KRISHNA UNIVERSITY

RUDRAVARAM, MACHILIPATNAM-521003, (A.P), India

B.A/B.Sc.,

STATISTICS SYLLABUS

(With Mathematics Combination)

CHOICE **B**ASED **C**REDIT **S**YSTEM **(CBCS)** REVISED SYLLABUS

with effect from the academic year 2020-21

Syllabus for the First Year (Semesters I and II) and Second year (Semesters III and IV) as per the frame work proposed by APSCHE

Dr N. Srinivasa Rao
Chairperson BoS KRU
Head Dept of Statistics
Andhra Loyola College (Autonomous)
Vijayawada - 520008

Framework Suggested by Andhra Pradesh State Council of Higher Education (APSCHE)

ANNEXURE - II CBCS CURRICULAR FRAMEWORK (2020 - 21 ONWARDS) - BACHELOR OF SCIENCES															
Subjects		SEM I		SEM II		SEM III		SEM IV		SEM V		SEM VI			
		Hrs/W	Credits	Hrs/W	Credits	Hrs/W	Credits	Hrs/W	Credits	Hrs/W	Credits	Hrs/W	Credits		
Languages															
English		4	3	4	3	4	3								
Language (H/T/S)		4	3	4	3	4	3								
Life Skill Courses		2	2	2	2	2+2	2+2								
Skill Development Courses		2	2	2+2	2+2	2	2								
Major 1	Core 1,2,3,& 4	4+2	4+1	4+2	4+1	4+2	4+1	4+2	4+1						
Major 2	Core 1,2,3,& 4	4+2	4+1	4+2	4+1	4+2	4+1	4+2	4+1						
Major 3	Core 1,2,3,& 4	4+2	4+1	4+2	4+1	4+2	4+1	4+2	4+1						
Major 1	Core -5							4+2	4+1						
Major 2	Core -5							4+2	4+1						
Major 3	Core -5							4+2	4+1						
Major 1	Skill Enhancement Courses (6 & 7)									4+2	4+1				
										4+2	4+1				
Major 2	Skill Enhancement Courses (6 & 7)									4+2	4+1				
										4+2	4+1				
Major 3	Skill Enhancement Courses (6 & 7)									4+2	4+1				
										4+2	4+1				
Hrs/W (Academic Credits)		30	25	32	27	32	27	36	30	36	30		12	4	4
Project Work															
Extension Activities	(Non														
NCC/NSS/Sports/Extra Curricular									2						
Yoga							1		1						
Extra Credits															
Hrs/W (Total Credits)		30	25	32	27	32	28	36	33	36	30		12	4	4

THIRD PHASE of APPRENTICESHIP Entire 5th / 6th Semester

FIRST and SECOND PHASES (2 spells) of APPRENTICESHIP between 1st and 2nd year and between 2nd and 3rd year (two summer vacations).

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RUDRAVARAM, MACHILIPATNAM-521003, (A.P), India

B.A/B.Sc., STATISTICS

CHOICE **B**ASED **C**REDIT **S**YSTEM **(CBCS)** REVISED SYLLABUS 2020-21

Syllabus for the First Year (Semesters I and II) and Second year (Semesters III and IV) as per the frame work proposed by APSCHE

Year	Semester	Paper	Subject	IA	EA	Total
1	I	I	Descriptive Statistics	25	75	100
	II	II	Probability Theory and Distributions	25	75	100
2	III	III	Statistical Inference	25	75	100
	IV	IV	Sampling Techniques and Design of Experiments	25	75	100
		V	Applied Statistics	25	75	100

Dr N. Srinivasa Rao
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Andhra Loyola College (Autonomous)
Vijayawada - 520008

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B.A/B.Sc., STATISTICS (WM) CBCS REVISED SYLLABUS 2020-21

Year	Semester	Paper	Subject	IA	EA	Total
1	I	I	Descriptive Statistics	25	75	100
	II	II	Probability Theory and Distributions	25	75	100
2	III	III	Statistical Inference	25	75	100
	IV	IV	Sampling Techniques and Design of Experiments	25	75	100
		V	Applied Statistics	25	75	100

OBJECTIVE OF THE COURSE

Statistics is a key to success in the field of science and technology. Today, the students need a thorough knowledge of fundamental basic principles, methods, results and a clear perception of the power of statistical ideas and tools to use them effectively in modeling, interpreting and solving the real life problems. Statistics plays an important role in the context of globalization of Indian economy, modern technology, computer science and information technology.

The main objectives of the course are

- To build the basis for promoting theoretical and application aspects of statistics.
- To underline the statistics as a science of decision making in the real life problems with the description of uncertainty.
- To emphasize the relevance of statistical tools and techniques of analysis in the study of inter-disciplinary sciences.
- To acquaint students with various statistical methods and their applications in different fields.
- To cultivate statistical thinking among students.

Dr N. Srinivasa Rao
Chairperson BoS KRU
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Andhra Loyola College (Autonomous)
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- To develop skills in handling complex problems in data analysis and research design.
- To prepare students for future courses having quantitative components.

This course is aimed at preparing the students to hope with the latest developments and compete with students from other universities and put them on the right track.

Paper Wise Objectives

PAPER-I: Descriptive Statistics

- The objective of this paper is to throw light on the role of statistics in different fields with special reference to business and economics.
- It gives the students to review good practice in presentation and the format most applicable to their own data.
- The measures of central tendency or averages reduce the data to a single value which is highly useful for making comparative studies.
- The measures of dispersion throw light on reliability of average and control of variability
- The concept of Correlation and Linear Regression deals with studying the linear relationship between two or more variables, which is needed to analyze the real life problems.
- The attributes gives an idea that how to deal with qualitative data.

PAPER-II: Probability Theory and Distributions

- This paper deals with the situation where there is uncertainty and how to measure that uncertainty by defining the probability, random variable and mathematical expectation which are essential in all research areas.
- This paper gives an idea of using various standard theoretical distributions, their chief characteristics and applications in analyzing any data.

PAPER-III: Statistical Inference

- This paper deals with standard sampling distributions like Chi Square, t and F and their characteristics and applications.
- This paper deals with the different techniques of point estimation for estimating the parameter values of population and interval estimation for population parameters.
- In this paper, various topics of Inferential Statistics such as interval estimation, Testing of Hypothesis, large sample tests (Z-test), small sample tests (t-test, F-test, chi-square test) and non-parametric tests are dealt with. These techniques play an important role in many fields like pharmaceutical, agricultural, medical etc.

Dr. P. Sanivesa Rao
Chairperson BoS KRU
Head Dept of Statistics
Andhra Loyola College (Autonomous)
Vijayawada - 520008

PAPER-IV: Sampling Techniques and Design of Experiments

- The sampling techniques deals with the ways and methods that should be used to draw samples to obtain the optimum results, i.e., the maximum information about the characteristics of the population with the available sources at our disposal in terms of time, money and manpower to obtain the best possible estimates of the population parameters
- This paper throw light on understanding the variability between group and within group through Analysis of Variance
- This gives an idea of logical construction of Experimental Design and applications of these designs now days in various research areas.
- Factorial designs allow researchers to look at how multiple factors affect a dependent variable, both independently and together.

PAPER-V: Applied Statistics

- This paper deals the time series on simple description methods of data, explains the variation, forecasting the future values, control procedures.
- It gives an idea of using index numbers in a range of practical situations, limitations and uses
- The vital statistics enlighten the students in obtaining different mortality, fertility rates thus obtaining the population growth rates and construction and use of life tables in actuarial science.

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B.A/B.Sc., STATISTICS CBCS REVISED SYLLABUS 2020-21

Semester – I (CBCS With Mathematics Combination Common to BA/BSc)

Paper - I: Descriptive Statistics

UNIT-I

Introduction to Statistics: Importance of Statistics. Scope of Statistics in different fields. Concepts of primary and secondary data. Diagrammatic and graphical representation of data: Histogram, frequency polygon, Ogives, Pie. Measures of Central Tendency: Mean, Median, Mode, Geometric Mean and Harmonic Mean. Median and Mode through graph.

UNIT-II

Measures of Dispersion: Range, Quartile Deviation, Mean Deviation and Standard Deviation, Variance. Moments, central and non-central moments, and their interrelationships- relation between moments about mean in terms of moments about any point and vice versa, Effect of change of origin and scale on moments Sheppard's corrections for moments, Pearson's coefficients, Measures of skewness and kurtosis with real life examples.

UNIT-III

Curve fitting: Bi- variate data, Principle of least squares, fitting of degree polynomial. Fitting of straight line, Fitting of Second degree polynomial or parabola, Fitting of power curve and exponential curves.

Correlation: Meaning, Types of Correlation, Measures of Correlation: Scatter diagram, Karl Pearson's Coefficient of Correlation, Rank Correlation Coefficient (with and without ties), Bi-variate frequency distribution, correlation coefficient for bi-variate data and simple problems. Concept of multiple and partial correlation coefficients (three variables only) and properties

UNIT-IV

Regression : Concept of Regression, Linear Regression: Regression lines, Regression coefficients and it's properties, simple problems on Regressions lines. Correlation vs regression.

UNIT-V

Attributes : Notations, Class, Order of class frequencies, Ultimate class frequencies, Consistency of data, Conditions for consistency of data for 2 and 3 attributes only , Independence of attributes , Association of attributes and its measures, Relationship between association and colligation of attributes, Contingency table: Square contingency**,** Mean square contingency, Coefficient of mean square contingency, Tschuprow's coefficient of contingency.

Dr N. Srinivasa Rao
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Text Books:

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

2 BA/BSc I year statistics - descriptive statistics, probability distribution - Telugu Academy - Dr M.Jaganmohan Rao,Dr N.Srinivasa Rao, Dr P.Tirupathi Rao, Smt.D.Vijayalakshmi.

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

Reference books:

1. Willam Feller: Introduction to Probability theory and its applications. Volume –I, Wiley
2. Goon AM, Gupta MK, Das Gupta B : Fundamentals of Statistics , Vol-I, the World Press Pvt.Ltd., Kolakota.
3. Hoel P.G: Introduction to mathematical statistics, Asia Publishing house.
4. M. JaganMohan Rao and Papa Rao: A Text book of Statistics Paper-I.
5. Sanjay Arora and Bansi Lal: New Mathematical Statistics: Satya Prakashan , New Delhi

Credits 2

Practicals - Paper – I

1. Graphical presentation of data (Histogram, frequency polygon, Ogives).
2. Diagrammatic presentation of data (Bar and Pie).
3. Computation of measures of central tendency(Mean, Median and Mode)
4. Computation of measures of dispersion(Q.D, M.D and S.D)
5. Computation of non-central, central moments, $\beta 1$ and $\beta 2$ for ungrouped data.
6. Computation of non-central, central moments, $\beta 1$ and $\beta 2$ and Sheppard's corrections for grouped data.
7. Computation of Karl Pearson's coefficients of Skewness and Bowley's coefficients of Skewness.
8. Fitting of straight line by the method of least squares
9. Fitting of parabola by the method of least squares
10. Fitting of power curve of the type by the method of least squares.
11. Fitting of exponential curve of the type and by the method of least squares.
12. Computation of correlation coefficient and regression lines for ungrouped data
13. Computation of correlation coefficient, forming regression lines for grouped data
14. Computation of Yule's coefficient of association
15. Computation of Pearson's, Tcherprows coefficient of contingency

Note: Training shall be on establishing formulae in Excel cells and derive the results. The excel output shall be exported to MS word for writing inference.

Course Learning Outcomes

Students will acquire

1) knowledge of Statistics and its scope and importance in various areas such as Medical, Engineering, Agricultural and Social Sciences etc.
2) knowledge of various types of data, their organization and evaluation of summary measures such as measures of central tendency and dispersion etc.
3) knowledge of other types of data reflecting quality characteristics including concepts of independence and association between two attributes,
4) insights into preliminary exploration of different types of data.
5) Knowledge of correlation, regression analysis, regression diagnostics, partial and multiple correlations.

Dr N. Srinivasa Rao
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Head Dept of Statistics
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KRISHNA UNIVERSITY

BA/B Sc - I YEAR: STATISTICS: I SEMESTER (CBCS)

(With Mathematics Combination)

SEMESTER- 1

PAPER-1: Descriptive Statistics

TIME: 3 Hours MODEL QUESTION PAPER Max Marks:75

Section – A

Answer any 5 Questions (5 x 5 = 25)

1. Explain Classification and Tabulation.
2. Explain Kurtosis.
3. Explain Sheppard's Corrections.
4. Define Curve Fitting
5. Define Correlation and Explain Types Of Correlation.
6. Define Regression Coefficients
7. Show that $\delta = \frac{1}{N}[(AB)(\alpha\beta) - (A\beta)(\alpha B)]$
8. Define Mean square contingency, Coefficient of mean square contingency, Tschprow's coefficient of contingency.

Section – B

Answer ALL Questions, Each Question Carries 10 Marks (5 x 10 =50)

9. **a)** Define Primary data. Explain various methods of collecting primary data.

(OR)

b) Define Central tendency and explain various measures of central tendencies.

10. **a)** Derive first four central moments in terms of non-central moments.

(OR)

b) Define Skewness and explain its measures**.**

11. **a)** Explain Fitting of a Second degree parabola

(OR)

b) Derive Spearman's formula for the Rank Correlation Coefficient

12. **a)** Derive equation of the Regression line of Y on X

(OR)

b) If the two Regression lines are $8X - 10Y + 66 = 0$, $40X - 18Y - 214 = 0$ then find i) correlation coefficient, ii) means of X and Y and iii) Calculate the Standard Deviation of Y if V(X) = 9

13. **a)** Define Consistency of data. Give the Conditions for Consistency of Data.

(OR)

b) For 'n' attributes $A_1, A_2, A_3 \ldots A_n$ show that the class frequency $(A_1\ A_2\ A_3 \ldots A_n) \geq (A_1) + (A_2) + (A_3) + \ldots\ldots\ldots\ldots + (A_n) - (n-1)N$

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B.A/B.Sc., STATISTICS CBCS REVISED SYLLABUS 2020-21

Semester – II (CBCS With Mathematics Combination Common to BA/BSc)

Paper - II: **Probability Theory and Distributions**

UNIT-I

Introduction to Probability: Basic Concepts of Probability, random experiments, trial, outcome, sample space, event, mutually exclusive and exhaustive events, equally likely and favourable outcomes. Mathematical, Statistical, axiomatic definitions of probability. Conditional Probability and independence of events, Addition and multiplication theorems of probability for 2 and for n events. Boole's inequality and Baye's theorem and its applications in real life problems.

UNIT-II

Random variable: Definition of random variable, discrete and continuous random variables, functions of random variable. Probability mass function. Probability density function, Distribution function and its properties. For given pmf, pdf calculation of moments, coefficient of skewness and kurtosis. Bivariate random variable - meaning, joint, marginal and conditional Distributions, independence of random variables and simple problems.

UNIT- III

Mathematical expectation : Mathematical expectation of a random variable and function of a random variable. Moments and covariance using mathematical expectation with examples. Addition and Multiplication theorems on expectation. Definitions of M.G.F, C.G.F, P.G.F, C.F and their properties. Chebyshev and Cauchy - Schwartz inequalities.

UNIT-IV

Discrete Distributions: Binomial, Poisson, Negative Binomial, Geometric distributions: Definitions, means, variances, M.G.F, C.F, C.G.F, P.G.F, additive property if exists. Possion approximation to Binomial distribution. Hyper-geometric distribution: Defination, mean and variance.

UNIT - V

Continuous Distributions: Rectangular, Exponential, Gamma, Beta Distributions: mean, variance, M.G.F, C.G.F, C.F. **Normal Distribution**: Definition, Importance, Properties, M.G.F, CF, additive property.

Text Books:

1. V.K.Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
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Dr.N.Srinivasa Rao
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Vijayawada -520008

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

Reference books:

1. Willam Feller: Introduction to Probability theory and its applications. Volume –I, Wiley
2. Goon AM, Gupta MK, Das Gupta B : Fundamentals of Statistics , Vol-I, the World Press Pvt.Ltd., Kolakota.
3. Hoel P.G: Introduction to mathematical statistics, Asia Publishing house.
4. M. JaganMohan Rao and Papa Rao: A Text book of Statistics Paper-I.
5. Sanjay Arora and Bansi Lal: New Mathematical Statistics: Satya Prakashan , New Delhi
6. Hogg Tanis Rao: Probability and Statistical Inference. 7th edition. Pearson.

Credits 2

Practicals Paper – II

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.

Note: Training shall be on establishing formulae in Excel cells and derive the results. The excel output shall be exported to MS word for writing inference.

Course Learning Outcomes

Students will acquire

1) ability to distinguish between random and non-random experiments,
2) knowledge to conceptualize the probabilities of events including frequentist and axiomatic approach. Simultaneously, they will learn the notion of conditional probability including the concept of Bayes' Theorem,
3) knowledge related to concept of discrete and continuous random variables and their probability distributions including expectation and moments,
4) knowledge of important discrete and continuous distributions such as Binomial, Poisson, Geometric, Negative Binomial and Hyper-geometric, normal, uniform, exponential, beta and gamma distributions,
5) Acumen to apply standard discrete and continuous probability distributions to different situations.

Dr N. Srinivasa Rao
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BA/B Sc - I YEAR: STATISTICS: II SEMESTER (CBCS)

(With Mathematics Combination)

SEMESTER- II

PAPER-2: Probability Theory and Distributions

TIME: 3 Hours **MODEL QUESTION PAPER** **Max Marks: 75**

Section – A

Answer any 5 Questions (5 x 5 = 25)

1. Prove that P(A U B) = P(A) + P(B) – P (A∩B)
2. Define Conditional Probability
3. Define Random Variable.
4. Define Distribution Function of one-dimensional random variable
5. Define Expectation of Function of a Random variable.
6. Define Moment Generating Function
7. Characteristic Function of Poisson Distribution
8. Area property of Normal Distribution.

Section – B

Answer ALL Questions, Each Question Carries 10 Marks (5 x 10 =50)

9. **a)** State and Prove Boole's Inequality.

(OR)

b) State and Prove Multiplication theorem on Probability for 'n' Events.

10. **a)** Explain Distribution function of the bi-variate random variable and its properties.

(OR)

b) Find Mean and Variance of a random variable 'X' whose probability density function is given by $f(x) = k\,x(2-x)$,$0 \le x \le 2$ where k is constant.

11. **a)** State and Prove Cauchy – Schwartz Inequality

(OR)

b) State and Prove Chebychev's Inequality

12. **a)** Prove Recurrence relation for the moments of Binomial Distribution

(OR)

b) Find Mean and Variance of Geometric Distribution.

13. **a)** Define Rectangular Distribution also find its Mean and Variance.

(OR)

b) Explain important features of Normal Distribution

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B.A/B.Sc., STATISTICS CBCS REVISED SYLLABUS 2020-21

Semester – III (CBCS With Mathematics Combination Common to BA/BSc)

Paper - III: Statistical Inference

UNIT-I

Concepts: Population, Sample, Parameter, statistic, Sampling distribution, Standard error. convergence in probability and convergence in distribution, law of large numbers, central limit theorem (statements only). Student's t- distribution, F – Distribution, χ^2- Distribution: Definitions, properties and their applications.

UNIT-II

Theory of estimation: Estimation of a parameter, criteria of a good estimator – unbiasedness, consistency, efficiency, &sufficiency and. Statement of Neyman's factorization theorem. Estimation of parameters by the method of moments and maximum likelihood (M.L), properties of MLE's. Binomial, Poisson &Normal Population parameters estimate by MLE method. Confidence Intervals.

UNIT-III

Testing of Hypothesis: 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. Neyman-Pearson's lemma. Examples in case of Binomial, Poisson, Exponential and Normal distributions.

UNIT – IV

Large sample Tests: large sample test for single mean and difference of two means, confidence intervals for mean(s). Large sample test for single proportion, difference of proportions. standard deviation(s) and correlation coefficient(s**).**

Small Sample tests: t-test for single mean, difference of means and paired t-test. χ2-test for goodness of fit and independence of attributes. F-test for equality of variances.

UNIT – V

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**.**

TEXT BOOKS

1. BA/BSc II year statistics - statistical methods and inference - Telugu Academy by A.Mohanrao, N.Srinivasa Rao, Dr R.Sudhakar Reddy, Dr. T.C. Ravichandra Kumar.

Dr N. Srinivasa Rao
Chairperson BoS KRU
Head, Dept of Statistics
Andhra Loyola College (Autonomous)
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2. K.V.S. Sarma: Statistics Made Simple: Do it yourself on PC. PHI.

REFERENCE BOOKS:

1. Fundamentals of Mathematics statistics : VK Kapoor and SC Guptha.
2. Outlines of statistics, Vol II : Goon Guptha, M.K.Guptha, Das Guptha B.
3. Introduction to Mathematical Statistics : Hoel P.G.
4. Hogg Tanis Rao: Probability and Statistical Inference. 7th edition. Pearson.

Credits: 2

Practicals - Paper –III

1. Large sample test for single mean
2. Large sample test for difference of means
3. Large sample test for single proportion
4. Large sample test for difference of proportions
5. Large sample test for difference of standard deviations
6. Large sample test for correlation coefficient
7. Small sample test for single mean
8. Small sample test for difference of means
9. Small sample test for correlation coefficient
10. Paired t-test(paired samples).
11. Small sample test for single variance(χ 2 - test)
12. Small sample test for difference of variances(F-test)
13. χ 2 - test for goodness of fit and independence of attributes
14. Nonparametric tests for single sample(run test, sign test and Wilcoxon signed rank test)
15. Nonparametric tests for related samples (sign test and Wilcoxon signed rank test)
16. 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 MS Word for writing inferences.

Course Learning Outcomes

The students will acquire

1) Concept of law large numbers and their uses
2) Concept of central limit theorem and its uses in statistics
3) concept of random sample from a distribution, sampling distribution of a statistic, standard error of important estimates such as mean and proportions,
4) knowledge about important inferential aspects such as point estimation, test of hypotheses and associated concepts,
5) knowledge about inferences from Binomial, Poisson and Normal distributions as illustrations,
6) concept about non-parametric method and some important non-parametric tests.

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KRISHNA UNIVERSITY

BA/B Sc - II YEAR: STATISTICS: III SEMESTER (CBCS)

(With Mathematics Combination)

SEMESTER- III

PAPER-3: Statistical Inference

TIME: 3 Hours **MODEL QUESTION PAPER** **Max Marks: 75**

Section – A

Answer any 5 Questions (5 x 5 = 25)

1. Define Parameter, Statistics
2. Define F - Distribution.
3. State Factorization theorem.
4. Explain Method of Moments
5. Define Type-I and Type-II errors.
6. Define Critical Region
7. Test of significance for single mean
8. Advantages of non-parametric methods.

Section – B

Answer ALL Questions, Each Question Carries 10 Marks (5 x 10 =50)

9. **a)** Explain Chi–Square distribution with properties and Applications.

(OR)

b) Explain t – distribution with properties and Applications.

10. **a)** Explain Criteria of a good Estimator.

(OR)

b) Explain Method of Maximum likelihood estimation

11. **a)** State and Prove Neyman-Pearson Lemma

(OR)

b) If $x \geq 1$ be the critical region and to test the hypothesis H_0: $\theta = 2$ against the alternative Hypothesis H_1: $\theta = 1$ for a sample observations then the probability density function $f(x) = \theta e^{-\theta x}$, $0 \leq x \leq \infty$ then find Type-I and Type-II errors

12. **a)** Explain the Test of Significance for difference of Proportion

(OR)

b) Explain F-test for equality of two population variances.

13. **a)** Explain Median test.

(OR)

b) Explain two samples Run Test

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Semester – IV (CBCS With Mathematics Combination Common to BA/BSc)

Paper IV: Sampling Techniques and Designs of Experiments

UNIT I

Simple Random Sampling (with and without replacement): Notations and terminology, various probabilities of selection. Random numbers tables and its uses. Methods of selecting simple random sample, lottery method, method based on random numbers. Estimates of population total, mean and their variances and standard errors, determination of sample size, simple random sampling of attributes.

UNIT II

Stratified random sampling: Stratified random sampling, Advantages and Disadvantages of Stratified Random sampling, Estimation of population mean, and its variance. Stratified random sampling with proportional and optimum allocations. Comparison between proportional and optimum allocations with SRSWOR.

Systematic sampling: Systematic sampling definition when N = nk and merits and demerits of systematic sampling - estimate of mean and its variance. Comparison of systematic sampling with Stratified and SRSWOR.

UNIT III

Analysis of variance : Analysis of variance(ANOVA) –Definition and assumptions. One-way with equal and unequal classification, Two way classification.

Design of Experiments: Definition, Principles of design of experiments, CRD: Layout, advantages and disadvantage and Statistical analysis of Completely Randomized Design (C.R.D).

UNIT IV

Randomized Block Design (R.B.D) and Latin Square Design (L.S.D) with their layouts and Analysis, Missing plot technique in RBD and LSD. Efficiency RBD over CRD, Efficiency of LSD over RBD and CRD.

UNIT V

Factorial experiments – Main effects and interaction effects of 2^2 and 2^3 factorial experiments and their Statistical analysis. Yates procedure to find factorial effect totals.

Text Books:

1. Telugu AcademyBA/BSc III year paper - III Statistics - applied statistics - Telugu academy by Prof.K.Srinivasa Rao, Dr D.Giri. Dr A.Anand, Dr V.Papaiah Sastry.
2. K.V.S. Sarma: Statistics Made Simple: Do it yourself on PC. PHI.

Reference Books:

1. Fundamentals of applied statistics : VK Kapoor and SC Gupta.
2. Indian Official statistics - MR Saluja.
3. Anuvarthita Sankyaka Sastram - Telugu Academy.

Credits: 2

Practicals - Paper –IV

Sampling Techniques:

Estimation of population mean and its variance by

1. Simple random sampling with and without replacement. Comparison between SRSWR and SRSWOR.
2. Stratified random sampling with proportional and optimum allocations. Comparison between proportional and optimum allocations with SRSWOR.
3. Systematic sampling with N=nk. Comparison of systematic sampling with Stratified and SRSWOR.

Design of Experiments:

4. ANOVA - one - way classification with equal and unequal number of observations
5. ANOVA Two-way classification with equal number of observations.
6. Analysis of CRD.
7. Analysis of RBD Comparison of relative efficiency of CRD with RBD
8. Estimation of single missing observation in RBD and its analysis
9. Analysis of LSD and efficiency of LSD over CRD and RBD
10. Estimation of single missing observation in LSD and its analysis
11. Analysis of 2^2 with RBD layout
12. Analysis of 2^3 with RBD layout

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

Course Learning Outcomes

The students shall get

1) Introduced to various statistical sampling schemes such as simple, stratified and systematic sampling.
2) an idea of conducting the sample surveys and selecting appropriate sampling techniques,
3) Knowledge about comparing various sampling techniques.
4) carry out one way and two way Analysis of Variance,
5) understand the basic terms used in design of experiments,
6) use appropriate experimental designs to analyze the experimental data.

Dr N. Srinivasa Rao
Chairperson BoS KRU
Head Dept of Statistics
Andhra Loyola College (Autonomous)
Vijayawada - 520008

KRISHNA UNIVERSITY

BA/B Sc - II YEAR: STATISTICS: IV SEMESTER (CBCS)

(With Mathematics Combination)

SEMESTER- IV

PAPER-4: Sampling Techniques and Design of Experiments

TIME: 3 Hours **MODEL QUESTION PAPER** **Max Marks: 75**

Section – A

Answer any 5 Questions (5 x 5 = 25)

1. Define Simple Random Sampling
2. Merits and limitation of Simple random Sampling
3. Advantages of Stratified random sampling.
4. Define Systematic Sampling.
5. State Cochran's theorem
6. Gauss- Markoff Linear model
7. Missing plot technique in RBD
8. life advantages of factorial experiments

Section – B

Answer ALL Questions, Each Question Carries 10 Marks (5 x 10 =50)

9. **a)** Prove that in srswor the variance of the sample mean is $V(\bar{y}_n) = \frac{S^2}{n}\ \frac{N-n}{N}$

(OR)

b) Explain Simple random sampling without replacement (SRSWOR) and Simple random sampling with replacement (SRSWR). In SRSWOR sample mean square is an unbiased estimator of the population mean square

10. **a)** In Neyman allocation show that $n_i \propto N_i S_i$

(OR)

b) With usual notations, prove that $V(\bar{y}_{st})opt \leq V(\bar{y}_{st})prop \leq V(\bar{y}_n)R$

11. **a)** Explain **ANOVA** I way classifications

(OR)

b) Explain Principles of Experimental Designs

12. **a)** Explain Randomised Block Design

(OR)

b) Explain Latin Square Design.

13. **a)** Explain main effects and interactions of 2^2 factorial design

(OR)

b) Write the statistical analysis of 2^3 factorial experiments design

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Chairperson BoS KRU
Head Dept of Statistics
Acharya Nagarjuna College (Autonomous)
Vijayawada - 520008

KRISHNA UNIVERSITY

RUDRAVARAM, MACHILIPATNAM-521003, (A.P), India

B.A/B.Sc., STATISTICS CBCS REVISED SYLLABUS 2020-21

Semester – II to IV (CBCS With Mathematics Combination Common to BA/BSc)

Paper V: Applied Statistics

UNIT I

Time Series: Time Series and its components with illustrations, additive, multiplicative models. Trend: Estimation of trend by free hand curve method, method of semi averages. Determination of trend by least squares (Linear trend, parabolic trend only), moving averages method.

UNIT II

Seasonal Component: Determination of seasonal indices by simple averages method, ratio to moving average, Ratio to trend and Link relative methods, Deseasonalization.

UNIT III

Growth curves: Modified exponential curve, Logistic curve and Grompertz curve, fitting of growth curves by the method of three selected points and partial sums. Detrending. Effect of elimination of trend on other components of the time series

UNIT IV

Index numbers: Concept, construction, problems involved in the construction of index numbers, uses and limitations. Simple and weighted index numbers. Laspayer's, Paasche's and Fisher's index numbers, Criterion of a good index number, Fisher's ideal index numbers. Cost of living index number and wholesale price index number.

UNIT V

Vital Statistics: Introduction, definition and uses of vital statistics, sources of vital statistics.

Measures of different Mortality and Fertility rates, Measurement of population growth. Life tables: construction and uses of life tables.

Text Books:

1. Fundamentals of applied statistics : VK Kapoor and SC Gupta.
2. BA/BSc III year paper - III Statistics - applied statistics - Telugu academy by prof.K.Srinivasa Rao, Dr D.Giri. Dr A.Anand, Dr V.Papaiah Sastry.

Reference Books:

3. Anuvarthita Sankyaka Sastram - Telugu Academy.
4. Mukopadhyay, P (2011). Applied Statistics, 2nd ed. Revised reprint, Books and Allied Pvt. Ltd.
5. Brockwell, P.J. and Devis, R.A. (2003). Introduction to Time Series Analysis. Springer.
6. Chatfield, C. (2001). Time Series Forecasting., Chapman & Hall.
7. Srinivasan, K. (1998). Demographic Techniques and Applications. Sage Publications
8. Srivastava O.S. (1983). A Text Book of Demography. Vikas Publishing House

Practical Paper –V Credits: 2

Time Series:

1. Measurement of trend by method of moving averages(odd and even period)
2. Measurement of trend by method of Least squares(linear and parabola)
3. Determination of seasonal indices by method simple averages
4. Determination of seasonal indices by method of Ratio to moving averages
5. Determination of seasonal indices by method of Ratio to trend
6. Determination of seasonal indices by method of Link relatives

Index Numbers:

7. Computation of simple index numbers.
8. Computation of all weighted index numbers.
9. Computation of reversal tests.

Vital Statistics:

10. Computation of various Mortality rates
11. Computation of various Fertility rates
12. Computation of various Reproduction rates.
13. Construction of Life Tables

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

Course Learning Outcomes

After completion of this course, the students will know about

1) time series data, its applications to various fields and components of time series,
2) fitting and plotting of various growth curves such as modified exponential, Gompertz and logistic curve,
3) fitting of trend by Moving Average method,
4) measurement of Seasonal Indices by Ratio-to-Trend , Ratio-to-Moving Average and Link Relative methods,
5) Applications to real data by means of laboratory assignments.
6) Interpret and use a range of index numbers commonly used in the business sector
7) Perform calculations involving simple and weighted index numbers
8) Understand the basic structure of the consumer price index and perform calculations involving its use
9) Various data collection methods enabling to have a better insight in policy making, planning and systematic implementation,
10) Construction and implementation of life tables,
11) Population growth curves, population estimates and projections,
12) Real data implementation of various demographic concepts as outlined above through practical assignments.

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KRISHNA UNIVERSITY

BA/B Sc - II YEAR: STATISTICS: IV SEMESTER (CBCS)

(With Mathematics Combination)

SEMESTER- IV

PAPER-5: Applied Statistics

TIME: 3 Hours **MODEL QUESTION PAPER** **Max Marks: 75**

Section – A

Answer any 5 Questions (5 x 5 = 25)

1. Define Time series analysis
2. Explain Semi Averages method to find the Trend Values
3. Explain de-seasonalisation data
4. Prove that Fisher index is Always Lies between Laspeyre's and Paasche's price Index numbers
5. Define Deflating.
6. Show that $m_x = \frac{2q_x}{2 - q_x}$
7. Explain Rates and Ratios of Mortality
8. Explain Pearl's Index.

Section – B

Answer ALL Questions, Each Question Carries 10 Marks (5 x 10 =50)

9. **a)** Explain the components in the Time Series.

(OR)

b) Explain Least Squares method to find the Trend Values, Merits & Demerits

10. **a)** Explain Ratio to Moving Average method to find the Seasonal Index

(OR)

b) Explain Ratio to Link Relatives method to find the Seasonal Index

11. **a)** Explain the method of 3 selected time points for fitting modified exponential curves

(OR)

b) Explain method of partial sums for fitting of Gompertz curve

12. **a)** What are the problems involved in the construction of index numbers

(OR)

b) Explain Cost of Living Index Number.

13. **a)** Explain Measurement of Mortality Rates

(OR)

b) Explain Complete Life Table

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