

STAT 218 - Applied Statistics for the Life Sciences

Fall 2003

1. Catalog Description

STAT 218 Applied Statistics for the Life Sciences (4) GE B1

Descriptive statistics, confidence intervals, parametric and nonparametric one-and two-sample hypothesis tests, analysis of variance, correlation, simple linear regression, chi-square tests. Applications of statistics to the life sciences. Use of a statistical computer package. Prerequisite: Intermediate algebra, appropriate score on ELM.

2. Required Background and/or Experience

Intermediate algebra or equivalent, appropriate score on the ELM examination.

3. Expected Outcomes

The student should be able to:

- a. design a data collection scheme based on simple random sampling or simple experimental designs;
- b. distinguish between observational studies and experiments and understand the limitations (practical and consequential) of each;
- c. summarize data using graphical and numerical techniques;
- d. construct and interpret confidence intervals for means and differences between means for independent and paired samples;
- e. conduct parametric and non-parametric two-sample hypothesis tests for means;
- f. conduct Chi-square goodness-of-fit tests and tests for independence;
- g. distinguish between case-control and cohort studies and compute relative-risk and odds in the appropriate settings;
- h. use simple linear regression to describe relationships between variables; and
- i. perform analysis of variance tests for completely randomized and randomized block designs.

4. Text and References

Text: Samuels, M.L. and Witmer, J.A., *Statistics for the Life Sciences*, 2nd ed., Prentice-Hall, 1999.

Reference: Ott, Lyman, *An Introduction to Statistical Methods and Data Analysis*, 4th ed., Duxbury, 1993.

5. Minimum Student Materials

Calculator for student use in preparing assignments and taking exams.

6. Minimum University Facilities

Chalkboard for instructional use, overhead projector.

7. **Expanded Description of Content and Method**

<u>CONTENT</u>	<u>NUMBER OF LECTURES</u>
A. THE NEED FOR STATISTICAL ANALYSIS	1
1. Examples and Overview	
2. Types of Data	
a. Qualitative, Quantitative	
B. PRINCIPLES OF DESIGN	2
1. Random Samples	
2. Observational Studies and Experiments	
3. Blocking and Stratification	
C. DESCRIPTIVE STATISTICS	3
1. Graphical Summaries	
a. Histograms, Boxplots, Stem-and-leaf	
2. Numerical Summaries	
a. Mean, Median	
b. Standard Deviation, IQR	
D. THE NORMAL DISTRIBUTION	3
1. The Empirical Rule	
2. z-scores	
3. Using Normal Tables	
4. Assessing Normality – Q-Q Plots	
E. SAMPLING DISTRIBUTIONS	2
1. Sampling Distribution of the Mean	
2. Standard Error of the Mean	
F. ONE AND TWO-SAMPLE METHODS FOR MEANS	10
1. One-sample confidence interval	
2. Two sample interval for differences	
a. Independent Samples	
b. Paired Samples	
3. Hypothesis tests for differences	
a. Two-sample and paired <i>t</i> -test	
b. Mann-Whitney and sign test	
G. ANALYSIS of VARIANCE	5
1. One-way AOV for a Completely Randomized Design	
2. AOV for Randomized Block Design	
3. Post-hoc Comparisons	
H. CATEGORICAL DATA	5
1. Chi-Square Goodness of Fit	
2. Chi-Square Test of Independence	
3. Relative Risk and Odds	
I. LINEAR REGRESSION	5
1. Fitting a line using Least Squares	
2. Interpretation of Computer Output	
3. Inference Concerning the Slope	
4. Correlation	
5. Diagnostic Plots	
	Total 36
<u>METHOD</u>	

Lecture-discussion development of fundamental theories and practice. Computation of statistics from actual problems.

8. **Method of Evaluating Outcome**

By individual recitation, assignment of exercises, and examinations.