Trinity Press.
- Payer T.A. (1982). *Introduction to simulation,* McGraw Hill.

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

COMMON POOL OF GENERIC ELECTIVES (GE) COURSES OFFERED BY DEPARTMENT OF STATISTICS (SEMESTER-VIII) CATEGORY-VI

GENERIC ELECTIVE COURSE–8A: ORDER STATISTICS

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		
Order Statistics	4	3	0	1	Class XII Pass with Mathematics	Knowledge of statistical distributions and stochastic processes

Learning Objectives
The learning objective of this course is:

- To make the students aware of the properties and applications of order statistics.

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

- Find joint, marginal, and conditional distributions of order statistics in the continuous and discrete cases.
- Find the distribution of sample range and other systematic statistics in case of sampling from an arbitrary continuous population and, in particular, from some specific continuous distributions such as uniform and exponential.
- Understand the Markov Chain property of order statistics in the continuous case.
- Understand the distribution-free bounds for moments of order statistics and of the range.
- Derive the recurrence relations and identities for moments of order statistics drawn from an arbitrary population (discrete or continuous), as well as from some specific distributions.
- Learn how to obtain distribution-free confidence intervals for population quantile and

distribution-free tolerance intervals for population distributions based on order statistics

SYLLABUS OF GE-8a
Theory

UNIT I **(15 hours)**
Introduction
Introduction to order statistics. Basic distribution theory. Joint and marginal distributions of order statistics in the continuous case. Distribution of the range, median and other systematic statistics, Examples based on some specific continuous distributions.

UNIT II **(10 hours)**
Conditional distribution of order statistics
Conditional distributions. Order statistics as a Markov Chain. Order statistics for a discrete parent. Examples based on some specific discrete distributions.

UNIT III **(10 hours)**
Moments of order statistics
Moments of order statistics. Need of Recurrence relations and identities for moments of order statistics. Recurrence's relations and identities for single and product moments of order statistics from an arbitrary distribution. Recurrence relations for single and product moments of order statistics from some specific distributions.

UNIT IV **(10 hours)**
Distribution-free intervals of order statistics
Distribution-free confidence intervals for population quantiles and distribution-free tolerance intervals. Distribution-free bounds for moments of order statistics and of the range.

PRACTICAL/LABWORK–(30hours)

List of Practical:

1. Problem solving using joint, marginal and conditional distributions of order statistics for some specific continuous distributions.
2. Distribution-free confidence intervals for population quantiles for various distributions.
3. Calculating Means, variances, and covariances by using exact expressions for the moment of order statistics for some specific continuous distribution.
4. Problems based on Markov Chain property of order statistics in the continuous case.
5. Distribution of sample range and other systematic statistics in sampling from differentdistributions.
6. Conditional distribution of order statistics in sampling from different distributions.
7. Calculating exact moments of order statistics by using recurrence relations for arbitrary continuous distributions.
8. Calculating exact moments of order statistics by using recurrence relations for some specific distributions.
9. Distribution-free confidence intervals for population quantiles for various distributions.

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

ESSENTIAL READINGS

- David, H. A. and Nagaraja, H. N. (2003). *Order Statistics*, 3rd ed., John Wiley & Sons.

SUGGESTIVE READINGS:

- Arnold, B.C., Balakrishnan, N. and Nagaraja H.N. (2008). *A First Course in Order Statistics,* SIAM Publishers.
- Arnold, B.C. and Balakrishnan, N. (1989). *Relations, Bounds and Approximations for Order Statistics*, Vol. 53, Springer-Verlag.
- Ahsanullah, M., Nevzorav, V.B. and Shakil, M. (2013). *An Introduction to Order Statistics, Atlantis Studies in Probability and Statistics*, Vol. III. Atlantis Press.
- Shahbaz, M.Q., Ahsanullah, M., Shahbaz, S.H. and Al-Zahrani, B.M. (2016). *Ordered Random variables: Theory and Applications*. Springer.

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

GENERIC ELECTIVE COURSE–8B: STATISTICS INFINANCE

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		
Statistics in Finance	4	3	0	1	Class XII pass with Mathematics.	Basic knowledge of Calculus, Probability theory and Financial markets

Learning Objectives
The learning objectives include:

- To study the Financial Statistics which deals primary and secondary financial markets and the mathematical models used by these markets?
- To study to deal with the risks in financial markets

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

- Primary financial markets and their products such as equity, bonds and cash deposits
- Secondary financial markets and their products such as futures, forwards and options (American and European)
- Applications of stochastic models to price various secondary financial markets products.
- Hedging techniques