MTH353 Basic Statistical Methods in Experimental Design

Level: 3

Credit Units: 5 Credit Units

Language: ENGLISH

Presentation Pattern: EVERY JULY

Synopsis:

MTH353 Basic Statistical Methods in Experimental Design examines how to design experiments, carry them out and analyse the data they yield. Various designs are discussed and their respective differences, advantages and disadvantages noted. Moreover, it focuses on the connection between the experiment and the model that the experimenter can develop from the results of the experiment. There are numerous examples based on real-world applications of experimental design. The course is relevant to those interested in in the design, conduct and analysis of experiments in the engineering and social sciences.

Topics:

- Basic Principles and Guidelines for designing experiments
- Simple Comparative Experiments
- Analysis of the Fixed Effects Model
- Practical Interpretation of Results
- Randomized Blocks, Latin Squares and Related Designs
- Two-Factor Factorial Design
- Fitting Response Curves and Surfaces
- The General 2^k Design
- Optimality of 2^k Designs
- The addition of Center Points to the 2^k Design
- Blocking a Replicated 2^k Factorial Design
- Confounding the 2^k Factorial Design in 2^p Blocks

Textbooks:

Douglas L. Montgomery: Design and Analysis of Experiments (eTextbook) John-Wiley & Sons, 2013 ISBN-13: 9781118531334

Douglas L. Montgomery: Design and Analysis of Experiments (eTextbook) John-Wiley & Sons, 2013 ISBN-13: 9781118531334-AA

Learning Outcome:

- Determine the experimental unit, response variable, factor(s) and level(s) of a basic experiment
- Demonstrate the role of randomisation and replication in inferring causation
- Implement a completely randomised design
- Construct the ANOVA table in R
- Compute the minimum number of replicates in a completely randomised design to achieve a given level of power
- Execute pairwise tests of differences in means in R to understand a significant overall F-test

Assessment Strategies:

Continuous Assessment Component	**Weightage (%)**
COMPUTER MARKED ASSIGNMENT	10
COMPUTER MARKED ASSIGNMENT	10
COMPUTER MARKED ASSIGNMENT	10
Sub-Total	**30**

Examinable Component	**Weightage (%)**
Written Exam	70
Sub-Total	**70**

Weightage Total	**100**