STATISTICS 642 -SPRING 2008
Methods of Statistics, II

Text: *Design of Experiments, Statistical Principles of Research Design and Analysis, 2nd Ed*, by Robert O. Kuehl

References:
1. *Analysis of Messy Data, Vol. I & III*, by G. Milliken & D. Johnson
2. *Methods and Applications of Linear Models*, by R. Hocking
3. *Linear Models for Unbalanced Data*, by S. Searle
4. *Variance Components*, by S. Searle, G. Casella, C. McCulloch
5. *Nonparametric Statistical Methods*, by M. Hollander and D. Wolfe
6. *Empirical Model Building and Response Surfaces*, by G. Box and N. Draper
7. *Statistics for Experiments*, by G. Box, W. Hunter, and S. Hunter
8. *Design and Analysis of Experiments*, by D. Montgomery
9. *A Handbook of Statistical Analysis using SAS*, by G. Der and B. Everitt

TOPICS COVERED

1. Introduction to Experimental Design: TEXT: Ch. 1 & Selections from other chapters
    a. Planning for the experiment: What is the goal of experiment
    b. Selection of Variables, Factors, EU's, Cost, Number of Replications
    c. One way randomization (CRD)
    d. Blocking and covariates:
        i. Randomized Complete Block Designs(RCBD)
        ii. Balanced Incomplete Block Designs
        iii. Latin Square Designs (LSD)
    e. Factorial treatment structures
    f. Split Plot Design
    g. Repeated Measures Design
    h. Crossover Design

2. Completely randomized model with single factor TEXT: Ch. 2
    a. How and what to randomize
    b. Statistical models: Effects Model vs Cell Means Model
    c. ANOVA and Sum of Squares
    d. Power and sample size selection

3. Treatment Comparisons: TEXT: Ch. 3
    a. What research questions go with what type of comparisons
    b. Response curves for quantitative treatment factors
    c. Multiple Comparisons: All pairs, vs control, finding Best trt
    d. General contrasts: Bonferroni and Scheffe
    e. Which error rate is being controlled

4. Assumptions, Diagnostics, Transformations: TEXT: Ch. 4

a. Residuals analysis of model assumptions
b. Robustness of statistical tests and C.I.'s
c. Alternatives:
    i. Transformations
    ii. Rank-based procedures: Kruskal-Wallis, Bonferroni Wilcoxon rank sum

5. Exam I - Chapters 1 through 4

6. Variance Components: TEXT: Ch. 5
a. Random factor levels
b. Methods for ¯nding point estimators
c. C.I.'s for variance components
d. Allocating sampling e®ort
e. Subsampling

7. Factorial Treatment Designs: TEXT: Ch. 6 & 7
a. Fixed factor levels, equal reps
b. Fixed factor levels, unequal reps
c. Fixed factor levels, missing trts
d. Decomposition of SS's using contrasts
e. Mixed models
f. Nested factors
g. Comparing methods of obtaining variance components
h. Expected MS rules

8. Exam II - Chapters 1 through 7

9. Complete Block Designs: TEXT: Ch. 8
a. Blocking to increase precision
b. Latin Squares
c. Rank-based test: Friedman

10. Analysis of Covariance: TEXT: Ch. 17

11. Incomplete Block Designs: TEXT: Ch. 9, 10, & 11
a. BIB's
b. Efficiency of Incomplete blocking
c. Choosing an incomplete block design
d. Incomplete block designs for 2n trt stucture

12. Fractional Factorial: TEXT: Ch. 12
a. Aliases, resolution, design of $2^{n¡p}$
b. Screening designs: Plackett-Burman designs

13. Split Plot & Repeated Measures Experiments: TEXT: Ch. 14, 15 & 16
    a. Different size EU's
    b. Split Block designs
    c. Split-Split-Plot
    d. Split Plot analysis of repeated measures
    e. Multivariate approach
    f. Crossover designs