

BIOLOGY 132: BIOSTATISTICS

INSTRUCTORS:

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Office Hours: Tuesdays 12–1 pm (and by appointment)

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Office Hours: Friday 10-12 noon (and by appointment)

TEACHING ASSISTANTS:

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OFFICE HOURS

Mon 8.15–10.15 am, alt Th 1-2 pm

Mon 2-4 pm, alt Th 1-2 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, Math 10, or Engineering Sciences 56.

TEXTS: The required textbook is *Statistics for the Life Sciences* by *Samuels & Witmer (4th edition)* which is available at the bookstore bundled with the student version of *SPSS 18*, the statistical analysis software that we will be using in the course. You can also purchase the textbook without the software, as all course software (*SPSS v.19* and *ConStats*) will be available in the Eaton Computer Lab. You get a 13-month software license when you buy the text/*SPSS* bundle, and *SPSS* runs under both Windows or MacOS. We also recommend *SPSS Guide to Data Analysis* by *Marija Norusis*, but this is not required.

GRADES: Course grades will be based on weekly problem sets (25%), two hour exams (20% 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).

ACADEMIC INTEGRITY: While we encourage collaborative learning on problem sets, each student is responsible for working through and completing each assignment on his/her own. Plagiarism or cheating (as well as facilitation of either) are unacceptable violations of Tufts Academic Integrity standards and will automatically result in a failing grade.

FALL 2011 SYLLABUS

BIOLOGY 132

DATE	TOPICS	READINGS IN S&W
Sept 6, 8 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.1.1, 2.1-2.4, 2.6-2.7
Sept 13, 15 Week 2	Sampling & Experimental design <i>ConStats Worksheet 2: Sampling Distributions & Problem Set 2</i>	Ch. 1.2-1.3, 2.8-2.9, 7.4, 11.6
Sept 20, 22 Week 3	Elements of probability theory & Probability distributions (Normal & Binomial) <i>ConStats Worksheet 3: Probability Distributions & Problem Set 3</i>	Ch. 3.1-3.6, 4.1-4.3, 4.5
Sept 27, 29 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, 6.5
Oct 4, 6 Week 5	Introduction to Hypothesis Testing; One-sample tests; Type I & II errors <i>Problem Set 5</i>	Ch. 7.1-7.3, 7.5-7.6, 7.9
Oct 11, 13 Week 6 Oct 15 (F)	Comparing two independent sample means, paired samples <i>Problem Set 6: SPSS Descriptive Statistics & Comparing Two Means</i> <i>Midterm Question & Answer session</i>	Ch. 6.6-6.8, 8.1-8.3, 8.6
Oct 18, 20 Week 7	Statistical power (Ch. 7.7); Mid-term exam <i>Problem Set 7: Power & Paired t tests</i>	
Oct 25, 27 Week 8	Test assumptions; Transformations <i>Problem Set 8: Checking Assumptions & Mann-Whitney</i>	Ch. 6.5, 4.4, 7.8-7.10
Nov 1, 3 Week 9	Non-parametric alternatives: Analysis of Variance (ANOVA) <i>Problem Set 9: ANOVA I</i>	Ch. 8.4-8.5, Ch. 11.1-11.4
Nov 8, 10 Week 10	No class (Tufts Friday); Analysis of Variance (continued) <i>Problem Set 10: ANOVA II: Transformations & Non-parametric alternatives</i>	Ch. 11.5- 11.6
Nov 15, 17 Week 11	Multiple comparisons <i>Problem Set 11: Multiple Comparisons</i>	Ch. 11.9
Nov 22, 24 Week 12	Introduction to bivariate analysis - Correlation & regression; No class (Thanksgiving) <i>ConStats Worksheet 5: Exploring Bivariate Data</i>	Ch. 12.1-12.2
N 29, Dec 1 Week 13	Linear regression <i>Problem Set 12: SPSS Regression</i>	Ch. 12.3-12.7
Dec 6, 8 Dec 12 (M) Dec 15 Dec 19	Analysis of categorical data: Goodness of Fit & Contingency Tables <i>Question & Answer Session</i> <i>In-Class Exam (12-2 pm)</i> <i>Take-Home Final Due</i>	Ch. 9.4-9.5, 10.1-10.7, 10.10, Ch. 13

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