

Biology 4401: Experimental Design & Statistical Methods
Fall 2008

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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! **NO** late work will be accepted unless it is caused by documented severe illness, family emergency or participation in a university-sanctioned event.

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 Nov. 21) will be posted to the course web site (T-Square).

SYLLABUS

DATE	TOPIC	TEXT CHAPTERS
Aug 19	Introduction to course	
Aug 21	Descriptive Statistics	1-3
Aug 26	Intro to Probability Distributions	4-5
Aug 28	Binomial & Poisson Distributions	4-5
Sep 2	Density Functions & Intro to Normal Distribution	6
Sep 4	The Normal (Gaussian) Distribution	6

<u>DATE</u>	<u>TOPIC</u>	<u>TEXT CHAPTERS</u>
Sep 9	The Standard Normal (z) Distribution	7
Sep 11	Sampling Distributions	7
Sep 16	Probability Statements: What do They Really Mean?	-
Sep 18	MIDTERM EXAM 1	1-7
Sep 23	Applications of sampling distributions	8
Sep 25	Central Limit Theorem	8
Sep 30	Hypothesis Testing	9
Oct 2	Type I & Type II Errors & Power	-
Oct 7	One-sample tests of hypotheses	
Oct 9	Sign test and Ranked Sign test	9
Oct 14	Fall Break, No Classes	15*
Oct 16	Two sample tests of hypotheses	10
Oct 21	MIDTERM EXAM 2	8, 9, 15
Oct 23	Two sample tests	10
Oct 28	Wilcoxon signed-rank test & rank sum test	15
Oct 30	Goodness of fit and Chi Square tests	11
Oct 31	Deadline for Critique Paper Approval	
Nov 4	Tests for multiple samples (ANOVA)	12
Nov 6	Analysis of variance	12, 15
Nov 11	Mean separation techniques in ANOVA	12
Nov 13	Intro. to Linear regression	13
Nov 18	Linear regression	
Nov 20	Linear regression with non-parametric applications	13, 15
Nov 21	Critique Paper Due	
Nov 25	MIDTERM EXAM 3	10, 11, 12, 13, 15
Nov 27	Thanksgiving Break, No classes	
Dec 2	Multiple Regression: Adding variables to a linear model	14*
Dec 4	Two-way ANOVA and ANCOVA models	-
	Take-Home Final Released to Class	
Dec 10	Final Exam (Take Home) Due @ 6:00 pm (hard copy ONLY, earlier submission is encouraged)	ALL

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