M.Sc. Statistics CO & PO (NEP 2024)

Programme Outcome

PO1	Making students well equipped with statistical tools and techniques.
PO2	Making them competent to get a job as a statistical officer and research officer in government organizations.
PO3	To train students to handle large data sets and carry out data analysis using software and programming language
PO4	To teach a wide range of statistical skills, including problem-solving, project work and presentation so as to enable students to take prominent roles in a wide spectrum of employment and research.
PO5	The programme covers the necessary statistical methodology which becomes useful to make career as a statistical officer in different government sectors.

Program Specific Outcome (PSO)

PSO1	Effectively use necessary statistical software and computing environment including R, Python, MS-EXCEL among others.
PSO2	Gain sound knowledge in theoretical and practical aspects of Statistics

Course Outcomes (CO)

STS-501-MJ: Fundamentals of Analysis and Calculus – 2 Credits

Course Outcome (CO)

After completion of this course, the students will be able to

CO1	Understand the concepts of mathematical analysis.
CO2	Understand the concepts of limits and convergence of sequences and series and solve related problems.
CO3	Understand the concepts of limits and continuity of functions and solve problems related to these concepts.
CO4	Solve the problems related to univariate differential calculus.
CO5	Solve the problems related to multivariate differential calculus
CO6	Apply the techniques for finding the optimum of functions.

STS-502-MJ: Linear Algebra – 4 Credits

Course Outcome (CO)

After completion of this course, the students will be able to

CO1	Solve the problems related to vector spaces.
CO2	Solve the problems related to matrix algebra and linear transformations.
CO3	Solve problems related to system of linear equations.
CO4	Understand the concepts of eigenvalue theory and solve problems related to eigenvalues of a matrix.
CO5	Understand the concepts of quadratic forms and solve problems related to these topics.
CO6	Understand the concepts of matrix derivatives.
CO7	Apply the concept of decomposition of a matrix.

STS-503-MJ: Probability Distributions – 4 Credits

Course Outcome (CO)

After completion of this course the students will be able to

CO1	Understand the concepts related to class of sets such as fields, sigma fields, Borel fields and solve related problems
CO2	Understand the measure theoretic definition of a random variable Understand and random vector and solve problems related to their distributions.
CO3	Solve the problems related to distribution function.
CO4	Solve problems related to quantile function.
CO5	Understand the concepts such as truncation, symmetry, convolution mixture, compound etc. and solve related problems.
CO6	Solve problems related to multiple and partial correlations.
CO7	Understand the concepts related to sampling distributions and solve problems related to them.
CO8	Understand the theory related to linear and quadratic functions Understand involving normal random vectors and solve related problems.
CO9	Understand the concepts related to order statistics and solve problems related to the distributions of order statistics.

STS-504-MJP: Data Analytics Using R (Practical) – 4 Credits

Course Outcome (CO)

After completion of this course the students will be able to

CO1	Use R for various statistical computations.
CO2	Understand the theory of random number generation using and various methods and apply them to generate random numbers.
CO3	Apply different search algorithms.
CO4	Use real data sets and perform analysis using R.

CO5	Write programs using R for analyzing data.

STS-541-RM: Research Methodology – 4 Credits

Course Outcome (CO)

After completion of this course the students will be able to

CO1	Understand the meaning and scope of doing scientific research.
CO2	Able to think logically.
CO3	Would be able to use some of the computational algorithms and tools used in modern statistical inference problems.
CO4	Would be able to apply several visualization graphical methods.

STS-551-MJ: Modern Statistical Inference – 2 Credits

Course Outcome (CO)

After completion of this course the students will be able to

CO1	Demonstrate the conceptual understanding of minimum variance unbiased estimation.
CO2	Evaluate estimates with optimal properties from a given sample with appropriate distributional assumptions.
CO3	Obtain tests and confidence intervals with some with optimal property
CO4	Understand the properties of MLE.

STS-552-MJ: Regression Analysis and Applications – 4 Credits

Course Outcome (CO)

After completion of this course the students will be able to

CO1	Solve problems involving simple and multiple linear regression.
CO2	Carry out regression analysis given the data.
CO3	Carry out binary and multiple logistic regression.
CO4	Analyze non-normal data using GLM.
CO5	Understand the concepts of semi parametric and nonparametric regression models including GAM.

STS-553-MJ: Multivariate Analysis and Applications – 4 Credits

Course Outcome (CO)

After completion of this course the students will be able to

CO1	Carry out an extensive exploratory multivariate analysis for a given multivariate data.
CO2	Carry out cluster analysis of given multivariate data.
CO3	Solve problems involving multivariate normal distribution.
CO4	Carry out statistical inference procedures using the data from a multivariate normal distribution.
CO5	Carry out classification of given multivariate data.

STS-554-MJP: Data Analytics using R and/or Python (Practical) – 4 Credits

Course Outcome (CO)

After completion of this course the students will be able to do data analysis using R and Python:

CO1	Carry out regression analysis given the data using R and Python.
CO2	Carry out binary and multiple logistic regression using R & Python.
CO3	Analyze non-normal data using GLM (Poisson, NB etc.).
CO4	Analyze multivariate data which uses PCA, FA, MDS etc.
CO5	Carry out clustering/classification given multivariate data.
CO6	Carry out statistical inference related to multivariate normal data (estimation, testing, and confidence interval).

STS-601-MJ: Probability Theory – 2 Credits

Course Outcome (CO)

After completion of this course, the students will be able to

CO1	Understand the basics of measure-theoretic approach to probability.
CO2	Solve problems related to probability measure and distribution function.
CO3	Solve problems involving expectations of random variables.
CO4	Examine the convergence of a sequence of random variables.

STS-602-MJ : Stochastic Processes – 4 Credits

Course Outcome (CO)

After completion of this course, the students will be able to

CO1	Understand the concepts related to the Markov chain and solve Understand problems related to the Markov chain model.
CO2	Understand the concepts related to Branching processes and solve Understand problems related to branching process models.

CO3	Understand the concepts related to birth-death processes Understand solve problems related to these models.
CO4	Understand the concepts related to Poisson processes, Renewal Understand processes etc. and solve problems related to these models.
CO5	Understand the concepts related to Gaussian and related processes Understand and solve problems related to these models.

STS-603-MJ: Design and Analysis of Experiments – 4 Credits

Course Outcome (CO)

After completion of this course the students will be able to

CO1	Understand the concepts related to different designs including BIBD and solve problems related to them.
CO2	Understand the concepts related to different factorial designs solve problems related to them.
CO3	Understand the concepts related various advanced designs Understand and solve problems related them.
CO4	Understand the concepts related to response surface methodology and solve problems related to them.
CO5	Understand the concepts related to Taguchi methods and solve problems related to them.
CO6	Analyze the data using all the designs discussed in the course.

STS-604-MJP: Advanced Data Analytics using R and/or Python-I (Practical)-4 Credits

Course Outcome (CO)

After completion of this course the students will be able to

CO1	Simulate various stochastic models discussed in STS-602-MJ Visualize.
CO2	Carry out data analysis related to all the designs in STS-603-MJ.

STS-631-RP: Research Project I – 4 Credits

Course Outcome (CO)

After completion of this course the students will be able to

CO1	Read research papers.
CO2	Formulate a statistical data analysis project involving, collection, coding, analysis (using elementary as well as advance statistical methods), and interpretation of results.
CO3	Prepare presentation and report of a project using LaTeX.

STS-652-MJ: Sampling Theory and Applications – 4 Credits

Course Outcome (CO)

After completion of this course the students will be able to

CO1	Understand the concepts related various standard sampling designs and solve problems related to them.
CO2	Understand the concepts related to cluster, double and Understand and multi-stage sampling and solve problems related to them.
CO3	Understand the concepts related various methods of Understand and imputing the missing data and solve related problems.
CO4	Understand the concept of super population model and Understand and solve related problems
CO5	Understand the concepts of network and adaptive sampling Understand and solve related problems.
CO6	Design an appropriate survey and provide the related analysis.

STS-653-MJP: Advanced Data Analytics using R and/or Python-II (Practical)

Course Outcome (CO)

After completion of this course the students will be able to

CO1	Analyze the time series data
CO2	Application of different Sampling methods

STS-681-RP: Research Project II – 6 Credits

Course Outcome (CO)

After completion of this course, the students will be able to

CO1	Formulate a statistical research problem and solve it.
CO2	Write One/Two Research papers and publish them in a Scopus Research/Publish Indexed Journal.
CO3	Prepare presentation and project report

CO4	Prepare Research Papers.

Electives – Semester I

STS-510-MJ: Optimization Techniques - 2 Credits

Course Outcome (CO)

After completion of this course, the students will be able to

CO1	Understand, formulate and solve Integer and Dynamic programming problems using advanced methods.
CO2	Understand, formulate and solve nonlinear programming problems.
CO3	Understand, formulate and solve network models problems.

STS-511-MJ: Statistical Quality Control - 2 Credits

Course Outcome (CO)

After completion of this course the students will be able to

CO1	Understand the concepts related to CUSUM and EWMA charts Understand and evaluate measures associated with these charts Evaluate.
CO2	Make economic design of control charts Evaluate.
CO3	Carry out process capability analysis Evaluate.
CO4	Construct control charts for vector-valued quality characteristics Evaluate.
CO5	Design sampling plans.

STS-562-MJ: Discrete Data Analysis - 2 Credits

Course Outcome (CO)

After completion of this course the students will be able to

CO1	Able to develop a critical approach to the analysis of Analyze contingency tables.
CO2	Understand the basic ideas and methods of Understand generalized linear models.
CO3	Able to link logit and log-linear methods with generalized Understand linear models.
CO4	To develop basic facility in the analysis of discrete data.

STS-612-MJ: Machine Learning - 2 Credits

Course Outcome (CO)

After completion of this course the students will be able to

CO1	Understand the concepts related to supervised and unsupervised Understand learning methods and apply them for different data.
CO2	Understand the concepts of feature selection and feature Understand and extraction.
CO3	Understand and apply the concepts of Regression Trees, Understand and Random Forests, Bagging and boosting.
CO4	Understand the concepts related to SVM, Neural Networks, etc. Understand and apply them for analyzing data.
CO5	Understand the concepts related to text mining and Understand and apply them in various contexts.
CO6	Apply clustering algorithms and related methods.

STS-661-MJ: Design and Analysis of Clinical Trials - 2 Credits

Course Outcome (CO)

After completion of this course the students will be able to

CO1	Understand different phases of clinical trials.
CO2	Understand data management in clinical trials.
CO3	Understand various aspects associated with designing, Understand and clinical trials (cross-over design, Balaam's design etc.).
CO4	Apply different statistical procedures useful in testing Apply Bioequivalence of more than two drugs 5. Carry out drug interaction, dose proportionality etc.