●Hogg, R.V, McKean, J. and Craig, A.T. (2012): Introduction to Mathematical Statistics, 7th Edn. Pearson Education.
●Casella, G. and Berger, R.L. (2002): Statistical Inference. 2nd Edition, Duxbury Press, Pacific Grove.
●Siegel, S. (1956). Nonparametric statistics for the behavioral sciences. McGraw-Hill.
●Lehmann, E. and Romano. J. (2005): Testing statistical hypotheses,3rd Edn. Springer, New York.

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

DISCIPLINE SPECIFIC CORE COURSE –17: 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		
Design of Experiments	4	3	0	1	Class XII pass with Mathematics	knowledge of sampling distributions and linear models

Learning Objectives

The learning objectives include:

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

Learning Outcomes:

After completing this course, students should have developed a clear understanding of:

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

SYLLABUS OF DSC-17

Theory

UNIT I **(13 hours)**
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, analysis with one missing observation in case of RBD.

UNIT II **(10 hours)**

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, Complimentary BIBD, Residual BIBD, Dual BIBD, Derived BIBD.

UNIT III **(12 hours)**

Factorial experiments

advantages, notations and concepts, 2^2, 2^3,…, 2^n, 3^2 factorial experiments, design and analysis, Total and Partial confounding for 2^n ($n \leq 6$), Factorial experiments in a single replicate.

UNIT IV **(10 hours)**

Fractional factorial experiments: Construction of one-half and one-quarter fractions of 2^n ($n \leq 6$) factorial experiments, Alias structure, Resolution of a design.

PRACTICAL/LAB WORK – (30 hours)

List of Practical:

1. Analysis of a CRD with equal and unequal replicates.
2. Analysis of RBD.
3. Analysis of LSD.
4. Analysis of RBD with one missing observation.
5. Analysis of 2^2 and 2^3 factorial in CRD, RBD and LSD.
6. Analysis of 3^2 factorial in CRD, RBD.
7. Analysis of a completely confounded two level factorial design in 2 blocks.
8. Analysis of a completely confounded two level factorial design in 4 blocks.
9. Analysis of a partially confounded two level factorial design.
10. Analysis of a single replicate of a 2^n design.
11. Analysis of one half fraction of 2^n factorial design.
12. Analysis of one quarter fraction of 2^n factorial design.

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

ESSENTIAL READINGS

- Das., M.N. and Giri, N.C. (1986): Design and Analysis of Experiments. Wiley Eastern.
- Goon, A.M., Gupta, M.K. and Dasgupta, B. (2005): Fundamentals of Statistics. Vol. II, 8th Edition. World Press, Kolkata.
- Montgomery, D. C. (2008): Design and Analysis of Experiments. John Wiley.
- 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.
- Federer, W. T. (1955): Experimental Design, Macmillan, N. Y.
- Anderson, V. L. and McLean, R. A. (1974): Design of Experiments, Marcel Dekker, Inc., N. Y.