DEPARTMENT OF STATISTICS

1. Programme specific outcomes and course outcomes offered by the department are stated and displayed on the website of the college.
2. Hard Copy of the syllabus is available in the department for ready reference to the teachers and students.
3. The students are also made aware of the Programme and course outcomes at the beginning of the program and at the start of each semester.

Programme: B.Sc. Statistics (Elective and Honours)

Program Specific Outcome:

PSO-1: Acquire core knowledge of the basic concepts of statistics which include the major areas of probability theory, probability distributions, distribution theory, statistical inference, survey sampling, designs of experiments, applied statistics, mathematical methods, non- parametric inference and operations research.

PSO-2: Practical exercises done will enable students to analyze and interpret data and also to draw valid conclusions. This will enable students to face real time applications.

PSO-3: Apply the concepts of statistics, Operations Research, Probability theory, Time Series, Designs of Experiment, etc. in real life problems.

PSO-4: Understand the applications of statistics concept in other disciplines such as mathematics, physics, economics, etc.

PSO-5: Provides a platform for pursuing higher studies leading to Pst Graduate or Doctorate degrees.

Course Outcome

- **STEH – 1 Descriptive Statistics, Numerical Analysis and Probability (Theory & Practical)**

CO-1: Understand the concept of a statistical population and a sample from a population.

CO-2: Classification and tabulation of data. Different types of data. Diagrammatical and graphical representation of data.

CO-3: Measures of central tendency, Dispersion, Skewness and Kurtosis and Moments.

CO-4: Concept of correlation, correlation coefficients - Karl Pearson's correlation coefficient, Spearman's rank correlation coefficient, multiple and partial correlation coefficients, Intraclass correlation.

CO-5: Concept of Regression, Principle of least squares, Linear and curvilinear regression.

CO-6: Concept of finite difference, forward and backward operators, shift operator, difference table.

CO-7: Newton Gregory Forward and Backward Interpolation formula for arguments at equal intervals. Newton's Divided Differences Interpolation formula and Lagrange's Interpolation formula for arguments at unequal intervals.

CO-8: Numerical Integration, the general quadrature formula, trapezoidal rule, Simpson's one- third and three- eight formula.

CO-9: Concept of probability, different approaches to the theory of probability. Concept of events, mutually exclusive independent and exhaustive events. Sample space and its properties. Use the basic probability rules including addition and multiplicative laws, conditional probability and Bayes theorem.

CO-10: Gain knowledge on random variables. Distinguish between discrete and continuous random variables. Probability mass function and probability density function. Mathematical expectation of a random variable. Conditional expectation and variance.

- **STEH – 2 Probability Distributions and Statistical Inference (Theory & Practical)**

CO-1: Understand discrete and continuous distributions and identify their characteristics. Students will be able to identify the type of statistical situation to which different distributions can be applied. Use the different distributions in solving statistical problems.

CO-2: Basic idea of Box Plot, QQ Plot and PP Plot.

CO-3: Gain knowledge in sampling distribution theory and their applications in statistical inference. Chi- square, t and F distribution, Chebyshev's inequality, Weak Law of Large numbers and the Central Limit Theorem.

CO-4: Gain knowledge in the concepts of Theory of estimation and distinguish various types of estimation. Know the properties of estimators and construction of point and interval estimators.

CO-5: Understand the process of hypothesis testing and its significance. Distinguish various test used in sampling theory. Use the different test in solving statistical problems.

- **STEH-3 Categorical data, Survey Sampling and Design of Experiment (Theory & Practical)**

CO-1: Gain knowledge on Categorical data. Consistency of categorical data. Know the association and independence between attributes.

CO-2: Understand basic concepts of survey sampling, basic principles in sampling, Simple random sampling, systematic sampling, stratified sampling.

CO-3: Understand the concepts of analysis of variance and appropriately interpret the results of analysis of variance test.

CO-4: Have a good understanding of the design of experiments and analyse the data they yield. Completely randomised design, Randomised block design, Latin square design. Factorial experiments with two levels.

- **STEH-4 Applied Statistics (Theory & Practical)**

CO-1: Understand the basic concepts of vital statistics. Mortality rates, fertility rates and their measurements. Have a basic idea about migration and population projection.

CO-2: Understand the concepts of quality control, control charts for variables and attributes. Know about the different types of control charts for variables and attributes and their construction. Producer's and consumer's risk, Acceptance sampling plans.

CO-3: Acquire knowledge on Index numbers and their applications. Have a clear understanding about the different indices, criteria of a good index, cost of living index number and calculate indices from given data.

CO-4: Understand the concepts of time series, the different models, measurement of trend and seasonal variations.

CO-5: Gain knowledge about demand analysis. Law of demand and supply. Price elasticity of demand, Pareto distribution, Lorenz curve and Gini's coefficient.

CO-6: Know about Indian Official Statistical system. The different methods of collection of official statistics and their reliability. Principal publications and the various official agencies responsible for data collection and their main functions.

- **STEH – 51 Mathematical Methods and Distribution Theory (Theory & Practical)**

CO-1: Gain knowledge on numerical differentiation based on Newton's forward and backward interpolation formula. Numerical integration – Weddle's rule, Euler's formula.

CO-2: Understand different methods of solving algebraic and transcendental equations.

CO-3: Understand concepts of partial derivatives, maxima and minima, applications of Lagrangian multipliers. Multiple integrals of Jacobian of transformation, Beta and Gamma integrals.

CO-4: Gain knowledge about concepts of linear algebra. Linear system of equations. Gauss Jordan Reduction method. Vector spaces and subspaces, Linear dependence and independence, rank of a matrix and applications. Eigen values and vectors, Caley Hamilton Theorem, Quadratic form and its types.

CO-5: Gain knowledge on random variables and expectations. Distribution functions and their properties. Properties of expectation of sums of Random variables. Conditional expectation. Generating functions- their properties and applications, characteristic function. Computing MGF by conditioning.

CO-6: Understand different discrete and continuous distributions, their properties and applications.

CO-7: Gain knowledge in derivation and independence of sampling distribution of sample mean and variance in random sampling from different distributions. Chi- square, t and F distribution – their properties and derivations.

CO-8: Analyse statistical data using MS-Excel.

- **STEH – 52 Linear Models, Regression, Deign of Experiments and Operations Research (Theory & Practical)**

CO-1: Understand basic concepts of linear models. Theory and estimation of linear models. Gauss Markov Theorem and linear model.

CO-2: Understand simple and multiple linear regression models. Violation of usual assumptions concerning normality, homoscedasticity and collinearity. Diagnostics using probability plots. Corelation ratio and co relation index.

CO-3: Gain knowledge about analysis of variance – two-way classification with m observations per cell under fixed, random and mixed effects model.

CO-4: Factorial experiments with two and three levels. Complete and partial confounding. Analysis of covariance.

CO-5: Understand the basic concepts of Operation research. Formulation of a linear programming problem. Obtain graphical solutions to a linear programming problem.

CO-6: Represent transportation and assignment problems as LPP, solve transportation and assignment problems using different methods.

CO-7: Analyse statistical data using MS-Excel.

- **STEH – 61 Statistical Inference (Theory & Practical)**

CO-1: Gain knowledge on Point estimation. Properties of estimators and mean square error. Minimum variance unbiased estimators, Rao- Cramer Lower Bound of variance and their results. Sufficient conditions for consistency. Sufficient statistic and optimal estimators. Rao- Blackwell theorem.

CO-2: Understand different methods of estimations. Estimating point estimators using different methods. Construction of confidence interval for parameters of different distributions.

CO-3: Gain knowledge on testing of hypothesis. Different types of hypothesis. Statistical tests, types of error, size and power of a test, Most powerful (MP), Uniformly most powerful (UMP) and unbiased test.

CO-4: Understand Neymann- Pearson Lemma and its applications in testing of hypothesis regarding different distributions. Power functions of UMP test. Likelihood Ratio test. Sequential test- Wald SPRT. Approximate OC and ASN functions for test regarding parameters of different distributions.

CO-5: Understand Large sample test. Use of central limit theorem to obtain large sample tests for binomial proportions and means of populations, etc. Related confidence intervals.

CO-6: Analyse statistical data using MS-Excel.

- **STEH – 62 Survey Sampling and Non parametric Inference (Theory and Practical)**

CO-1: Gain knowledge about linear systematic sampling, population with linear trends, estimation of variance using interpenetrating sub-samples (IIPS). Circular systematic sampling, estimation of parameters, estimation of variance using different methods under SRSWR and SRSWOR.

CO-2: Understand cluster sampling, single stage cluster sampling under SRSWR and SRSWOR. Estimation of parameters. Estimation of variance in terms of intraclass correlation.

CO-3: Two stage sampling with equal size first stage units SRSWR at both stages, SRSWOR at both stages, SRSWR at first and SRSWOR at second stage, SRSWOR at first stage and SRSWR at second stage. Estimation of parameters.

CO-4: Understand basic concept of order statistics. Derivation of distribution of order statistics from Uniform distribution, joint distribution of two order statistics, distribution of functions of order statistics.

CO-5: Difference of parametric and non- parametric test. Area of applications. Testing of hypothesis using Non-Parametric tests like sign test, Wilcoxon rank test, Mann- Whitney test, etc. and ability to use them judiciously for the testing of given data.

CO-6: Analyse statistical data using MS-Excel.