Biometrics and Experimental Design
BIO 6301

Lecture: MW 5:00-6:15 (CAV 031)

Instructor Information
Dr. Nicholas J. Negovetich
Office: CAV 002B
Phone: x6646
email: nicholas.negovetich@angelo.edu
Office Hours: M-F 9:00-11:00; Other times by appointment

Course Description
An examination of statistical methods used in biological research. Emphasis will be on the application of statistical procedures and the design of experiments. This course will include an overview of more complex statistical procedures including multivariate methods, randomization tests, and resampling techniques.

Learning Outcomes
1. Learn how to apply course material
   – You will be able to choose and perform the statistical tests in R
   – You will be able to assess the validity of assumptions of parametric tests in R
2. Learning appropriate methods for collecting, analyzing, and interpreting numerical information
   – You will be able to choose and perform the appropriate statistical test
   – You will be able to assess the validity of assumptions of parametric tests
   – You will be able to interpret the results of statistical tests
3. Gain factual knowledge of statistics
   – You will be able to define terms used in statistics
   – You will be able to state when various statistical tests can be used

Text

Course Format
This course will be a combined lecture and lab course. The lab portion of the course is using the computer to perform statistical tests. I will introduce various tests when lecturing, then allow you to perform the tests on the computer. You will learn how to perform all tests in R using R Studio.

Attendance
Attendance is expected for this course. You are responsible for all material presented during class and in the reading assignments. Instructor notes will NOT be provided.

Homework and Assignments
Homework for the lecture will be assigned after the various statistical tests have been introduced and examples given. While not difficult, the student is expected to complete the homework and submit it to the instructor on the due date prior to the start of class. The focus of the homework assignments is to give the student practice in performing data analysis outside of lecture. 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.
Quizzes and Exams
The lecture will consist of a several quizzes, two one-hour exams, and a comprehensive final exam. Quizzes and exams are the principles methods through which the learning outcomes will be assessed. The quizzes/exams will be a mixture of questions that test theoretical/factual knowledge (closed-book) and assess your ability to perform/interpret the various statistical tests (open-book).

Make-up Exams and Lab Exercises
I understand that special circumstances beyond one's control can result in the inability to attend class when an exam is given. For these circumstances, a make-up exam may be scheduled provided that I was notified prior to the day of the exam.

Point Breakdown
Final grades will be assigned as follows: A=100-90%, B=89-80%, C=79-70%, F=69% 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 in the table below:

<table>
<thead>
<tr>
<th>Assignments</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Homework</td>
<td>10%</td>
</tr>
<tr>
<td>Quizzes</td>
<td>10%</td>
</tr>
<tr>
<td>Exams (3 at 20% each)</td>
<td>60%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>20%</td>
</tr>
</tbody>
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Academic Dishonesty
Angelo State University expects its students to maintain complete honesty and integrity in their academic pursuits. Students are responsible for understanding the Academic Honor Code, which is contained in both print and web versions of the 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
If any member of the class feels that he/she has a disability and needs special accommodations please contact the Office of Student Affairs, Houston Harte University Center, Suite 112, 942-2047 or ada@angelo.edu.

Religious Holy Days
A student who intends to observe a religious holy day should make that intention known in writing to the instructor during the first week of the semester and one week prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence.

Technology in the Classroom
I strongly encourage all with laptops to bring them to class for use during the course. Tablets are OK, but you will be unable to perform the analyses during lecture. **Cell phone usage is prohibited** (bring a scientific calculator if you need to use a calculator). Being told to put your cell phone away will result in a 2-percentage point deduction in your final course grade.
**Class Schedule**
This schedule is tentative and subject to change

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Book</th>
<th>Misc</th>
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</thead>
</table>
| 1/14/19| Introduction  
Review of R and Descriptive Stats | 1-7   |            |
| 1/21/19| Review of ANOVA and related tests  
Two- and Three-way ANOVA | 8-9, 13, 15 |        |
| 1/28/19| Two- and Three-way ANOVA  
Correlation Review | 11, 13 |            |
| 2/04/19| Correlation Review  
ANCOVA and Regression | 14, 16 | Exam #1    |
| 2/11/19| ANCOVA and Regression | 14, 16 |            |
| 2/18/19| Regression | 14, 16 |            |
| 2/25/19| Categorical Variables: GOF Review  
Tests of Independence | 17 |            |
| 3/04/19| Categorical Variables: Posthoc Tests | 17 |            |
| 3/11/19| **SPRING BREAK** | | |
| 3/18/19| Categorical Variables: Posthoc Tests | 17 | Exam #2    |
| 3/25/19| GLM: Logistic Regression | | Last Day to Drop 3/28 |
| 4/01/19| GLM: Logistic Regression | | |
| 4/08/19| Model II ANOVA  
Generalized Mixed Effects Models | 8, 10, 14 | |
| 4/15/19| Generalized Mixed Effects Models | 8, 10, 14 | |
| 4/22/19| Generalized Mixed Effects Models | 8, 10, 14 | Exam #3 |
| 4/29/19| Review of Methods | | |
| 5/06/19| **Final Exam: Monday, May 6, 5:00-7:00, CAV 031** | | |

* The official date and time for our class is Wednesday, May 8, at 6pm. Due to the nature of this course, the theoretical portion (closed book) of the final exam will be given on Monday, May 6, at 5pm. The application portion (open book) will be unlocked during the theoretical portion of the exam and will be due on Wednesday, May 8, at 6pm.