A.G& S.G.SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE

VUYYURU-521165, KRISHNA Dt., A.P.(Autonomous)

Accredited by NAAC with "A" Grade

2022-2023

DEPARTMENT OF STATISTICS

MINUTES OF BOARD OF STUDIES

ODD SEMESTER

05-11-2022

Minutes of the meeting of BOS in Statistics for B.Sc(MSCs) Degree Courses of AG & SG Siddhartha Degree College of Arts & Science, Vuyyuru, held at 2.30 PM on 05-11-2022 through online mode.

N.V. SrinivasaRao   Presiding

Members Present:

1) _(N.V.Srinivasa Rao)_	Chairman	Head, Department of Mathematics, AG & SG S Degree College.
2) _(P. Ravi Kumar)_	University Nominee	Department of Statistics, Pavitra Degree College, Machilipatnam.
3) _(G. Chakravarthy)_	Subject Expert	Department of Statistics, P. B. Siddhartha College, Vijayawada
4) _(N. Siva Naga Raju)_	Member	Lecturer in Statistics AG & SG S Degree College.
5) _(D.Sunitha)_	Member	Lecturer in Mathematics AG & SG S Degree College.
6) _(A.Bhargavi)_	Member	Lecturer in Mathematics AG & SG S Degree College.
7) _(Noor Mohammad)_	Member	Lecturer in Mathematics AG & SG S Degree College.
8) _(K. Rajya Lakshmi)_	Member	Lecturer in Mathematics AG & SG S Degree College.

Agenda of B.O.S Meeting:

1. To discuss and recommend the Syllabi, Model Question Papers and Guidelines to be followed by question paper setters in Statistics for 1st Semester as per the guidelines and instructions prescribed APSCHE and Krishna Universityfrom the Academic Year 2022-23.

2. To discuss and recommend the Syllabi, Model Question Papers and Guidelines to be followed by question paper setters in Statistic for 3rd Semester as per the guidelines and instructions prescribed APSCHE and Krishna Universityfrom the Academic Year 2022-23.

3. Discussed and recommended the teaching and evaluation methods for approval of Academic Council

4. Any other matter.

Resolutions.

1. Discussed and recommended that no changes are required in Syllabi. Changes are required in Model Question Papers and Guidelines to be followed by the question paper setters in Statistics for 1st Semester from the Academic year 2022-23.

2. To recommed the teaching and evaluation methods to be followed under Autonomous status. The maximum marks for IA is 30 and SE is 70. Each IA written examination is of 1 Hr.30 min duration for 30 marks. The tests will be conducted centrally. The average of two such IA is calculated for 20 marks. 5 marks will be allotted for attendance and 5 marks are allotted for Assignment/ Activity. There is no minimum passing for IA and there is no provision for improvement in IA. Even though the candidate is absent for two IA exams/obtain zero marks the external marks are considered (if he/ she gets 40 out of 70) and the result shall be declared as 'PASS' from the Academic year 2022-23.

3. To introduce new Syllabi, Model Question Papers and Guidelines to be followed by the question paper setters in Statisticsof 3rd Semester from the Academic year 2022-23. The maximum marks for IA is 25 and SE is 75. Each IA written examination is of 1 Hr. duration for 15 marks. The tests will be conducted centrally. The average of two such IA is calculated for 15 marks. 5 marks will be allotted basing on Assignment and 5 marks are allotted for activity. There is no minimum passing for IA and there is no provision for improvement in IA. Even though the candidate is absent for two IA exams/obtain zero marks the external marks are considered (if he/ she gets 40 out of 75) and the result shall be declared as 'PASS' from the Academic year 2022-23.

4. Discussed and recommended for organizing seminars, Guest lecturers, Online Examinations and Workshops to upgrade the knowledge of students for Competitive Examinations for the approval of the Academic Council.

Department of Statistics
Programme Specific Outcomes (PSOs)

PSO1 : Apply the concepts, principles and methods of statistics to various fields of study

PSO2 : Understand the importance and value of statistical principles and convert a problem description into testable research hypotheses

PSO3 : Select appropriate statistical tools to investigate a research hypothesis.

PSO4 : Perform data analysis by apply appropriate statistical methodology and interpret result in a variety of settings

PSO5 : Compute statistical measures using software and programs.

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Title of the Paper: DESCRIPTIVE STATISTICS AND THEORY OF PROBABILITY

Semester: I

Course Code	STATllB	Course Delivery Method	Class Room / Blended Mode - Both
Credits	4	CIA Marks	30
No. of Lecture Hours / Week	4	Semester End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Year of Introduction :2021-22	Year of Offering: 2021 - 22	Year of Revision: ----	Percentage of Revision: 0%

SEMESTER- | **PAPER** - | **No of Credits: 4**

S. No	PROGRAMME OUTCOMES
POI	Remember the basic concepts of statistics at different levels and to understand them for gaining of knowledge.
PO2	Apply the statistical techniques in the analysis of data and also acquire knowledge in optimization techniques.
PO3	Facilitate students to acquire flair knowledge to estimate the values in real life problems.

COURSE OUTCOMES

CO.NO	Upon successful completion of this course, students should have the knowledge and skills to:	Mapping
Col	knowledge of various types of data, their organization andevaluation of summary measures such as non- central and central moments, measures of skewness and kurtosis.	**BTL2, PO2**
CO2	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,	**BTL3, PO2**
CO3	knowledge related to concept of discrete and continuous random variables and their probability distributions including expectation and moments,	**BTL4, PO2**
CO4	knowledge related to concept of generating functions andweak law of large numbers.	**BTL4,PO2**

About this Course

Statistics is an important field of math that is used to analyze, interpret, and predict outcomes from data. Descriptive statistics will teach you the basic concepts used to describe data. This is a great beginner course for those interested in Data Science, Economics, Psychology, Machine Learning,

Sports analytics and just about any other field. This paper deals with the situation where there is uncertainty and how to measure that uncertainty by defining the probability.

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STATISTICS	STAT1IB	2021-22 Onwards	B.Sc.(MSCs)

SEMESTER- I   **PAPER- I**   **No. of Credits: 4**

DESCRIPTIVE STATISTICS AND THEORY OF PROBABILITY

Unit- I   **12L**

Moments: Central and non-central moments and their inter-relationships, Sheppard's corrections for moments for grouped data. **Skewness:** Definition, measures of skewness by Karl Pearson' s, Bowley's formulae and based on moments. **Kurtosis:** Definition, measures of kurtosis based on moments, Simple problems.

Unit- II   **12L**

Probability-I: Definitions of various terms - Random experiments, trial, sample space, mutually exclusive, exhaustive , equally likely, favourable and independent events. Definitions- Mathematical, Statistical and Axiomatic definitions of probabilities. Law of addition of probabilities for two events and extension of general law of addition of probabilities. Boole's inequality for n events and real-life problems.

Unit -III   12L

Probability-II : Conditional Probability-Definition - dependent and independence events, multiplication law of probability for two events, extension of multiplication law ofprobability. Pairwise independent events and conditions for mutual independence of n eventsand Baye's theorem and its applications and problems.

Unit- IV   **12L**

Random Variables: Univariate Random variables- Definition, Discrete and Continuous random variables - Probability mass function and probability density function with illustrations. Distribution function and its properties. Bivariate random variables- Definition, Discrete and Continuous bi-variate random variables- joint, marginal and conditional distributions- its properties. Distribution functions of the bivariate random variables and its properties. Independence of random variables, and simple problems.

UnitV: **12L**

Mathematical Expectations: Definition, Mathematical expectation of function of a random variable, Properties of Expectations - Addition and Multiplication theorems of expectation. Properties of Variance and Covariance. Cauchy-Schwartz Inequality. Generating Functions- 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 inequality and its applications. Statement of Weak Law of Large Numbers for identically and independently distributed (i.i.d) random variables with finite variance.

Text Book: Fundamentals of Mathematical Statistics, 12th Edition, 10th September 2020,

S. C. Gupta and V. K. Kapoor, Sultan Chand & Sons, New Delhi.

Recommended References books:

1. B.A/B.Sc. First Year Statistics(2010), Telugu Academy, Hyderabad.

2. Mathematical Statistics with Applications, 2009, K.M.Ramachandran and Chris
   P.Tsokos Academic Press(Elsevier), Haryana.

3. Probability and Statistics,Volume I, D.Biswas, New central book Agency (P) Ltd,
   New Delhi.

4. An outline of Statistical theory, Volume Two,3rd Edition,2010(with corrections)
   A.M.Goon,M.K. Gupta, B.Dasgupta ,The World Press Pvt.Ltd., Kolakota.

5. Sanjay Arora and BansiLal:. New Mathematical Statistics, SatyaPrakashan, New Delhi.

Websites of Interest: http://onlinestatbook.com/rvls/index.html

Co-Curricular Activities in the class:

1. Pictionary

2. Case Studies on topics in field of statistics

3. Snap test and Open Book test

4. Architectural - To be build the procedures

5. Extempore - Random concept to students

6. Interactive Sessions

7. Teaching through real world examples

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COURSE-I, DESCRIPTIVE STATISTICS AND THEORY OF PROBABILITY
B.Sc STATISTICS MODEL PAPER (W.E.F 2022 – 2023)

Time: 3Hrs   Max.Marks:70M

Answer the following questions.   5 x 14 = 70M
Section A

1.   (a)   4m
           (or)
      (b)   4m
2.   (a)   4m
           (or)
      (b)   4m
3.   (a)   4m
           (or)
      (b)   4m
4.   (a)   4m
           (or)
      (b)   4m
5.   (a)   4m
           (or)
      (b)   4m

Section B

1.   (a)   10m
           (or)
      (b)   10m
2.   (a)   10m
           (or)
      (b)   10m
3.   (a)   10m
           (or)
      (b)   10m

4. (a) 10m

        (or)

    (b)   10m

5. (a) 10m

        (or)

    (b)   10m

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STATISTICS	STATllB	2021-22 Onwards	B.Sc.(MSCs)

SEMESTER-I   **Practical** - I: **Descriptive Statistics**   **No of Credits: 1**

CO.NO	Upon successful completion of this course, students should have the knowledge and skills to:	Mapping
COl	draw the suitable diagram and graphs of the givensample data	**P02**
CO2	Analyze the uni-variate data using statisticaltechniques.	**P02**

List of Practicals
1. Diagrams & Graphs- Bar, Pie , Histogram, frequency polygon, and Ogive curves
2. Computation of measures of central tendency- Arithmetic Mean, Geometric mean and Harmonic Mean - Grouped Data.
3. Computation of measures of central tendency- Median, Mode and Partition Values - Grouped Data.
4. Computation of measures of Dispersion - Quartile Deviation, Mean Deviation, Standard Deviation, Variance and Coefficient of Variation - Grouped Data.
5. Computation of non-central, central moments, $_1$ and $_2$ and Sheppard's corrections for grouped data.
6. Computation of central moments, $_1$ and $_2$ and Sheppard's corrections when non -central moments are given.
7. Computation of Karl Pearson's coefficients, Bowley's coefficients of Skewness and coefficients of skewness based on moments - Grouped Data

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.

Reference Books
1.   Practical Manual -Prepared by the Department Faculty Members
2.   K.V.S. Sarma: Statistics Made Simple: Do it yourself on PC. PHI

Websites of Interest: http://www.statsci .org/datasets.html

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Offered to: B.SC (MSCs) / STAT31C (Theory) **Course Type:** Core

Year of Introduction: 2022	**Year of Revision: 2022**	**Percentage of Revision: 0%**
Semester: III	**Paper No. : III**	**Credits: 4**

Hours Taught: 60 periods. per Semester **Max. Time: 3** Hours

Course Prerequisites (if any): Student required basic knowledge in Probability and DistributionTheory

Course Description:
This course helps the students to familiarize with the ways in which we talk about uncertainty and estimate their situations in which probability arises. Also this course aims at providing basic knowledge about theoretical and application to test according to situations.

Course Objectives:
1) To describe many of the important estimation methods and characteristics of theestimators.
2) To understand the problem of statistical inference with specific reference to pointestimation and interval estimation.
3) To differentiate between large and small samples and apply apt testing procedures.

Learning Outcomes: At the end of the course, the student will
1) Students will understood the distinguish between the parametric and Non Parametric situations.
3) The parameters describe an underlying physical setting in such a way that their value affectsthe distribution of the measured data..

S. No	Program Outcomes
PO1.	**Effective Communication**: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaningof the world by connecting people, ideas, books, media and technology
PO2.	**Effective Citizenship**: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
PO3.	**Ethics:** Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.
PO4.	**Environment and Sustainability**: Understand the issues of environmental contexts and sustainable development
PO5.	**Critical Thinking**: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO6:	**Specialized Skills / Transferable Skills:** Acquisition of communication and soft, analytical and technological skills that aid in enhancing	
PO7.	**Self-directed and Life-long Learning:** Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes	

Course Outcomes:

Course Outcome	Upon successful completion of this course, students should have the knowledge and skills to:	Program Outcomes Mapping
CO 1	Obtain the knowledge on Exact sampling distributions and their application towards real world examples	PO - 5
CO 2	knowledge of point and interval estimation procedures and different methods of point estimation	PO - 6
CO3	Obtain the knowledge on various testing hypothetical statements and finding Uniformly Most Powerful Test	PO - 6
CO 4	a fundamental understanding of Parametric models for developing relevant inferences on associated parameters large and small samples.	PO - 6
CO 5	To obtain the knowledge and to know the applications of various Non-Randomized tests	PO - 6

Syllabus

Course Details

Unit	Learning Units	Lecture Hours
I	**Exact Sampling Distributions** Concepts of Population, Sample, Parameter, Statistic, Sampling distribution, Standard error. law of large numbers, central limit theorem (statements only). Student's t- distribution, F – Distribution, χ^2 - Distribution: Definitions, properties and their applications.	9
II	**Theory of estimation** Introduction, criteria of a good estimator – unbiasedness, consistency, efficiency, & sufficiency. Statement of Neyman's factorization theorem. Estimation of parameters by the method of moments and maximum likelihood (M.L), properties of MLE's (statements only). Binomial,Poisson & Normal population parameters estimate by MLE method. Interval estimation – construction of confidence intervals for population mean using normal distribution.	15
III	**Testing of Hypothesis** Concepts of Statistical hypotheses, Null and Alternative hypothesis, Critical region, Type I and II errors, level of significance and Power of a test. One and two tailed tests, p-value. Neyman-Pearson's lemma. Examples in case of Binomial, Poisson, Exponential and Normal distributions.	12

IV	**Large sample Tests** Test for single mean and difference of two means, test for single proportion and difference of proportions. Simple Problems. **Small Sample tests - I** t-test for single mean, difference of means and paired t-test. F-test for equality of population variances. Simple Problems.	**12**
V	**Small Sample tests - II** χ^2-test for goodness of fit and independence of attributes **Non – Parametric Tests** Non-parametric tests- Advantages and Disadvantages, Measurement scales - Nominal, Ordinal, Interval and Ratio. One sample tests – Sign and Run test. Two sample tests - Median test, Wilcoxon–Mann-Whitney U test, Kruskal – Wallis test or H- test, Run test. Simple Problems.	**12**

Text Book:

Fundamentals of Mathematical Statistics, 11th Edition, 2010, S. C. Gupta and V. K. Kapoor,Sultan Chand & Sons, New Delhi

 Reference Books:
 1. B.A/B.Sc. Second Year Statistics(2010) , Telugu Akademi, Hyderabad.
 2. Mathematical Statistics with Applications, 2009, K.M.Ramachandran and Chris P.TsokosAcademic Press(Elsevier), Haryana .
 3. Probability and Statistics, Volume I & II, D. Biswas, New central book Agency (P) Ltd,NewDelhi.
 4. An outline of Statistical theory, Volume II,3rd Edition,2010(with corrections)A.M.Goon,M.K. Gupta, B.Dasgupta ,The World Press Pvt.Ltd., Kolakota.
    Sanjay Arora and Bansi Lal:. New Mathematical Statistics, Satya Prakashan , New Delhi.

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Model Question Paper Structure for SEE

Max.: 75 Marks   **Min.Pass: 30 Marks**
Statistical
InferenceSection –
A
Answer any FIVE of the following   **5 x 5M = 25Marks**
1.   Write the statements of Weak Law of large numbers and Central limit theorem.

2.   Define F-distribution and write its applications.

3.   Prove that sample mean is an unbiased and consistent estimator of population mean.

4.   Define the following terms:

    (i) Null hypothesis (ii) Alternative hypothesis (iii) critical region.

5.   Explain Type I and Type II errors.

6.   Write the procedure for single mean in large sample tests.

7.   Write the procedure of F-test for equality of population variances.

8.   Explain the procedure of Sign test for single mean.

Section – B
Answer ALL questions   **5 x 10M = 50Marks**
9.   a. Define student's t-distribution. Write its applications and their properties.

                    (OR)
        b. Define chi-square distribution. Write its applications and their properties.

10.   a. Explain the characteristics of a good estimator

                    (OR)
        b. Find Maximum likelihood estimator for μ and σ^2 in normal population.

11.   a. State and prove Neyman-Pearson's lemma.
                    (OR)
        b. If x≥1 is the critical region for testing H_0: θ=2 vs H_1: :θ=1 on the basis of the singleobservation
           from an exponential distribution with probability density function
           f(x, θ)= $\theta e^{-\theta x}$. Obtain the value of Type I and Type II errors.

12.   a. In a Survey of buying habits, 400 women shoppers are chosen at random on
           supermarket 'A' located in a certain section of the city. Their average weekly food
           expenditure is Rs.250 with a S.D. of Rs. 40. For 400 women shoppers are chosen at
           random on Supermarket 'B' in another section of the city, the average weekly food
           expenditure is Rs.220 with a S.D. of Rs 55.Test at 1% level of significance whether the
           average weekly food expenditure of the populations of shoppers are equal.

                    (OR)
        b. Explain the procedure of t- test for difference of means.

13.   a. Out of 8,000 graduates in a town 800 are females, out of 1,600 graduate employees 120are females.Use$\chi^2$to determine if any distinction is made in appointment the basis of sex.

(O
R)

b. Explain the procedure of Wald-Wolfowitz run test for two samples.

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Offered to: B.SC (MSCs) / STAP31C

Course Type: Core (Practical)

Year of Introduction: 2022	**Year of Revision: 2022**	**Percentage of Revision: 0%**
Semester: III	**Paper No. III**	**Credits: 1**

Hours Taught: 30 periods. per Semester   **Max.Time: 2** Hours

Course Prerequisites (if any): Student required basic knowledge in computers

Course Description:

This course gives a working knowledge of Excel to students with the aim of getting to use dataanalysis and testing.

Course Objectives

1)   To train students in SPSS Software
2)   To expose the students to the analysis of statistical data and comparing data sets.

Learning Outcomes: At the end of the course, the student will

1)   able to do data analysis using Excel
2)   known to choose the data to test various types.

S. No	Programme Outcomes
PO1.	**Effective Communication**: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology
PO2.	**Effective Citizenship**: Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
PO3.	**Ethics:** Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.
PO4.	**Environment and Sustainability**: Understand the issues of environmental contexts and sustainable development
PO5.	**Critical Thinking**: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
PO6:	**Specialized Skills / Transferable Skills:** Acquisition of communication andsoft, analytical and technological skills that aid in enhancing
PO7.	**Self-directed and Life-long Learning:** Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes

Course Outcomes:

Course Outcome	Upon successful completion of this course, students should have the knowledge and skills to:	Programme Outcomes Mapping
CO 1	To Apply statistical analysis that can test hypotheses under parametric approaches.	PO –6
CO 2	To Apply statistical analysis that can test hypotheses under non-parametric approaches.	PO –6

List of practical's

1. Small sample test (t-test): One Sample, Independent Sample and Paired Sample.

2. Large sample tests: One Sample, Independent Sample, Paired Sample (Using Excel)

3. Small sample test (F-test): Equality of population variances (Using Excel)

4. Chi square Test: Test of Independence

5. Chi square Test: Goodness of fit

6. Chi square Test: Test of Independence, 2X2, 3X3,…, mXn Cross tabulation (Using Excel)

7. Non Parametric Tests: Mann Whitney U test and Wilcoxon Signed ranks test

8. Non Parametric Tests: Kruskal Wallis Test and Friedman test (Using Excel)

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