

B.Sc. (P)/B.A(P) with Statistics as Major

Category II

DISCIPLINE SPECIFIC CORE COURSE - 9: INTRODUCTION TO DESIGN OF EXPERIMENTS

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Introduction to Design of Experiments	4	3	0	1	Class XII pass with Mathematics	knowledge of inferential statistics, and ANOVA

Learning Objectives:

The learning objectives include

- To design and conduct experiments.
- To analyze and interpret data.

Learning Outcomes:

After completing this course, students will developed a clear understanding of

- The fundamental concepts of Design of Experiments.
- Introduction to planning valid and economical experiments.
- Completely randomized design.
- Randomized block design.
- Latin square design.
- Balanced incomplete block design.
- Full and confounded factorial designs with two levels.
- Fractional factorial designs with two levels.

SYLLABUS OF DSC-9

Theory

UNIT I

(15 hours)

Experimental designs

Experimental designs: Role, historical perspective, terminology, experimental error, basic principles, uniformity trials, fertility contour maps, choice of size and shape of plots and blocks. Basic designs: Completely Randomized Design (CRD), Randomized Block Design (RBD), Latin Square Design (LSD) - layout, model and statistical analysis, relative efficiency.

UNIT II **(09 hours)**

Balanced Incomplete Block Designs

Balanced Incomplete Block Design (BIBD)- parameters, relationships among its parameters, incidence matrix and its properties, Symmetric BIBD, Resolvable BIBD, Affine Resolvable BIBD.

UNIT III **(15 hours)**

Factorial experiments

Factorial experiments: Concepts, notations and advantages, 2^2 , $2^3 \dots 2^n$ factorial experiments, design and analysis, Total and Partial confounding for 2^n ($n \leq 5$). Factorial experiments in a single replicate.

UNIT IV **(06 hours)**

Fractional factorial experiments

Fractional factorial experiments: Construction of one-half and one-quarter fractions of 2^n ($n \leq 5$) factorial experiments, Alias structure, Resolution of a design.

PRACTICAL/LAB WORK – (30 hours)

List of Practical:

1. Analysis of CRD, RBD & LSD.
2. Analysis of 2^2 and 2^3 factorial experiments in CRD and RBD.
3. Analysis of a completely confounded two level factorial designs in 2 and 4 blocks.
4. Analysis of a partially confounded two level factorial design.
5. Analysis of a single replicate of a 2^n design.
6. Analysis of one-half and one-quarter fractions of 2^n factorial design.

Practical work to be conducted using electronic spreadsheet / EXCEL/ Statistical Software Package/ SPSS/ calculators.

ESSENTIAL READINGS

- Goon, A.M., Gupta, M.K. and Dasgupta, B. (2005): Fundamentals of Statistics, Vol. II, 8thEd. World Press, Kolkata.
- Montgomery, D. C. (2008): Design and Analysis of Experiments, John Wiley.
- Das., M.N. and Giri, N.C. (1986): Design and Analysis of Experiments, Wiley Eastern.
- Mukhopadhyay, P (2011): Applied Statistics, 2nd edition revised reprint, Books and Allied (P) Ltd.

SUGGESTIVE READINGS

- Cochran, W.G. and Cox, G.M. (1959): Experimental Design, Asia Publishing House.
- Kempthorne, O. (1965): The Design and Analysis of Experiments, John Wiley.
- Joshi, D.D. (1987): Linear Estimation and Design of Experiments, John Wiley & Sons.
- Dey, Aloke (1986): Theory of Block Designs, Wiley Eastern Ltd.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch University of Delhi, from time to time.