

Telangana University
B.A/B.Sc. I Year I Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of I Year I Semester)
Paper-I: Descriptive Statistics and Probability (DSC-2A)
(4 HPW with 4 Credits and 100 Marks)

UNIT –I

Descriptive Statistics: Concept of primary and secondary data. Methods of collection and editing of primary data. Designing a questionnaire and a schedule. Sources and editing of secondary data. Classification and tabulation of data. Measures of central tendency (mean, median, mode, geometric mean and harmonic mean) with simple applications. Absolute and relative measures of dispersion (range, quartile deviation, mean deviation and standard deviation) with simple applications. Importance of moments, central and non-central moments, and their inter relationships, Sheppard's corrections for moments for grouped data. Measures of skewness based on quartiles and moments and kurtosis based on moments with real life examples.

UNIT-II

Probability: Basic concepts in probability - deterministic and random experiments, trial, outcome, sample space, event, and operations of events, mutually exclusive and exhaustive events, and equally likely and favorable outcomes with examples. Mathematical, statistical and axiomatic definitions of probability with merits and demerits. Properties of probability based on axiomatic definition. Conditional probability and independence of events. Addition and multiplication theorems for n events. Boole's inequality and Bayes' theorem. Problems on probability using counting methods and theorems.

UNIT-III

Random Variables: Definition of random variable, discrete and continuous random variables, functions of random variables, probability mass function and probability density function with illustrations. Distribution function and its properties. Transformation of one-dimensional random variable (simple 1-1 functions only). Notion of bivariate random variable, bivariate distribution and statement of its properties. Joint, marginal and conditional distributions. Independence of random variables.

UNIT-IV

Mathematical Expectation: Mathematical expectation of a function of a random variable. Raw and central moments and covariance using mathematical expectation with examples.

Addition and multiplication theorems of expectation. Definition of moment generating function (m.g.f), cumulant generating function (c.g.f), probability generating function (p.g.f) and characteristic function (c.f) and statements of their properties with applications. Chebyshev's and Cauchy-Schwartz's inequalities and their applications.

List of reference books:

1. Charles M. Grinstead and Laurie Snell, J: Introduction to Probability, American Mathematical Society.
2. Willam Feller: Introduction to Probability theory and its applications. Volume – I, Wiley.
3. V.K.Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
4. Goon A M, Gupta M K, Das Gupta B: Fundamentals of Statistics ,Vol-I, the World Press Pvt. Ltd., Kolakota.
5. Hoel P.G: Introduction to mathematical statistics, Asia Publishing house.
6. M. Jagan Mohan Rao and Papa Rao: A Text book of Statistics Paper-I.
7. Sanjay Arora and Bansi Lal: New Mathematical Statistics, Satya Prakashan, New Delhi.
8. Hogg.Tanis. Rao: Probability and Statistical Inference. 7th edition. Pearson.
9. Sambhavyata Avadhi Siddantalu—TeluguAcademy.
- 10.Sahasambandham- Vibhajana Siddantamulu – TeluguAcademy.
- 11.K.V.S. Sarma: Statistics Made Simple: do it yourself on PC. PHI.
- 12.Gerald Keller: Applied Statistics with Microsoft excel. Duxbury, Thomson Learning.
- 13.Levine, Stephen, Krehbiel, Berenson: Statistics for Managers using Microsoft Excel 4th edition. Pearson Publication.
14. Abraham Kendall and Baker: Discrete Mathematics for Computer Science.

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Telangana University
B.A/B.Sc. I Year II Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of I Year II Semester)
Paper-II: Probability Distributions (DSC-2B)
(4 HPW with 4 Credits and 100 Marks)

UNIT-I

Discrete Distributions: Uniform, Bernoulli, Binomial, Poisson, Negative binomial, Geometric and Hyper-geometric (mean and variance only) distributions. Their applications and uses.

UNIT-II

Properties of these distributions such as m.g.f, c.g.f., p.g.f., c.f., and moments up to fourth order and their real life applications. Reproductive property wherever exists. Binomial approximation to Hyper-geometric, Poisson approximation to Binomial and Negative binomial distributions.

UNIT-III

Continuous distributions: Rectangular and Normal distributions. Normal distribution as a limiting case of Binomial and Poisson distributions. Exponential, Gamma, Beta of two kinds (mean and variance only) and Cauchy (definition and c.f. only) distributions.

UNIT-IV

Properties of these distributions such as m.g.f., c.g.f., c.f., and moments up to fourth order, their real life applications and reproductive property wherever exists. Statement and applications of weak law of large numbers, Strong law of large numbers and central limit theorem for identically and independently distributed (i.i.d) random variables with finite variance.

List of reference books:

1. Willam Feller: Introduction to Probability theory and its applications. Volume-I, Wiley.
2. V.K. Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics, Sultan Chand& Sons, New Delhi.

3. Goon A M, Gupta M K, Das Gupta B : Fundamentals of Statistics, Vol-I, The World Press Pvt. Ltd., Kolakota.
4. Hoel P.G: Introduction to mathematical statistics, Asia Publishing house.
5. M. Jagan Mohan Rao and Papa Rao: A Text book of Statistics Paper-I.
6. Sanjay Arora and Bansilal: New Mathematical Statistics : Satya Prakashan, New Delhi.
7. Hogg, Tanis. Rao: Probability and Statistical Inference. 7th edition. Pearson.
8. Sambhavyata Avadhi Siddantalu—TeluguAcademy.
9. Sahasambandham-Vibhajana Siddantamulu – TeluguAcademy.
10. K.V.S. Sarma: Statistics Made Simple: do it yourself on PC. PHI.
11. Gerald Keller: Applied Statistics with Microsoft excel. Duxbury, Thomson Learning.
12. Levine, Stephen, Krehbiel, Berenson: Statistics for Managers using Microsoft Excel 4th edition. Pearson Publication.
13. Abraham Kendall and Baker: Discrete Mathematics for Computer Science.
14. Charles M. Grinstead and Laurie Snell, J: Introduction to Probability, American Mathematical Society.

Telangana University
B.A/B.Sc. II Year III Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of II Year III Semester)
Paper-III: Statistical Methods (DSC-2C)
(4 HPW with 4 Credits and 100 Marks)

UNIT-I

Population correlation coefficient and its properties. Bivariate data, scattered diagram, sample correlation coefficient, computation of correlation coefficient for grouped data.

Correlation ratio, Spearman's rank correlation coefficient and its properties. Principle of least squares, simple linear regression, correlation verses regression, properties of regression coefficients. Concepts and computation of Partial and Multiple correlation coefficients (for 3 variables only).

UNIT-II

Fitting of quadratic and power curves. Concepts of partial and multiple correlation coefficients (only for three variables). Analysis of categorical data, independence and association and partial association of attributes, various measures of association (Yule's) for two way data and coefficient of contingency (Pearson and Tcherprow), coefficient of colligation.

UNIT-III

Concepts of population, parameter, random sample, statistic, sampling distribution and standard error. Standard error of sample mean(s) and sample proportion(s). Exact sampling distributions- Statement and properties of χ^2 , t and F distributions and their interrelationships. Independence of sample mean and variance in random sampling from normal distributions.

UNIT-IV

Point estimation of a parameter, concept of bias and meansquare error of an estimate. Criteria of good estimator - consistency, unbiasedness, efficiency and sufficiency with examples. Statement of Neyman's Factorization theorem, derivations of sufficient statistics in case of Binomial, Poisson, Normal and Exponential (one parameter only) distributions. Estimation by method of moments, Maximum likelihood (ML), statements of asymptotic properties of MLE. Concept of interval estimation. Confidence intervals of the parameters of normal population by Pivot method.

List of Reference Books:

1. V.K. Kapoor and S.C. Gupta: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Goon A M, Gupta M K, Das Gupta B :Outlines of Statistics, Vol-II, The World Press Pvt. Ltd., Kolakota.
3. Hoel P.G: Introduction to mathematical statistics, Asia Publishing house.
4. Sanjay Arora and Bansilal: New Mathematical Statistics, Satya Prakashan, New Delhi.
5. Hogg and Craig : Introduction to Mathematical statistics. Prentice Hall.
6. Siegal, S.,and Sidney: Non-parametric statistics for Behavioral Science. McGraw Hill.
7. Gibbons J.D and Subhabrata Chakraborti: Nonparametric Statistical Inference. Marcel Dekker.
8. Parimal Mukhopadhyay: Mathematical Statistics. New Central Book agency.
9. Conover : Practical Nonparametric Statistics. Wiley series.
10. V.K.Rohatgi and A.K.Md. Ehsanes Saleh: An introduction to probability and statistics. Wiley series.
11. Mood A M, Graybill F A, Boe's D C: Introduction to theory of statistics. TMH.
12. Paramiteya mariyu aparameteya parikshalu. Telugu Academy.
13. K.V.S. Sarma: Statistics Made simple do it yourself on PC. PHI.
14. Gerald Keller: Applied Statistics with Microsoft excel. Duxbury. Thomson Learning.
15. Levin, Stephan, Krehbiel, Berenson: Statistics for Managers using Microsoft Excel. 4th edition. Pearson Publication.
16. Hogg, Tanis, Rao. Probability and Statistical Inference. 7th edition. Pearson Publication.
17. Milton and Arnold (fourth Edition): Introduction to Probability and statistics, Tata Mc graw Hill Publication.

Telangana University
B.A/B.Sc. II Year III Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of II Year III Semester)
SEC-1 : Computation using MS-Excel
(2 HPW with 2 Credits and 50 Marks)

UNIT –I

Introduction to MS-Excel sheet, Statistical Functions in it and writing formula in the Excel sheet. Computation of the Statistical functions FACT, MMULT, MINV, GCD, LCM, LN, LOG10, MOD, POWER, ROUND, SQRT, SUMPRODUCT, TRUNK, AVEDEV, AVERAGE, AVERAGEIF, AVERAGEIFS, GEOMEAN, HARMEAN, MEDIAN, SMALL, MODE, PERMUT, PERCENTILE, QUARTILE, DEVSQ, COVAR, STANDARDIZE, STDEV, SKEW, KURT and interpretation.

UNIT-II

Computation of the Statistical functions RSQ, CHIDIST, CHIINV, CHITEST, FDIST, FINV, FORECAST, CONFIDENCE, NORMDIST, NORMINV, NORMSDIST, NORMSINV, RANK, TDIST, TINV, TREND, TRIMMEAN, TTEST, VAR, ZTEST and interpretation.

List of reference books:

1. K.V.S. Sarma: Statistics Made Simple: do it yourself on PC. PHI.
2. Gerald Keller: Applied Statistics with Microsoft excel. Duxbury, Thomson Learning.
3. Levine, Stephen, Krehbiel, Berenson: Statistics for Managers using Microsoft Excel 4th edition. Pearson Publication.

Telangana University
B.A/B.Sc. II Year IV Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of II Year IV Semester)
Paper-IV: Inference (DSC-2D)
(4 HPW with 4 Credits and 100 Marks)

UNIT - I

Concepts of statistical hypotheses, null and alternative hypothesis, critical region, two types of errors, level of significance and power of a test. One and two tailed tests, test function (non-randomized and randomized). Neyman - Pearson's fundamental lemma for Randomized tests. Examples in case of Binomial, Poisson, Exponential and Normal distributions and their powers. Use of central limit theorem in testing.

UNIT - II

Large sample tests and confidence intervals for mean(s), proportion(s), standard deviation(s), and correlation coefficient(s).

UNIT – III

Tests of significance based on χ^2 , t and F. χ^2 -test for goodness of fit and test for independence of attributes. Definition of order statistics and statement of their distributions.

UNIT – IV

Non-parametric tests - their advantages and disadvantages, comparison with parametric tests. Measurement scale - nominal, ordinal, interval and ratio. One sample runs test, sign test and Wilcoxon-signed rank tests (single and paired samples). Two independent sample tests: Median test, Wilcoxon –Mann-Whitney U test, Wald Wolfowitz's runs test.

List of Reference Books:

1. V. K. Kapoor and S. C. Gupta: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Goon AM, Gupta MK, Das Gupta B : Outlines of Statistics , Vol-II, the World Press Pvt. Ltd., Kolakota.
3. Hoel P.G: Introduction to mathematical statistics, Asia Publishing house.

4. Sanjay Arora and Bansilal: New Mathematical Statistics Satya Prakashan, New Delhi.
5. Hogg and Craig: Introduction to Mathematical statistics. Prentice Hall.
6. Siegal, S. and Sidney: Non-parametric statistics for Behavioral Science. McGraw Hill.
7. Gibbons J.D and Subhabrata Chakraborti: Nonparametric Statistical Inference. Marcel Dekker.
8. ParimalMukhopadhyay: Mathematical Statistics. New Central Book agency.
9. Conover : Practical Nonparametric Statistics. Wiley series.
- 10.V.K.Rohatgi and A.K.Md. Ehsanes Saleh: An introduction to probability and statistics.Wiley series.
- 11.Mood AM, Graybill FA, Boe's DC.: Introduction to theory of statistics. TMH
- 12.Paramiteya mariyu aparameteya parikshalu. Telugu Academy.
- 13.K.V.S. Sarma: Statistics Made simple do it yourself on PC. PHI.
- 14.Gerald Keller: Applied Statistics with Microsoft excel. Duxbury. Thomson Learning
- 15.Levin, Stephan, Krehbiel, Berenson: Statistics for Managers using Microsoft Excel.4th edition. Pearson Publication.
- 16.Hogg, Tanis, Rao. Probability and Statistical Inference.7th edition. Pearson Publication.
- 17.Milton and Arnold(fourth Edition):Introduction to Probability and statistics, Tata Mcgraw hill Publication.

Telangana University
B.A/B.Sc. II Year IV Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of II Year IV Semester)
SEC-2 : Statistical Computation Using C-Programming
(2 HPW with 2 Credits and 50 Marks).

UNIT – I

Components of C language, Structure of a C program. Data type; Basic data types, Enumerated data types, Derived data types. Variable declaration; Local, Global, Parametric variables, Assignment of variables. Numeric, Character, real and string constants. Arithmetic relation and logical operators. Assignment operators. Increment and Decrement operators, conditional operators, Bitwise operators. Type modifiers and expressions, writing and interpreting expressions, using expressions in statements. Basic input/output.

Control statements, conditional statements, if..else, Nesting of if..else, elseif ladder, switch statements, loops in C: for, while, do.., while loops. Break, continue, exit(), goto and label declarations.

One dimensional and two dimensional arrays. Functions, classification of functions, functions definition and declaration, assessing a function, return statement.

UNIT-II

Writing C program for the formation of frequency distribution table for the given raw data by setting the number of classes and class width using functions. Writing C program for the Computation of Arithmetic Mean, Median and Mode, Standard deviation, Variance and coefficient of variation, Moments, Skewness and Kurtosis for raw data and for grouped data using functions. Writing C program for the computation of Karl-Pearson's coefficient of correlation and obtaining Regression lines Y on X and X on Y.

List of Reference Books:

1. C Programming Language (2nd Edition) By B. W. Kernighan & D. M. Ritchie.
2. Programming with C by Schaum Series.
3. Let us C by Yashwant Kanitker.

(Examination at the end of III Year V Semester)

Paper-V: Sampling Theory, Time series, Index Numbers and Demand Analysis (DSC-2E)
(3 Hours Per Week with 3 Credits and 75 Marks)

UNIT-I

Sample Surveys: Concepts of population, sample, sampling unit, parameter, statistic, sample frame and standard error. Principal steps in sample surveys - need for sampling, census versus sample surveys, sampling and non-sampling errors, sources and treatment of non-sampling errors, advantages and limitations of sampling.

Sampling Methods: Types of sampling: Subjective, probability and mixed sampling methods. Methods of drawing random samples with and without replacement. Estimates of population mean, total, and proportion, their variances and the estimates of variances in Simple Random Sampling With and Without Replacement

UNIT-II

Estimates of population mean, total, and proportion, their variances and the estimates of variances in the following methods.

- Stratified Random Sampling with Proportional and Neyman allocation, and Systematic Sampling when $N = nk$.
- Comparison of relative efficiencies. Advantages and disadvantages of SRS, Stratified and Systematic sampling methods.

Time series: Time series and its components with illustrations, additive, multiplicative and mixed models. Determination of trend by least squares and moving average methods. Growth curves and their fitting with reference to Modified exponential, Gompertz and Logistic curves. Determination of seasonal indices by Ratio to moving average, ratio to trend and link relative methods.

UNIT-III

Demand Analysis: Introduction. Demand and supply, price elasticity of supply and demand. Methods of determining demand and supply curves, Leontief's, Pigou's methods of determining demand curve from time series data, limitations of these methods. Pigou's method from time series data. Pareto law of income distribution curves of concentration.

Index Numbers: Concept, construction, uses and limitations of simple and weighted index numbers. Laspeyres's, Paasche's and Fisher's index numbers, criterion of a good index numbers, problems involved in the construction of index numbers. Fisher's index as an ideal index number. Fixed and chain base index numbers. Cost of living index numbers and wholesale price index numbers. Base shifting, splicing and deflation of index numbers.

Reference Books:

1. V.K. Kapoor and S.C. Gupta : Fundamentals of Applied Statistics. Sultan Chand
2. Parimal Mukhopadhyay : Applied Statistics, New Central Book agency.
3. Daroga Singh and Chowdhary: Theory and Analysis of Sample survey designs. Wiley Eastern.
4. M.R.Saluja : Indian Official Statistics. ISI publications.
5. B.L.Agarwal: Basic Statistics. New Age publications.
6. S.P.Gupta : Statistical Methods. Sultan Chand and Sons.
7. Anuvartita Sankhyaka Sastram – Telugu Academy.
8. Arora, Sumeet Arora, S.Arora: Comprehensive Statistical Methods. S.Chand.
9. A.M.Goon, M.K.Gupta, B. Dasgupta: Fundamentals of Statistics Vol II World Press Private Ltd., Calcutta
10. A.M.Goon, M.K.Gupta, B.Dasgupta An outline of Statistical Theory Vol II World Press Private Ltd., Calcutta 17.

Note: *Theory paper is for 60 Marks and Internal is 15 Marks*

(Examination at the end of III Year, Semester V)

GE – 1 – Basic Statistics-1 (with 2 HPW, Credits 2 and Marks 50).

UNIT-I

Origin, Importance and growth of Statistics, Collection and tabulation of data. Frequency distribution. Graphical and Pictorial representation of data. Measures of central tendency: Mean, Median and Mode their merits and demerits with examples. Partition Values: Quartiles, Deciles and percentiles and examples.

Measures of dispersion: Range and standard deviation, coefficient of variation. Central and non-Central moments, coefficient of Skewness and Kurtosis, Examples.

Unit - II

Review of permutations and combinations. Deterministic and random experiment, Sample space, event mutually exclusive, equally likely and independent events with examples. Mathematical, Statistical and axiomatic definition of probability, Addition theorem, conditional probability and multiplication theorem of probability. Statistical independence and Bayes theorem –simple examples (all theorems without proofs and only statements).

List of reference books:

1. V.K.Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi
2. GoonAM, GuptaMK, Das Gupta B : Fundamentals of Statistics , Vol-I, the World Press Pvt.Ltd., Kolakota.
3. Charles M.Grinstead and Laurie Snell, J: Introduction to Probability, American Mathematical Society

Note: *Theory paper is for 40 Marks and Internal is 10 Marks*

Telangana University
B.Sc. III Year V Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of III Year V Semester)
SEC-3: Big Data Analysis
(2 HPW with 2 Credits and 50 Marks)

UNIT I

The Rise of Big Data: What is Big Data and why does it matter; Web Data: The original Big Data; The cross section of Big Data and the value they hold;

UNIT II

Taming Big Data: The Technologies, Process and Methods: The Evolution of Analytic Scalability, The Evolution of Analytic Process, The Evolution of Analytic Tools and Methods.

Text Book:

1. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012. (Chapters 1 to 6).

Reference Books:

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Glenn J. Myatt, "Making Sense of Data", John Wiley & Sons, 2007
3. Pete Warden, "Big Data Glossary", O'Reilly, 2011.

Note: *Theory paper is for 40 Marks and Internal is 10 Marks*

Telangana University
B.A/B.Sc. III Year V Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of III Year V Semester)
SEC-3 : Statistical Computation Using SPSS
(2 HPW with 2 Credits and 50 Marks).

UNIT-I

An Overview of SPSS:

Mouse and keyboard processing, frequently –used dialog boxes, editing output, Printing results, Creating and editing a data file.

Managing Data:

Listing cases, replacing missing values, computing new variables, recording variables, exploring data, selecting cases, sorting cases, merging files.

Graphs:

Creating and editing graphs and charts including Cluster bar chart, Stem and leaf chart.

UNIT-II

Frequencies:

Frequencies, bar charts, histograms, percentiles.

Descriptive Statistics:

Measures of central tendency, variability, deviation from normality, Cross Tabulation and Chi-square analyses, the means (t-test for single sample, two independent samples, paired samples and observed correlation coefficient procedures).

Bivariate Correlation:

Bivariate Correlation, Partial Correlations (for 3 variables), Simple Linear Regression, Multiple regression analysis (for 3 Variables).

List of Reference Books:

- 1) Paul R.Kinnear and Colin D Gray –Taylor and Francis Group –Psychology press-SPSS for Windows Made Simple.

(Examination at the end of III Year V Semester)

Paper-VI A: Statistical Quality Control and Reliability (DSE-2E)

(3 Hours Per Week with 3 Credits and 75 Marks)

Unit –I

Statistical Quality Control: Importance of SQC in industry. Dimensions of quality, Statistical basis of Shewart control charts. Construction of control charts for variables (mean, range and standard deviation) and attributes (p , np with fixed and varying sample sizes) and their Interpretation.

Unit –II

Control charts for attributes (c and u charts with fixed and varying sample sizes) and their Interpretation. Construction of control charts for Natural tolerance limits and specification limits, process capability index and modified control charts.

Unit –III

Acceptance sampling plans: Concept of AQL and LTPD. Producers risk and consumer's risk Single and Double sampling plans for attributes and their OC and ASN functions. Design of single and double sampling plans for attributes using Binomial and Poisson distributions. Construction of OC and ASN functions.

Reliability: Introduction. Hazard function, Exponential distribution as life model, its memory-less property. Reliability function and its estimation.

System reliability - series, parallel and k out of N systems and their reliabilities with simple examples.

Reference Books:

1. D.C. Montgomery: Introduction to Statistical Quality Control. Wiley
2. V.K. Kapoor and S.C.Gupta L Fundamentals of Applied Statistics. Sultan Chand
3. Parimal Mukhopadhyay : Applied Statistics . New Central Book agency
4. Anuvartita Sankhyakasastram – Telugu Academy.
5. R.C.Gupta: Statistical Quality Control.
6. S.K.Sinha: Reliability and life testing. Wiley Eastern
7. L.S.Srinath: Reliability Engineering. Affiliated East-West Press.

Note: *Theory paper is for 60 Marks and Internal is 15 Marks*

Telangana University
B.Sc. III Year V Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of III Year V Semester)
Paper-VI B: Bio-Statistics - I (DSE-2E)
(3 HPW with 3 Credits and 75 Marks)

Unit –I

Bioassay: The purpose and structure of biological assay. Types of biological assays, Direct assays, Ratio estimates, asymptotic distributions: Feller's theorem. Regression approach to estimate dose – response and relationships.

Unit –II

Logit and Probit approaches when dose-response curve for standard preparation is unknown, quantal responses, methods of estimation of parameters, estimation of extreme quantiles, dose allocation schemes, polychotomous quantal response, estimation of points on the quantal response function.

Unit –III

Statistical Genetics: Basic terminology of genetics. Frequencies of genes and genotypes, Mendel's law, Hardy-Weinberg equilibrium. Mating Frequencies, estimation of allele frequency (dominant / codominant cases). Multiple alleles.

Approach to equilibrium for X-linked gene, natural selection, mutation, genetic drift, equilibrium when both natural selection and mutation are operative.

Reference Books:

1. D.J.Finney (1970): Statistical methods in Biological Assay. Charles Griffin.
2. Govindarajulu (2000): Statistical Techniques in Bioassay. Karger Publishers/Panther Publishers.
3. C.C.Li (1976): First course in population genetics. Boxwood press, California.
4. Falcon and Mackay (1998) : Introduction to quantitative genetics. Longman
5. J.F.Lawless: Statistical models and methods of life data. Wiley.
6. James F Crow and Motoo Kimura: An Introduction to Population Genetics Theory. Alpha edition.

Note: *Theory paper is for 60 Marks and Internal is 15 Marks*

Telangana University
B.Sc. III Year V Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of III Year V Semester)
Paper-VI C: Actuarial Statistics - I (DSE-2E)
(3 HPW with 3 Credits and 75 Marks)

Unit –I

Utility theory, insurance and utility theory, models for individual claims and their sums, survival function, curate future lifetime, force of mortality.

Unit –II

Life table and its relation with survival function examples, assumptions of fractional ages, some analytical laws of mortality select and ultimate tables.

Multiple life functions, joint life and last survivor status, insurance and annuity benefits through multiple life functions, evaluation for special mortality laws.

Unit –III

Multiple decrement models, deterministic and random survivorship groups, associated single decrement tables, central rates of multiple decrement, net single premiums and their numerical evaluations.

Distribution of aggregate claims, compound Poisson distribution and its applications.

Reference Books:

1. N.L.Bowers, H.U.Gerber, J.C.Hickman, D.A.Jones and C.J.Nesbitt (1986): Actuarial Mathematics, Society of Actuaries, Ithaca, Illinois, USA .
2. Neill,A.(1977): Life contingencies, Heineman.
3. Spurgeon E.T.(1972): Life contingencies, Cambridge University Press
4. Benjamin,B and Pollard,J.H(1980): Analysis of Mortality and other Actuarial Statistics.
5. Federation of Insurance Institutes study courses: mathematical basis of Life Assurance (Published by Federation if Insurance Institutes, Bombay).

Note: *Theory paper is for 60 Marks and Internal is 15 Marks*

Telangana University
B.A/B.Sc. III Year V Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of III Year V Semester)
Paper-VI: Elective-II-A (SQC and LPP)(DSE-2E)
(3 HPW with 3 Credits)

UNIT – I

Statistical Quality Control:

Importance of SQC in industry. Statistical basis of Shewhart control charts. Construction of control charts for variables (mean, range and standard deviation) and attributes (p, np, and c-charts with fixed and varying sample sizes). Interpretation of control charts.

UNIT- II

Natural tolerance limits and specification limits, process capability index. Concept of Six sigma and its importance.

Acceptance sampling plans: Concept of AQL and LTPD. Producers risk and consumer's risk. Single and Double sampling plans for attributes and their OC and ASN functions. Design of single and double sampling plans for attributes using Binomial and Poisson distributions.

UNIT – III

Linear Programming:

Meaning and scope of OR. Convex sets and their properties.

Definition of general LPP. Formulation of LPP. Solution of LPP by graphical method. Fundamental theorem of LPP. Simplex algorithm. Concept of artificial variables. Big –M /Penalty method and two-phase simplex methods. Concept of degeneracy and resolving it. Concept of duality, duality as LPP. Dual Primal relationship.

List of reference books:

1. Kanti Swaroop, P.K. Gupta and ManMohan: Operations Research. Sultan Chand.
2. D.C. Montgomery: Introduction to Statistical Quality Control. Wiley
3. V.K. Kapoor and S.C. Gupta: Fundamentals of Applied Statistics. Sultan Chand

4. Gass: Linear Programming. Mc Graw Hill.
5. Hadley: Linear programming. Addison-Wesley.
6. Wayne L. Winston : Operations Research. Thomson, India edition.4th edition.
7. Parimal Mukhopadhyay: Applied Statistics, New Central Book agency.
8. Anuvartita Sankhyaka sastram – Telugu Academy.
9. R.C. Gupta: Statistical Quality Control.
- 10.Taha: Operations Research: An Introduction : Mac Millan.
- 11.Parikriya Parishodhana - Telugu Academy.
- 12.O.R. Models and Methods by Chandrasekhar, Salimath and Bhupender Parashar,Univ.Press

Telangana University
B.A/B.Sc. III Year VI Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of III Year VI Semester)
Paper-VIII: Elective-II-C (Actuarial Statistics-II)(DSE-2F)
(3 HPW with 3 Credits)

UNIT – I

Elements of compound interest (nominal and effective rate of interest).

Life annuities: single payment, continuous life annuities, discrete life annuities, life annuities with monthly payments, communication functions, varying annuities, recursions and complete annuities- immediate and apportionable annuities – due.

UNIT – II

Net premiums: Continuous and discrete premiums, true monthly payment premiums, apportionate premiums, commutation functions, and accumulation type benefits.

UNIT - III

Net premium reserves: continuous and discrete net premium reserve, reserves on a semi continuous basis, reserves based on true monthly premiums, reserves on an apportionable or accounted continuous basis reserves at fractional durations.

List of reference books:

1. N.L.Bowers, H.U.Gerber, J.C.Hickman, D.A.Jones and C.J.Nesbitt (1986): Actuarial Mathematics, Society of Actuaries, Ithaca, Illinois,USA .
2. Neill,A.(1977): Life contingencies, Heineman.
3. Spurgeon E.T.(1972): Life contingencies, Cambridge University Press.
4. Benjamin,B and Pollard,J.H(1980): Analysis of Mortality and other Actuarial Statistics.
5. Federation of Insurance Institutes study courses: mathematical basis of Life Assurance F.I.21 (Published by Federation if Insurance Institutes, Bombay).

Telangana University
B.A/B.Sc. III Year VI Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of III Year VI Semester)
Paper-VII: Applied Statistics – 2 (DSC-2F)
(3 HPW with 3 Credits)

UNIT –I

Analysis of Variance and Design of Experiments:

Statement of Cochran's theorem, ANOVA – one-way, two-way classifications with one observation per cell Expectation of various sums of squares, Statistical analysis, Importance and applications of design of experiments. Principles of experimentation, Concept of Gauss-Markoff linear model with examples, Analysis of Completely randomized Design (C.R.D), Randomized Block Design (R.B.D) and Latin Square Design (L.S.D) including one missing observation, expectation of various sum of squares. Comparison of the efficiencies of above designs.

UNIT –II

Vital statistics: Introduction, definition and uses of vital statistics. Sources of vital statistics, registration method and census method. Rates and ratios, Crude death rates, age specific death rate, standardized death rates, crude birth rate, age specific fertility rate, general fertility rate, total fertility rate. Measurement of population growth, crude rate of natural increase - Pearl's vital index. Gross reproductive rate sand Net reproductive rate, Life tables, construction and uses of life tables and Abridged life tables.

UNIT –III

Demand Analysis: Introduction. Demand and supply, price elasticity of supply and demand. Methods of determining demand and supply curves, Leontief's ,Pigous's methods of determining demand curve from time series data, limitations of these methods Pigou's method from time series data. Pareto law of income distribution curves of concentration.

Official Statistics: - Functions and organization of CSO and NSSO. Agricultural Statistics, area and yield statistics. National Income and its computation, utility and difficulties in estimation of national income.

List of reference books:

1. V.K.Kapoor and S.C.Gupta : Fundamentals of Applied Statistics. Sultan Chand
2. ParimalMukhopadhyay : Applied Statistics . New Central Book agency.
3. M.R.Saluja : Indian Official Statistics. ISI publications.
4. B.L.Agarwal: Basic Statistics.New Age publications.
5. S.P.Gupta : Statistical Methods. Sultan Chand and Sons.
6. PrtirupaSidhanthamulu – Telugu Academy.
7. PrayogaRachana and Visleshana – Telugu Academy.

Telangana University
B.A/B.Sc. III Year VI Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of III Year VI Semester)
SEC-4: Data Mining
(2 HPW with 2 Credits and 50 Marks).

UNIT – I

Data Mining – Definition, Knowledge Data Discovery Techniques, Applications, Mining Frequent Patterns and Associations – Basic concepts, market basket analysis, definitions (with examples) of frequent item sets, closed item sets and association rules, Apriori algorithm for finding frequent item sets using candidate generation, generating association rules from frequent item sets, Mining multilevel association rules.

UNIT – II

Mining Time Series Data – Trend analysis. Mining on Social Networks, Mining Customer Networks on Social Networks for Viral Marketing, Mining News groups using Networks.

List of reference books:

1. Jai Wai Han and Micheline Kamber – Data Mining concepts and Techniques, Morgan Kaufmann Publishers (An imprint of Elsevier) -2006.
2. Arun K. Pujari – Data Mining Techniques, University Press -2001.

(Examination at the end of III Year, Semester VI)**GE – 2 –Basic Statistics-2 (with 2 HPW, Credits 2 and Marks 50).****Unit - I**

Definition and sample examples of random variables and distribution function, probability mass function and probability density function. Mathematical expectation and moments-simple examples.

Discrete probability distributions: Bernoulli, Binomial, Poisson. (Concept, definition, statements of mean and variance only) with real life examples.

Continuous probability distributions: Uniform, Normal and Exponential distributions (concept, definition, statements of mean, variance and other properties).

Unit - II

Empirical bivariate distributions, Covariance, Karl Pearson coefficient, Rank Correlation, Curve fitting by least squares principle. Simple linear regression.

Concept and definition of population, parameter, sample, statistic, sampling distribution and standard error.

Properties of Estimates: Unbiasedness, Consistency and Efficiency (concept and definition only), simple examples.

Concept of testing Statistical hypothesis-Definition of Null and Alternative hypothesis, Critical region, Types of errors, level of Significance and Power of a Test.

Tests of significance based on Chi-Square, t and F distributions and ANOVA (One and Two way) with examples (No mathematical derivation only methodology).

List of reference books:

1. V.K.Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi
2. GoonAM,GuptaMK, Das Gupta B : Fundamentals of Statistics , Vol-I, the World Press Pvt.Ltd.,Kolakota.
3. Charles M.Grinstead and Laurie Snell.J: Introduction to Probability, American Mathematical Society

Note: *Theory paper is for 40 Marks and Internal is 10 Marks*

Telangana University
B.Sc. III Year VI Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of III Year VI Semester)
SEC-4: Statistical Techniques in Data Mining
(2 HPW with 2 Credits and 50 Marks)

R-16

UNIT-I

Introduction: Introduction to Data mining, The nature of Data sets, Types of structure, Models and patterns, Data mining Tasks, components of data mining algorithms, The Interacting roles of Statistics and Data mining, Data mining: Dredging, snooping and fishing.

Data mining: Definitions, KDD vs Data mining, DBMS vs DM, other related areas, DM Techniques, other mining problems, Issues and challenges in Data mining,

Association Rules: What is an association rule, methods to discover association rules; Apriori Algorithm, Partition Algorithm

UNIT-II

Association Algorithms: Dynamic Item Set Counting Algorithm, FP Tree growth algorithm.

Clustering Algorithms: Introduction, Clustering Paradigm, K-Medoid Algorithm, DBSCAN

Classification Algorithms: Introduction, Nearest Neighbor methods

Decision tree Algorithms: Introduction, Pruning technique.

Reference Books:

1. David Hand, Heikki Manila and Padhraic Smyth (2012): Principles of Data Mining, PHI, New Delhi, (Text Book: Ch. 1, Ch. 2, Ch. 10.6)
2. Arun K Pujari (2013): Data Mining Techniques, University Press India private Ltd. Third Edition. (T.B-2: (T.B.2: Ch 5.4, 5.8, Ch. 6.18).

Note: *Theory paper is for 40 Marks and Internal is 10 Marks*

(Examination at the end of III Year VI Semester)

Paper-VII: Design of Experiments, Vital Statistics, Official Statistics and Business Forecasting
(DSC-2F)
(3 HPW with 3 Credits and 75 Marks)

Unit –I

Analysis of Variance and Design of Experiments : Concept of Gauss-Markoff linear model with examples, statement of Cochran's theorem, ANOVA – one-way, two-way classifications with one observation per cell Expectation of various sums of squares, Statistical I analysis, Importance and applications of design of experiments.

Principles of experimentation: Analysis of Completely randomized Design (C.R.D), Randomized Block Design (R.B.D)

Unit –II

Latin Square Design (L.S.D) including one missing observation, expectation of various sum of squares. Comparison of the efficiencies of above designs.

Official Statistics: Functions and organization of CSO and NSSO. Agricultural Statistics, area and yield statistics. National Income and its computation, utility and difficulties in the estimation of national income.

Business Forecasting: Role of forecasting in Business, Steps in Forecasting, Methods of Forecasting, Choice of a method of Forecasting, Theories of Business Forecasting, Cautions while using Forecasting Techniques.

Unit – III

Vital statistics: Introduction, definition and uses of vital statistics. Sources of vital statistics, registration method and census method. Rates and ratios, Crude death rates, age specific death rate, standardized death rates, crude birth rate, age specific fertility rate, general fertility rate, total fertility rate. Measurement of population growth, crude rate of natural increase- Pearl's vital index. Gross reproductive rate sand Net reproductive rate, Life tables, construction and uses of life tables and Abridged life tables.

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1. V.K.Kapoor and S.C.Gupta : Fundamentals of Applied Statistics. Sultan Chand
2. ParimalMukhopadhyay : Applied Statistics . New Central Book agency.
3. M.R.Saluja : Indian Official Statistics. ISI publications.
4. B.L.Agarwal: Basic Statistics. New Age publications.
5. S.P.Gupta : Statistical Methods. Sultan Chand and Sons.
6. Pratirupa Sidhanthamulu – Telugu Academy. Prayoga Rachana and Visleshana – Telugu Academy.

Note: *Theory paper is for 60 Marks and Internal is 15 Marks*

Telangana University
B.A/B.Sc. III Year VI Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of III Year VI Semester)
Paper-VIII: Elective-II-A (Operations Research)(DSE-2F)
(3 HPW with 3 Credits).

UNIT - I

Transportation Problem:

Definition of transportation problem, TPP as a special case of LPP, Initial basic feasible solutions by North-West Corner Rule, Matrix minimum methods and VAM. Optimal solution through MODI tableau and stepping stone method for balanced and unbalanced transportation problem.

Degeneracy in TP and resolving it. Concept of Transshipment problem.

UNIT - II

Assignment Problem:

Formulation and description of Assignment problem and its variations. Assignment problem as special case of TP and LPP. Unbalanced assignment problem, traveling salesman problem. Optimal solution using Hungarian method.

UNIT - III

Sequencing Problems:

Problem of Sequencing. Optimal sequence of N jobs on two and three machines without passing.

Reliability: Introduction. Hazard function, Exponential distribution as life model, its memory-less property. Reliability function and its estimation. System reliability - series, parallel and k out of N systems and their reliabilities.

List of reference books:

1. KantiSwaroop, P. K., Gupta and ManMohan: Operations Research. Sultan Chand.
2. S.K.Sinha: Reliability and life testing. Wiley Eastern
3. L.S.Srinath: Reliability Engineering. Affiliated East-West Press.
4. Wayne L. Winston : Operations Research. Thomson, India edition. 4th edition.
5. Taha: Operations Research: An Introduction : Mac Millan.
6. O.R.Models and Methods by Chandrasekhar Salimath and Bhupender Parashar University Press.

(Examination at the end of III Year VI Semester)
Paper-VIII A: Operations Research (DSE-2F)
(3 Hours Per Week with 3 Credits and 75 Marks)

Unit –I

Operations Research: Meaning and scope of OR. Convex sets and their properties. Definition of general LPP. Formulation of LPP. Solution of LPP by graphical method. Statements of Fundamental theorem of LPP and other related theorems. Simplex algorithm.

Concept of artificial variables. Big –M /Penalty method and two-phase simplex methods. Concept of degeneracy and resolving it.

Unit –II

Concept of duality of LPP. Dual Primal relationship, Statement of Fundamental Theorem of Duality.

Definition of transportation problem, TPP as a special case of LPP, Initial basic feasible solutions by North-West Corner Rule, Matrix minimum method and VAM. Optimal solution through MODI tableau and stepping stone method for balanced and unbalanced transportation problem.

Unit –III

Degeneracy in TP and resolving it. Concept of Transshipment problem.

Formulation and description of Assignment problem and its variations. Assignment problem as special case of TP and LPP. Unbalanced assignment problem, optimal solution using Hungarian method and traveling salesman problem and its solution.

Problem of Sequencing. Optimal sequence of N jobs on two and three machines without passing.

Reference Books:

1. Kanti Swaroop, P.K.Gupta and ManMohan: Operations Research. Sultan Chand.
2. S.D. Sharma: Operations Research
3. J.K. Sharma: Operations Research Theory and Applications. Macmillan Publishers India LTD.
4. Parikriya Parishodhana - Telugu Academy.

Note: *Theory paper is for 60 Marks and Internal is 15 Marks*

Telangana University
B.Sc. III Year VI Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of III Year VI Semester)
Paper-VIII B: Bio-Statistics - II (DSE-2F)
(3 HPW with 3 Credits and 75 Marks)

R-16

Unit –I

Survival Analysis: Survival functions and hazard rates. Types of censoring and likelihood in these cases. Life distributions - Exponential, Gamma, Weibull, Lognormal, and Pareto. Linear failure rate. Point estimation, confidence intervals, scores, likelihood ratio, MLE, tests for these distributions.

Unit –II

Life tables, failure rates, mean residual life and their elementary properties, Ageing classes and their properties, Bathtub failure rate. Estimation of survival function. Actuarial estimator, Kaplan-Meier estimator, estimation under the assumption of IFR/ DFR. Tests of exponentiality against nonparametric classes, total time on test.

Unit –III

Introduction to modern epidemiology, principles of epidemiological investigation, surveillance and disease monitoring in populations.

Epidemiologic measures: Organizing and presenting epidemiologic data, measures of disease frequency, measures of effect and association, causation and casual inference.

Design and analysis of epidemiologic studies. Types of studies, case-control studies, cohort studies, cross over design, regression models for the estimation of relative risk.

Meta –analysis, quantitative methods in screening.

Reference Books:

1. Cox.D.R. and Oakes.D (1984): analysis of survival data. Chapman and Hall.
2. Miller, R.G. (1981): Survival analysis. John wiley.
3. Anil gore and S.A.Paranjpe (2000). A course in mathematical and statistical ecology. Kulwer Academic Publishers.
4. Rielon E.C (1977): An introduction to Mathematical Ecology. Wiley.
5. J.F.Lawless: Statistical models and methods of life data. Wiley.
6. James F Crow and Motoo Kimura: An Introduction to Population Genetics Theory. Alpha edition.
7. Abraham M.Lilienfeld : Foundations of Epidemiology. Oxford University Press.

Note: *Theory paper is for 60 Marks and Internal is 15 Marks*

Telangana University
B.Sc. III Year VI Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of III Year VI Semester)
Paper-VIII C: Actuarial Statistics - II (DSE-2F)
(3 HPW with 3 Credits and 75 Marks)

Unit –I

Elements of compound interest (nominal and effective rate of interest)

Life annuities: single payment, continuous life annuities, discrete life annuities, life annuities with monthly payments, communication functions.

Unit –II

Varying Life annuities, recursions and complete annuities- immediate and apportionable annuities –due.

Net premiums: Continuous and discrete premiums, true monthly payment premiums, apportionate premiums, commutation functions, and accumulation type benefits.

Unit –III

Net premium reserves: continuous and discrete net premium reserve, reserves on a semi continuous basis, reserves based on true monthly premiums, reserves on an apportionable or accounted continuous basis reserves at fractional durations.

Reference Books:

1. N.L.Bowers, H.U.Gerber, J.C.Hickman, D.A.Jones and C.J.Nesbitt (1986): Actuarial Mathematics, Society of Actuaries, Ithaca, Illinois, USA .
2. Neill,A.(1977): Life contingencies, Heineman.
3. Spurgeon E.T.(1972): Life contingencies, Cambridge University Press
4. Benjamin,B and Pollard,J.H(1980): Analysis of Mortality and other Actuarial Statistics.
5. Federation of Insurance Institutes study courses: mathematical basis of Life Assurance
8. F.I.21 (Published by Federation if Insurance Institutes, Bombay).

Note: *Theory paper is for 60 Marks and Internal is 15 Marks*