

Math 123 Statistics for Scientists
Syllabus Spring 2008

Instructor: John Liukkonen **Office:** 405 Gibson **Phone:** 862-3440

Email: jrl@math.tulane.edu Students are encouraged to contact me by email.

Lab Instructor: Andrea Hebert **Email:** ahebert1@tulane.edu

Text: Devore and Peck, Statistics—The Exploration and Analysis of Data, sixth edition

Required Calculator—TI-83 or TI-84

Recommended software—Minitab 15, available by download for \$30 per 6 month rental

Blackboard: This course will be maintained on MyTulane.blackboard.com. Check that site regularly for announcements, assignments, etc.

Course goals: This course will cover the treatment of data. The course divides into three parts. In part I we will go over graphical and numerical methods of summarizing data, and key issues involved in the collection and use of data. In part II we will develop the theoretical context needed to draw formal conclusions from data. In part III we will go over formal methods for drawing statistical conclusions from data. In particular we will cover statistical methods for the analysis of means and proportions from one or two populations, and linear regression. At the end of the course you should be aware of basic issues in statistics and common pitfalls, have some idea of the issues inherent in various forms of data collection, and be proficient in the presentation and analysis of data from one and two populations and from linear regression.

What is expected from you: you should be proficient in algebra and precalculus and have completed one term of calculus. You are expected to attend classes regularly, complete all assignments, and you are expected to take the initiative and ask questions when you do not understand.

Quizzes: there will be a quiz each lab period; your top 10 quiz scores will be added to count as one test score—i.e. 15% of your semester grade.

Tests: there will be three tests during the term: Wed Jan 30, Wed Feb 27, Wed Apr 16
Each test will count 15% of your semester grade.

Homework: Collected each laboratory period; will count 5% of your final grade

Final Exam: Friday May 2, 8AM-noon; will count 35% of your final grade

Grading Policies: Your semester average is calculated by the following scheme: Final Exam 35%, In class tests 15% each; quiz total 15%, homework total 5%. The grade scale is 90-100 A, 80-89 B, 60-79 C, 50-59 D, below 50 F. In the event I am convinced you know the subject beyond what your semester average indicates (e.g. by a very strong performance on the final exam) I will increase your grade accordingly.

Makeup Policies: NO MAKEUPS. No late homework, no makeups on quizzes as we are counting only the top 10. No makeups on in class tests—in the event of an excused absence from a test, we will determine your grade from your remaining work. All students must take the final exam to pass the course.

Topics Covered

Group I—Collecting and summarizing data

- Ch 1 Populations, units variables Sec 4 Categorical variables, discrete numerical variables, continuous numerical variables
- Ch 2 Data collection Sec 1 experimental studies and observational studies
 - Sec 2 sampling—simple random sampling, stratified sampling, cluster sampling
 - Sec 3 some experimental design—randomizing, single and double blind studies
 - Sec 5 surveys and their problems
- Ch 3 Graphical summaries of data—Sec 1 bar charts for categorical data Sec 2 stem and leaf diagrams Sec 3 frequency distributions and histograms for numerical data Sec 4 scatter plots and trend for bivariate data
- Ch 4 Numerical summaries of data—Sec 1 measures of center—mean and median Sec 2 describing variability—standard deviation, range, interquartile range Sec 3 boxplots Sec 4 interpreting standard deviations—Chebyshev’s Rule, Empirical rule and z scores
- Ch 5 Numerical summaries for bivariate data—correlation and slope

Group II—Theoretical context for statistics

- Ch 6 sec 1,2 and supplementary handout—the frequency interpretation of probability and conditional probability. Addition and multiplicative rules. Bayes’ Rule
- Ch 7 Population variables and random variables
 - Sec 1, 2 and supplementary handout—mass distribution, mean and standard deviation for discrete random variables; density, mean and standard deviation for continuous random variables
 - Sec 3 the normal distribution
 - Sec 4 checking normality—qq plots and transformations to normality
- Ch 8 The concept of sampling distribution; sampling distribution of the sample mean, sampling distribution

Group III—Inference

- Ch 9 Estimation and confidence intervals for the mean or proportion of one population
- Ch 10 Hypothesis tests on the mean or proportion of one population
- Ch 11 Inference for two populations—comparing the means of two populations using independent samples, using paired samples. Comparing the proportions of two populations using large independent samples

Ch 13 and supplementary handouts—basic inference for simple linear regression. Tests and confidence intervals for the slope. Checking the assumptions for the linear regression model. Extending these concepts to multiple linear regression. Understanding the multiple regression summary.