BIOL 7050: "Experimental Design and Biological Data Analysis", Fall 2019

Dr. Brad Bergstrom   9-9:50 am, 1202 BSC
bergstrm@valdosta.edu   Offc Hrs 10-11 MW, 2-3 M; other times by appt.
1107 BSC, 333-5770

Required Text: **Whitlock, M.W., and D. Schluter. 2015. The analysis of biological data. 2nd ed. W. H. Freeman, New York.** (*I chose this text for its readability, comprehensiveness, and links to numerous resources that you may use for years to come; I expect you will purchase and keep this book as an important reference in your career.) Bring your book to class!

Overview: the format will be a combination of lecture, hands-on data collection and analysis (with graded write-ups), regular homework assignments (due every Friday), a few quizzes, and some discussion of papers. There will also be a component of individualized design of an experimental protocol, whether that represents your actual Masters research or other proposed project. An initial prospectus (due Week 3) will be returned with comments from me plus a "blind" reviewer (one of your classmates), for you to consider.

I expect you to READ the assigned chapters and "Interleaf"s preceding them (first, skim in advance, whenever possible), because I won't always lecture on them. To learn the content, perform a variety of Practice Problems at the end of each chapter (check answers in back of text); I will assign a few Assignment Problems from each chapter.

Quizzes will focus on definitions of terms as outlined in yellow throughout text (and in some cases other sources made available to you[1]).

Tentative Schedule by Week (Chapter to read and associated homework problems due every Friday):

1   Introduction to sampling and statistics (1)
2   Displaying Data, Describing Data (2, 3)
3   Uncertainty in Estimation (4); Probability (5: read and learn terms only). Questionnaire due.
4   Hypothesis Testing (6). Lab analysis 1 due.
5   Designing Experiments (14). QUIZ 1: Chapts 1-6.
6   Designing Experiments (14 + assigned readings discussion[1])
7   Analyzing Proportions (7)
8   Fitting probability models to frequency data (8). Lab analysis 2 due.
9   The Normal Distribution (10)
10   Inference for a Normal Population (11). QUIZ 2: Chapts 7,8,10,14
11   Comparing Two Means and Deviations from Normality (12, 13)
12   Comparing Means from More Than Two Groups (ANOVA) (15)
13   Correlation (16). Lab analysis 3 due.
14   Regression (17)
15   Multiple Explanatory Variables (18). QUIZ 3: Chapts. 11-17

*Final Experimental Design Protocol due Wed., Dec. 11

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[1]You will find several resources for this course under the "Public" folder in the V:\ drive for this course

While I can't require it, it would be advantageous if you had a laptop available to bring to class, with Microsoft Excel installed, particularly on days when we do some data analyses as a group.

Notes on Final Experimental Design Protocol: this will be, essentially, an Introduction and Methods (with partial Literature Cited) of a scientific paper, with emphasis on: 1) justifying your specific hypotheses in the context of your species/system, with preliminary literature review, and 2) specifying the precise methods and all details for sampling, including manipulating explanatory variable(s), measuring effect on response variables, and specific statistical tests needed. Give details of replicates, sample size (do calculations of *n* needed for particular power and precision desired), temporal, ecological, spatial scope of study, grain of sampling units, etc. Also specify types of graphs that will be used to display data. Unlike the Methods section of an actually published paper (which is written in past tense), you may write this in future tense, because it is a proposal for what you *will* do.

Points and Grading:

Initial Questionnaire	30	
Collegial Review	15	
15 Homeworks @ 10 pts	150	
3 Quizzes @ 25	75	
Lab analyses	30	
Class Discussion	10	
Final Design Protocol	50	

TOTAL	360	Lowest A/B/C = 320/285/250

Links and other resources:

Textbook Website: http://whitlockschluter.zoology.ubc.ca/

Calculate sample sizes for Power and Precision in Experimental Design:
http://www.divms.uiowa.edu/~rlenth/Power/

Random number generators: several smart phone Apps, inlcuding "Random Pro"
(But, also download the "Analysis ToolPak" Add-in to your copy of Excel, then activate it in the Analysis group on the Data tab).