CALIFORNIA POLYTECHNIC STATE UNIVERSITY
San Luis Obispo, California

STAT 322 – Statistical Analysis for Engineers and Scientists

March 2007

1. Catalog Description

STAT 322 Statistical Analysis for Engineers and Scientists (4)

Confidence intervals, hypothesis testing, one and two-factor analysis of variance, simple linear regression, nonlinear and multiple regression, chi-square tests, introduction to statistical quality control. 4 lectures. Prerequisite: STAT 321.

2. Required Background and/or Experience

STAT 321

3. Expected Outcomes

The student should:

a. understand the properties and uses of t, chi-squared, and F distributions;
b. be able to test hypotheses about and construct confidence intervals for means, variances, and proportions based on one or two samples of data;
c. be able to carry out a chi-squared test for independence, homogeneity, or goodness-of-fit of a model;
d. understand the meaning of regression and models;
e. be able to find and use regression equations and correlation coefficients;
f. understand and be able to use basic analysis of variance procedures;
g. understand and be able to use Chi-square tests for independence and association; and
h. understand the principles underlying the construction of control charts.

4. Text and References

Text: Devore, Jay, *Probability and Statistics for Engineering and the Sciences*, 7th Edition, Duxbury Press, 2007.

References: Montgomery, Douglas and Runger, George C., *Applied Statistics and Probability for Engineers*, 3rd ed., Wiley, New York, 2003.

Hogg, Robert and Ledolter, Johannes, *Engineering Statistics*, 2nd ed., MacMillan, New York, 1992

5. Minimum Student Materials

Hand calculator strongly recommended.

6. Minimum University Facilities

Chalkboards for class use. Calculating machines and computer facilities for student use in preparing assignments.

7. Expanded Description of Content and Method

CONTENT	**NUMBER OF LECTURES**
A. Inferences concerning the mean of a normal population	5
1. Hypotheses and test procedures (8.1)	
2. Large sample tests for a population mean (8.2)	
3. Small sample inference for the mean of a normal population (7.3, 8.2)	
4. P-values (8.4)	
B. Inference concerning two means	3
1. Large sample z-test (9.1)	
2. Two-sample (independent samples) t-test (9.2)	
3. Paired t-test (9.3)	
4. Confidence intervals (9.1-9.3)	
C. Inferences concerning proportions	3
1. Hypothesis tests (8.3, 9.4)	
2. confidence intervals (7.2, 9.4)	
D. Analysis of Variance	7
1. One-way ANOVA (10.1)	
2. Multiple comparisons (10.2)	
3. Randomized block analysis (11.1)	
4. Two-way ANOVA (11.2)	
E. Simple linear regression	6
1. Model description, estimates via the principle of least squares, MINITAB (12.1, 12.2)	
2. Estimation of σ, inferences concerning the slope parameter (12.3)	
3. Inference concerning E(y|x) and prediction (12.4)	
4. The coefficient of determination, r, and inference concerning ρ (12.5)	
F. Non-linear and multiple regression	5
1. Residual analysis and transforming to linearity (13.1, 13.2)	
2. Quadratic and polynomial regression (13.3)	
3. Multiple regression (13.4)	
G. The analysis of categorical data	3
1. Goodness of fit (14.1, 14.2)	
2. Contingency tables (14.3)	
H. Introduction to statistical quality control (ch. 16)	5
1. Run charts	
2. Introduction to control charts	
3. $\bar{X}$ and R charts	
4. p charts	
5. Process capability analysis	
6. Lot acceptance plans	
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METHOD

Largely lecture with chalkboard illustrations of methods and problems, class discussion, and supervised work.

8. Method of Evaluating Outcome

Daily problem assignments, scheduled tests, and final examination.