

B.Sc./B.A./B.A(H)(Subsi.)
Semester I
Paper: Basic Mathematics and Computer Application

Paper code: STT-101

Max. Marks: 100

Credit: 3

Periods/week: 3 hrs/week

Contact hrs/semester: 45hrs/semester

Objective

Paper is designed to acquaint the students with elementary mathematics and various computational techniques which are basic to introduce probability, and the application of computers in statistics.

Unit I

9 Hours

Polynomials, exponential, logarithmic and Binomial functions and their expansions, Basic ideas of Permutations and Combinations (simple problems).
Matrices: Types, Addition, Subtraction, Product and Inverse of Matrices. Determinants of order 3×3 and problem based on its properties.

Unit II

9 Hours

Differential Calculus- Functional relationship between two variables. Introduction to limits, continuity and differentiability. Standard results for differential coefficients of x^n , e^x , $\log x$ etc (without proof). Rules for differentiation of sum, difference, product and Quotient and function of a function (without proof). Maxima and minima of functions of one and two variable.

Unit III

9 Hours

Integral calculus: Definition and meaning of Integration. Integration as inverse of differentiation. Indefinite integral, Integration of simple function, Integration by substitution, integration by parts. Definite Integral and its properties. Beta and Gamma integral and their properties.

Unit IV

9 Hours

Overview of C: Basic structures of c programs, sample c program, programming style, exe.a c program, data types, constants and variables, operators and expression, managing input and output operators.

Unit V

9 Hours

Decision making and branching: IF, IF ELSE, NESTED IF ELSE, IF ELSE ladder, SWITCH statement, ?: operator ,GOTO statement,
Decision making and looping: WHILE statement; DO statement, FOR statement, jumps in loops, Arrays: Introduction to arrays, single dimensional array and two dimensional arrays

Books Recommended

Essential readings

1. Sharma, G.C. and Jain, Madhu (2001) :Essential Mathematics , Galgotia Publications Pvt Ltd, 2001
- 2Text Books of Mathematics prescribed by NCERT for class XI and XII.
3. Kanetkar, Yashwant: Let Us C, BPB Publication.
4. Balaguruswami, E.: 'ANSI C', Tata McGraw Hill Publication.

Reference Books

1. Deitel and Deitel: How to Programme C, Pearson's Edition
2. Shubhilall: Structured Programming and computer graphics, University book house pvt

B.Sc./B.A./B.A(H)(Subsi.)
Semester I
Paper: Basic Statistics and Probability

Paper code: STT-102

Max. Marks: 100

Credit: 3

Periods/week: 3 hrs/week

Contact hrs/semester: 45hrs/semester

Objective:

This paper is designed to acquaint the students with the fundamental statistical techniques. To understand the role of statistics for analyzing and interpreting data meaningfully.

Unit I 9 Hours

Basic Concepts: Definition, scope, and limitations of statistics, Concept of statistical population. Types of data- Primary and Secondary data, Univariate and Bivariate data. Census and Sample Survey and their advantages and disadvantages.

Unit II 9 Hours

Organization of data –Qualitative and Quantitative classification, discrete and continuous classification, Geographical and Chronological classification. Construction of frequency tables, frequency distribution for continuous and discrete data, cumulative frequency distributions (inclusive and exclusive methods. Graphical presentation of data: Histogram, Frequency Polygon, Frequency curve and Ogives

Unit III 9Hours

Univariate Data – Measures of Central Tendency – Definition, different measures of Central Tendency, merits and demerits. Measure of Dispersion- Definition, different measures of Dispersion, merits and demerits. Coefficient of variation. Relative dispersions

Unit IV 9 Hours

Moments: Central moments and Non-central moments and their computation from data. Absolute and Factorial moments. Concept of Quantiles. Measure of Skewness and Kurtosis, Sheppard's, Correction for moments (without proof).

Unit V 9Hours

Probability- Random Experiment, Trial, Events and their types. Classical, Statistical and Axiomatic definition of probability and its properties (simple). Addition and Multiplication theorems of Probability and their application, Conditional Probability and Independent events. Baye's theorem and its application(simple questions).

Books Recommended
Essential readings

1. Goon, A.M., Gupta, M.K. and Dasgupta, B. (1991): Fundamentals of Statistics, Volume I, The World Press Pvt Ltd , Calcutta
2. Gupta, S.C. and Kapoor ,V.K.: Fundamentals of Mathematical Statistics, S Chand & Company, New Delhi.
3. Mood Alexander M., Graybill Frankline and Boes Duane C.: Introduction to Theory of Statistics, Mc Graw Hill & Company Third Edition

Reference Books

1. Gupta, O.P.:Mathematical Statistics, Kedarnath Publication, Meerut
2. Yule, G.Udny and Kendall,M.G. (1999): An Introduction to the theory of Statistics, 14th Edition.
3. Hooda, R.P. (2002): Introduction to Statistics: Macmillan India Ltd. 1st edition.
4. Spiegel M.R., (1967): Theory and Problem of Statistics, Schaum's Series.
5. Meyer, P.L.(1970) : Introductory Probability and Statistical Application, Addison Wesley.
6. Rohatgi, V.K. and Saleh, A.K. Md. Ehsanes (2001): An Introduction to Probability Theory and Statistics, Second Edition, John Wiley andSons.
7. Bhat,B.R (1981): Modern Probability Theory, New Age Publishers, Third edition,

B.Sc./B.A./B.A(H)(Subsi.)
Semester I
Practical Paper

Paper code: STT-103

Max. Marks: 100

Credit: 2

Periods/week: 4 hrs/week

Contact hrs/semester: 60hrs/semester

- 1) Preparation of frequency table by using exclusive and inclusive method of classification for continuous/discrete variables.
- 2) Graphical representation of data by:
 - a) Histogram
 - b) Frequency Polygon
 - c) Curve
 - d) Ogives
- 3) Diagrammatic presentation of data by:
 - a) One Dimensional Diagram (Simple-Bar, Multiple-Bar and Divided) and Pie- diagram.
- 4) Calculation of Measures of Central Tendency, Dispersion, Moments, Skewness and Kurtosis. Coefficient of variation
- 5) Practical based on different constructs of C- language, which may include problems of paper

Note: Practical exercises will be conducted on computer by using MS-Excel and. C-language.

B.Sc./B.A./B.A(H)(Subsi.)
Semester II
Paper: Probability Distributions

Paper code: STT-201

Max. Marks: 100

Credit: 3

Periods/week: 3 hrs/week

Contact hrs/semester: 45hrs/semester

Objective:

This paper is aimed at teaching the students various probability distributions which are useful in day to day life.

Unit I 8 Hours

Random Variable: Definition and types of random variables, Probability mass function, Probability density function, Distribution function with properties(without proof), Joint, Marginal and Conditional probability distributions. Independence of two variable, definition and application of Jacobian transformation for one and two variables.

Unit II 9 Hours

Mathematical Expectations: Expectation of a random variable and its simple properties, Addition and Multiplication theorems of Expectations, Variance and covariance and their properties.

Unit III 8 Hours

Chebychev's inequality with simple applications. Central moments and Non-central moments, Moment generating functions and their properties, Cumulant generating functions.

Unit IV 10 Hours

Univariate Discrete Distribution : Bernoulli, Binomial, Poisson, Geometric Distribution with simple properties and applications. Fitting of Binomial and Poisson Distribution. Hypergeometric and Negative Binomial Distribution(examples, derivations, mean and variance)

Unit V 10 Hours

Univariate Continuous Distribution : Rectangular, Normal, Exponential, Cauchy, Gamma, Beta Distribution with properties.

Books Recommended

Essential readings

1. Goon, A.M., Gupta, M.K. and Gupta, B. Das (1991): Outline of Statistics, Volume I, The World Press Pvt Ltd , Calcutta
2. Gupta, S.C. and Kapoor ,V.K.: Fundamentals of Mathematical Statistics, S Chand & Company, New Delhi
3. Gupta, O.P.:Mathematical Statistics, Kedarnath Publication, Meerut.

Reference Books

1. Mood Alexander M., Graybill Frankline and Boes Duane C.: Introduction to Theory of Statistics, Mc Graw Hill & Company Third Edition
2. Paul Mayor L. (1970): Introductory Probability and Statistical Application, Oxford & IBM Publishing Company Pvt Ltd, Second Edition.
3. Yule Udney G., and Kendall,M.G. (1999): An Introduction to the theory of Statistics, 14th Edition
4. Spiegel M.R., (1967): Theory and Problem of Statistics, Schaum's Series.
5. Johnson Norman L., Kotz Samuel and Kemp Adriene W.: Univariate Discrete Distributions, Second Edition.

B.Sc./B.A./B.A(H)(Subsi.)
Semester II
Paper: Statistical Methods

Paper code: STT-202

Max. Marks: 100

Credit: 3

Periods/week: 3 hrs/week

Contact hrs/semester: 45hrs/semester

Objective:

This paper aims to familiarize the students with the handling of bivariate data and numerical techniques.

Unit I

7 Hours

Theory of attributes: Class, class frequencies, order of class frequencies, Ultimate class frequency, Consistency of data (up to order 3). Independence of attributes, contingency table, Association of attributes, Measures of association.

Unit II

9 Hours

Curve Fitting: Scatter Diagram, Concept of curve fitting and Principles of Least Squares. Fitting of straight line, Parabola, Power Curves and Exponential Curves.

Unit III

9 Hours

Correlation and Regression: Correlation, Scatter Diagram, Karl Pearson's Coefficient of Correlation and its properties. Spearman's Rank Correlation Coefficient. Regression-Fitting of Regression Lines, Regression Coefficients with properties.

Unit IV

10 Hours

Finite Differences: Operators E, ∇, Δ , their relationship and properties, factorial notation, Difference table and nth order difference of polynomial, Fundamental Theorem of finite differences. Estimation of one and two missing terms.

Unit V

10 Hours

Interpolation and Extrapolation: Meaning, uses and assumptions of interpolation and extrapolation. Newton's Forward and Backward formulae for equal intervals, Lagrange's formula and numerical problems.

Books Recommended
Essential readings

1. Goon, A.M., Gupta, M.K. and Dasgupta, B. Das (1991): Fundamentals of Statistics, Volume I, The World Press Pvt Ltd, Calcutta
2. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, S Chand & Company, New Delhi
3. Bansal & Ojha: Numerical Analysis, Jaipur Publishing House, Jaipur.

Reference Books

1. Yule, G.Udny and Kendall, M.G. (1999): An Introduction to the Theory of Statistics, 14th Edition
2. Spiegel M.R., (1967): Theory and Problem of Statistics, Schaum's Series.

**Semester II
Practical Paper**

Paper code: STT-203

Max. Marks: 100

Credit: 2

Periods/week: 4 hrs/week

Contact hrs/semester: 60hrs/semester

1. Exercise on raw and central moments and finding measures of central tendency, dispersion, Skewness and kurtosis of univariate probability distributions with interpretation.
2. Fitting of Binomial and Poisson distribution.
3. Fitting of the following curves by the method of least squares:
 - a) Straight Line
 - b) Parabola
 - c) Exponential Curve
 - d) Power Curve
4. Computation of Correlation Coefficient and rank correlation.
5. Fitting of Regression lines.
6. Estimation of one or two missing values .
7. Interpolation for equal intervals by:
 - a) Newton-Gregory formula (forward & backward).
8. Interpolation for equal intervals: Lagrange's formula.
9. Testing of Independence of Attributes.
10. Yule's Coefficient of Association of Attributes.

Note: Practical exercises will be conducted on computer by using MS-Excel or C- language.

Semester III
Paper: Sampling Distributions

Paper code: STT-301

Max. Marks: 100

Credit:3

Periods/week: 3 hrs/week

Contact hrs/semester: 45 hrs/semester

Objective:

To understand the concept of sampling and sampling distributions and its applications.

Unit I.

7 Hours

Basic Concepts: Concept of statistic and sampling distribution. Sampling Distribution of sum of Binomial, Poisson and mean of Normal Distribution. Standard Error: Meaning and role. The Central Limit Theorem for identically independently distributed(i.i.d) random variable.

Unit II

10 Hours

Statistical Hypothesis and test of significance: Null and Alternative Hypotheses, two Types of errors in sampling ,critical region , level of significance, statistical test: one tailed and two tailed test, critical and p-values, procedure and testing of hypothesis.

Unit III

10 Hours

Chi-square Distribution: Definition, Derivation, Moments, Moment Generating Function, Cumulant Generating Function,. Limiting and Additive property of Chi-square variate. Distribution of ratio of chi-square variates. Applications: Chi-square test for testing normal population variance, Test for goodness of fit, Contingency table and Test for independence of attributes, Yates correction for 2x2 contingency table conditions of Chisquare.

Unit IV

10 Hours

t-Distribution: Definition of Student's-t and Fisher's-t statistics and derivation of their distributions. Limiting property of t-distribution. Applications: Testing of single mean, Difference of two means, paired t-test and sample correlation coefficient.

Unit V

8 Hours

F-Distribution: Definition of Snedecor's F-distribution and its derivation. Applications- Testing of equality of two variance. Fisher's transformation and its uses. Relationship between 't' and 'F' statistics and between 'F' and chi-square statistics.

Books Recommended

Essential readings

1. Goon, A.M., Gupta, M.K. and Dasgupta, B. (1991): Fundamentals of Statistics, Volume II, The World Press Pvt Ltd, Calcutta
2. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, S Chand & Company, New Delhi

Reference Books

1. Mood Alexander M., Graybill Frankline and Boes Duane C.: Introduction to Theory of Statistics, Mc Graw Hill & Company Third Edition
2. Spiegel M.R., (1967): Theory and Problem of Statistics, Schaum's Publishing Series.
3. Gupta, O.P.: Mathematical Statistics, Kedarnath Publication, Meerut
4. Goon, A.M., Gupta, M.K. and Dasgupta, B. (1991): An Outline of Statistics Volume II, The World Press Pvt Ltd, Calcutta

B.Sc./B.A./B.A(H)(Subsi.)
Semester III
Paper: Industrial Statistics

Paper code: STT-302

Max. Marks: 100

Credit: 3

Periods/week: 3 hrs/week

Contact hrs/semester: 45 hrs/semester

Objective:

This paper is focused on the study of different statistical techniques in psychometric analysis and statistical quality control, which involves the techniques for maintaining and improving the quality of products.

Unit I

10 Hours

Statistical Method in Psychology and Education - I: Types of scales: Nominal, Ordinal, Ratio and Interval, scaling of difficulty. Scaling of scores: Z- score, standard score, normalized score- Tscore, Percentile score.

Unit II

8 Hours

Statistical Method in Psychology and Education - II: Intelligence test and intelligence quotient and its uses. Reliability and validity of test scores: Concept, method of determination and effect of length and range of test.

Unit III

9 Hours

Statistical Quality Control -I Concept of SQC, process control. Causes of variation in quality, Shewhartz Control Charts technique of rational sub groups, control limits, Natural tolerance limits, Specification limits , summary of out of control criteria.

Unit IV

10 Hours

Statistical Quality Control -II : Control Charts for Variables: Construction of Mean, Range and Standard Deviation Charts. Concept of defects and defectives. Control chart for attributes: Construction of np-chart, p-chart, and c-chart.

Unit V

8 Hours

Product Control (lot control)

Sampling Plan: Acceptance Sampling for Attributes, AQL, AOQL, LTPD, process average fraction defective , consumer's risk and producer's risk, ASN, ATI, Rectifying inspection plan. Concept of Single sampling Inspection plans.

Books Recommended

Essential Readings

1. Goon, A.M., Gupta, M.K. and Dasgupta, B. (1991): Fundamentals of Statistics ,Volume II, The World Press Pvt Ltd, Calcutta
2. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Applied Statistics, S Chand & Company, New Delhi.

Reference Books

1. Montgomery, D.C. (2001): Introduction to Statistical Quality Control, John Wiley and Sons, Third Edition.
2. Spiegel M.R., (1967): Theory and Problem of Statistics, Schaum's Publishing Series.
3. Guilford, J.P. and Fruchter B.(1980): Fundamental Statistics in Psychology and Education. Mc Graw Hill.
4. Grant, E.L. (1964): Statistical Quality Control, Mc Graw Hill.

B.Sc./B.A./B.A(H)(Subsi.)
Semester III
Paper :Practical Paper

Paper code: STT-303

Max. Marks: 100

Credit: 2

Periods/week: 4hrs/week

Contact hrs/semester: 60hrs/semester

1) Test of Significance:

b) Chi-square test for variance, goodness of fit and independence of Attributes.

c) t-test for mean and difference of means (paired and unpaired cases and for correlation coefficient).

d) F-test for equality of population variances.

e) Use of Z-transformation.

2) Control Charts:

a) X, R chart.

b) p and np - chart for equal & unequal sample sizes.

c) c-chart.

Note: Practical exercises will be conducted on computer by using MS-Excel and C-language

Semester IV
Paper: Statistical Inference

Paper code: STT-401

Max. Marks: 100

Credit: 3

Periods/week: 3 hrs/week

Contact hrs/semester: 45 hrs/semester

Objective:

This paper is designed to familiarize the students with concept of statistical inference which include estimation theory

Unit I

10 Hours

Large Sample Test of Significance: Sampling for attributes and variables, tests of significance for single mean, standard deviation and proportions, tests of significance for difference between two means, standard deviations and proportions.

Unit II

8 Hours

Theory of Estimation: Point Estimation: problems of point estimation, properties of a good point estimator- unbiasedness, consistency, efficiency & sufficiency.(factorization theorem and examples)

Unit III

9 Hours

Minimum Variance Unbiased Estimation, Cramer Rao Inequality, mean square error estimation, Rao-Blackwell Theorem

Unit IV

9 Hours

Methods of point estimation: Method of Maximum Likelihood and properties of MLEs for finite sample size, statement of asymptotic property(without proof). Methods of Moments : Least Squares method

Unit V

9 Hours

Interval Estimation: Concept, confidence interval, confidence coefficient, construction of confidence interval for population mean, variance, difference of population mean when standard deviation are known and unknown of Normal Distribution.

Books Recommended

Essential readings

1. Goon, A.M., Gupta, M.K. and Dasgupta, B. Das (1991): An Outline of Statistics, Volume II, The World Press Pvt Ltd, Calcutta
2. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, S Chand & Company, New Delhi.
3. Mood Alexander M., Graybill Frankline and Boes Duane C.: Introduction to Theory of Statistics, Mc Graw Hill & Company Third Edition

Reference Books

1. Rohatgi, V.K.(1967): An Introduction to Probability Theory and Statistics, John Wiley And Sons.
2. Casella,G. and Berger, Roger L.: Statistical Inference, Duxbury Thompson Learning , Second Edition.
3. Snedecor, G.W. and Cochran, W.G. (1967): Statistical Methods, Iowa State University Press.
4. Gibbons, J. Dickinson and Chakraborty, S.: Nonparametric Statistical Inference, CRC, Fourth Edition.
5. Rohatgi, V.K. and Saleh, A.K. Md. Ehsanes (2001): An Introduction to Probability Theory and Statistics, Second Edition, John Wiley and Sons.

B.Sc./B.A./B.A(H)(Subsi.)
Semester IV
Paper: Statistical Applications in Society and Industry

Paper code: STT-402

Max. Marks: 100

Credit: 3

Periods/week: 3 hrs/week

Contact hrs/semester: 45 hrs/semester

Objective:

This paper is focused on the study of Vital statistics, Index numbers .Vital Statistic deals with laws of human mortality, morbidity and fertility. Role of index number is in formulation of executive decisions.

Unit I

10 Hours

Vital Statistics - I: Meaning, definition and utility. Sources of demographic data- census, registration. Indices of mortality. Measurement of mortality, crude death rate and standardization death rates .

Unit II

8 Hours

Indices of fertility, Measurement of fertility – crude birth rate, general fertility rate. Age- specific fertility rate, total fertility rate. Gross and Net Reproduction Rates.

Unit III

10 Hours

Vital Statistics - II: Stationary and stable population, concept and determination of the rate of increase in a stable population.

Life table: Construction of life table from graduated rates of mortality and evaluation of probabilities of survival and death from a life table.

Unit IV

8 Hours

Index Number – I: Meaning and uses of index numbers, problem in the construction of index numbers, price relatives, quantity and value relatives. Fixed base and chain base index numbers, use of averages. Weighted and unweighted index numbers- Laspeyers, Paasche's, Marshall-Edgeworth and Fisher's ideal index numbers, Dorbish , Kelly's fixed base index numbers.

Unit V

9 Hours

Index Number – II : Test for index numbers: Unit test, Factor and Time Reversal test, Circular test. Base shifting, splicing and deflating. Consumer Price Index numbers, Construction of cost of living index and Whole-sale price index.

Books Recommended

Essential readings

1. Goon, A.M., Gupta, M.K. and Dasgupta, B. (1991): Fundamentals of Statistics, Volume II, The World Press Pvt Ltd, Calcutta
2. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Applied Statistics, S Chand & Company, New Delhi

Reference Books

1. Croxton, F.E. and Cowden, D.J. (1969): Applied General Statistics, Prentice Hall Of India
2. Srivastava, O.S.: A Textbook of Demography, Vikas Publishing.
3. Gupta, O.P.: Mathematical Statistics, Kedarnath Publication, Meerut
4. Shrinivasan, K. and Srinivasan, K.: Basic Demographic Techniques and Applications.

Semester IV
Paper: Practical Paper

Paper code: STT-403

Max. Marks: 100

Credit: 2

Periods/week: 4hrs/week

Contact hrs/semester: 60 hrs/semester

1) Vital Statistics:

a) CDR, CBR, Age specific death rates, standardized death rates.

b) GFR, ASFR, TFR.

c) Crude rate of natural increase GRR, NRR.

d) Life table and finding out certain values with its help.

2) Economic Statistics:

a) Laspeyres, Paasche's and Fisher's Index Numbers.

b) Fixed base and chain base index number.

c) Cost of Living Index Numbers

3) Large sample tests for mean and proportions for one and two sample problems.

Note: Practical exercises will be conducted on computer by using MS-Excel and C-language

Semester -V
Paper: Testing Of Hypothesis and Applied Statistics

Paper code: STT-501

Max. Marks: 100

Credit: 3

Periods/week: 3hrs/week

Contact hrs/semester: 45 hrs/semester

Objective:

This paper is designed to familiarize the students with concept of testing and Non- Parametric Inference and In Time series analysis we will study about different trends and various methods useful in the determination of trends.

Unit I

9 Hours

Statistical Hypothesis: Definition, Simple and Composite hypotheses, Null and Alternative Hypotheses, Power and size of the test, and critical region
Neyman Pearson Lemma and its application for finding BCR. BCR in case of Binomial, Poisson

Unit II

9 Hours

BCR in case of Normal and Exponential Populations. Definition of order statistics, distributions of range and median (when n is odd)

Unit III

9 Hours

Non Parametric Tests: Definition, merits and limitations, Sign test for univariate and bivariate distributions, Run test and Median test for small and large samples.

Unit IV

9 hours

Demand Analysis: Demand and supply, law of demand and supply. Elasticity of demand: Price, Income and Cross elasticity.. Engel's curve and Engel's law, Pareto's law of income.

Unit V

9 hours

Time Series Analysis- Definition and its different components, additive and multiplicative models. Different methods of determining trend and seasonal fluctuations, their merits and demerits.

Books Recommended

Essential readings

1. Goon, A.M., Gupta, M.K. and Dasgupta, B. Das (1991): An Outline of Statistics, Volume II, The World Press Pvt Ltd, Calcutta
2. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, S Chand & Company, New Delhi.
3. Mood Alexander M., Graybill Frankline and Boes Duane C.: Introduction to Theory of Statistics, Mc Graw Hill & Company Third Edition

Reference Books

1. Rohatgi, V.K.(1967): An Introduction to Probability Theory and Statistics, John Wiley And Sons.
2. Casella,G. and Berger, Roger L.: Statistical Inference, Duxbury Thompson Learning , Second Edition.
3. Snedecor, G.W. and Cochran, W.G. (1967): Statistical Methods, Iowa State University Press.
4. Gibbons, J. Dickinson and Chakraborty, S.: Nonparametric Statistical Inference, CRC, Fourth Edition.
5. Rohatgi, V.K. and Saleh, A.K. Md. Ehsanes (2001): An Introduction to Probability Theory and Statistics, Second Edition, John Wiley andSons.

B.Sc./B.A./B.A(H)(Subsi.)
Semester-V
Paper: Optimization Technique

Paper code: STT-502

Max. Marks: 100

Credit: 3

Periods/week: 3hrs/week

Contact hrs/semester: 45 hrs/semester

Objective:

This paper aims at teaching the students various optimization techniques and to introduce them with the concept of operational research.

Unit I

9 Hours

Linear Programming: History and scope of operation research limitations and advantages concept of basis, basic feasible solutions, convex sets and extreme points. Definition of General L.P.P., formulation problems of L.P.P,

Unit II

9 Hours

Graphical Method of solving L.P.P. ,bounded and unbounded solutions, Simplex Method: Theory of Simplex Method, M-Charne's simplex method. . Degeneracy in linear programming.

Unit III

9 Hours

Two-Phase simplex method, Duality in linear programming. Assignment problem

Unit IV

10 Hours

Transportation Problem: North West Corner rule, Least-Cost method, and Vogel's approximation method(VAM) to find the starting solution (initial basic feasible solution). Procedure to find the optimal solution using MODI method.

Unit V

8 Hours

Theory of games: introduction , description and characteristics of game theory,two person zero sum game ,solution of pure and mixed strategy problems-principle of dominance.solution of mix game by linear programming method.

Books Recommended

Essential readings

- 1) Taha, H.A. (1998): Operation Research: An Introduction, Prentice Hall of India Ltd.
- 2) Sharma, S.D. (1997): Operation Research, Kedar nath Ramnath and Co. (Publishers)
3. Khandelwal R.S.: Quantitative technique

Reference Books

- 1) Garvin, W.W.(1960): Introduction to Linear Programming, McGraw Hill.
- 2) Rao, S.S.(1984): Optimization Technique and Applications, Wiley Eastern.

.B.Sc./B.A./B.A (H)(Subsi.)
Semester V
Practical Paper

Paper code: STT-503

Max. Marks: 100

Credit: 2

Periods/week: 4 hrs/week

Contact hrs/semester: 60 hrs/semester

1) i) Measurement of Trend by method of:

a) Moving Averages.

b) Curve fitting by least squares.

ii) Measurement of seasonal fluctuations:

a) Ratio to Trend

b) Ratio to Moving Averages.

c) Link Relative Method.

2) Non-Parametric Tests: Sign, Run, Median Tests (for large samples).

3) Linear Programming Problem

i) Graphical Method.

ii) Simplex Method (Big M and Two Phase).

iii) Duality in L.P.P.

iv) Degeneracy in L.P.P.

4) Transportation Problem

i) North-West Corner Rule

ii) Least-Cost Method

iii) Vogel's Approximation Method.

5) Assignment Problem.

6) Problems based on Game Theory: two person zero sum game

Note: Practical exercises will be conducted on computer by using MS-Excel and SPSS.

B.Sc./B.A./B.A(H)(Subsi.)
Semester VI
Paper :Sample Survey

Paper code: STT-601

Max. Marks: 100

Credit: 3

Periods/week: 3hrs/week

Contact hrs/semester: 45 hrs/semester

Objective:

Application in different domains This paper is aimed at teaching the students various sampling techniques and their.

Unit I

8 Hours

Concept of population and sample, need for sampling, census and sample surveys. Advantages of sample survey over complete enumeration. Principal steps in a sample survey. Sampling and Non-sampling errors.

Unit II

9 Hours

Principles of Sample survey, Probability and No probability Sampling, Concept of Sampling Design Method of drawing a random sample from a finite population, accuracy and precision of an estimator. Estimation of sample size for a specified precision

Unit III

10Hours

Simple Random Sampling- Simple random Sampling with and without replacement. Probability of selecting any specified unit in the sample, variance of the estimate of population mean and population total. Estimation of the standard error of the estimate.

Unit IV

8 Hours

Stratified random sampling: Its advantages. Estimation of the population mean and its variance, optimum and proportional allocation and their comparisons with Simple Random Sampling without Replacement.

Unit V

10 Hours

Systematic Sampling and its advantages and disadvantages, variance of the estimated mean, comparison of systematic sampling with Simple and Stratified Random Sampling. for population with linear trend. Cluster Sampling with equal size clusters and its advantages and disadvantages, estimation of population mean. Variance and variance estimator of the estimated population mean

Books Recommended

Essential readings

1. Goon, A.M. Gupta, M.K. and Dasgupta, B. (2001): Fundamentals of Statistics, Vol II, The World Press Pvt Ltd , Calcutta, VIIth Edition,
2. Gupta ,S.C. & .Kapoor,V.K: Fundamentals of Applied Statistics,Sultan Chand & Sons, New Delhi.

Reference Books

1. Cochran, William G. (1984): Sampling Techniques, Wiley Eastern Limited, Third Edition.
2. Singh, Daroga and Chaudhary, F.S.(2002) : Theory and Analysis of Sample Survey Designs, New Age International Publisher.
3. Murthy, M.N.: Sampling Theory and Methods.
4. Sukhatme, et al.: Sampling Theory of Surveys with Applications, Piyush Publications, IInd Edition.
5. Mukhopadhyay, P. (2007): Survey Sampling, Narosa Publishing House..

Semester VI
Paper: Analysis of Variance and Design of Experiments

Paper code: STT-602

Max. Marks: 100

Credit: 3

Periods/week: 3hrs/week

Contact hrs/semester: 45 hrs/semester

Objective:

This paper aims at teaching the students about Analysis of Variance and Design of Experiment.

Unit I

8 Hours

Analysis of Variance - I: Linear Model and its different types (only introduction). Concept of ANOVA (i).One-way classified data.(ii)Two-way classification with one observation per cell. Fixed effect models of (i) and (ii) and the assumptions involved. Effects of violation of assumptions made in ANOVA.

Unit II

9 Hours

Analysis of Variance – II: Estimation of treatment effects and treatment differences. Expectation of sum of squares, variance of the estimates for both one-way and two-way classified data and critical difference.

Unit III

9 Hours

Design of Experiments – I: Need for design of experiments, Meaning of experiment, experimental unit, treatment, field, block, experimental error, precision, uniformity trials. Fundamental principles of design of experiments- replication, randomization and local control, Efficiency of design choice of size and shape of plots and blocks.

Unit IV

10 Hours

Design of Experiments – II: Basic designs(with one observation per cell and fixed effects model)- Completely Randomized Design, Randomized Block Design - Analysis of these designs, standard error of treatment differences, efficiency of RBD over CRD, their advantages , disadvantages and usages. Missing Plot Techniques, Estimation of single missing value in RBD

Unit V

9 Hours

Design of Experiments – III: Latin Square Design – Its analysis, least square estimates, expectation of sum of squares, efficiency of LSD over CRD and RBD. Estimators of single missing value in LSD. Factorial experiments- 2² experiments, main effects, interaction effects and their analysis.

Books Recommended

Essential readings

1. Goon, A.M. Gupta, M.K. and Dasgupta, B. (2001): Fundamentals of Statistics (Volume II), The World Press Pvt Ltd, Kolkata, VII Edition,
2. Gupta, S.C. & Kapoor, V.K: Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi.
3. Das, M.N. and Giri, N.C. (2002): Design and Analysis of Experiments, New Age International Publisher, Second Edition.

Reference Books

1. Joshi, D.D. (2003): Linear Estimation and Design of Experiments, New Age International Publisher.
2. Montgomery D.C.: Design and Analysis of Experiments, Sixth Edition, Wiley Eastern Ltd. Limited
3. Cochran, W.G. and Cox, G.M.(1957): Experimental Design, Asia Publishing House.

**B.Sc./B.A./B.A(H)(Subsi.)
Semester VI
Practical Paper**

Paper code: STT-603

Max. Marks: 100

Credit: 2

Periods/week: 4 hrs/week

Contact hrs/semester: 60 hrs/semester

1) Analysis of Variance and Design of Experiments:

ii) One-Way and Two-Way classifications.

iii) C.R.D.

iv) R.B.D.

v) L.S.D

2) Missing Plot Technique for one missing observation in R.B.D. and L.S.D.

3) One project based on statistical analysis of primary/secondary data collected by students,

4) Sample Surveys: To draw a simple random sample (SRS) with & without replacement to obtain an estimate of the population mean along with estimate of their variances. To compare the efficiency of SRSWOR with respect to SRSWR.

5) To draw all the possible samples by **SRS** – technique and to show that expected value of the sample mean equals the population mean and to show the expected value of sample mean square is population mean square.

6) Stratified Sampling:

i) Estimate the sample sizes by proportional allocation and Neyman's Optimum Allocation.

ii) Estimate the mean of the population under the above scheme.

iii) Calculation of the sampling variance.

iv) Computation of relative efficiencies of the allocation scheme among themselves as well as with SRS.

7) Systematic Sampling and its comparison with SRS and Stratified Sampling.

8) Cluster Sampling

Note: Practical exercises will be conducted on computer by using Analysis Tool Pack.