Programme Specific Outcomes and Course Outcomes
Department of Mathematics and Statistics

Programme Specific Outcomes	**PSOs of M.Sc. Statistics** PSO1. Preliminaries of integration and probability distribution. PSO2. Analysis study of different sampling methods and classification of design of experiments. PSO3. Study of multivariate analysis, optimization techniques and different models of stochastic process. PSO4. Advanced study of design, inference and sample survey.

Course Outcomes	**COs** of the course **"Measure and Integration" (Sem-I)** Course outcome:- at the end of class students will gain knowledge of CO1 Set theory with its limits, classes and functions. CO2 Measure and its properties. CO3 Probability measure- measurable space. CO4 Measurable functions and its properties. CO5 Properties of Integral. **COs** of the course **"Matrices and Linear Algebra" (Sem-I)** Course outcome:- at the end of class students will gain knowledge of CO1 Matrices properties, partitioning and universe matrices with linear dependence and independence. CO2 Basic and dimension, orthonormal basis. CO3 Characteristic equations with Eigen values and vectors. CO4 Bilinear and quadratic forms. CO5 Singular value and Jordon decomposition. **COs** of the course **"Probability Theory" (Sem-I)** Course outcome:- at the end of class students will gain knowledge of CO1 Axiomatic approach to probability and its application. CO2 Independence of experiments and events, Baye's theorem and its application. CO3 Random variables, distribution function and multivariate and frequency function. CO4 Mathematical expectation and its properties. CO5 WLLN and central limit theorem.

COs of the course **"Theoretical Distributions" (Sem-I)**

Course outcome:- at the end of class students will gain knowledge of

CO1 Generating functions and their applications.

CO2 Inversion theorem, derivation of distribution function and application of central lime theorem.

CO3 Discrete distributions with their properties and application.

CO4 Continuous distributions with their properties and application.

CO5 Compound distributions, Pearsonian system of frequency curve.

COs of the course **"Practicals Based on C-Programming in Computational Statistics" (Sem-I)**

Course outcome:- at the end of class students will gain knowledge of

Introduction to computer and its uses. Application of C-programming in various areas of computational statistics. Techniques related to generating random number. Developing algorithm, flow chart and program for some useful statistical data analysis problems.

COs of the course **"Practicals Based on CT 03 & CT 04" (Sem-I)**

Course outcome:- at the end of class students will gain knowledge of

* Calculation of moments, Skewness and Kurtosis.
* Fitting of Binomial, Poisson and Normal distribution.
* Calculation of area under normal curve.

COs of the course **"Sampling Distributions" (Sem-II)**

Course outcome:- at the end of class students will gain knowledge of

CO1 Univariate sampling distributions, Chi-square distribution (central and non-central) and their applications.

CO2 t- and F distribution (central and non central) and their applications.

CO3 Orthogonal polynomials, order statistics and their distribution.

CO4 Sampling distribution of median and range, regression and correlation, null and non-null distribution of sample correlation coefficient.

CO5 Bivariate distribution (discrete and Continuous)

COs of the course **"Statistical Inference-I" (Sem-II)**

Course outcome:- at the end of class students will gain knowledge of

CO1 Elements of statistical decision functions, point estimation and their properties.

CO2 Minimum mean square, MVU and UMVU estimators, CR bounds.

CO3 Various method to obtain maximum likelihood estimators (MLE's) interval estimation.

CO4 Basic concepts of testing hypothesis, two kind of errors, NP Lemma for determination of best critical region.

CO5 Non-parametric test and sequential analysis its construction and its application.

COs of the course **"Design of Experiments-I" (Sem-II)**

Course outcome:- at the end of class students will gain knowledge of

CO1 Analysis of models, orthogonal polynomial, ANCOVA, transformation.

CO2 Principles of experimentation, CRD, RBD.

CO3 LSD & BIBD and their analysis.

CO4 Factorial experiments and confounding.

CO5 Missing plot technique with reference to RBD and split plot design.

COs of the course **"Theory of Sample Surveys-I" (Sem-II)**

Course outcome:- at the end of class students will gain knowledge of

CO1 Planning and execution of analysis of sample survey, simple random sampling.

CO2 Stratified and cluster sampling.

CO3 Two stage and systematic sampling.

CO4 Ratio and regression method of estimation, Double sampling.

CO5 Elements of unistage sampling with varying probability.

COs of the course **"Practicals Based on CT 05 & CT 06" (Sem-II)**

Course outcome:- at the end of class students will gain knowledge of

* Calculate correlation and regression for Bivariate frequency distribution.
* Large sample test, F-test, Chi-Square test and t-test.
* Barlet's test for homogeneity of variance.
* Power curves for testing simple hypothesis v/s composite hypothesis.
* Test of significance for simple correlation coefficient.
* Non-parametric test.
* SPRT calculations of constants.
* Fitting of orthogonal polynomials.

COs of the course **"Practicals Based on CT 07 & CT 08" (Sem-II)**

Course outcome:- at the end of class students will gain knowledge of

* Analysis of CRD, RBD, LSD and BIBD.
* Analysis of RBD, LSD with missing observations.
* Analysis of a factorial experiments confounded factorial experiments.
* Drawing of random samples from finite populations.
* Drawing samples from Binomial and normal populations.
* Estimation of population mean and variance in SRS, stratified sampling.
* Systematic sampling, cluster sampling, two stage sampling, double sampling and by ratio and regression method of estimation.

	* PPSWR selection of sample and estimation. **COs** of the course **"Multivariate Analysis" (Sem-III)** Course outcome:- at the end of class students will gain knowledge of CO1 Multivariate normal distribution and its properties and distribution o quadratic forms. CO2 MLE's of the mean vector and covariance matrix. CO3 Hotelling's T^2 its properties and uses, Mahalnobis D^2. CO4 Wishart distribution and its properties classification of observations. CO5 Null and non-null distributions of partial and multiple correlation coefficients and multivariate central limit theorem. **COs** of the course **"Statistical Inference-II" (Sem-III)** Course outcome:- at the end of class students will gain knowledge of CO1 Likelihood ratio test and its applications. CO2 Properties of MLE's and generalization of CR inequality for multipalametric case. CO3 Complete family of probability distributions. CO4 UNP test with and more than one parameter. CO5 Similar regions and relationship between notions of completeness. **COs** of the course **"Practicals Based on CT 09" (Sem-III)** Course outcome:- at the end of class students will gain knowledge of * Multivariate analysis. * Linear combination of correlated normal variates and evaluation of probabilities. * Estimation and testing of mean vector, covariance, partial and multiple correlation coefficient. * Analysis of discriminate functions. Their software development in C-language. **COs** of the course **"Operations Research" (Sem-III)**

Course outcome:- at the end of class students will gain knowledge of

CO1 OR definition, scope and nature, transpiration and assignment problems.

CO2 Deterministic, Inventory models with at most one linear restriction and without restriction probabilistic inventory models.

CO3 Queuing theory and its differ models of process.

CO4 Simulation, definition, its types uses and limitations.

CO5 Steady state, solutions of Markovian queuing models.

COs of the course **"Stochastic Processes" (Sem-III)**

Course outcome:- at the end of class students will gain knowledge of

CO1 Stochastic process with stationary transition probabilities and its properties.

CO2 Classification of states stationary distribution of a Markov chain.

CO3 Markov pure jump process, passion process, birth and death process.

CO4 Second order processes mean and covariance function.

CO5 Stochastic differential equations, estimation theory and special distribution.

COs of the course **"Practicals Based on DSE 01 & DSE 02" (Sem-III)**

Course outcome:- at the end of class students will gain knowledge of

* OP and stochastic.
* process and their software developments in C-language.

COs of the course **"Design of Experiments-II" (Sem-IV)**

Course outcome:- at the end of class students will gain knowledge of

CO1 Linear estimation of Gauss Markoff theorem, testing of hypothesis and sub hypothesis.

	CO2 Analysis of two way elimination of heterogeneity, orthogonality connectedness and Balancedness, incomplete block designs. CO3 Concept of association scheme with two associate classes. CO4 Lattice and Linked block designs, MOLS for prime and power of prime, Construction and analysis of Youden square design. CO5 Methods of construction of BIBD and SBIBD. **COs** of the course **"Non-Parametric Inference" (Sem-IV)** Course outcome:- at the end of class students will gain knowledge of CO1 Order statistics and their sampling distribution and hypothesis testing for population quantities. CO2 Tolerance limits for distribution and coverage's, Chi-square goodness of fit test and signed test. CO3 Test for two sample problems comparison and their distributions, Run test, median test and U-test. CO4 Linear ranks statistics, Probability distribution and irefulness. CO5 Correlation between rank order statistics and variate values. Test based on the total number of runs and the length of the longest run. **COs** of the course **"Practicals Based on CT 11" (Sem-IV)** Course outcome:- at the end of class students will gain knowledge of * Testing of hypothesis for one-way and two-way classification. * Analysis of IBD, GDD. * Analysis of linked block design. * Analysis of simple lattice, youden square etc. **COs** of the course **"Theory of Sample Surveys" (Sem-IV)** Course outcome:- at the end of class students will gain knowledge of CO1 Partition of sample space and definition of T-classes of linear estimators.

	CO2 Quenouille's techniques of bias reduction and its applications, methods of estimation in PPSWR, ratio method of estimation. CO3 Ratio and regression method of estimation for PPSWR, Variance by HT-estimator and YG-estimators. CO4 Sen- Midzuno scheme of sampling of inclusion probabilities. CO5 The theory of multistage sampling with VPWR and VPWOR. **COs** of the course **"Demography" (Sem-IV)** Course outcome:- at the end of class students will gain knowledge of CO1 Census and vital data. CO2 Stationary populations, construction of life table. CO3 Stable population theory. CO4 Demographic trends in India CO5 Bivariate growth models, migration models, fertility and mortality analysis models. **COs** of the course **"Practicals Based on CT-12" (Sem-IV)** Course outcome:- at the end of class students will gain knowledge of * Horvitz and Thompson's procedure of estimating mean of the population. * Yates and Grundy method, Midzuno's sampling scheme, Rao-Hartley Cochran schemes. * Two stage sampling method. * Ratio and regression method of estimation and software development of above practical in C- language.