Statistics

B.A. B.Sc. (I - IV Semesters) Syllabus (CBCS)

(w.e.f. 2016 - 2017)

Faculty of Science

PALAMURU UNIVERSITY

Mahabubnagar - 509 001, Telangana

2016

Palamuru 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 interrelationships, Sheppard's corrections for moments for grouped data. Measures of skewness based on quartilesand moments and kurtosis based on moments with real life examples.

UNIT-II

Probability: Basic concepts in probability—deterministic and random experiments, trail, 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. GoonAM,GuptaMK,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.JaganMohan Rao and Papa Rao: A Text book of Statistics Paper-I.
7. Sanjay Arora and BansiLal:.New Mathematical Statistics : Satya Prakashan , New
   Delhi
8. Hogg.Tanis.Rao: Probability and Statistical Inference. 7th edition. Pearson
9. SambhavyataAvadhiSiddantalu—TeluguAcademy
10. Sahasambandham-VibhajanaSiddantamulu – 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.

B.A/B.Sc. I Year: Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of Semester I)
Practical Paper – I (with 2 HPW, Credits 1 and Marks 25)

1. Basics of Excel- data entry, editing and saving, establishing and copying formulae, built in Functions in excel, copy and paste and exporting to MS word document. (Not for The Examination).
2. Graphical presentation of data (Histogram, frequency polygon, Ogives).
3. **Graphical presentation of data (Histogram, frequency polygon, Ogives) using MS Excel**
4. Diagrammatic presentation of data (Bar and Pie).
5. **Diagrammatic presentation of data (Bar and Pie) using MS Excel**
6. Computation of non-central and central moments – Sheppard's corrections for grouped data.
7. Computation of coefficients of Skewness and Kurtosis – Karl Pearson's and Bowley's β_1 and β_2.
8. Computation of Measures of central tendency, dispersion, Coefficient of Variation and coefficients of Skewness, Kurtosis using MS Excel.

Palamuru 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 – I **:** Uniform and Bernoulli distributions : definitions, mean, variance and simple examples. Definition and derivation of probability function of Binomial distribution, Poisson distribution definition, properties of these distributions such as median, mode, m.g.f, c.g.f., p.g.f., c.f., and moments up to 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 physical condition, properties of these distributions such as m.g.f, c.g.f., p.g.f., c.f. and moments up to fourth order, reproductive property, wherever exists, lack of memory property for Geometric distribution and their real life applications. Poisson approximation to Negative binomial distribution. Hyper-geometric distribution – definition, physical conditions, derivation of probability function, mean, variance and real life applications. Binomial approximation to Hyper-geometric.

UNIT-III

Continuous distributions – I : Rectangular and 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 : Exponential, Gamma : 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. Beta distribution of two kinds : Definitions, mean and variance. Cauchy distribution - Definition and c.f..

Definition of convergence in Law, in probability and with probability one or almost sure convergence. Definition of Weak Law of Large Numbers (WLLN) and Strong Law of Large numbers (SLLN). Definition of Central Limit Theorem (CLT) 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. GoonAM,Gupta MK,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.JaganMohan 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. SambhavyataAvadhiSiddantalu—TeluguAcademy

9. Sahasambandham-VibhajanaSiddantamulu – 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

B.A/B.Sc. I Year: Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of Semester II)
Practical Paper – II (with 2 HPW, Credits 1 and Marks 25)

1. Fitting of Binomial distribution – Direct method.
2. **Fitting of Binomial distribution – Direct method using MS Excel.**
3. Fitting of binomial distribution – Recurrence relation Method.
4. Fitting of Poisson distribution – Direct method.
5. **Fitting of Poisson distribution – Direct method using MS Excel.**
6. Fitting of Poisson distribution - Recurrence relation Method.
7. Fitting of Negative Binomial distribution.
8. Fitting of Geometric distribution.
9. Fitting of Normal distribution – Areas method.
10. Fitting of Normal distribution – Ordinates method.
11. Fitting of Exponential distribution.
12. **Fitting of Exponential distribution using MS Excel**.
13. Fitting of a Cauchy distribution.
14. **Fitting of a Cauchy distribution using MS Excel**.

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Palamuru 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- Concepts of Sequences of Random Variables
(2 HPW with 2 Credits and 50 Marks)

Unit –I

Stochastic process, Index set, state space, classification of stochastic processes with examples, stationary process, Covariance stationary process, Martingale sequence of random variables. Applications of stochastic processes through examples.

Unit II

Definition and examples of finite – dimensional distributions of a Markov Chain, time – homogeneity, transition probability matrix, marginal distribution. Classification of states – recurrent, transient, positive recurrent and null recurrent states.

Reference Books:

1. Medhi, J. (1982) : Stochastic Processes, Wiley Eastern.
2. U. N. Bhat (1984) : Elements of Applied Stochastic Processes, Wiley series.

Palamuru 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

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, 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.
Point estimation of a parameter, concept of bias and mean square error of an estimate. Criteria of 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 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 AM, Gupta MK,Das Gupta B : Outlines of Statistics , Vol-II, the World Press Pvt.Ltd.,Kolakota.
3. Hoel P.G: Introduction to matehematical statistics, Asia Publiushing 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.
7GibbonsJ.D and SubhabrataChakraborti: 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.MoodAM,GraybillFA,Boe's DC. Introduction to theory of statistics. TMH
12. Paramiteyamariyuaparameteyaparikshalu. 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.

B.A/B.Sc. II Year: Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of Semester III)
Practical Paper – III (with 2 HPW, Credits 1 and Marks 25)

1. Generation of random samples from Uniform (0,1), Uniform (a,b) and exponential Distributions.
2. Generation of random samples from Normal and Poisson distributions.
3. **Simulation of random samples from Uniform (0,1), Uniform (a,b),Exponential, Normal and Poisson distributions using MS Excel**.
4. Fitting of straight line and parabola by the method of least squares.
5. **Fitting of straight line and parabola by the method of least squares using MS Excel.**
6. 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.
7. **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.**
8. Computation of Yule's coefficient of association.
9. Computation of Pearson's, Tcherprows coefficient of contingency.
10. Computation of correlation coefficient and regression lines for ungrouped data.
11. Computation of correlation coefficient, forming regression lines for ungrouped data.
12. Computation of correlation coefficient, forming regression lines for grouped data.
13. **Computation of correlation coefficient, forming regression lines using MS Excel.**
14. Computation of multiple and partial correlation coefficients.
15. **Computation of multiple and partial correlation coefficients using MS Excel.**
16. Computation of correlation ratio

Palamuru 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-Statistics for Psychology and Education
(2 HPW with 2 Credits and 50 Marks).

Unit I

Introduction, Scaling procedures, scaling of rankings in terms of Normal Probability curves.

Unit II

Reliability of test scores, effect of test length and different ranges on reliability of the test, Validity of test scores, comparison between reliability and validity.

Reference Books :

Fundamentals of Applied Statistics by SC Gupta and VK Kapoor, Sultan Chand & Sons

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

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.

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

7GibbonsJ.D and SubhabrataChakraborti: 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.MoodAM,GraybillFA,Boe's DC. Introduction to theory of statistics. TMH

12. Paramiteyamariyuaparameteyaparikshalu. 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.

B.A/B.Sc. II Year: Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of Semester IV)
Practical Paper – IV (with 2 HPW, Credits 1 and Marks 25)

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 tests for mean(s), paired t-test and correlation coefficient using MS Excel.**
5. Small sample test for single and difference of variances.
6. **Small sample test for single and difference of variances using MS Excel.**
7. $\chi 2$ – test for goodness of fit and independence of attributes.
8. **$\chi 2$ – test for goodness of fit and independence of attributes using MS Excel.**
9. **Nonparametric tests for single and related samples (sign test and Wilcoxon signed rank test) and one sample runs test.**
10. Nonparametric tests for two independent samples (Median test,Wilcoxon Mann Whitney - U test, Wald - Wolfowitz's 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.