UNIVERSITY OF CALGARY

FACULTY OF SCIENCE
Department of Mathematics and Statistics

Statistics 425 Experimental Design

(see Course Descriptions for the applicable academic year: http://www.ucalgary.ca/pubs/calendar/)

Syllabus

Topics	**Number of hours**
Overview of types of experimental designs and selection criteria.	2
Partitions of total sum of squares and expectations.	2
Transformations.	2
Computing packages: MINITAB, SPSS, SAS, SPLUS/R.	3
Multiple comparison tests: Orthogonal tests; Fisher's LSD test, Tukey's HSD test, Scheffe's test, Newman-Keuls test, Duncan's test, Dunnett's test	5
Completely randomized Design: Assumptions and computations; A priori tests and a posteriori tests; Test for trends	4
Randomized Block Design: Fixed effects, random effects and mixed models and their analysis; Test for symmetry of covariance matrix	4
Latin Square Design: Randomization and layout, estimation of missing observations and relative efficiency	4
Nested and Nested Factorial Designs: Layout and computational procedures, Tests of differences in means and for trends. Problem of unequal cell frequencies. Tests for interactions	4
Split-Plot Design with confounding: Description and features; layout and computational procedures. Assumptions and tests of equality and symmetry of covariance matrices. Tests for differences and for trends, relative efficiency.	4
TOTAL HOURS	**34**

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Course Outcomes:

Statistics 425 – Experimental Design (3-1T)

This is a course on the modern concepts and methods of designing statistical experiments and analyzing data from such experiments. It is a course that provides an introduction to many commonly used experimental designs and the corresponding design-based analysis of the data, including its implementation via the statistical programming language R.

Outcomes: Students completing this course successfully are expected to be able to

1. describe how to plan and design an experiment, carry it out, and analyze the resulting data from it;

2. identify the population of interest, response variables, factors and their levels (i.e., treatments), experimental units, number of replicates, and other extraneous variables (e.g., confounders, blocking variables);

3. construct an analysis of variance (ANOVA) table and carry out ANOVA tests for various experimental designs (e.g., completely randomized design, randomized complete block design, Graeco-Latin squares, balanced incomplete block design, factorial designs, split-plot design);

4. establish the connection between ANOVA and regression analysis;

5. define the concepts of blocking, full and partial confounding, fixed and random effects, nested and crossed factors, and apply them in actual problems;

6. carry out an analysis of data from repeated measures and crossover designs, including the analysis of covariance (ANCOVA);

7. use the programming language R efficiently and effectively, particularly its functions and packages related to ANOVA, for implementing methods of data analysis for various designs.

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2017/11/10
RJS
Course outcomes added