Biology 4401: Experimental Design & Statistical Methods
Fall 2011

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Course description: This course is designed to provide an introduction to the basic methods for designing experiments, analyzing data, and drawing inferences. Mathematical concepts and theory underlying statistical methods commonly applied in the biological sciences will be covered, including fundamentals of discrete and continuous distributions, random and fixed variables, hypothesis testing, regression and analysis of variance techniques. Parametric and non-parametric approaches for data analysis are included. The computer program MINITAB provides the analytical tool for putting statistical theory into practice using a variety of data sets. In addition, students are required to examine critically the application and use of statistical analysis in the scientific literature.

Textbook: "*Introductory Statistics*," by Prem S. Mann (6th Ed.), J. Wiley & Sons

Grading:

Homework assignments	30%
Midterm Exams (3 @10% each)	30%
Final Exam	25%
Student Critique on Applied Statistics	15%

Homework assignments are to be completed and submitted prior to the posted deadline! Any homework submitted after the deadline will be assessed a 25% penalty, and no homework will be accepted after graded assignments have been returned.

Midterm exams will be based on lecture material. Formula sheets and calculators are **not** allowed unless specifically indicated by the instructor. Any statistical tables required for answering questions will be provided.

The final exam is a comprehensive take-home exam.

Instructions for preparing the Critique paper (due Dec. 2) will be posted to the course web site (T-Square).

SYLLABUS

DATE	TOPIC	TEXT CHAPTERS
Aug 23	Introduction to course	
Aug 25	Descriptive Statistics	1-3
Aug 30	Intro to Probability Distributions	4-5
Sep 1	Binomial & Poisson Distributions	4-5
Sep 6	Density Functions & Intro to Normal Distribution	6
Sep 8	The Normal (Gaussian) Distribution	6

DATE	TOPIC	TEXT CHAPTERS
Sep 13	The Standard Normal (z) Distribution	7
Sep 15	Sampling Distributions	7
Sep 20	Probability Statements: What do They Really Mean?	-
Sep 22	**MIDTERM EXAM 1**	**1-7**
Sep 27	Applications of sampling distributions	8
Sep 29	Central Limit Theorem	8
Oct 4	Hypothesis Testing	9
Oct 6	Type I & Type II Errors & Power	-
Oct 11	One-sample tests of hypotheses	9
Oct 12	Sign test and Ranked Sign test	15*
Oct 18	**Fall Break, No Classes**	
Oct 20	Two sample tests of hypotheses	10
Oct 25	**MIDTERM EXAM 2**	**8, 9, 15**
Oct 27	Two sample tests	10
Nov 1	Wilcoxon signed-rank test & rank sum test	15
Nov 3	Goodness of fit and Chi Square tests	11
Nov 4	**Deadline for Critique Paper Approval**	
Nov 8	Tests for multiple samples (ANOVA)	12
Nov 10	Analysis of variance	12, 15
Nov 15	Mean separation techniques in ANOVA	12
Nov 17	Intro. to Linear regression	13
Nov 22	Linear regression	
Nov 24	**Thanksgiving Break, No classes**	
Nov 29	Linear regression with non-parametric applications	13, 15
Dec 1	**MIDTERM EXAM 3**	10, 11, 12, 13, 15
Dec 2	**Critique Paper Due**	
Dec 6	Multiple Regression: Adding variables to a linear model	14*
Dec 8	Two-way ANOVA and ANCOVA models	-
	Take-Home Final Released to Class	
Dec 15	**Final Exam (Take Home) Due @ 5:00 pm** (hard copy ONLY)	**ALL**

*Note: Chapters 14 & 15 are not included in the textbook but are available as a free download from the publisher