Tennessee Technological University
Mathematics Department

MATH 6170-6180: Experimental Design I-II

I. COURSE DESCRIPTION FROM CATALOG: Introduction to basic concepts of experimental design, fundamental assumptions in analysis of variance, multiple design, fundamental assumptions in analysis of variance, multiple comparison tests, complete randomized design, general linear model approach to ANOVA, various experimental designs, incomplete block designs, factorial experiments, fractional factorial experiments, response surface methods, repeated measure designs. Lec. 3. Cr. 3.

II. PREREQUISITE(S):
MATH 6170: Consent of instructor.
MATH 6180: C or better in MATH 6170.

III. COURSE OBJECTIVE(S): Develop basic skills in the design and analysis of statistical experiments

IV. TOPICS TO BE COVERED:

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Chapter 15 **Introduction to the Design of Experimental and Observational Studies**
15.1 to 15.4 - Experimental and observational studies, and causation, basic concepts, overview of standard designs, designing observational studies.

Appendix A **Simple Comparative Experiments**
Basic Statistical Concepts, Sampling and Sampling Distributions, Inferences About Differences in Means, Randomized Designs, Inferences About the Differences in Means, Paired Comparison Designs, Inferences About the Variances of Normal Distributions.

Chapter 16 **Single-Factor Studies**
16.1 to 16.11 Single Factor ANOVA model, The Analysis of Variance , The Regression Approach to the Analysis of Variance, Determining Sample Size

Chapter 17 **Analysis of Factor Level Means**
17.1 to 17.9 Estimating factor level means and making comparisons

Chapter 18 **ANOVA Diagnostics and Remedial Measures**
18.1 to 18.6 Residual analysis, assessing the model assumptions, remedial measures.

Chapter 19 **Two-Factor Studies with Equal Sample Sizes**
19.1 to 19.11 ANOVA model, F-tests, analyzing interactions.

Chapter 20 **Two-Factor Studies – One Case per treatment**
20.1 and 20.2 – The no-interaction model and Tukey's test of non-additivity.

Chapter 21 **Randomized Complete Blocks Designs**
21.1 to 21.9 The ANOVA Model, analyzing treatment effects, replication within blocks, factorial arrangement of treatments.

Chapter 28 **Balanced Incomplete Block, Latin Square, and Related Designs**
28.3 to 28.7 – Analysis of Latin squares, ANOVA Model, replication.

Chapter 22 **Analysis of Covariance**
22.1 to 22.5 – The single and two-factor ANCOVA model, estimation, and interpretation.

Chapter 24 **Multi-Factor Studies**
24.1 to 24.7 The ANOVA model, ANOVA, analysis of fixed effects, interpretation of interaction.

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Chapter 25 **Random and Mixed Effects Models**
25.1 to 25.7 One and two factor studies, estimation, inference, and interpretation of variance components

Chapter 26 **Nested Designs, Subsampling, and Partially Nested Designs**
26.1 to 26.9 ANOVA model for nesting, estimation, and interpretation.

Chapter 27 **Repeated Measures and Related Designs**
27.1 to 27.5 One and two factor repeated measures models, estimation, model comparisons, split-plot designs.

Chapter 29 **Exploratory Experiments: Two-Level Factorial and Fractional Factorial Designs**
29.1 to 29.6 ANOVA model for inference, estimation, and interpreting results.

Chapter 30 **Response Surface Methodology**
30.1 to 30.5 Design, analysis, and visualizing models.

V. ADDITIONAL INFORMATION:

VI. POSSIBLE TEXTS AND REFERENCES:

Applied Linear Statistical Models, 5th edition, by Kutner, Nachtsheim, Neter, and Li

VII. ANY TECHNOLOGY THAT MAY BE USED:

SAS software