

**DEPARTMENT OF STATISTICS  
UNIVERSITY OF KASHMIR, SRINAGAR**

**Entrance Syllabus for M.A/M.Sc. Statistics Under NEP 2020 of the year 2025.**

**UNIT I:** Measures of Central Tendency: Arithmetic mean, Median, Mode, Geometric mean and Harmonic mean on both grouped and ungrouped data for all the measures . Empirical relation between mean median and mode. Measures of Dispersion. Types of measures of dispersion- Range, Quartile deviation, Mean deviation and standard deviation with relative measures. Properties of Standard deviation, simple problems on ungrouped and grouped data) . Skewness and Kurtosis: Skewness- Measures of skewness- Karl Pearson's coefficient of skewness and Bowley's coefficient of skewness.

**Unit II** Bivariate Data: Concept of correlation and its types. Scatter diagram method and product moment method of studying correlation. Properties of a correlation coefficient (limits of the correlation coefficient, effect of change of origin and scale). Concept of rank correlation, derivation of Spearman's rank correlation coefficient and its limits. Regression: Concept of regression. Regression Coefficients and their properties.

**UNIT III:** Introduction to Probability: Random experiment, Trial, Sample point and Sample space, Events, Operations of events, mutually exclusive and Exhaustive events. Classical, Relative frequency and Axiomatic approaches of probability . Discrete Probability Space, Properties of Probability under Set Theory Approach, Independence of Events, Addition and Multiplication Law of events. Conditional Probability, Bayes theorem and its applications. Random Variables - Discrete and Continuous, Probability Mass Function (pmf) and Probability density function (pdf), Cumulative distribution function (cdf). Marginal and Conditional distributions, Independence of random variables. Expectation of a random variable and its properties.

**UNIT IV:** Discrete Distributions: Uniform, Bernoulli, Binomial, Poisson Geometric and Negative Binomial and Hypergeometric distributions . Moments, Moment generating function (m.g.f.) & its properties.

Continuous Probability Distributions: Uniform, Exponential, Gamma and Normal distribution and their properties. Standard Normal variate.

**UNIT V:** Concept of population, sample, Statistic, parameter and sampling distribution. Standard error of sample means and sample proportion. Statistical hypothesis and its types. One tail and two tail tests. Types of errors, level of significance and critical region, P Value, Procedure for testing of hypothesis. Point Estimation and Interval Estimation, confidence Interval. Large sample tests: Tests of significance and confidence Interval for testing of a single mean, single proportion, difference of two means and two proportions. Small sample tests: t-Statistic. Test for single mean and difference between two means. Paired t-test for difference between two means. F- Statistic . Assumptions in F-test. Tests of hypothesis of the variance of two populations.

*Dr. J. R. Jan*

*Sham Lal*



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**UNIT VI :** Introduction to times series data, application of time series from various fields, Components of a times series, Decomposition of time series. Estimation of trend by free hand curve method, method of semi averages, fitting mathematical curve and growth curves. Estimation of trend by method of moving averages. Detrending: effect of elimination of trend on other components of a time series. Seasonal Component: Estimation of seasonal component by the methods of - simple averages, Ratio to Trend, Ratio to Moving Averages and Link Relative method. Deseasonalization. Cyclic Component: Harmonic Analysis.

**UNIT VII:** Economic Statistics: Index number, its definition and applications. Criteria for good index numbers, Problems involved in computation of index number, Construction of wholesale price index number, fixed base index number and Consumer price index number with interpretation. Uses and limitations of index numbers. Price relatives and quantity or volume relatives, link and chain relatives, Uses of averages, simple aggregative and Weighted average methods, Laspeyres's, Passche's, Marshall-Edgeworth's and Fisher's index numbers, time and factor reversal tests of index number.

**UNIT VIII:** Methods of collection of official statistics, their reliability and limitations. Introduction and definition of vital Statistics, errors in census and registration data. Measurement of population, rate and ratio of vital events. Coverage and content errors in demographic data, use of balancing equations, Chandrasekharan-Deming formula to check completeness of registration data. Dependency ratio. Accuracy of age data on sex and age: Whipple's and Myer's indices.

**UNIT IX:** Measurements of Mortality: Crude Death Rate (CDR), Specific Death Rate (SDR), Infant Mortality, Rate (IMR) and Standardized Death Rates. Stationary and Stable population, Central Mortality Rates and Force of Mortality. Life Tables : Assumption, description, construction of Life Tables and Uses of Life Tables. Measurements of Fertility: Crude Birth Rate, General Fertility Rate, Specific Fertility Rate and Total Fertility Rate. Measurement of Population Growth: Crude rates of natural increase, Pearl's Vital Index, Gross Reproduction Rate and Net Reproduction Rate.

**UNIT X:** Sampling Theory: Concept of population and sample, Need for sampling, Census and sample survey, basic concept in sampling, Principles of sample survey, Principle Steps of Sample Survey, advantages of sample survey over census. Sampling and non-Sampling errors, Types of sampling: non-probability and probability sampling, sample size determination. Simple random sampling (SRS) with and without replacement. Merits and demerits of Simple random sampling (SRS). Methods of selecting SRS. Estimation of mean, its Variance and estimate of its variance. Unbiased estimate of population mean square.

**UNIT XI:** Stratified random sampling: Need for stratification. Principles of stratification. Advantages of stratified sampling over simple random sampling. Estimation of mean and variance. Proportion and Optimum allocation: Allocation of sample size under proportional and optimum allocation and variance under these allocations. Comparison of stratified sampling over SRS.

*Dr. J. R. S. S.*

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**UNIT XII:** Linear programming: Introduction to linear programming (LPP), Concepts of Convex set, basic solution, feasible solution, basic feasible solution, optimum solution and slack & surplus variables in linear programming problems (LPP). Mathematical formulation of LPP. Standard form of LPP, graphical method of solving LPP. Simplex Method. Transportation Problem: Methods for finding initial basic feasible solution: North West Corner Rule, Lowest Cost Entry, Vogel's Approximation method. Hungarian method to find optimal solution.

**UNIT XIII:** Non- Parametric Inference: Introduction,, Sign Test-one sample and two samples: Median test ,Wilcoxon-Signed rank test- one sample and two samples,Wilcoxon -Mann Whitney test. Test of randomness based on total number of runs: Wald -Wolfowitz run test, Kolmogorov-Smirnov- one sample and two samples test .

**UNIT XIV:** Statistical Inference: Types of Estimation, Confidence Interval. Unbiasedness, consistency, efficiency and sufficiency. Methods of Estimation: Maximum likelihood Estimation, method of moments, method of minimum chi-square, method of minimum variances and method of least square properties and applications. Cramer-Rao inequality Factorization theorem ,Rao-Blackwell, statement and applications. Best critical region, most powerful test, uniformly most powerful test, Neyman Pearson Lemma

**UNIT XV:** Design of Experiments: Introduction. Principles of Experimental Design: Randomization, Replication and Local control. Completely Randomized Design (CRD): layout, analysis, advantages and disadvantages. Randomized Block Design (RBD): layout, analysis, advantages and disadvantages of RBD over CRD. Latin Square Design (LSD) layout, analysis of mxm LSD for one observation per experimental unit; advantages and disadvantages. Single missing observation analysis for RBD.

*Dr. D. D. S. S.*

*Shamshad Ali*