TELANGANA TRIBAL WELFARE RESIDENTIAL DEGREE COLLEGE (WOMEN)
HRD campus, DEVARAKONDA, NALGONDA-508248 (College code: 4133)
Recognized by UGC, India; Affiliated to Mahatma Gandhi University, Nalgonda.
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B.A./B.Sc. (STATISTICS) Semester Pattern Syllabus (CBCS) (With Mathematics Combination)

Year	Semester	Theory / Practical	Paper Title	Work Load (Hrs/Week)	Credits	Marks
I	FIRST	Paper - I (DSC - A)	Descriptive Statistics and probability	4	4	100
		Practical – 1	Descriptive Statistics and probability	3	1	50
	SECOND	Paper - II (DSC - B)	Probability distributions	4	4	100
		Practical – 2	Probability distributions	3	1	50
II	THIRD	Paper - III (DSC - C)	Statistical Methods and Estimation	4	4	100
		Practical – 3	Statistical Methods and Estimation	3	1	50
	FOURTH	Paper - IV (DSC - D)	Statistical Inference	4	4	100
		Practical – 4	Statistical Inference	3	1	50
III	FIFTH	Paper – V (A) (DSE - A)	Applied Statistics - 1	4	4	100
		Paper – V (B) (DSE - A)	Analytical Statistics - 1	4	4	100
		Practical – 5(A)	Applied Statistics - 1	3	1	50
		Practical – 5(B)	Analytical Statistics - 1	3	1	50
	SIXTH	Paper – VII (A) (DSE - B)	Applied Statistics - 2	4	4	100
		Paper – VII (B) (DSE - B)	Analytical Statistics - 2	4	4	100
		Practical – 7(A)	Applied Statistics - 2	3	1	50
		Practical – 7(B)	Analytical Statistics - 2	3	1	50

B.A/B.Sc. I Year I Semester (CBCS) : Statistics Syllabus

(With Mathematics Combination)

(Examination at the end of Semester - I)

Paper – I : Descriptive Statistics and Probability

[4 HPW :: 4 Credits :: 100 Marks (External:80, Internal:20)]

Unit-I

Descriptive Statistics: Concept of primary and secondary data, Classification of data, Measures of central tendency (Arithmetic mean, median, mode, geometric mean and harmonic mean) with simple applications, Absolute and relative measures of dispersion (range, quartile deviation, mean deviation, standard deviation and variance) with simple applications.

Importance of moments, central and non-central moments, their inter-relationships, Sheppard's correction for moments for grouped data, Measures of skewness based on quartiles and moments, kurtosis based on moments with real life examples.

Unit-II

Probability: Basic concepts of probability, deterministic and random experiments, trial, outcome, sample space, event, operations of events, mutually exclusive and exhaustive events, equally likely and favorable events with examples, Mathematical, Statistical and Axiomatic definitions of probability, their 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, statements 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, covariance using mathematical expectation with examples, Addition and multiplication theorems of expectation. Chebyshev's and Cauchy-Schwartz's inequalities and their applications.

Definitions of moment generating function (m.g.f), characteristic function (c.f), cumulant generating function (c.g.f), probability generating function (p.g.f) and statements of their properties with applications.

Reference books:

1. **Fundamentals of Statistics, (Vol-I)** - Goon A M, Gupta M K, Das Gupta B, The World Press (Pvt) Ltd., Kolkata.

2. **Fundamentals of Mathematical Statistics** - V. K. Kapoor and S. C. Gupta, Sultan Chand & Sons, New Delhi.

Additional References:

1. Sanjay Arora and Bansilal: New Mathematical Statistics, Satya Prakashan , New Delhi.
2. William Feller: Introduction to Probability theory and its applications, (Vol-I), Wiley.
3. M. Jagan Mohan Rao and Papa Rao: A Text book of Statistics (Paper-I).
4. Hogg,Tanis, Rao: Probability and Statistical Inference, (7th edition), Pearson.
5. K.V.S. Sarma: Statistics Made Simple: Do it yourself on PC, PHI.
6. Gerald Keller: Applied Statistics with Microsoft Excel, Duxbury, Thomson Learning.
7. Levine, Stephen, Krehbiel, Berenson: Statistics for Managers using Microsoft Excel (4th edition), Pearson Publication.

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B.A/B.Sc. I Year I Semester (CBCS) : Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of Semester - I)

Practical-1 : **Descriptive Statistics and Probability**
[3 HPW :: 1 Credit :: 50 Marks]

Part - 1 (Using Calculator)

1. Graphical presentation of data (Histogram, frequency polygon, Ogives) and its interpretation.
2. Diagrammatic presentation of data (Bar and Pie).
3. Computation of central tendency and dispersion measures for ungrouped and grouped data.
4. Computation of non-central and central moments – Sheppard's corrections for grouped data.
5. Computation of coefficients of Skewness - Karl Pearson's, Bowley's, β_1 and Kurtosis – β_2 and their interpretation.

Part - 2 (Using MS-Excel)

1. **Basics of Excel** - Data entry, editing and saving, establishing and copying formulae, Built in Functions - copy and paste, Find and Replace, Sorting.
2. **Basics of Excel** - Built in Functions - Filtering, Conditional formatting and creating Hyperlinks, Exporting to MS word document
3. Computation of descriptive Statistics using Pivote table - Univariate.
4. Data visualization through diagrams.
5. Computation of central tendency and dispersion measures, Coefficient of Variation for ungrouped and grouped data.
6. Computation of Coefficients of Skewness, Kurtosis using MS-Excel and interpretation.

Note : Training shall be on establishing formulae in Excel cells and deriving the results. The Excel output shall be exported to MSWord for writing inferences.

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B.A/B.Sc. I Year II Semester (CBCS) : Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of Semester - II)

Paper – II : Probability Distributions
[4 HPW :: 4 Credits :: 100 Marks (External:80, Internal:20)]

Unit-I

Discrete distributions – I : Uniform and Bernoulli distributions : definitions, mean, variance and simple examples. Definition and derivation of probability mass functions of Binomial distribution, Poisson distribution, properties of these distributions: median, mode, m.g.f, c.g.f., p.g.f., c.f., and moments upto fourth order, reproductive property (wherever exists) and their real life applications. Poisson approximation to Binomial distribution.

Unit-II

Discrete distributions – II: Negative binomial, Geometric distributions: Definitions and real life applications, properties of these distributions: m.g.f, c.g.f., p.g.f., c.f. and moments upto fourth order, reproductive property (wherever exists), lack of memory property for Geometric distribution. Poisson approximation to Negative binomial distribution.
Hyper-geometric distribution: definition, real life applications, derivation of probability function, mean, variance. Binomial approximation to Hyper-geometric distribution.

Unit-III

Continuous distributions – I : Normal distributions – definition, properties such as m.g.f., c.g.f., c.f. and moments up to fourth order, reproductive property, wherever exists and their real life applications. Normal distribution as a limiting case of Binomial and Poisson distributions.

Unit-IV

Continuous distributions – II : Rectangular, Exponential, Gamma distributions - definition, properties: m.g.f., c.g.f., c.f. and moments up to fourth order, reproductive property (wherever exists) and their real life applications. Beta distribution of two kinds: Definitions, mean and variance.

Reference books:

3. **Fundamentals of Statistics, (Vol-I)** - Goon A M, Gupta M K, Das Gupta B, The World Press (Pvt) Ltd., Kolkata.

4. **Fundamentals of Mathematical Statistics** - V. K. Kapoor and S. C. Gupta, Sultan Chand & Sons, New Delhi.

Additional References:

8. Sanjay Arora and Bansilal: New Mathematical Statistics, Satya Prakashan , New Delhi.

9. William Feller: Introduction to Probability theory and its applications, (Vol-I), Wiley.

10. M. Jagan Mohan Rao and Papa Rao: A Text book of Statistics (Paper-I).

11. Hogg,Tanis, Rao: Probability and Statistical Inference, (7th edition), Pearson.

12. K.V.S. Sarma: Statistics Made Simple: Do it yourself on PC, PHI.

13. Gerald Keller: Applied Statistics with Microsoft Excel, Duxbury, Thomson Learning.

14. Levine, Stephen, Krehbiel, Berenson: Statistics for Managers using Microsoft Excel (4th edition), Pearson Publication.

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B.A/B.Sc. I Year II Semester (CBCS) : Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of Semester - II)

Practical-2 : Probability Distributions
(3 HPW :: 1 Credit :: 50 Marks)

Part - 1 (Using Calculator)

1. Fitting of Binomial distribution-Direct method.

2. Fitting of Binomial distribution-Recurrence relation Method.

3. Fitting of Poisson distribution-Direct method

4. Fitting of Poisson distribution-Recurrence relation Method.

5. Fitting of Negative Binomial distribution.

6. Fitting of Geometric distribution.

7. Fitting of Normal distribution-Areas method.

8. Fitting of Normal distribution - Ordinates method.

9. Fitting of Exponential distribution.

Part - 2 (Using MS-Excel)

1. Data Visualization through graphs (Histogram, frequency polygon, Ogives) using MS-Excel and their interpretation.
2. Computation of descriptive Statistics using Pivote table – Bivariate.
3. Fitting of Binomial distribution-Direct method.
4. Fitting of Poisson distribution-Direct method.
5. Fitting of Normal distribution-Areas method.
6. Fitting of Exponential distribution.

**Note : Training shall be on establishing formulae in Excel cells and deriving the results.
The Excel output shall be exported to MSWord for writing inferences.**

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B.A/B.Sc. II Year III Semester (CBCS) : Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of Semester - III)
Paper – III : Statistical Methods and Theory of Estimation
[4 HPW :: 4 Credits :: 100 Marks (External:80, Internal:20)]

Unit –I

Bivariate data, Scattered diagram, Principle of least squares, fitting of straight line, quadratic and power curves. Concept of correlation, computation of Karl-Pearson correlation coefficient for grouped and ungrouped data and its properties.
Correlation ratio, Spearman's rank correlation coefficient and its properties. Simple linear regression, correlation verses regression, properties of regression coefficients.

Unit –II

Concepts of partial and multiple correlation coefficients (only for three variables). Analysis of categorical data, their independence, Association and partial association of attributes. Various measures of association: (Yule's) for two way data and coefficient of contingency (Pearson and Tcherprow) and 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.
Point estimation of a parameter, concept of bias and mean square error of an estimate. Criteria of a good estimator- consistency, unbiasedness, efficiency and sufficiency with examples.

Unit – IV

Statement of Neyman's Factorization theorem, derivations of sufficient statistics in case of Binomial, Poisson, Normal and Exponential (one parameter only) distributions. Estimation by the method of moments, Maximum likelihood estimation (MLE), statements of asymptotic properties of MLE. Concept of interval estimation. Confidence intervals of the parameters of normal population by Pivot method.

Reference Books:

1. Goon AM, Gupta MK, Das Gupta B : Outlines of Statistics , Vol-II, the World Press Pvt. Ltd., Kolkata.

2. V. K. Kapoor and S. C. Gupta: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi

Additional References:

1. Hoel P.G : Introduction to Mathematical statistics, Asia Publishing house.

2. Sanjay Arora and Bansilal :.New Mathematical Statistics Satya Prakashan , New Delhi

3. Hogg and Craig : Introduction to Mathematical statistics. Prentice Hall

4. Siegal, S., and Sidney: Non-parametric statistics for Behavioral Science. McGraw Hill.

5. Gibbons J.D and Subhabrata Chakraborti : Nonparametric Statistical Inference. Marcel Dekker.

6. Parimal Mukhopadhyay : Mathematical Statistics. New Central Book agency.

7. Conover : Practical Nonparametric Statistics. Wiley series.

8. V. K. Rohatgi and A. K. Md. Ehsanes Saleh : An introduction to probability and statistics, Wiley series.

9. Mood A M, Graybill F A, Boe's DC. Introduction to theory of statistics. TMH

10. Paramiteya Mariyu Aparameteya Parikshalu. Telugu Academy.

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. Levin, Stephan, Krehbiel, Berenson: Statistics for Managers using Microsoft Excel.4th Edition, Pearson Publication.

14. Hogg, Tanis, Rao. Probability and Statistical Inference.7th edition. Pearson Publication.

15. Milton and Arnold (fourth Edition):Introduction to Probability and Statistics, Tata McGraw Hill Publication.

B.A/B.Sc. II Year III Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of Semester - III)
Practical – 3 : *Statistical Methods and Theory of Estimation*
(3 HPW, Credits 1 and Marks 50)

Part – A (Using Calculator)

1. Generation of random samples from Uniform (0,1), Uniform (a,b), Normal and Poisson and Exponential Distributions.

2. Fitting of straight line and parabola by the method of least squares.

3. Fitting of power curves of the type $y = a x^b$, $y = a b^x$ and $y = a e^{bx}$ by the method of least squares.

4. Computation of Yule's coefficient of association and Pearson's, Tcherprows coefficient of contingency.

5. Computation of correlation coefficient and regression lines for ungrouped data.

6. Computation of correlation coefficient, forming regression lines for ungrouped data.

7. Computation of correlation coefficient, forming regression lines for grouped data.

8. Computation of multiple and partial correlation coefficients.

9. Computation of correlation ratio

Part – B (Using Excel)

10. Simulation of random samples from Uniform (0,1), Uniform (a,b), Exponential, Normal and Poisson distributions using MS Excel.

11. Fitting of straight line and parabola by the method of least squares using MS Excel.

12. Fitting of power curves of the type $y = a x^b$, $y = a b^x$ and $y = a e^{bx}$ by the method of least squares using MS Excel.

13. Computation of correlation coefficient, forming regression lines using MS Excel.

14. Computation of multiple and partial correlation coefficients using MS Excel.

B.A/B.Sc. II Year IV Semester (CBCS) : Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of Semester - IV)
Paper - IV : Statistical Inference
[4 HPW :: 4 Credits :: 100 Marks (External:80, Internal:20)]

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). Statement and Proof of Neyman-Pearson's fundamental lemma for Randomized tests. Examples in case of Binomial, Poisson, Exponential and Normal distributions and their power of the test functions.

Unit-II

Large sample tests for single sample mean, difference of means, single sample proportion, difference of proportions and difference of standard deviations. Fisher's Z-transformation for population correlation coefficient(s) and testing the same in case of one sample and two samples. Definition of order statistics and statement of their distributions.

Unit – III

Tests of significance based on χ^2 - χ^2-test for specified variance, goodness of fit and test for independence of attributes (rxs, 2xk and 2x2 contingency tables). Tests of significance based on student's - t – t-test for single sample specified mean, difference of means for independent and related samples, sample correlation coefficient. F - test for equality of population variances.

Unit – IV

Non-parametric tests - their advantages and disadvantages, comparison with parametric tests. Measurement scale - nominal, ordinal, interval and ratio. Use of Central Limit Theorem in testing. 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. Use of central limit theorem in testing.

Reference Books:

1. Goon AM, Gupta MK, Das Gupta B : Outlines of Statistics , Vol-II, the World Press Pvt. Ltd., Kolkata.
2. V. K. Kapoor and S. C. Gupta: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi

Additional References:

1. Hoel P.G : Introduction to Mathematical statistics, Asia Publishing house.
2. Sanjay Arora and Bansilal :.New Mathematical Statistics Satya Prakashan , New Delhi
3. Hogg and Craig : Introduction to Mathematical statistics. Prentice Hall
4. Siegal, S., and Sidney: Non-parametric statistics for Behavioral Science. McGraw Hill.
5. Gibbons J.D and Subhabrata Chakraborti : Nonparametric Statistical Inference. Marcel Dekker.
6. Parimal Mukhopadhyay : Mathematical Statistics. New Central Book agency.
7. Conover : Practical Nonparametric Statistics. Wiley series.
8. V. K. Rohatgi and A. K. Md. Ehsanes Saleh : An introduction to probability and statistics, Wiley series.
9. Mood A M, Graybill F A, Boe's DC. Introduction to theory of statistics. TMH
10. Paramiteya Mariyu Aparameteya Parikshalu. Telugu Academy.
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. Levin, Stephan, Krehbiel, Berenson: Statistics for Managers using Microsoft Excel.4th Edition, Pearson Publication.
14. Hogg, Tanis, Rao. Probability and Statistical Inference.7th edition. Pearson Publication.
15. Milton and Arnold (fourth Edition):Introduction to Probability and Statistics, Tata McGraw Hill Publication.

B.A/B.Sc. II Year IV Semester (CBCS) : Statistics Syllabus

(With Mathematics Combination)
(Examination at the end of Semester - IV)
Practical – 4 : Statistical Inference
[3 HPW, Credits 1 and Marks 50]

Part – A (Using Calculator)

1. Large sample tests for mean(s), proportion(s), Standard deviation(s) and correlation coefficient.
2. Small sample tests for single mean and difference of means and correlation coefficient.
3. Paired t-test.
4. Small sample test for single and difference of variances.
5. χ^2 – test for goodness of fit and independence of attributes.
6. Nonparametric tests for two independent samples (Median test, Wilcoxon Mann Whitney - U test, Wald - Wolfowitz's runs test)

Part – B (Using Excel)

7. Use of Look up and Reference functions for data analysis.
8. Creating and assigning Macros.
9. Small sample tests for mean(s), paired t-test and correlation coefficient using MS Excel.
10. Small sample test for single and difference of variances using MS Excel.
11. χ^2 – test for goodness of fit and independence of attributes using MS Excel.
12. Nonparametric tests for single and related samples (sign test and Wilcoxon signed rank test) and one sample runs test.

Note : Training shall be on establishing formulae in Excel cells and deriving the results. The Excel output shall be exported to MSWord for writing inferences.

B.A/B.Sc. III Year V Semester (CBCS) : Statistics Syllabus

(With Mathematics Combination)

(Examination at the end of Semester - V)

Paper – V(A) : Applied Statistics - I

[4 HPW :: 4 Credits :: 100 Marks (External : 80, Internal : 20)]

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

UNIT-III

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-IV

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.

Control charts for attributes (c and u charts with fixed and varying sample sizes) and their Interpretation.

B.A/B.Sc. III Year V Semester (CBCS) : Statistics Syllabus

(With Mathematics Combination)

(Examination at the end of Semester - V)

Practical – 5(A) : Applied Statistics - I

[with 3 HPW, Credits 1 and 50 Marks]

Practical using R – Software and MS – Excel

R – Software : Overview of R, R data types and objects, reading and writing data, sub setting R Objects, Essentials of the R Language, Running R, Packages in R, Variable names and assignment, Operators, Integers, Factors, Logical operations. Operations of Scalars, Vectors, Lists, Arrays, Matrices, Data Frames. Control structures, Functions.

1. Data Visualization using R - Frequency polygons and curves, Ogives, Histogram using R.

2. Data Visualization using R - Bar diagrams (simple, compound, percentage and multiple) and Pie diagram (single and multiple) using R.

3. Computation of Descriptive Statistics using R (Measures of Central tendencies and Dispersion, Moments, Skewness and Kurtosis) using R.

4. Computation of expected frequencies for Binomial, Poisson, Normal and Exponential distributions using R.

5. Computation of Karl Pearson's coefficient of correlation and rank correlation using R.

6. Computation of partial and multiple correlations using R.

7. Time series Analysis : Computation of Secular trend by least squares and moving averages methods using R and MS-Excel.

8. Computation of Seasonal variations by Ratio to moving averages, Ratio to trend and Link Relatives methods using R and MS-Excel.

9. Construction of control charts for variables ($\bar{x}$, **R** and σ - charts) using R and MS – Excel.

10. Construction of control charts for attributes (p, np with fixed and varying sample size, C and u charts) using R and MS – Excel.

B.A./B.Sc. III Year V Semester (CBCS): Statistics Syllabus

(With Mathematics Combination)

(Examination at the end of Semester - V)

Paper - V(B) : Analytical Statistics - I

[4 HPW :: 4 Credits :: 100 Marks (External : 80, Internal : 20)]

UNIT-I

Sample Surveys : Principal steps in sample surveys, census versus sample surveys, sampling and non- sampling errors, advantages and limitations of sampling.

Sampling Methods: Types of sampling : Subjective, Quota, probability and mixed sampling methods. Methods of drawing random samples with and without replacement. Estimates of population mean and total, their variances and the estimates of variances in Simple Random Sampling With and Without Replacement, Stratified Random Sampling with Proportional and Neyman optimum allocation and Systematic Sampling when N= nk.

UNIT-II

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

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, c and u- charts with fixed and varying sample sizes). Interpretation of control charts.

UNIT-IV

Analysis of Variance and Design of Experiments : Concept of Gauss-Markov linear model with examples, statement of Cochran's theorem, ANOVA – one-way, two-way classifications with one observation per cell, Statistical 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) and Latin Square design (LSD) including one missing observation.

B.Sc. III Year V Semester (CBCS): Statistics Syllabus

(With Mathematics Combination)

(Examination at the end of Semester - V)

Practical – 5(B) : Analytical Statistics – I

[with 3 HPW, Credits 1 and 50 Marks]

Practical using R – Software

R – Software : Overview of R, R data types and objects, reading and writing data, sub setting R Objects, Essentials of the R Language, Running R, Packages in R, Variable names and assignment, Operators, Integers, Factors, Logical operations. Operations of Scalars, Vectors, Lists, Arrays, Matrices, Data Frames. Control structures, Functions.

1. Data Visualization using R - Frequency polygons and curves, Ogives, Histogram.

2. Data Visualization using R - Bar diagrams (simple, compound, percentage and multiple) and Pie diagram (single and multiple).

3. Computation of Descriptive Statistics using R (Measures of Central tendencies and Dispersion, Moments, Skewness and Kurtosis).

4. Computation of expected frequencies for Binomial, Poisson using R.

5. Computation of expected frequencies of Normal and Exponential distributions using R.

6. Computation of Karl Pearson's coefficient of correlation and rank correlation using R.

7. Computation of partial and multiple correlations using R.

8. Analysis of Variance for one way and two way classified data using R.

9. Analysis of Variance for CRD and RBD two way classified data using R.

10. Time series Analysis : Computation of Secular trend by least squares and moving averages methods using R.

11. Computation of Seasonal variations by Ratio to moving averages, Ratio to trend and Link Relatives methods using R.

12. Construction of control charts for variables ($\bar{x}$, **R** and σ - charts) using R.

13. Construction of control charts for attributes (p, np with fixed and varying sample size, C and u charts) using R.

Reference Books :

1. V.K. Kapoor and S.C. Gupta : Fundamentals of Applied Statistics. Sultan Chand

2. A. M. Goon, M. K. Gupta, B. Das Gupta : Fundamentals of Statistics Vol - II World Press Private Ltd.,Calcutta

3. A. M. Goon, M. K. Gupta, B. Das Gupta : An outline of Statistical Theory Vol – II, World Press Private Ltd.,Calcutta17.

4. Anuvartita Sankhyaka Sastram – Telugu Academy.

Additional References :

5. Arora, Sumeet Arora, S.Arora : Comprehensive Statistical Methods, S. Chand.

6. B. L. Agarwal : Basic Statistics, New Age publications.

7. S. P. Gupta : Statistical Methods. Sultan Chand and Sons.

8. Parimal Mukhopadhyay : Applied Statistics, New Central Book agency.

9. Daroga Singh and Chowdhary : Theory and Analysis of Sample survey designs. Wiley Eastern.

10. M. R. Saluja : Indian Official Statistics. ISI publications.

B.A/B.Sc. III Year VI Semester (CBCS) : Statistics Syllabus

(With Mathematics Combination)

(Examination at the end of Semester - Vi)

Paper - VII(A) : Applied Statistics - II

[4 HPW :: 4 Credits :: 100 Marks (External : 80, Internal : 20)]

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 l analysis, Importance and applications of design of experiments.

Unit –II

Principles of experimentation, 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 – 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.

Unit –IV

Indian 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.

Index Numbers : Concept, construction, uses and limitations of simple and weighted index numbers. Laspeyer'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.

B.A/B.Sc. III Year VI Semester (CBCS) : Statistics Syllabus

(With Mathematics Combination)

(Examination at the end of Semester - VI)

Practical – 7(A) : Applied Statistics - II

[with 3 HPW, Credits 1 and Marks 50]

Practical using R – Software and MS – Excel

1.   Generation Random Samples from the Uniform, Binomial, Poisson, Normal and Exponential distributions using R.

2.   Fitting of straight line, parabola and power curves of the type $y = a x^b$, $y = a b^x$ and $y = a e^{bx}$ using R.

3.   Large sample tests : Testing population means, proportions, variances based on single and two samples using R.

4.   Parametric Tests : Testing means, variances based on single and two samples using R.

5.   Tests based on χ^2 distribution using R using R.

6.   Nonparametric Tests : one sample run test, Sign test and Wilcoxon sign rank test for one and two samples using R.

7.   Nonparametric Tests : Median test, Wilcoxon Mann Whitney - U test, Wald - Wolfowitz's runs Test using R.

8.   Analysis of Variance for CRD and RBD data using R and MS - Excel.

9.   Analysis of Variance for RBD without and with one missing observation using R and MS - Excel.

10.   Analysis of Variance for LSD without and with one missing observation using R and MS - Excel.

11.   Computation of Morality rates, Fertility rates and Reproduction rates using MS-Excel.

12.   Construction of life tables using MS-Excel.

B.Sc. III Year VI Semester (CBCS) : Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of Semester - VI)
Paper - VII(B) : Analytical Statistics - II
[4 HPW :: 4 Credits :: 100 Marks (External : 80, Internal : 20)]

Unit –I
Multivariate distributions : Introduction, concept of Multivariate, Definitions and Statements of properties of Multinomial and Multivariate Normal Distributions with Real life applications.

Regression Analysis : Definition, procedure of Least square estimation, methods of analysis and interpretation, Simple Linear Regression and Multiple Linear Regression for 'n' variables : estimation of parameters, Lack of fit, Mean Square Error, R^2 and adjusted R^2 values, Testing Regression coefficients.

Logistic regression : Definition and model assumptions, estimation of parameters, statements of properties for simple and Multiple Logistic regression. Interpretation of the same.

UNIT-II
Multivariate Data Analysis Techniques : Definitions, Statements of properties of Principal Component Analysis, Factor Analysis, Cluster analysis and Linear Discriminant Analysis (Bayesian and Fishers approaches), Multidimensional Scaling, Applications and interpretation of above techniques to Image processing / pattern recognition.

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.

Unit –IV
Indian 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.

Index Numbers : Concept, construction, uses and limitations of simple and weighted index numbers. Laspeyer'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.

Note : In first two Units emphasis will be on concepts and applications of techniques only.

B.Sc. III Year VI Semester (CBCS) : Statistics Syllabus

(With Mathematics Combination)

(Examination at the end of Semester - VI)

Practical - 7(B) : Analytical Statistics - II

[with 3 HPW, Credits 1 and Marks 25]

Practical using R – Software

1. Generation Random Samples from the Uniform, Binomial, Poisson, Normal and Exponential distributions using R

2. Fitting of straight line, parabola and power curves of the type $y = a x^b$, $y = a b^x$ and $y = a e^{bx}$ using R.

3. Large sample tests : Testing population means, proportions, variances based on single and two samples and tests based on χ^2 distribution using R.

4. Parametric Tests : Testing means, variances based on single and two samples using R.

5. Nonparametric Tests : one sample run test, Sign test and Wilcoxon sign rank test for one and two samples, Median test, Wilcoxon Mann Whitney - U test, Wald - Wolfowitz's runs test using R.

6. Principal Component Analysis using R.

7. Factor Analysis using R.

8. Cluster analysis and Linear Discriminant analysis using R.

9. Model fitting by Simple and Multiple Linear Regression methods using R.

10. Model fitting by simple Logistic regression using R.

11. Computation of Morality rates, Fertility rates and Reproduction rates using R.

12. Construction of life tables using R.

Reference Books:

E-Book : https://onlinelibrary.wiley.com/doi/book/10.1002/9781118391686

1. V.K.Kapoor and S.C.Gupta : Fundamentals of Applied Statistics. Sultan Chand

2. **Multivariate Analysis by Johnson and Wrichon**

3. Pratirupa Sidhanthamulu – Telugu Academy,

4. Prayoga Rachana and Visleshana – Telugu Academy.

Additional References:

5. ParimalMukhopadhyay : Applied Statistics . New Central Book agency.

6. M.R.Saluja : Indian Official Statistics. ISI publications.

7. B.L.Agarwal: Basic Statistics.New Age publications.

8. S.P.Gupta : Statistical Methods. Sultan Chand and Sons.