description

An introduction to the application of statistics to biological research. This course will include an introduction to probability, sampling theory, and hypothesis testing. Emphasis will be on common statistical techniques for biological research.

Learning Outcomes

1. Students will gain a basic understanding of the subject
 - Students will be able to define terms used in statistics
 - Students will be able to calculate probabilities
2. Students will learn appropriate methods for collecting, analyzing, and interpreting numerical information
 - Students will be able to choose the correct type of figure or table to display various data
 - Students will be able to choose and perform the appropriate statistical test
 - Students will be able to assess the validity of assumptions of statistical tests
 - Students will be able to interpret the results of statistical tests

Text

Introductory Statistics (Illowsky and Dean) - <https://openstax.org/details/introductory-statistics>

Course Format

This course merges the lecture and lab portions into a single course. The lecture portion introduces concepts and methods, while the lab portion gives you hands-on practice in performing the methods on the computer. Thus, lecture continues during our assigned lab time.

Analyses

Emphasis will be on choosing, performing, and interpreting statistical tests. Any statistical program can be used for assignments, but we will primarily use R (www.R-project.org) and MS Excel.

Attendance

Attendance is expected for the lecture and lab portion of the course. You are responsible for all material presented in lecture. Instructor notes will NOT be provided.

Homework and Assignments

Homework will be assigned after most classes. While not difficult, the student is expected to complete the homework and submit it by the due date. The focus of the homework assignments is to give the student practice in performing data analysis. Homework will be graded on a 2 point scale: 2 = >75% correct, 1 = <75% correct and/or partially completed to satisfaction, 0 = incomplete and/or demonstrated lack of effort. It is the student's responsibility to check their work against the key that will be posted outside of my office. Due dates for assignments will be given in class and posted on blackboard.

Quizzes and Exams

The course will consist of several short quizzes, three two-hour exams, and a comprehensive final exam. The exams will be taken during the assigned laboratory and will consist of two parts. The first part is a closed-book, theoretical portion where you will demonstrate your knowledge and understanding of statistical concepts. You may be asked to perform calculations by hand on this part of the exam. The second part focuses on the application of statistics. This portion of the exam is open-book/open-notes because you will use the computer to perform and interpret statistical calculations and tests. Exams will count as 60% (20% for each exam) of the final course grade. The quizzes (<10 minutes in length) will serve as a model on which the format of the remaining exams will be based. The quiz will be a review of previous material (cumulative to the current quiz) and should take no more than 10 minutes. The lowest quiz grade will not count toward the final grade. Errors in scoring on quizzes and exams is possible. If an error is suspected, then the instructor must be notified within one week from the day the exam was returned.

Make-up Exams and Quizzes

I understand that special circumstances beyond one's control can result in the inability to attend class when an exam or quiz is given. For these circumstances, a make-up exam or quiz may be scheduled provided that I was notified prior to the exam/quiz for scheduled and unscheduled absences. Make-up exams and quizzes must be completed within 1 week of the absence.

Point Breakdown

Final grades will be assigned as follows: A=100-90%, B=89-80%, C=79-70%, D=69-60%, F=59% or lower. Standard rounding methods will be used (round up for 0.5 or higher). The percentage breakdown for each portion of the course is listed below:

Main Assignment	Percentage of Total Grade
Homework	10%
Quizzes	15%
Exams (20% each)	60%
Final Exam	15%

Honors Students

Graduate students and students in the honors program will perform an additional project(s) that contains a statistical component. The student, with approval from the instructor, will perform an experiment of their choosing, analyze their data, and write a brief manuscript that summarizes their results. Creating the research question (10 pts), designing and performing the experiment to answer this question (10 pts), analysis of the data (35 pts), interpretation of the results (25 pts), and reporting the experimental results (20 pts) are the key components of this project. The final project is due by the last day of class. The course grade may be adjusted based on the project. A project grade of 90% or higher will not reduce the overall course grade. A project grade of 80%-89% will reduce the overall course grade by 5 percentage points. A project grade of 70%-79% will reduce the overall course grade by 10 percentage points. A project grade of 60%-69% will reduce the overall course grade by 15 percentage points. A project grade less than 60% will not result in honors or graduate credit.

Due to the design of the course, most of our statistical analysis will not be introduced until well into the second half of the semester. As such, much of the basic information required for the statistical analysis, i.e., the assumptions of the tests and associated R code, must be researched by the student. I will help and provide direction to valuable resources that can aid the student in choosing and performing the analyses, but successful completion of the honors project will require independent learning.

Religious Holy Day

A student who intends to observe a religious holy day during the semester should make that intention known in writing to the instructor during the first week of the semester and one week prior to the absence. If this submission is completed, a student who is absent from classes for the observance of a religious holy day shall be allowed to take missed exams or assignments scheduled for that day in accordance with syllabus policy.

Academic Dishonesty

Angelo State University expects its students to maintain complete honesty and integrity in their academic pursuits as presented in the [University's Statement of Academic Integrity](#). Students are responsible for understanding the Academic Honor Code, which is contained in the [University Catalog](#) and [Student Handbook](#). Any form of cheating or plagiarism in this course will result in a zero on the assignment or exam for all involved. Working with others is encouraged, but each person is responsible for their own work. Allowing others access to your work potentially involves you in cheating. If you have any question about what constitutes plagiarism or cheating, then please contact the instructor. Further information regarding academic dishonesty and university policy may be found in the Student handbook.

Special Accommodations

ASU is committed to the principle that no qualified individual with a disability shall, on the basis of disability, be excluded from participation in or be denied the benefits of the services, programs or activities of the university, or be subjected to discrimination by the university, as provided by the Americans with Disabilities Act of 1990 (ADA), the Americans with Disabilities Act Amendments of 2008 (ADAA) and subsequent legislation. Student Disability Services is the designated campus department charged with the responsibility of reviewing and authorizing requests for reasonable accommodations based on a disability. It is the student's responsibility to initiate such a request by contacting an employee of the Office of Student Affairs, in the Houston Harte University Center, Room 112, or contacting the department via email at ADA@angelo.edu or telephone (325-942-2047) For more information about the application process and requirements, visit the [Student Disability Services website](#).

Title IX at Angelo State University

The University prohibits discrimination based on sex, which includes pregnancy, sexual orientation, gender identity, and other types of Sexual Misconduct. Sexual Misconduct is a broad term encompassing all forms of gender-based harassment or discrimination including: sexual assault, sex-based discrimination, sexual exploitation, sexual harassment, public indecency, interpersonal violence (domestic violence and/or dating violence), and stalking. As a faculty member, I am a Responsible Employee meaning that I am obligated by law and ASU policy to report any allegations I am notified of to the Office of Title IX Compliance.

Students are encouraged to report any incidents of sexual misconduct directly to ASU's Office of Title IX Compliance and the Director of Title IX Compliance/Title IX Coordinator at:

Michelle Boone, J.D.
Director of Title IX Compliance/Title IX Coordinator
Mayer Administration Building, Room 210
325-942-2022
michelle.boone@angelo.edu

You may also file a report online 24/7 at www.angelo.edu/incident-form. If you are wishing to speak to someone about an incident in confidence you may contact the University Health Clinic and Counseling Center at 325-942-2173 or the ASU Crisis Helpline at 325-486-6345. For more information about Title IX in general you may visit www.angelo.edu/title-ix.

Information about COVID-19

Please refer to [ASU's COVID-19 \(Coronavirus\) Updates](#) web page for current information about campus guidelines and safety standards as they relate to the COVID-19 pandemic.

Course Delivery in the COVID-19 Era

This course is scheduled to meet face-to-face, but this could change based on the current COVID-19 situation in San Angelo. If the university requires a student to isolate or quarantine, then I will do my best to ensure that the student receives the information presented during lecture provided that they have an official university accommodation provided to me by Student Services.

Lectures will be live streamed on YouTube. You can subscribe to my channel (Dr. Nick Negovetich) to be notified when I go live. The lectures will then become available under our course playlist (URL link will be posted on Blackboard). I will not record attendance, however, attendance in-class is strongly encouraged. This class can be difficult if you struggle in math or have limited knowledge of computers. But, if errors are encountered during class, then we can stop class and correct them before moving on. This difficult to do when students participate virtually. This is nearly impossible to do if you skip class and try to learn the material and methods on your own time. We should have sufficient space in the computer lab for social distancing.

Other Comments

- This course is mathematical in nature. A scientific calculator is required and must be brought to every lecture and laboratory meeting. I also strongly recommend pencils for exams.
- The goal of this course is application and interpretation of common statistical methods. As such, memorization of formulas is not a key component. Some formulae must be memorized; others formulae will be provided on quizzes and tests. More information regarding the memorization of formulae will be provided during class.
- **Do not fear the math.** The emphasis is on choosing, performing, and interpreting statistical tests. Most equations will be given to you. Therefore, you only need to “plug-and-chug” to obtain the answer. The difficulty will be in selecting the appropriate test and interpreting the results.
- Emphasis will be on using R and Excel. An add-in called poptools (www.poptools.org) can simplify some of the analysis that we can perform in excel, but we will not use it in this class. Other statistical programs that may be used include SPSS and Systat, but I can only provide limited support for these programs.

Class Schedule

This schedule is tentative and subject to change

Week	Topic	Book*	Notes
08/23/20	Samples, Populations, and Variables	1	
08/30/20	Variables, Accuracy/Precision, Rounding	2	
09/06/20	Frequency Distributions	2	September 6 – No Class or Lab
09/13/20	Central Tendency and Dispersion	2	
09/20/20	Probability	3	
09/27/20	Bayes Theorem Binomial and Poisson Distributions	3	Exam #1 in Lab
10/04/20	Normal Distributions	4	
10/11/20	Hypothesis Testing: Power, Error, and Confidence Intervals	5, 6	
10/18/20	Hypothesis Testing: P-values and Sample Means	7, 8, 9	Exam #2 in Lab
10/25/20	One-Sample and Two-Sample Tests	9, 10	
11/01/20	ANOVA: Introduction, Assumptions, Output	13	
11/08/20	ANOVA: Posthoc Tests and Interpretation	10	
11/15/20	Analysis of Categorical Data	11	Exam #3 in Lab
11/22/20	Categorical Data: GOF Tests and Contingency Analysis	11	November 22 – Drop Date THANKSGIVING WEEK
11/29/20	Two Continuous Variables: Correlation and Regression	12	Grad/Honor Projects DUE FRIDAY
12/06/20	Final Exam: Wednesday, December 8, 10:30-12:30 (CAV 031)		

* Additional handouts or webpages may posted