PROGRAMME OUTCOMES IN B.A./B.Sc. (Hons.) STATICSTICS

The student graduating with the Degree B.Sc. (Hons.) Statistics should be able to :

1. Demonstrate the ability to use skills in statistics and its related areas of technology for formulating and tackling statistical related problems and identifying and applying appropriate principles and methodologies to solve a wide range of problems associated with statistics.

2. **Acquire**

   i) A fundamental understanding of the academic field of statistics, its different learning areas and applications in Medical Statistics, Actual Statistics, Agricultural Statistics, Geo-Statistics, Financial Statistics, Population Statistics, Financial Econometrics, Clinical Trials and Epidermiology, Queuing Theory, Stochastic Processes etc.

   ii) Procedural knowledge that creates different types of professionals related to the disciplinary/ subject area of Statistics, including professionals engaged in research and development, teaching and government/public service.

   iii) Skills in area related to one's specialization area within the disciplinary/subject area of statistics and current and emerging developments in the field of statistics.

3. Recognize the importance of statistical modeling simulation and computing and the role of approximation and mathematical approaches to analyze the real world problems.

4. Plan and execute statistical related experiments or investigations, analyze and interpret data/information collected using appropriate methods, including the use of appropriate software such as programming languages and purpose written packages and report accurately the findings of the experiment/ investigation while relating the conclusions/findings to relevant theories of Statistics.

5. Demonstrate relevant generic skills and global competencies such as :

   i) Problem solving skills that are required to solve different types of statistics related problems with well defined solutions, and tackle open-ended problems that belong to the disciplinary area boundaries.

   ii) Investigative skills, including skills of independent investigation of statistics related issues and problems.

   iii) Communication skills involving the ability to listen carefully to read texts and research analytically and to present complex information in a concise manner to different groups/audiences of technical or popular nature.

   iv) Analytical skills involving paying attention to detail and ability to construct logical arguments using correct technical language related to Statistics and ability to translate them in simple language when needed.

6. At the end of graduation they should possess expertise which will provide them competitive advantage in pursuing higher studies to India or abroad and seek jobs in academia , research or industries.

7. Skill enhancement course shall be making students successful entrepreneurs.

COURSE OUTCOMES IN B.A./B.Sc. (Hons.) STATICSTICS

SEMESTER - I

Core Course-I : STA 501C (Descriptive Statistics)

Outcome :

The outcomes expected on completion of Course

a) Having knowledge of Statistics and its scope and importance in various areas such as Medical, Engineering, Agricultural, Social Sciences etc.

b) Knowledge of various types of data, their organisation and evaluation of summary measures such as measures of central tendency and dispersion.

c) Knowledge of quality characteristics including concepts of independence and association between two attributes.

Core Course-II : STA 502C (Probability Theory I and Distribution I)

Outcome :

The outcome expected on completion of course

a) Having knowledge of ability to distinguish between random and non-random experiments.

b) Knowledge to conceptualise the probabilities of events including frequentist and axiomatic approach simultaneously, they will learn the notion of conditional probability including the concept of Bayes' Theorem.

c) Knowledge of related to concept of discrete random variable and its probability distribution including expectation and moments.

d) Knowledge of two dimensional random variable (r.vs) its pmf, df, marginal, conditional probability distribution, identically distributed r.vs raw and central joint *mgf* and *cf*.

e) Concept of pairwise independent, transformation of r.vs and Jacobian transformation.

f) Concept of Set, Set operation, Set types, field, Sigma-field and measure.

Skill Enhancement Course (SEC)-I : STA 501S (Computational Techniques and R Programming)

Course Outcome :

After completion of the course the students will get acquainted with

a) Various basic concepts related to computer architecture and its organization, various peripheral devices.

b) Languages : Machine language, assembly language and high level languages.

c) Ideas on operating systems, linker, loader and compiler etc.

d) R Programming with some basic notions for developing their own simple programs and visualizing graphics in R.

SEMESTER - II

Core Course- III : STA 503C (Statistical Methods-I)

Outcomes :

Students will acquire :

a) Knowledge related to concept of discrete/continous random variable and its probability distribution including expectation and moments.

b) Knowledge of important discrete distributions such as Binomial, Poisson, Geometric, Negative Binomial and Hyper-geometric and their interrelations if any,

c) Acumen to apply standard discrete probability distribution to different situations.

d) Knowledge of correlation of bivariate data, correlation coefficients and its properties.

Core Course- IV : STA 504C (Distribution -II, Estimation-I and Prob. Theory-II)

Outcomes :

After going through this course, the students will get :

a) A fundamental understanding of Parametric models for developing relevant inferences on associated parameters,

b) Knowledge of point and interval estimation procedures and different methods of point estimation,

c) To understand the Cramer-Rao Inequality, Rao Blackwell and Lehmann Scheffe theorems and their applications in obtaining Minimum Variance Unbiased and Minimum Variance Boundestimators,

d) To work on several, standard examples to help them understand the various inherent concepts.

Skill Enhancement Course (SEC)-II (STA 502S)

(Statistical Techniques for Reserach Methodology)

Outcomes :

Statistical Techniques provide scientific approaches to develop the domain of human knowledge.
The course will enable to the students to :

a) Understand basic concepts and aspects related to research, data collection, analysis and interpretation.

b) Prepare and Finalize research report on some real lifesituations.

SEMESTER-III

Course Core -V (STA 605C)

(Statistical Methods-II and Index Number)

Outcomes :

This course will acquaint the student with :

a) Knowledge of standard normal variate, its p.d.f normal probability plot and q-q plot to test normality.

b) Various basic concepts on sampling distributions and large sample tests based on normal distribution.

c) Small sample tests based on chi-square, student's t distribution and snedecor's F-distribution.

d) Knowledge of Index Number, various method for computing Index Numbers, requirements of good Index Numbers and the construction of whole scale and Cost Living Index Number.

Course Core VI (STA 606C) (Statistical Inference I, Basic Mathematics and Matrices I)

Outcomes :

After going through this course, the student will get :

a) Knowledge of MVUE of different distributions, viz (i) Binomial, Poisson and Normal families.

b) Knowledge of interval estimation procedures and procedure of getting interval.

c) To understand the Cramer-Rao Inequality, Rao Blackwell and Lehmann Scheffe Theorems and their applications in obtaining Minimum Variance Unbiased and Minimum Variance Boundestimators.

d) Knowledge of Convegence of sequence related to infinite series and alternating series.

e) Knowledge on finding determinant, inverse, rank of a square matrix.

Course Core VII (STA 607C) (Sampling Techniques & Official Statistics)

Outcomes :

The students shall get :

a) Basic knowledge of complete enumeration and sample, sampling frame, sampling distribution, sampling and non-sampling errors, principal steps in sample surveys, limitations of sampling etc.

b) Introduce to various statistical sampling schemes such as simple stratified, systematic and PPS sampling.

c) An idea of conducting the sample surveys and selecting appropriate sampling techniques.

d) Knowledge about various statistical data and records used in the Indian administration.

GENERIC : GEC-I STA 601G (Introduction to Statistics-I)

Outcomes :

This course is designed for students other than statistics discipline and can be opted as choice based credit system (SBCS). This course will make the students conversant with :

a) Various techniques used in summarization, presentation and analysis of different types of statistical data

b) various summary measures of central tendency, dispersion, moments, skewness and kurtosis.

c) Simple and rank correlation, Partial and Multiple correlation coefficients.

d) Fitting of linear and quadratic regressions using principle of least squares.

e) Measures of association for 2x2 and r x s contingency tables.

f) Have knowledge on theoritical as well as practical approach.

SEMESTER-IV

Course Core-VIII (STA 608C) (Regression Analysis)

Outcome :

The students shall :

a) Know about correlation and regression technique, the two very powerful tools in statistics.

b) Get in idea of Linear, Polynomial and Multiple linear regression.

c) Learn about regression diagnostics, multicollinearity, residual plots and estimation and tests for regression co-efficients.

d) Study concept of co-efficient of determination and inference on partial and multiple correlation co-efficients.

Course Core-IX (STA 609C) (Statistical Inference-II)

Outcome :

The course will provide the students with a knowledge of :

a) Advanced level topics in statistical inference on testing of statistical hypotheses for both randomized and non-randomized tests,

b) Using Neyman Pearson Lemma and finding Uniformly Most Powerful Test,

c) Likelihood ratio test and its applications,

d) Confidence interval estimation and their relationships with testing,

e) Order statistics and their distributions,

f) Wald's Sequential Probability Ratio Test and concepts of ASN and OC functions,

g) Sequential estimation with examples based on standard probability distributions,

h) Statistical decision problem including the concept of loss and risk functions, Bayes and Minimax Decision rules.

Course Core-X (STA 610C) (Numirical Analysis)

Outcome : The Student Shall

a) Demonstrate knowledge of different numerical method, essential for providing Mathematical support to the Statistician where intractability becomes severe.

b) be able to learn various difference, interpolation formulae,

c) be in a position to find solutions to equations using Bisection, Newton Raphson and Regula Falsi Methods.

d) handle numerical differentiation and integration,

e) be able to find solutions to difference equations of first order and linear difference equations with constant coefficients.

f) be able to forcast numerical phenomenon.

GENERIC : GEC-II STA 602G (Introduction to Statistics-II)

Outcome :

This course is designed for students other than statistics discipline and can be opted as choice based credit system (CBCS). This course will make the students conversant with

a) Various summary measures of dispersion, moments, skewness and kurtosis.

b) Simple and rank correlation, Partial and Multiple correlation coefficients.

c) Measures of association for 2X2 and rxs contigency tables.

d) have knowledge on attributes and Chi-square.

SEMESTER-V

Course Core-XI (STA 711C) (Optimization Technique)

Outcome :

The students shall exposed to

a) Graphical and simplex method of solving linear programming problem(LPP) for finding degenerate, unbounded, alternate and infeasible solutions,

b) Post-optimality:addition of constraints, change in requirement vector, addition of new activity and chnage in cost vector,

c) Use of duality to solve a LPP,

d) Obtaining solution of a transportation problem by North West corner method, Matrix Minima method, Vogel's method.

e) Hungarian Method for solving assignment problems,

f) Game theory for graphical solution of mx2 or 2xn rectangular game and mixed strategy.

g) Networking problem using minimal spanning tree and shortest route,

h) Optimal inventory policy for EOQ model and its variations.

i) Solving quantity discounts model with pricebreaks.

Course Core-XII (STA 712C) (Statistical Quality Control and Reliability)

Outcome :

The students will be able to

a) Construct group control chart,

b) draw charts for variables and attributes,

c) draw CUMSUM chart,

d) understand single and double sampling inspection plans, OC and ASN functions,

e) get introduced to notion of censored data, Type II and random censoring schemes,

f) get idea of important lifetime distributions for complete and censored data,

g) compute MLEs of exponential distribution for complete and censored data,

h) compute MLEs of lognormal distributions,

i) compute MLEs of gamma and Weibull distributions using iterative procedure,

j) fit exponential and Weibull distributions for a given life time data set,

k) find interval estimates for the parameters of exponential, Weibull, gamma and lognormal distributions,

l) Test reliabality hypotheses for exponential and Weibull distributions,

m) Evaluate system reliability for series, parallel, k out of n systems.

Course Core-DSE I - STA 701D (Time Series Analysis)

Outcome :

This course is meant to acquaint the students with some important but useful concepts on topics in time series analysis so that the students can get an important background material for taking up an advanced course in financial econometrics and data analysis. After completion of this course, the students will know about

a) Time series data, its applications to various fields and components of time series,

b) Fitting and plotting of various growth curves such as modified exponential, Gompertz and logistic curve,

c) fitting of trend by Moving Average method,

d) measurement of Seasonal Indices by Ratio-to-Trend, Ratio-to-Moving Average and Link Relative methods,

e) calculation of variance of random component by variate component method,

f) forecasting by exponential smoothing and short term forecasting methods such as Box Jenkins Method and Bayesian forecasting

g) weak stationarity, auto correlation and correlogram,

h) applications to real data by means of laboratory assignments.

GENERIC : GEC-III STA 703G (Introduction to Probability Theory)

Outcome :

This course is designed for students other than statistics discipline and can be opted as choice based credit system (CBCS). This course will lay the foundation to probability theory and statistical modeling of outcomes of real life random experiments through various statistical distributions.

The students will get to know about

a) Writing of sample space, events and algebra of events and finding Probability of events,

b) Conditional Probability and applications of Theorem of total probability and Bayes' theorem,

c) Discrete and continous Random Variable, Probability mass function (p.m.f.) and probability density function(p.d.f.) cumulative distribution function (c.d.f.)

d) Expectation, variance, moments and moment generating function.

e) Problem solving pertaining to binomial, Poisson, geometric, negative binomial, hyper geometric, uniform, normal, exponential, beta, gamma distributions.

f) fitting of Binomial, Poisson and Normal distributions

g) Chebyshev's inequality, Convergence in probability, weak law of large numbers, convergence in distribution, De-Moivre Laplace and Lindeberg-Levy Central Limit Theorems (C.L.T.),

h) Various aspects as outlined above through practical assignments.

Semester -VI

Course Core-XIII (STA 713C) (Design of Experiments)

Outcome :

The students will be in a position to

a) carry out one way and two way Analysis of Variance (ANOVA).

b) understand the basic terms used in design of experiments,

c) use appropriate experiments designs to analyze the experimental data, 2^2,2^3, & 2^4 factorial experiments.

d) analyze 2^2,2^3, and 2^4 factorial experiments,

e) apply Multiple range test, the LSD test or the multiple t-test, Student-Newman-Keuls test, Duncan's multiple range test, Turkey; s test, Multiple F tests, Fisher's least significant difference test, Scheffe's tests,

f) give statistical interpretation of the experimental results obtained.

Course Core-XIV (STA 714C) (Non Parametric Inference)

Outcome :

This course will help the students to

a) use different non-parametric/distribution-free test when data don't meet the assumption of parametric test,

b) understand importance of different non-parametric test procedures, their applications and interpretation,

c) analyse categorical data using logistic regression models.

Course DSE-(2)-STA702D (Applied Statistics)

Outcome :

After going through this course, the students will have an idea of

a) income distributions and their fitting in real lifesituations,

b) commonly used measures of demography pertaining to its three basic aspects, viz. the fertility, mortality and migration,

c) various data collection methods enabling them to have a better in sight in policy making, planning and systematic implementation,

d) Construction and implication of lifetables,

e) Population growth curves, population estimates and projections,

f) Real data implementation of various demographic concepts as outlined above through practical assignments.

GENERIC : GEC-IV STA 704G (Introduction Statistical Inference)

Outcome :

This course is designed for students other than statistics discipline and can be opted as choice based credit system (CBCS).

The students will get an exposure to

a) Techniques of estimation and testing of hypotheses for mean, variance, proportions, correlation, association and goodness of fit,

b) Confidence intervals for the parameters of a normal distributions (one and two sample problems),

c) Test of significance for correlation coefficient, Fisher's z-transformation.

d) Tests of proportions, tests of association and goodness-of-fit using chi-square test, Yates' correction,

e) analysis of variance technique for one and two way classifications,

f) analysis of commonly use dexperimental designs such as CRD,RCBD etc.,

g) non-parametric tests such as test for median and symmetry, Wilcoxon two -sample tests,

h) practical applications through labolatory assignments.