

CALIFORNIA POLYTECHNIC STATE UNIVERSITY
San Luis Obispo, California

STAT 323/523 – Design and Analysis of Experiments I**Fall 2015****1. Catalog Description****STAT 323/523 Design and Analysis of Experiments I (4)**

Principles, construction and analysis of experimental designs. Includes completely randomized, randomized complete block, Latin squares, Graeco Latin squares, factorial, and nested designs. Fixed and random effects, expected mean squares, multiple comparisons, and analysis of covariance. 4 lectures. Prerequisite: STAT 302.

2. Required Background and/or Experience

STAT 302

3. Expected Outcomes

The student should:

- a. understand the single factor fixed effects model, and be able to carry out the analysis culminating in the F test and appropriate multiple comparisons.
- b. understand the difference between fixed and random effects.
- c. understand the rationale behind the use of blocking, Latin squares, and other noise-reducing designs.
- d. be able to recognize different designs.
- e. be able to perform the statistical computations and express the results of the quantitative work through their writing skills.

4. Text and References

Text: Oehlert, G. W., *A First Course in Design and Analysis of Experiments*, W.H. Freeman, 2000.

References: Box, G., Hunter, W., and Hunter, J.S., *Statistics for Experimenters*, Wiley, 1978.

Hicks, C. R. and Turner, K.V., *Fundamental Concepts in the Design of Experiments*, 5th ed. Oxford Press, 1999.

Kuehl, R. O., *Design of Experiments: Statistical Principles of Research Design and Analysis*, 2nd ed. Duxbury Press, 2000.

Montgomery, D. C., *Design and Analysis of Experiments*, 7th ed., Wiley, 2009.

5. Minimum Student Materials

Hand-held calculator.

6. Minimum University Facilities

Chalkboards for class use. Computer laboratory for student use in preparing assignments.

7. Expanded Description of Content and Method of Instruction

CONTENT	Number of Lectures
A. Introduction	1
B. Basic principles of experimental design	3
a. design structure versus treatment structure	
C. Single Factor ANOVA	13
a. fixed effects model, expected mean squares, F-test	
b. checking assumptions	
c. multiple comparisons; contrasts and orthogonal contrasts	
d. analysis by computer	
e. random effects model	
f. regression model	
g. analysis by computer	
h. choice of sample size	
i. Kruskal-Wallis test	
j. analysis of covariance	
k. analysis by computer	
D. Randomized Complete Block Design	5
a. analysis	
b. checking assumptions	
c. estimating missing values	
d. multiple comparisons	
e. analysis using computers	
f. Friedman test	
E. Latin Squares and Graeco-Latin Squares	2
F. Factorial Designs	9
a. definition, advantages	
b. two-factor factorial	
c. fixed effect model and concept of interaction	
d. multiple comparisons	
e. no interaction model	
f. one observation per cell	
g. random and mixed models	
h. general factorial design	
i. dealing with unbalanced data	
j. analysis by computer	
G. Two stage nested design and analysis	3

Total	36
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METHOD

Lecture supported by computer laboratory.

8. Method of Evaluating Outcome

Homework, computer assignments, examinations, and term projects.