

BIOLOGY 132: BIOSTATISTICS

INSTRUCTOR: Dr. Sara Lewis (Barnum 101, X73548, sara.lewis@tufts.edu)

OFFICE HOURS: Tuesdays 12–1 pm (or by appointment)

TEACHING ASSISTANTS:

Adam South (Barnum 216, adam.south@tufts.edu)

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OFFICE HOURS

Monday 9-11 AM

Monday 3 - 5 PM

CLASS MEETINGS: Class meets Tuesday & Thursday 10.30-11.45 AM in Barnum 104: class attendance is **mandatory**, so please email Dr. Lewis in advance if you must miss a class.

COURSE DESCRIPTION: In this introductory statistics course we will explore the use of statistical methodology in designing, analyzing, interpreting, and presenting biological experiments and observations. We will cover descriptive statistics, elements of experimental design, probability, hypothesis testing and statistical inference, analysis of variance, correlation, regression techniques, and non-parametric statistical methods. Throughout the course the application of statistical techniques within a biological context will be emphasized, using data from laboratory and field studies.

PREREQUISITES/CREDIT: Biology 13 & 14, plus one additional biology course. This course cannot normally be taken for credit if you've already taken Psych 31, CD 140, Econ 13, Soc 101, or Engineering Sciences 56.

TEXTS: The required textbook is *Statistics for the Life Sciences* by Samuels & Witmer (3rd edition) which is available at the bookstore bundled with the student version of SPSS 17.0 (only available in Windows): SPSS is the statistical analysis software that we will be using in the course. You can also purchase the textbook without the software. We also recommend *SPSS Guide to Data Analysis* by Marija J. Norusis, but this is not required. All course software (both *SPSS* and *ConStats*) will be available in the Eaton Computer Lab.

GRADES: Course grades will be based on weekly problem sets (35%), two hour exams (15% each), a take-home final exam (20%), *ConStats* worksheets (10%), and class attendance & participation (5%).

PROBLEM SETS: This course has mandatory weekly problem sets that are intended to provide you with practical experience in conducting statistical analyses: problem sets are generally handed out on Thursdays and are due the following Tuesday **before class**. Problem sets are graded on a 0-10 point scale, and there is a non-negotiable late penalty of -2 points per day (or any portion thereof) late. Corrected problem sets may be turned in again at the next class meeting to be regraded (up to 7 point maximum).

FALL 2009 SYLLABUS

BIOLOGY 132

DATE	TOPICS	READINGS IN S&W
Sept 8, 10 Week 1	Introduction & Describing data: frequency distributions & descriptive statistics <i>ConStats Worksheets 1a: Displaying Data & Worksheet 1b: Descriptive Statistics</i> <i>Problem Set 1</i>	Ch.1, 2.1-2.7
Sept 15, 17 Week 2	Sampling & Experimental design <i>ConStats Worksheet 2: Sampling Distributions & Problem Set 2</i>	Ch. 2.8, 3.2, Ch. 8
Sept 22, 24 Week 3	Elements of probability theory & Probability distributions (Normal & Binomial) <i>ConStats Worksheet 3: Probability Distributions & Problem Set 3</i>	Ch. 3.3-3.8, 4.1-4.3, 4.6
S 29, Oct 1 Week 4	Introduction to inference; Sampling Distributions & Confidence intervals <i>ConStats Worksheet 4: Confidence Intervals & Problem Set 4</i>	Ch. 5, Ch. 6.1-6.3, 6.7
Oct 6, 8 Week 5	Introduction to Hypothesis Testing; One-sample tests; Type I & II errors <i>Problem Set 5</i>	Ch. 7.1-7.7, 7.10
Oct 13, 15 Week 6	No class (Tufts Monday) Comparing two sample means <i>No Problem Set</i>	Ch. 9.1-9.3, 9.6-9.7
Oct 16 (F)	<i>Midterm Question & Answer session</i>	
Oct 20, 22 Oct 26 (M) Week 7	Comparing two sample means (continued); Mid-term exam <i>Intro to SPSS (Eaton Computer Lab)</i> <i>Problem Set 6: SPSS Descriptive Statistics & Comparing Two Means</i>	
Oct 27, 29 Week 8	Statistical power (Ch. 7.8); Test assumptions; Transformations <i>Problem Set 7: Power & Paired t tests</i>	Ch. 6.5, 4.4, 7.9-7.11
Nov 3, 5 Week 9	Non-parametric alternatives: Analysis of Variance (ANOVA) <i>Problem Set 8: Checking Assumptions & Mann-Whitney</i>	Ch. 9.4-9.5, Ch. 11.1-11.4
Nov 10, 12 Week 10	Analysis of Variance (continued) <i>Problem Set 9: ANOVA I</i>	Ch. 11.5, 11.7
Nov 17, 19 Week 11	Multiple comparisons <i>Problem Set 10: ANOVA II: Transformations & Non-parametric alternatives</i>	Ch. 11.8-11.9
Nov 24, 26 Week 12	Introduction to bivariate analysis - Correlation & regression; No class (Thanksgiving) <i>ConStats Worksheet 5: Exploring Bivariate Data</i> <i>Problem Set 11: Multiple Comparisons</i>	Ch. 12.1-12.2
Dec 1, 3 Week 13	Linear regression <i>Problem Set 12: SPSS Regression</i>	Ch. 12.3-12.7
Dec 8, 10	Analysis of categorical data	Ch. 10.1-10.6, 10.10, Ch. 13
Dec 11 (F)	<i>Question & Answer Session</i>	
Dec 15	<i>In-Class Exam (12-2 pm)</i>	
Dec 18	<i>Take-Home Final Due</i>	

Note: Problem sets are generally distributed on Thursdays of the weeks listed & are due the following Tuesday before class.