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

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

Accredited by NAAC with "A" Grade

2021-2022

DEPARTMENT OF STATISTICS

MINUTES OF BOARD OF STUDIES

ODD SEMESTER

12-11-2021

Minutes of the meeting of BOS in Statistics for B.Sc(MSCs) Degree Courses of AG&SGSiddhartha Degree College of Arts & Science, Vuyyuru, held at 3.00 PM on 12- 11-2021.

N.V. SrinivasaRao   *Presiding*

<u>Members Present:</u>

1) (N.V.SrinivasaRao)	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	Head. Department of Statistics, P. B. Siddhartha College, Vijayawada
4) (D.Sunitha)	Member	Lecturer in Mathematics AG & SG S Degree College.
5) (A.Bhargavi)	Member	Lecturer in Mathematics AG & SG S Degree College.
6) (Noor Mohammad)	Member	Lecturer in Mathematics AG & SG S Degree College.
7) (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 1stSemester as per the guidelines and instructions under APSCHE prescribed by Krishna University from the Academic Year 2021-22.

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

3. Any other matter.

Resolutions.

1. To introduce new Syllabi, Model Question Papers and Guidelines to be followed by the question paper setters in Statistics of 1stSemester from the Academic year 2021-22.
2. To recommed the teaching and evaluation methods to be followed under Autonomous status.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 2021-22.

3. 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.

A.G. & S.G. Siddhartha Degree College of Arts & Science
Vuyyuru, Krishna District
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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| STATISTICS | STATIIB | 2021-22 Onwards | B.Sc.(MSCs) |

SEMESTER- I　　　　　　**PAPER - I**　　　　　　**No of Credits:4**
DESCRIPTIVE STATISTICS AND THEORY OF PROBABILITY

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 and evaluation 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 and weak 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 Learnin g, 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 probabilit y.

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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

Model Paper Structure

Section A: Answer FIVE questions out of EIGHT questions (5 x 5M= 25 M)

Section B: Answer FIVE questions out of FIVE questions with internal choice .(5 x 10M = 50M)

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

Model Paper

Section-A

Answer any **FIVE** of the following   5 x 5 = 25Marks

1. Show that for discrete distributions $\beta_1 > 1$ **(L-2, C0-1)**

2. State and prove addition theorem of probability for two events   **(L-1, C0-2)**

3. If A and B are independent events, then prove that   **(L-3, C0-2)**

    i) $\bar{A}$ and B ii) $\bar{A}$ and $\bar{B}$ are also independent

4. Define the "distribution function" (or cumulative distribution function) of a random variable and state its essential properties.   **(L-2, C0-3)**

5. Explain the concepts marginal and conditional probability distributions.   **(L-2, C0-3)**

6. Show that the mathematical expectation of the sum of two random variables is the sum of their individual expectations.   **(L-3, C0-3)**

7. Define moment generating function (m.g.f.) of a random variable X. If $M_X(t)$ is the m.g.f. of a random variable X about the origin, show that the moment μ_r' is given by

    $\mu_r' \left[\frac{d^r}{dt^r} M_X(t)\right]_{t=0}$ **(L-1, C0-4)**

8. Explain the concept of "weak law of large numbers".   **(L-2, C0-4)**

Section- B

Answer **ALL** the questions   5 x 10 = 50 Marks

9. A) Define moments. Establish the relationship between the moments about mean, (Central moments) in terms of moments about any arbitrary point and vice versa.   **(L-3,C0-1)**

    (OR)

    B) The scores in Statistics of 250 candidates appearing at an examination have Mean= 39.72, variance= 97.80, 3rd central moment and fourth central moments are -114.18 and 28,396.14. It was later found on scrutiny that the score 61 of a candidate has been wrongly recorded as 51.Make necessary corrections in the given values of the mean and the central moments.   **(L-3, C0-1)**

10. A) State and Prove Boole's inequality. **(L-1, C0-2)**

(OR)

B) For two events A and B, prove that **(L-1, C0-2)**

(i) $P(A \cap \bar{B}) = P(B) - P(A \cap B)$ (ii) $P(\bar{A} \cap B) = P(A) - P(A \cap B)$

(iii) if $B \subset A$ then $P(A \cap \bar{B}) = P(A) - P(B)$ (iv) If $A \subset B$ then $P(A \cap B) = P(B) - P(A)$

11. A) It is 8:5 against the wife who is 40 years old living till she is 70 and 4:3 against her husband now 50 living till he is 80. Find the probability that
(i) Both will be alive,   (ii) None will be alive,
(iii) Only wife will be alive,   (iv) Only husband will be alive,
(v) Only one will be alive,   (vi) At least one will be alive. **(L-3, C0-2)**

(OR)

B) A and B are two weak students of statistics and their chances of solving a problem in statistics correctly are 1/6 and 1/8 respectively. If the probability of their making a common error is 1/525 and they obtain the same answer, find the probability that their answer is correct. **(L-3, C0-2)**

12. A) Let X be a random variable with cumulative distribution function

$$F(x) = \begin{cases} 0, & \text{if } x < 0, \\ \dfrac{x^2 + 2}{4}, & \text{if } 0 \le x < \dfrac{1}{2}, \\ x + \dfrac{1}{8}, & \text{if } \dfrac{1}{2} \le x < \dfrac{3}{4}, \\ \dfrac{x+1}{2}, & \text{if } \dfrac{3}{4} \le x < 1, \\ 1, & \text{if } x \ge 1 \end{cases}$$

Find

i) $P(0 \le x < \tfrac{1}{4})$ (ii) $P(0 < X \le \tfrac{1}{4})$ (iii) $P(0 \le x \le \tfrac{1}{4})$

(iv) $P(0 < X < \tfrac{1}{4})$ v) $P(x = \tfrac{3}{4})$ **(L-5, C0-3)**

(OR)

B) Two discrete random variables X and Y have the joint probability density

function: $p(x, y) = \dfrac{A x e^{-\lambda} p^y (1 - p)^{y-y}}{y!(x-y)!}$, $y = 0,1,2,\dots, x; \; x = 0,1,2\dots$

Where are constants with $\lambda, 1, > 0 \; \& \; 0 < p < 1$ are constants.

Find   (i) The marginal probability density functions of X and Y.

(i) The conditional distribution of Y for a given X and of X for a given Y. **(L-5, C0-3)**

13. A) Explain the variance of a Linear Combination of Random Variables. **(L-2, C0-4)**

(OR)

B) (i) Define characteristic function of random variables and state its properties.

(ii) State and Prove Chebychev's inequality. **(L-2, C0-4)**

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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
CO1	draw the suitable diagram and graphs of the given sample data	P02
CO2	Analyze the uni-variate data using statistical techniques.	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