

DEPARTMENT OF STATISTICS

WAIKHOM MANI GIRLS COLLEGE, THOUBAL

Programme Specific Outcomes & Course Learning Outcomes of B.Sc./ B.A. (Hons.) in Statistics.

Programme Specific Outcome:

Statistics is the language of the uncertainties riddled modern information age. This program is a compact combination of detailed courses of Statistics and adequate amount of courses on Computer Science, Mathematics and Operations research to complement and offer diversification after the completion of program. The thrust of the program is to provide a platform for pursuing higher studies leading to post-graduate or doctorate degrees.

The student graduating with the degree 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 a fundamental/systematic or coherent understanding of the academic field of Statistics, its different learning areas and applications in Medical statistics, Agricultural statistics, Actuarial statistics, Population statistics, Stochastic Processes etc.
3. Acquire knowledge that creates different types of professionals related to the subject area of statistics including research and development, teaching and government/public service.
4. Skills in areas related to one's specialization area within the disciplinary/subject area of statistics and current and emerging developments in the field of Statistics.
5. Apply appropriate techniques and recognize the importance of statistical modeling simulation and computing, the role of approximation and mathematical approaches to analyze the real world problems.
6. Demonstrate professional behavior such as
 - (i) being objective, unbiased and truthful in all aspects of work and avoiding unethical, irrational behavior such as fabricating, falsifying or misrepresenting data or committing plagiarism
 - (ii) the ability to identify the potential ethical issues in work-related situations
 - (iii) promoting safe learning and working environment.

COURSE LEARNING OUTCOMES

SEMESTER-1 STATISTICS PAPER-I (STA:101)

Course Title:- Descriptive Statistics, Measures of Central Tendency, Measures of Dispersion, Moments, Skewness and Kurtosis and Probability; Practical based on Diagrammatic representation of statistical data, construction of frequency distribution and its graphical representation, measures of central tendency, partition values, measures of dispersion, coefficient of variation calculation of moments, measures of skewness and kurtosis.

Course Outcomes:-

After completing the course students should have developed a clear understanding of

- Meaning, importance and scope of Statistics.
- Types of characteristics and types of data.
- Concept of statistical population and sample, variables and attributes.
- Tabular and graphical representation of data based on variables.
- Measures of central tendency, measures of dispersion, skewness and kurtosis, coefficient of variation and calculations based on them.
- Moments and their use in studying various characteristics of data and calculation of moments.
- Different approaches to the theory of probability.

SEMESTER-2
STATISTICS PAPER-II (STA:202)

Course Title:- Random Variables, Mathematical Expectations and Generating functions, Correlation, Curve fitting and Regression Analysis, Limit Theorems, Finite difference and Numerical Analysis; Practical based on correlation, fitting of polynomials, interpolation and numerical integration.

Course Outcomes:-

After completing the course students will acquire

- Knowledge about continuous & discrete random variables.
- Knowledge about probability density function, probability mass function, distribution functions and their properties.
- Knowledge about moment generating function, mathematical expectations and its properties.
- Knowledge about correlation, formulae of rank correlation coefficient, Karl Pearson correlation coefficient and calculations based on them.
- Knowledge about curve fitting and regression.
- Knowledge about operators, difference tables, various difference and interpolation formulae and calculations using different interpolation formulae.
- Knowledge about numerical differentiation and integration and calculations using different formulae based on them.

SEMESTER-3
STATISTICS PAPER-III(STA:303)

Course Title:- Discrete Probability Distribution, Continuous Probability Distributions, Theory of Estimation, Sample Survey, Theory of Attributes, Demography and Practical on theory of attributes, demography, sample survey and fitting of Binomial and Poisson distribution.

Course Outcomes:-

The students should be able to understand about

- Discrete and continuous probability distributions with their properties.
- Problems of statistical inference and problems of point estimation.
- Properties of point estimator such as consistency, unbiasedness and sufficiency.
- Obtaining minimum variance unbiased estimator.
- Obtaining estimators using estimation methods such as maximum likelihood, least squares, moments etc.
- Basic concepts of sample survey.
- Principles of sampling theory and main steps in selecting a sample.
- Simple random sampling and techniques of selecting a random sample.
- Stratified random sampling, systematic sampling cluster sampling, multi-stage sampling and multi-phase sampling.
- Concepts of attributes, conditions for consistency and criteria for independence of data and calculations about consistency, coefficient of association, independence of attributes.
- Commonly used measures of demography pertaining to its three basic aspects viz. the fertility, mortality and migration. Construction and implication of life tables.
- Population growth curves, population estimates and projections.
- Calculations on life table , population growth and projection(logistic curve).
- Fitting of Binomial and Poisson Distributions.

SEMESTER-4
STATISTICS PAPER-IV(STA:404)

Course Title:- Sampling Distribution, Testing of Hypotheses, Time Series, ANOVA & Design of Experiments, Index Numbers and Practical based on Index No., Time series, Analysis of CRD & RBD, Large & Small sample Tests.

Course Outcomes:-

After the course students should be able to understand the

- Concept of sampling distribution of a statistic, standard error of important estimates such as mean and proportions.
- Concept of sampling distribution of t, F, X^2 distributions and Fisher's Z-transformation. Also the concept of how to use t, F, X^2 statistic & Fisher's Z-transformation respectively in small and large sample tests.
- Concept of statistical hypothesis, critical regions, test functions, two kinds of errors power function.
- Concept of test of significance and its validity.
- Applications of t-distribution, F-distribution, X^2 -distribution and Fishers Z-transformation.
- Concept of Time series and its components.
- Models of Time series and measurement of trends.
- Analysis of variance, its model and estimation of parameters with reference to one way and two way classified data.
- Concept of Design of Experiments and its principles.
- Statistical analysis of C.R.D. and RBD.
- Concept of index numbers and construction of index numbers.
- Requirements of a good index number.

SEMESTER-5
STATISTICS PAPER-V(STA:505)

Course Title:- Set Theory and Measure, Basic Mathematics, Determinant and Matrices, Computer Programming.

Course Outcomes:-

At the end of this course Students will be able to understand

- Set theory, measurable sets, field of sets, sigma field and their properties, elementary properties of measure.
- Convergence of sequence, different methods for test of convergence.
- Lagranges method of determining multiplier, mean value theorem, Riemann integrability, Beta and Gamma functions.
- Concepts of determinants and matrix algebra, rank of matrix , inverse of matrix.
- Various basic concepts related to computer architecture and its organization, various peripheral devices.
- Lagranges machine language, assembly language and high level languages.
- Concepts of binary numbers, internet, windows, desktop, toolbar, folder, icon, creation of files and folders.
- Programming with FORTRAN, FORTRAN variables, expressions, statements, control statements, arrays.
- Writing statistical program in FORTRAN of mean, variance, Karl Pearson's correlation coefficient linear regression and Newton's interpolation formula

SEMESTER-5
STATISTICS PAPER-VI(STA:506)

Course Title:- Normal and Bivariate Probability Distributions, Theory of Estimation, Design of Experiments, Correlation and Curve fitting and Sampling Distribution.

Course Outcomes:-

After the course the students will acquire

- Knowledge of normal distribution and its mean, median, mode, variance, m.g.f., moments.
- Knowledge of bivariate probability distribution, joint distribution functions, joint probability functions, marginal & conditional distributions.
- Knowledge to understand the Cramer-Rao inequality, Rao-Blackwell theorem and their applications in obtaining minimum variance estimators.
- Knowledge of point and interval estimation procedures, confidence co-efficient and confidence limits.
- Knowledge of analysis of LSD, missing plot techniques for CRD & RBD.
- Concepts of factorial experiments.
- Knowledge of analysis of $2^2, 2^3, 2^4, 3^2, 3^3$ factorial experiments.
- Concepts of total and partial confounding in $2^2, 2^3, 2^4, 3^2, 3^3$ factorial experiments.
- Concepts of split plot technique, strip plot arrangement and series of experiments.
- Knowledge to compute multiple and partial correlation coefficients.
- Knowledge of computing intra class correlation coefficient and correlation ratio.
- Knowledge of fitting of Pearsonian type I, II, III curves and orthogonal polynomials.
- Knowledge of derivation of sampling distributions of t, F, X^2 , sample total correlation coefficient and sample range.
- Knowledge about theorems of chi-square.

SEMESTER-5
STATISTICS PAPER-VII(STA:507) PRACTICALS

Course Title:- Practical based on Paper vii

Course Outcomes:-

After completing the course students should be able to understand

- About fitting of normal distribution and test of goodness of fit.
- How to calculate multiple correlation, partial correlation, intraclass correlation coefficient and correlation ratio.
- About fitting of Pearsonian curves and fitting of curves using orthogonal polynomials (1st & 2nd degree).
- About analysis of LSD, one missing plot of RBD & CRD, factorial experiments (2^2 , 2^3 and 2^4), partial and total confounding (2^3 and 2^4).
- About writing and running FORTRAN program for mean, variance, correlation, linear regression, interpolation formula in computer.
- About drawing of charts, calculation of sum, product, quotient in MSEXCEL.

SEMESTER-6
STATISTICS PAPER-VIII(STA:608)

Course Titles:- Statistical Inference, Statistical Quality Control, Time series, Sample Survey, National Income & Demand and Supply Analysis.

Course Outcomes:-

After the course the students will be able to:

- Understand concepts of most powerful critical region (MPCR), UMPCR, UMPUCR and order statistics.
- Understand Newman Pearson Lemma and use of uniformly most powerful test.
- Perform non parametric test such as sign test, run test, median test, Wilcoxon signed rank test and Mann-Whitney U-test.
- Know concepts of statistical quality control, its tools and advantages.
- To draw various control charts such as mean, range, fraction defective, number of defectives and number of defects per unit.
- Know concepts of sampling inspection plan, consumer's risk, producer's risk, AQL, LTPD, ASN, ATL, OC, AOQ, and AOQL.
- Know concepts on operation of single and double sampling inspection plans.
- Know about objectives of measuring seasonal variation.
- Perform measurement of seasonal variation by the methods of simple averages, ratio to trend, ratio to moving averages and link relatives.
- Perform measurement of cyclic movements by residual approach.
- Use Spencers 15-point and 21-point formulae in determining trend.
- Understand about simple random sampling, stratified random sampling, systematic sampling, cluster sampling, multi stage sampling and multi-phase sampling.
- Clearly understand about ratio and regression methods of estimation.
- Have clear idea about National income, its importance and methods of estimation of national income.
- Know about demand and supply analysis, types of data required for estimation of elasticity, method of estimating demand function, Engel's law and Pareto's law.

SEMESTER-6
STATISTICS PAPER-IX(STA:609)

Course Title:- Finite Difference and Numerical Analysis, Operation Research, Psychological and Educational Statistics, Indian Official Statistics.

Course Outcomes:-

After the course the students will be able to:

- Use inverse interpolation formula.
- Use central difference formulae: Gauss formula, Stirling's formula, and Bessel's formula.
- Derive and apply Laplace Everett formula; Newton-Cote's formula; Euler-Maclaurin's summation formula & Stirling's formula for factorial n.
- Find solutions to difference equations with constant coefficients.
- Know concepts of operation research (OR) and models of OR.
- Formulate LPP and solve LPP by graphical method & Simplex method.
- Formulate dual problem and solve dual simplex method.
- Understand concepts of comparison and combination of exams and ranks, mental measurement.
- Understand methods for the estimation of test reliability and validity.
- Know about statistical system in India and different statistical publications.
- Know about official statistics of India related to census, agriculture and industries.
- Know about publications and journals of North Eastern Council (NEC).

SEMESTER-6
STATISTICS PAPER-X(STA:610) (PRACTICAL)

Course Title:- Experiments based on Stratified Random sampling (including proportional and optimum allocation and comparison of efficiencies), Systematic sampling, Trend values by Spencer's formulae, construction of control charts, Finite difference, Numerical analysis, Scale (T-score and P.C. chart),LPP by Simplex method.
A field work (including Report Writing)

Course Outcomes:-

This course is based on Statistics Paper (VIII) and (IX) of 6th semester and will provide practical knowledge to the students on various topics elaborated in these courses. After completing the course students will be able to solve problems involving

- Stratified random sampling (including proportional and optimum allocation and comparison of efficiencies).
- Systematic sampling.
- Trend values by spencer's formulae.
- Construction of various control charts.
- Finite difference.
- Numerical analysis.
- Scale (T-score and P.C. graph).
- LPP by simplex method.

Course Outcome of the Field Work (Project Work):-

At the end of this project, students will be in a position to

- Analyze and interpret and take appropriate decisions in solving real life problems using statistical tools.
- Use different statistical packages for graphical interface, data analysis and interpretation.
- Write a systematic statistical project report.
