STATISTICS 642 - SPRING 2004
Methods of Statistics, II

Time and Place: MWF 11:30 a.m.- 12:20 p.m., BLOCKER 163

Instructor: Dr. Michael Longnecker

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Office Hours: TR: 10-12 or by appointment.

Grader for Course: Hyejin Shin will be our homework grader. Office Hours: MW 2-5 p.m. in Room 506B.


References:
2. Methods and Applications of Linear Models, by R. Hocking
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. The Analysis of Variance, by H. Scheffe
10. The Basics of S and S-Plus, by A. Krause and M. Olson

Computing: Data sets will be analyzed using SAS, Minitab and Splus software. These software packages are available on the department’s computer network.

Homework: Homework will be regularly assigned and collected. Hyejin Shin will be first grader of all homework assignments and I will also review all assignments. We will select a subset of the assigned problems for grading. In this course, the methods of solving a problem are as important as the final solutions. Homework should therefore be detailed enough to adequately demonstrate your method of solution. You may discuss the homework problems with other students, but you should write up your solutions independently. Do not copy other students’ solutions.

Exams: There will be two semester exams and a comprehensive final exam. The exams will be worth 30% each. The final exam is 10:30 a.m. - 12:30 p.m. on Wednesday, May 12 and will be comprehensive.
Make-up Policy: Make-up of missed exams will be allowed only for university approved reasons. The Course Instructor must be notified of the absence as soon as possible. If the absence is approved, then the final exam grade will be used as the grade for the missed exam, that is, the final exam will be worth 60% of the course grade.

ADA Statement: STATEMENT ON DISABILITIES: The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation for their disabilities. If you believe you have a disability requiring an accommodation, please contact the Office of Support Services for Students with Disabilities in Room 126 of the Koldus Student Services Building. The phone number is 845-1637.

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TOPICS COVERED

1. Introduction to Experimental Design: **TEXT: Ch. 1 & 2**
   a. Planning for the experiment: What is the goal of experiment
   b. Selection of Variables, Factors, EU’s, Cost, Blocking, Number of Reps
   c. How and what to randomize
   d. Statistical models: Effects Model vs Cell Means Model
   e. ANOVA and Sum of Squares
   f. Power and sample size selection

2. 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

3. 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

4. Variance Components: **TEXT: Ch. 5**
   a. Random factor levels
   b. Methods for finding point estimators
   c. C.I.’s for variance components
   d. Allocating sampling effort
   e. Subsampling

5. 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

6. Exam I
7. Complete Block Designs: **TEXT: Ch. 8**
   a. Blocking to increase precision
   b. Latin Squares
   c. Rank-based test: Friedman

8. Analysis of Covariance: **TEXT: Ch. 17**

9. 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 $2^n$ treatment structure

10. Exam II

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

12. 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

13. Comprehensive Final Exam - Wednesday, May 12, 10:30 a.m. - 12:30 p.m.