

Syllabus for Pre Ph.D.-Examination in Statistics

STAT 901: Research Methodology

UNIT-I:

Research Methodology: An Introduction - Meaning of Research, Objectives of Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India. **Defining the Research Problem** - What is a Research Problem? Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem.

UNIT-II:

Interpretation and Report Writing - Meaning of Interpretation, Techniques of Interpretation, Precautions in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports.

UNIT-III:

Law of large Numbers (IID and Non-IID cases)-Distribution function and methods of transformations of random variables, Generating Function: Probability, Moment and Characteristic functions for univariate set up. Probability distributions: Exponential; Multinomial, Multivariate normal, Weibull distributions- properties and characterizations.

UNIT-IV:

Estimation-Classical and Bayesian Approach, Methods of Estimation-Moment, Likelihood and EM Algorithm-Properties and related problems- Prior distribution: Conjugate, informative and non-informative priors, Loss function-SELF, LINEX Loss function, Risk functions-Problems.

UNIT-V:

Generating random samples using probability integral transformation – accept/reject algorithm – metropolis algorithm, Gibbs sampling, Monte Carlo integration, MCMC principle – Metropolis Hasting algorithm, Bootstrap methods.

Books for Study:

For Unit-I and II

Kothari, C.R. and Gaurav Garg(2024). Research Methodology: Methods and Techniques. 5th ed. New Age International Publishers. [Relevant sub-titles under Chapters 1, 2 and 19].

For Unit-III and IV

Rohatgi, V. K. and Md. Ehsanes Saleh, A. K. (2015). An introduction to probability theory and mathematical statistics, John Wiley & Sons. [Relevant sub-titles under Chapters 2, 3, 7 and 8].

For Unit-V

Robert, C.P., and Casella, G. (2004), Monte Carlo Statistical Methods, Springer. [Relevant sub-titles under Chapters 2, 3, 7 and 9]