

STAT 323 – Design and Analysis of Experiments I

Fall 2003

1. Catalog Description

STAT 323 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 322.

2. Required Background and/or Experience

STAT 322

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.
- c. be able to perform the statistical computations and express the results of the quantitative work through their writing skills.

4. Text and References

Text: Montgomery, Douglas C., *Design and Analysis of Experiments*, 5th ed., Wiley, 2001.

References: Devore, Jay L., *Probability and Statistics for Engineering and the Sciences*, 6th ed. Duxbury, 2004.

Box, George, Hunter, William and Hunter, J.S., *Statistics for Experimenters*. Wiley. 1978

Hicks, Charles, *Fundamental Concepts in the Design of Experiments*, 4th ed. Oxford Press. 1993.

Hocking, Ronald, *The Analysis of Linear Models*. Brooks/Cole. 1985.

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

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
1. design structure versus treatment structure	
C. Single Factor ANOVA.....	13
2. fixed effects model, expected mean squares, F-test	
3. checking assumptions	
4. multiple comparisons; contrasts and orthogonal contrasts	
5. analysis by computer	
6. random effects model	
7. regression model	
8. analysis by computer	
9. choice of sample size	
10. Kruskal-Wallis test and the rank transformation	
11. analysis of covariance	
12. analysis by computer	
D. Randomized Complete Block Design	4
1. analysis	
2. checking assumptions	
3. estimating missing values	
4. multiple comparisons	
5. analysis using computers	
E. Latin Squares and Graeco-Latin Squares.....	2
F. Factorial Designs	8
1. definition, advantages	
2. two-factor factorial	
3. fixed effect model and concept of interaction	
4. multiple comparisons	
5. no interaction model	
6. one observation per cell	
7. random and mixed models	
8. general factorial design	
9. dealing with unbalanced data	
10. analysis by computer	
G. Expected Mean Squares	2
H. Two stage nested design and analysis	3
	Total 36

METHOD

Lecture supported by computer laboratory.

8. Method of Evaluating Outcome

Homework, computer assignments, examinations, and term projects.