

# Analysis of variance and design of experiment-II - Web course

## COURSE OUTLINE

The course of Analysis of Variance and Design of Experiments is developed in two parts. The course focuses on the topics of statistical design of experiments from the linear model's perspective.

The emphasis will be more on the theoretical concepts and how the tests are developed. How to execute them in real life will also be detailed. This course presents various types of analysis of variance along with the description of related designs of experiment.

The part two of the course starts with the development of detailed theory and fundamentals about incomplete block designs. It describes the inter-block analysis, intra-block analysis and recovery of inter-block information. The classical (non-matrix theory) as well as matrix theory based approaches will be used to describe the analysis.

The balanced incomplete block design and partially balanced incomplete block designs are considered explaining the concepts and methodologies with detailed derivations of various involved expressions. Various partial association schemes will also be explained.

The concept of confounding has already been introduced in the first part of the course. This concept will be extended to the concept of fractional confounding, partial confounding and fractional replications in  $2^n$  factorial experiments along with various examples. The two factorial model with random or mixed effect are considered.

The split plot and strip plot designs are also discussed. The topics on the response surface methodology are explained.



NP-TEL

# NPTEL

<http://nptel.iitm.ac.in>

## Mathematics

### Pre-requisites:

- Knowledge of basic statistics

### Additional Reading:

1. M.D. Morris: Design of experiments- An introduction based on linear models, CRC Press, 2011.
2. Aloke Dey: Incomplete block design, Hindustan Book Agency, 2010.
3. G. Casella: Statistical Design, Springer, 2008.
4. D. D. Joshi: Linear estimation and design of experiments. Wiley eastern 1987
5. H. Sahai and M.I. Ageel: The analysis of variance-Fixed, random and mixed models, Springer, 2001

The use of software “design experiment” will also be described.

## COURSE DETAIL

Module No	Topics	Number of Lecture(s)
1	Incomplete block design- General theory	6
2	Balanced incomplete block design- Interblock analysis, intrablock analysis and recovery of interblock information	8
3	Partial association scheme	3
4	Partially balanced incomplete block design	4
5	Fractional confounding	2
6	Partial confounding	2
7	Fractional replications	2
8	Two factorial model with random or mixed effect	3
9	Split plot design	2
10	Strip plot design	2
11	Response surface methodology	4

### Coordinators:

**Prof. J. Ramkumar**

Department of Mechanical Engineering IIT Kanpur

**Prof. Shalabh**

Department of Mathematics & Statistics IIT Kanpur

12	Introduction to Design Expert software	4
	<b>Total</b>	<b>42</b>

**References:**

1. H. Toutenburg and Shalabh: Statistical Analysis of designed experiments, Springer 2009
2. D. C. Montgomery: Design & Analysis of Experiments, 5th Edition, Wiley, 2001