Different types of redundancy. Notions of Ageing: Different ageing classes, ageing properties of common lifetime distributions, closure properties of different ageing classes under formation of coherent structures.

PRACTICAL/LABWORK–(30hours)

List of Practical:

1. Calculation of reliability function and its estimates
2. Calculation of hazard rate for various models.
3. Calculation of stress-strength reliability.
4. Various reliability and hazard rate plots.
5. Behavior of reliability estimates corresponding to sample size.
6. Practical on ageing.
7. Other relevant problems.

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

ESSENTIAL READINGS:

- Sinha, S.K. (1986): Reliability and Life testing; Wiley Eastern.

SUGGESTIVE READINGS:

- Barlow, R.E. and Proschan F. (1981): Statistical Theory of Reliability and Life Testing; Holt, Rinehart and Winston.
- Lawless, J.F. (2011): Statistical Models and Methods for Life Time Data, 2nd edition; John Wiley.
- Bain L.J. and Max Engelhardt (1991): Statistical Analysis of Reliability and Life Testing Models; Marcel Dekker.

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

DISCIPLINE SPECIFIC ELECTIVE COURSE–6C: MULTIVARIATE DATA ANALYSIS

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		
Multivariate Data Analysis	4	3	0	1	Class XII pass with Mathematics	Knowledge of sampling distributions

Learning Objectives
The learning objectives include:

- To study the concept of Bivariate Normal Distribution along with their properties.
- To study the concept of Multivariate Normal Distribution along with their properties and analysis of multivariate data.
- Concepts of regression plane, multiple and partial correlation coefficients.
- Applications of discriminant analysis, principal component analysis and factor analysis.

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

- The basic concepts associated with Multivariate Normal Distributions and their properties with special emphasis on Bivariate Normal Distribution.
- The understanding of regression plane, multiple and partial correlation coefficients.
- Analysing multivariate data using data reduction techniques like principal component analysis, factor analysis.
- Classification method namely discriminant analysis.

SYLLABUS OF DSE-6C
Theory

UNIT1 **(16 hours)**
Bivariate Normal Distribution:
Probability density function of Bivariate Normal Distribution. Moment generating function, marginal, conditional pdf of BVN and properties of BVN. Introduction of random vector, probability mass/ density functions, distribution function, mean vector and dispersion matrix. Marginal and conditional distributions of random vector.

UNIT2 **(16 hours)**
Multivariate Normal distribution:
Probability density function and properties of Multivariate Normal distribution. Moment generating function, marginal and conditional pdf of MVN. Sampling distribution for mean vector and variance-covariance matrix. Regression plane, multiple and partial correlation coefficient and their properties.

UNIT3 **(13 hours)**
Data Analysis
Data Reduction Techniques: Principal component analysis and its applications, Factor analysis and its applications, Discriminant analysis and its applications.

PRACTICAL/LABWORK–(30hours)

List of Practical:
1. Bivariate Normal Distribution and its properties.
2. Mean vector and dispersion matrix of Multivariate Normal Distribution.
3. Marginal distributions of Multivariate Normal Distribution.
4. Conditional distributions of Multivariate Normal Distribution.
5. Regression space.
6. Partial Correlation Coefficient.
7. Multiple Correlation Coefficient.
8. Principal Component Analysis.
9. Discriminant analysis.
10. Factor Analysis.

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

ESSENTIAL READINGS

- Anderson, T.W. (2003). An Introduction to Multivariate Statistical Analysis, 3rdEd., John Wiley & Sons.
- Johnson, R.A. and Wichern, D.W. (2012). Applied Multivariate Analysis, 6th Ed., Prentice Hall Indi Learning Private Limited
- Gun, A.M., Gupta, M.K. and Dasgupta, B. (2013). An Outline of Statistical Theory, Volume II, World Press
- Brian S. Everett and Graham Dunn. (2001). Applied multivariate data analysis, second edition, Oxford University Press.

SUGGESTED READINGS

- S.C. Gupta and V.K. Kapoor (2020). Fundamentals of Mathematical Statistics, 12th Ed., Sultan Chand and Sons.
- Kshirsagar, A.M. (1972). MultivariateAnalysis,1stEd., Marcel Dekker.
- Muirhead, R.J. (2005). Aspects of Multivariate Statistical Theory, John Wiley.
- Arora, S. and Bansi, L. (1989 - Reprint 2002). New Mathematical Statistics, 1st Ed., Vanita Printers.

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

DISCIPLINE SPECIFIC ELECTIVE COURSE–6D: STATISTICAL SIMULATION

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITESOFTHE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Statistical Simulation	4	3	0	1	Class XII pass with Mathematics	Knowledge of basic statistics

Learning Objectives

The learning objectives include:

- Concept of simulation and simulation modelling.
- Generation of pseudo-random number generators as well as from standard statistical distributions. Monte-Carlo simulation technique.
- Application of simulation techniques.

Learning Outcomes

After completing this course, students will possess skills concerning:

- Howsimulationmaybeusedtounderstandthebehaviorofreal-worldsystemsby utilizing mathematical models with an emphasis on simulation.