BIOL689 Experimental Design in Biology

Instructor:
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Learning Objectives:
This course is intended to provide an introduction to the design of scientific research projects in the field of biology. A wide range of biological experiments will be covered, and each type of experiment will be designed with an eye toward choosing the appropriate statistical technique for analysis. At the end of the course, successful students will be able to design biological studies that are statistically tractable and perform basic statistical analyses using the statistical programming language R.

Required Textbook:
The Analysis of Biological Data, Second Edition by Michael C. Whitlock and Dolph Schluter (ISBN-10: 1936221489, ISBN-13: 978-1936221586).

Suggested Textbook:
Mixed Effects Models and Extensions in Ecology with R by A. Zuur, E. N. Ieno, N. Walker, A. A. Saveliev, and G. M. Smith (Available as a free download from the TAMU library).

Grading:
Grades will be based on 10 homework assignments (10 points each), two exams (100 points each), and class participation (100 points), for a total of 400 points. The breakdown of grades will be: 0-60% = F; 60%-70% = D; 70%-80% = C; 80%-90% = B; 90%-100% = A.

Makeup Assignments:
Makeup assignments will be given only for excused absences. Written documentation will be necessary to show that an absence qualifies as an official excused absence according to TAMU policy. The student must contact the course instructor **within 3 days** to arrange a makeup assignment or the grade will be converted to a zero.

Americans with Disabilities Act (ADA) Policy Statement:
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, currently located in the Disability Services building at the Student Services at

White Creek complex on west campus or call 979-845-1637. For additional information, visit http://disability.tamu.edu.

Aggie Honor Code:
"An Aggie does not lie, cheat or steal, or tolerate those who do." See http://aggiehonor.tamu.edu.

Topics: (corresponding roughly to one topic per week)

Week 1 (Jan. 17, 19): **Introduction to R and Statistics, Reading: W&S Ch. 1-2**
Week 2 (Jan. 24, 26): **Summaries and Estimates, W&S Ch. 3-4**
Week 3 (Jan. 31, Feb. 2): **Hypothesis Testing, W&S Ch.6-9**
Week 4 (Feb. 7, 9): **Continuously Distributed Variables, W&S Ch. 10-13**
Week 5 (Feb. 14, 16): **Experimental Design, ANOVA, Correlation, W&S Ch. 14-16**
Week 6 (Feb. 21, 23): **Regression and Multiple Factors, W&S Ch. 17-18**
Week 7 (Feb. 28, Mar. 2): **Review, Exam I**
Week 8 (Mar. 7, 9): **Multiple Factors, Ch. 18-19**
SPRING BREAK (Mar. 13-17)
Week 9 (Mar. 21, 23): **More Complex Experimental Designs**
Week 10 (Mar. 28, 30): **Mixed Models**
Week 11 (Apr. 4, 6): **Heterogeneity and Hierarchical Data**
Week 12 (Apr. 11, 13): **Non-Gaussian Response Variables**
Week 13 (Apr. 18, 20): **Big Data, Part 1**
Week 14 (Apr. 25, 26): **Big Data, Part 2**
Final Exam: May 9, 1-3pm.