PROGRAMME OUTCOMES AND COURSE OUTCOMES

2023 – 2024

Name of the Programme: B.Sc. STATISTICS **Programme Code: USST**

Programme Outcomes:

PO 1	Apply acquired scientific knowledge to solve complex issues.
PO 2	Attain Analytical skills to solve complex cultural, societal and environmental issues.
PO 3	Employ latest and updated tools and technologies to analyse complex issues.
PO 4	Demonstrate Professional Ethics that foster Community, Nation and Environment Building Initiatives.

Course Outcomes:

Course Code	Course Title	Course Outcomes
23ST1CC1	Descriptive Statistics	CO1: Describe the scope, functions, applications and limitations of Statistics. CO2: Also to explain the statistical survey, collection of data, sampling and presentation of data.

		CO3: Discuss the importance and uses of central values and dispersions for the various types of data. CO4: Also to measure the various measures of averages and scatteredness of the mass of data in a series. CO5: Explain about the lack of symmetry, rth moments and peakedness of the frequency distributions.
23ST1CC2	Probability Theory	CO1: Identify from a probability scenario events that are simple, complementary, mutually exclusive, and independent. CO2: Recognize multiplication rule for two independent events, the addition rule for union of two events, and the complement rule. CO3: Describe the main properties of probability distribution and random variables. CO4: Construct discrete and continuous random variables CO5: Apply general properties of the expectation and variance operators.
23ST1SE1/ 23ST2SE2	Basics Of Statistics	CO1: Summarize the origin of statistics and its relation with other disciplines CO2: Explain the collection and scrutiny of Data CO3: Explain and evaluate various measure of central tendency CO4: Examine the various measures of dispersion CO5: Evaluate skewness
23ST1FC	Bridge Course in Statistics	CO1: Recognizes investigation, investigator, numerator and enumeration CO2: Explain statistical survey CO3: Identifies the need of Classification and Tabulation in sampling

		CO4: Explain different methods of data collection CO5: Construct and analyse graphical display to summarize data
23ST2CC3	Distribution Theory	CO1: Recognize cases where the Binomial distribution could be an appropriate model. CO2: Able to apply the Poisson distribution to a variety of problems. CO3:Explorethekeypropertiessuchasthemomentgeneratingfunction,cumulantofanegativebinomialdistribution CO4: Understand and derive the formula for the geometric and hyper geometric probability mass function. CO5: Explain and evaluate multinomial and power series distribution.
23ST2CC4	Matrix and Linear Algebra	CO1: Do basic operations of matrices CO2: Understand various transactions of matrices and its applications CO3: Able to understand various properties of matrices CO4: Able to understand vector space, eigen vector and its applications CO5: Able to understand vector and matrix applications
23ST2EC2	Real Analysis	CO1: Can do basic operations of sets and understand set functions CO2: Understands sequence and its convergence CO3: Understands series and its convergence CO4:Identifies real valued functions and its discontinuity CO5: Understands Necessary and Sufficient condition for Riemann integrable.
23ST2SE3	Statistics	CO1: Calculate measures of central tendency

	Practical I	CO2: Classify measures of dispersion, skewness and kurtosis CO3: Compute correlation, regression and measures of association of attributes CO4: Recognise and solve problems on binomial, poisson and normal distribution CO5: Able to apply geometric and hyper geometric distribution
19ST3CC5	Continuous Probability distribution	**CO1**: Recognize cases where the normal distribution could be appropriate. **CO2**: Understand and derive the moments, moment-generating functions, and characteristic functions of rectangular, beta, and gamma distributions. **CO3**: Explore the key properties such as the moment-generating function and cumulants of exponential and Cauchy distributions. **CO4**: Derive the chi-square distribution and apply it in real-life problems. **CO5**: State and apply the definitions of the t and F distributions.
19ST3CC6	Sampling Theory	**CO1**: Illustrate census and sampling and their advantages and disadvantages. **CO2**: Differentiate the SRSWOR, SRSWR methods of SRS – lottery method and random number table method. **CO3**: Understand and identify stratified random sampling.

		CO4: Understand and identify systematic sampling. **CO5**: Analyze ratio estimator.
19ST3AC3	Linear Programming	**CO1**: Formulate linear programming problems and solve by graphical method. **CO2**: Classify simplex method to solve linear programming problems. **CO3**: Identify and solve two-phase and Big-M method. **CO4**: Recognize and formulate transportation and find the optimal solution. **CO5**: Recognize and formulate assignment problems and find the optimal solution.
19ST3SB1	Practical Statistics I	**CO1**: Calculate measure of central tendency. **CO2**: Classify measures of dispersion, skewness, and kurtosis. **CO3**: Compute correlation, regression, and measures of association of attributes.
19ST4CC7	Estimation Theory	**CO1**: Explain and compute point estimation.

		CO2: Estimate maximum likelihood estimator. **CO3**: Analyze minimum variance unbiased estimator. **CO4**:Compute interval estimation in large samples using normal distribution. **CO5**: Distinguish interval estimation in small samples based on F, chi-square, and t-distribution.
22ST4CC8	Applied Statistics	CO1:Fitting of Linear trend and Calculation of Moving Average. CO2:Understand the calculation of seasonal variations using different methods and able to find cyclic fluctuations. CO3:Apply the concept of Index numbers uses and its applications. CO4:Prepare cost of living index and other index numbers for real life situations. CO5:To estimate the national income and to analysis its difficulties.
19ST4AC4	Linear Algebra	**CO1**: Define vector space and explain its various concepts. **CO2**: Explain basis and dimension. **CO3**: Illustrate inner product spaces. **CO4**: Define basic concepts of matrices and solve linear equations; appraise eigenvalue and eigenvectors of matrices.

		CO5: Describe bilinear forms and quadratic forms.
22ST4SB2	Sampling Distribution	CO1:Recall the definition of a t statistic in terms of statistics of a sample from a normal distribution. CO2:State and apply the definitions of the t, F and Chisquare distributions in terms of the standard normal. CO3:Explain the relation between t, f and χ^2
19ST5CC9	Testing of Hypothesis	**CO1**: Describe the process of hypothesis testing and, given a statement of a research question, construct an appropriate null and alternative hypothesis to use for hypothesis testing. **CO2**: Explain the best critical region and carry out UMP test for the parameters of univariate normal and exponential distribution. **CO3**: Explain LRT and its properties, and test the mean and variance of a normal population. **CO4**: Analyze the basic properties of nonparametric statistical techniques and illustrate the significance level as the probability of rejecting a true null hypothesis. **CO5**: Illustrate sequential probability ratio test.

19ST5CC10	Design of Experiments	**CO1**: Define and recognize the terminology of experimental design. **CO2**: Apply and interpret the methods of analysis of variance. **CO3**: Analyze CRD, RBD, and LSD. **CO4**: Analyze missing plot technique, IRBD, and LSD. **CO5**: Design and conduct two-level functional factorial designs and split-plot designs.
19ST5CC11	Demography	**CO1**: Explain sources of demographic data. **CO2**: Apply fertility measurements such as CBR, TFR, GRR, and NRR. **CO3**: Compute mortality measures such as CDR, SDR, and infant mortality rate. **CO4**: Construct the demographic table. **CO5**: Explain the factors affecting migration and the basic ideas of stationary and stable population.
19ST5CC12	Real Analysis	CO1:Describe fundamental ideas and theorems on sequences. CO2:Distinguish convergent and divergent sequences. CO3:Distinguish convergent and divergent series. CO4:Explain the concept of limits and metric space and their roles in the

		real line. CO5:Organize theorems in a correct mathematical way.
19ST5ME1	Computer Programming in C	**CO1**: Explain various data types and operators in C. **CO2**: Summarize decision making, branching, looping statements, and arrays. **CO3**: Categorize functions, pointers, and structures. **CO4**: Describe strings and string handling functions. **CO5**: Create C programs for real-life problems.
19ST5MEP1	C Practicals	CO1: Explain various data types and operators in C CO2: Summarize Decision Making Branching, looping statements and arrays CO3: Categorize function, pointers and structures CO4: Describe Strings and String Handling Functions. CO5: Create C program for real life problems
22ST5ME3	Object Or iented programming with C++	CO1:Define the features of C++ supporting object oriented programming. CO2:Describe classes and objects. CO3:Distinguish Constructors and Destructors and Explain overloading concepts. CO4:Classify Inheritance in C++.

		CO5:Design C++ programs for real life situations.
19ST5SB3	Practical Statistics III	**CO1**: Analyze the problems based on confidence interval for proportions, mean, variances, and correlation coefficient. **CO2**: Apply and interpret the methods of curve fitting, time series. **CO3**: Analyze the problem based on vital statistics.
19ST5SB4	Statistical Software-SPSS	**CO1**: Understand how to start SPSS, record variables, and prepare data for analysis. **CO2**: Conduct descriptive and basic inferential statistics. **CO3**: Carry out statistical analysis that can test hypotheses and analyze factorial experiments.
19ST6CC13	Statistical Quality Control	**CO1**: Describe the use of control charts. **CO2**: Demonstrate the ability to design, use, and interpret control charts for variables. **CO3**: Identify the difference between $\bar{X}$, R, p, np, and C charts. **CO4**: Explain the process of acceptance sampling and describe the use of the OC curve. **CO5**: Make use of the concept of reliability and examine its uses in problems of quality and cost.
19ST6CC14	Stochastic Processes	CO1:Explain the concept of stochastic processes and stationary and

		appreciate their significance. CO2:Compute probabilities of transition between states and identify classes of states in Markov chains and characterize the classes. CO3:Generalization of independent Bernoulli trails. CO4:Explain Poisson process and its related distributions. CO5:Demonstrate the knowledge in Pure and Death process.
19ST6CC15	Actuarial Statistics	**CO1**: Calculate quantities such as SI & CI, nominal and effective rates of interest, and simple discount. **CO2**: Recognize simple assurance and annuities contracts and develop formulas for the present value of payments. **CO3**: Explain the concepts of redemption of loans. **CO4**: Construct the demographic statistics and premiums. **CO5**: Describe the policy values and its types.
19ST6ME5	Numerical Methods	**CO1**: Solve algebraic and transcendental equations using various methods. **CO2**: Identify the various methods of solving simultaneous linear algebraic equations. **CO3**: Recognize difference operators and apply the concept of

		interpolation. **CO4**: Compute the values of the derivatives at some point using numerical differentiation and integration. **CO5**: Compute numerical solutions of differential equations.
19ST5ME6	Multivariate Analysis	**CO1**: Derive the important properties of multivariate normal distribution. **CO2**: Compute Hotelling's T^2 statistic test on mean vector and multivariate normal population. **CO3**: Understand how to assess the efficacy of classification and discrimination analysis. **CO4**: Introduce principal components analysis and clustering methods. **CO5**: Explain and analyze contingency tables.
19ST6ME7	Regression Analysis	**CO1**: Classify and compute simple, multiple, and partial correlation. **CO2**: Evaluate the regression model and estimate the standard error. **CO3**: Apply multiple linear regression analysis and classify simple linear regression analysis and multiple linear regression analysis. **CO4**: Test the equality of regression coefficients.

19ST6ME8	Operations Research	**CO1**: Define sequencing problems and apply it to solve real-life problems. **CO2**: Solve problems in decision making. **CO3**: Apply inventory control to solve practical problems. **CO4**: Classify queuing models. **CO5**: Explain CPM and PERT to plan, schedule, and control project activities.
19ST6ME9	Industrial Statistics	**CO1**: Summarize the concept of deterministic models when the demands occur uniformly, with and without shortage costs. **CO2**: Explain the policy for production planning when inventory levels are reviewed periodically. **CO3**: Demonstrate the concept of forecasting and its applications in manufacturing and non-manufacturing industrial situations. **CO4**: Classify survival functions and hazard functions.
19ST6ME10	Econometrics	CO1:Ability to perform analyses of economic data based on broad knowledge of the linear regression model. CO2:Estimate and test regression model. CO3:Assess the appropriateness of a linear regression model by defining

		residuals and examining the residual plot graphs. CO4:Check the existence of multicollinearity in a data set can lead to less reliable results due to larger standard errors. CO5:Articulate the null and alternative hypotheses for the Durbin-Watson (DW) test.
19ST6SB5	Practical Statistics IV	CO1:Analyze the problems based on statistical quality control. CO2:Examine various non parametrictests. CO3:Examine various non parametrictests.
19ST6SB6	Statistical Software - R	**CO1**: To impart efficient data handling techniques. **CO2**: To equip students with statistical programming skills based on examples and datasets. **CO3**: Able to explore results using ANOVA and ANCOVA.
22ST2SL1	Quantitative Aptitude and Data Interpretations	CO1:Can interpret the data in picture format CO2: Understand Venn diagram and Casselet data. CO3:Able to compute Permutations and Combination. CO4:Understand the share value and brokerage. CO5:Able to find the present worth , bankers' discount and gain.

19UGSLST1	Official Statistics	CO1:Understand the function of various Indian statistical organisations. CO2:Knows the procedure of collecting informations. CO3:Able to understand the method of National Income and its estimates. CO4:Find different methods of collecting population census. CO5:Understand various sources and limitations of Industrial statistics.
19UGSLST2	Bio Statistics	CO1:Understand the study design and its risk value. CO2:Measures the accuracy of diagnosis through chi-square method. CO3:Estimate the different phases of cinical trials. CO4:Understand the survival distributions and its parameters. CO5:Able to estimate the survival function and its variance using various methods.
22UGSLST1	Differential Equations	CO1:Able to solve homogenuous and non-homogenuous differential equations. CO2:Compute solutions for I order differential equations. CO3:Able to solve linear equations with constant and variable coefficients. CO4:Form partial differential equations of some standard forms. CO5:Understand the application of linear differential equations.

22ST2SL1	Quantitative Aptitude and Data Interpretations	CO1:Can interpret the data in picture format CO2: Understand Venn diagram and Casselet data. CO3:Able to compute Permutations and Combination. CO4:Understand the share value and brokerage. CO5:Able to find the present worth , bankers' discount and gain.