

STAT 513 – Applied Experimental Design and Regression Models

Spring 2009

1. **Catalog Description**

STAT 513 Applied Experimental Design and Regression Models (4)

Analysis of variance and regression analysis for graduate students not majoring in mathematics. Includes one-way classification, randomized blocks, Latin squares, factorial designs, multiple regression, diagnostics, and model comparison. 4 lectures. **Prerequisite:** Stat 217, Stat 218, Stat 221, Stat 512, or equivalent.

2. **Required Background and/or Experience**

Stat 217, Stat 218, Stat 221, Stat 512, or equivalent.

3. **Expected Outcomes**

The student should be able to:

- a. Understand and know how to use the following designs in analysis of variance:
 1. One-way classification
 2. Randomized blocks
 3. Latin squares
 4. Two-factor and three-factor completely randomized designs
- b. Be able to make multiple comparisons of population means.
- c. Understand the basics of simple linear and multiple regression including:
 1. Residual analysis
 2. Lack of fit
 3. Transformations
 4. Tests for normality
 5. Indicator variables
- d. Understand and know how to use variable selection techniques in regression.
- e. Understand and know how to use analysis of covariance with one factor classification.

4. **Text and References**

Text: Grafen, Alan and Rosie Hails, Modern Statistics for the Life Sciences, Oxford, 2002

References: Ott, Lyman and Michael Longnecker, An Introduction to Statistical Methods and Data Analysis, Duxbury, 2008, 6th ed.
Ramsey, Fred and Daniel Schafer, The Statistical Sleuth, Duxbury, 2001, 2nd ed.

5. **Minimum Student Materials Required**

Text, paper, pencils and pocket calculator.

6. **Minimum Facilities Required**

Classrooms with chalkboards, audiovisual equipment, and computer access.

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

CONTENT	HOURS OF LECTURES
a. Review of Linear Regression Concepts	3
1. Least square principle	
2. Least square estimation	
3. Inference on parameters $E(Y x)$, $Y x$	
4. Analysis of variance approach	
5. Polynomial regression	
b. Aptness of Model	4
1. Residual analysis	
2. Test for lack of fit	
3. Linearizing transformations	
4. Test for Normality	
c. Multiple Regression Models	7
1. General Multiple Regression Model	
2. Testing and Estimation	
3. Qualitative variable	
4. Models containing interaction effects	
5. Comparing slopes of two lines	
6. Variable Selection Techniques	
d. Review of Fundamental Design of Experiments	3
1. Analysis of variance – logic and use	
2. Model for one-way classification	
e. Multiple Comparisons – selected techniques	2
1. Tukey’s W test	
f. Standard Experimental Designs	5
1. Randomized Block Design	
2. Latin Square Design	
3. K-way classification and factorial experiments	
4. Incomplete block design	
g. Unbalanced Designs	2
h. Fixed, Mixed and Random Models – EMS	4
i. Analysis of Covariance	4
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METHOD OF INSTRUCTION

- a. Lecture/discussion and activity
- b. Readings in the text and other assigned material
- c. Appropriate homework assignments.

8. **Methods of Evaluation Outcomes**

Periodic assignments and in-class examinations.