AQAR – QUALITATIVE METRIC

2023 - 2024

Criterion 1 - Curricular Aspects

1.1.1 Curricula developed and implemented have relevance to the local, national, regional and global developmental needs which is reflected in Programme outcomes (POs), Programme specific outcomes (PSOs) and Course Outcomes (COs), of the Programmes offered by the Institution.

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.

Programme Specific Outcomes:

PSO1	Gain broad knowledge and understanding in pure Mathematics and applications of Mathematics.
PSO 2	Demonstrate a computational ability and apply logical thinking skills to solve problems that can be modelled Mathematically
PSO 3	Read, understand, analyse and formulate Mathematical theorems
PSO 4	Acquire proficiency in the use of technology to assist in learning and investigating, Mathematical ideas and in problem solving.
PSO 5	Communicate Mathematical concepts accurately, precisely and effectively with clarity and coherence both verbal and in written form

Course Outcomes:

Course Code	Course Title	Nature of the Course (Local/ National/ Regional/ Global)	Course Description	Course Outcomes
23ST1CC1	Descriptive Statistics	National	This course introduces measurement of relationship in terms of quantitative and qualitative data.	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	Global	This course introduces the concepts of functions and its properties,	CO1: Identify from a probability scenario events that are simple, complementary, mutually exclusive, and independent. CO2: Recognize multiplication rule for two

			theorems related to random variables.	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	Global	This course is designed to make the students learn the 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	National	This course is designed to make the students learn the basic concepts of 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	National	This course introduces probability functions for random variables that are defined for different probabilistic situations.	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:Explorethekeypropertiessuchasthemoment generatingfunction,cumulantofanegativebinomi aldistribution 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	National	This course will focus on properties of matrix and their applications	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	Global	This course introduces the basic concepts in analysis and to enable the students understand	CO1: Can do basic operations of sets and understand set functions CO2: Understands sequence and its convergence CO3: Understands series and its convergence

			fundamental ideas and theorems in analysis.	CO4:Identifies real valued functions and its discontinuity CO5: Understands Necessary and Sufficient condition for Riemann integrable.
23ST2SE3	Statistics Practical I	National	The course provides problems related to measure of central tendency, measure of dispersion, and measures of association of attributes.	CO1: Calculate measures of central tendency 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	National	This course is designed to expose the students various important continuous probability models	**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	National	This course is introduced to the students to impart the basic knowledge of statistical sampling concepts.	**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	National	This course enable the students convert real life problems into a	**CO1**: Formulate linear programming problems and solve by graphical method.

			Mathematical problem and to solve the musing different techniques like graphical method, simplex method, Big–M method, Two-phase method and dual simplex 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	National	The course provides problems related to measure of central tendency, measure of dispersion, and measures of association of attributes.	**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	National	This course introduces the concepts of statistical 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	Global	This course provides some of the applications of statistics which includes topics such as time series, index numbers and national income.	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	National	This course will focus on matrix as linear transformations relative to a basis of a vector space.	**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	Global	The course provides an application related to the concepts of sampling distribution for large & small samples.	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	National	The course provides the basics of hypothesis testing with emphasis on some commonly encountered hypothesis tests in statistical data analysis.	**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	National	This course is introduced to the students to understand the fundamental principles of experimental designs.	**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	National	This course begins by focusing on understanding the core social demographic variables such as fertility, mortality and	**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.

			migration and how these variables influence population growth,composition and structure.	**CO5**: Explain the factors affecting migration and the basic ideas of stationary and stable population. .
19ST5CC12	Real Analysis	Global	This course introduces the basic concepts in analysis and to enable the students understand fundamental ideas and theorems in 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	National	This course provides skills in designing and writing simple programs 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	National	This course provides skills in designing and	

			writing simple programs in C.	
22ST5ME3	Object Or iented programming with C++	Global	This course introduces the student to object-oriented programming through a study of the concepts of program specification and design, algorithm development.	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	National	The course provides an application based on MLEs, analysis of time series, index numbers and vital statistics & curve fitting.	**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	National	The course is introduced to learn a programming language which helps to handle all aspects of	**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

			data analysis using statistical software SPSS.	hypotheses and analyze factorial experiments.
19ST6CC13	Statistical Quality Control	National	This course is designed to introduce students to statistical qualitycontrolemphasizingthoseaspectswhicharerelevantforSQCspracticalimplementation	**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 □̄, 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	Global	This course covers Markov chains in discrete time, the Poisson process and the Markov processes in continuous time	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	National	The course covers the applications of insurance and finance.	**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	National	This course enables the students to solve equations using various 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	National	The course covers multivariate normal distribution, hotelling T^2 statistics, multivariate classification and discrimination analysis, principal components and cluster 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	National	This course focuses on building a greater understanding on statistical tools for applying the linear regression model and its generations.	**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	National	This helps in solving indifferent environments that needs decisions.	**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	National	This course is concerned with maintaining and improving the quality of goods and services	**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	National	This course provides the basic principles of econometric models	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	Global	The course provides an application related to statistical quality control, non parametric tests & design of experiments	CO1:Analyze the problems based on statistical quality control. CO2:Examine various non parametrictests. CO3:Examine various non parametrictests.

19ST6SB6	Statistical Software - R	National	The course is introduced to learn a programming language which helps to handle all aspects of statistical software.	**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	National	To enable the students understand the mathematical concepts required to learn statistics	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	National	This paper gives an idea about various methods in which Statistics are being collected in different sectors Goal	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	National	This course covers the basic tools for the collection, analysis, and presentation of data in all areas of public health.	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	National	To enable the students understand the mathematical concepts required to learn statistics	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	National	To enable the students understand the mathematical concepts required to learn statistics	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.