CALIFORNIA POLYTECHNIC STATE UNIVERSITY
San Luis Obispo, California

STAT 218 - Applied Statistics for the Life Sciences **Winter 2016**

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. construct and interpret a confidence interval for a single proportion;
g. conduct Chi-square goodness-of-fit tests and tests for independence;
h. distinguish between case-control and cohort studies and compute relative-risk and odds in the appropriate settings;
i. perform analysis of variance tests and post-hoc comparisons for completely randomized designs; and
j. use simple linear regression to describe relationships between variables.

4. Text and References

Text: Samuels, M.L. and Witmer, J.A., *Statistics for the Life Sciences,*5rd ed., Prentice-Hall, 2015.

5. Minimum Student Materials

Calculator for student use in preparing assignments and taking exams.

6. Minimum University Facilities

Chalkboard for instructional use, overhead projector. Smartrooms preferred.

7. Expanded Description of Content and Method

CONTENT			NUMBER OF LECTURES
A.	**THE NEED FOR STATISTICAL ANALYSIS**		1
	1.	Examples and Overview	
B.	**PRINCIPLES OF DESIGN**		3
	1.	Random Samples	
	2.	Types and sources of Data	
		a. Quantitative, Qualitative	
		b. Observational Studies and Experiments	
	3.	Collecting Data	
		a. Random sampling	
		b. 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**		2
	1.	The Empirical Rule	
	2.	*z*-scores	
	3.	Using software to compute normal probabilities and quantiles	
	4.	Assessing Normality – Q-Q Plots	
E.	**SAMPLING DISTRIBUTIONS**		3
	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 *t*-test	
		b. Mann-Whitney and sign test	
G.	**CATEGORICAL DATA**		5
	1.	Confidence interval for a single proportion	
	2.	Chi-Square Goodness of Fit	
	2.	Chi-Square Test of Independence	
	3.	Relative Risk and Odds	
H.	**ANALYSIS of VARIANCE**		5
	1.	One-way AOV for a Completely Randomized Design	
	2.	Post-hoc Comparisons	
I.	**LINEAR REGRESSION**		5
	1.	Correlation	
	2.	Fitting a line using Least Squares	
	3.	Interpretation of Computer Output	
	4.	Inference Concerning the Slope	
	5.	Diagnostic Plots	
		Total	37

METHOD

Lecture-discussion development of fundamental theories and practice. In class activities and computer (web-based) simulation. Computation of statistics from actual problems using software.

8. Method of Evaluating Outcome

By individual recitation, assignment of exercises, and examinations.