

SRI VENKATESWARA UNIVERSITY – TIRUPATI
B.S.c., (Honours) in STATISTICS (Major)
FIRST YEAR – II SEMESTER (W.E.F. Academic Year 2023 - 24)
COURSE 3: DESCRIPTIVE STATISTICS

Theory Credits: 3

3 hrs/week

I. Learning Outcomes : After successful completion of the course students will be able to:

1. To acquaint with the role of statistics in different fields with special reference to business and economics.
2. To review good practice in presentation and the format most applicable to their own data.
3. To learn the measures of central tendency or averages reduce the data to a single value which is highly useful for making comparative studies.
4. To familiar with the measures of dispersion throw light on reliability of average and control of variability.
5. To deal with the situation where there is uncertainty and to measure that uncertainty by using the probability, which is essential in all research areas.

Unit – 1: Statistical Description of Data:

Origin, history and definitions of Statistics. Importance, Scope and limitations of Statistics. Function of Statistics – Collection, Presentation, Analysis and Interpretation. Collection of data - primary and secondary data and its methods. Classification of data –Types of classification, Presentation of data – Tabulation – Essential parts.

Unit – 2: Measurement Scales :

Nominal, Ordinal, Ratio and Interval. Frequency distribution and types of frequency distributions, forming a frequency distribution. Diagrammatic representation of data – Bar, Sub-divided, Percentage, Multiple bar diagrams and Pie diagram.

Unit – 3: Measures of Central Tendency or Averages:

Features of good average. Arithmetic Mean – Properties, Methods. Median, Mode . Determination of Median and Mode by constructing Ogive curve and Histogram, Geometric Mean (GM), Harmonic Mean (HM). Empirical relation between mean, media and mode.

Unit – 4: Measures of Dispersion :

Range, Quartile Deviation, Mean Deviation and Standard Deviation, Variance. Central and Non – Central moments and their inter relationship. Sheppard's correction for moments. Skewness Kurtosis and their Methods, Measures.

Unit – 5: Elementary Probability :

Basic Concepts of Probability, Trial, Event, Random experiment, Sample Space, Mutually Exclusive and Exhaustive Events, Equally Likely and Favourable Outcomes. Mathematical, Statistical and Axiomatic Definitions of Probability. Conditional Probability and independent events, Addition and Multiplication theorems of probability for 2 and for n events and simple problems. Boole's inequality, Bayes theorem and its applications in real life problems.

SEMESTER-II COURSE 3: DESCRIPTIVE STATISTICS PRACTICALS

Practical Credits: 1

2 hrs/week

1. Forming a grouped frequency distribution table.
2. Construction of Simple and Multiple Bar Diagrams
3. Construction of Sub- divided and Percentage Bar Diagrams.
4. Construction of Pie Diagram for two groups
5. Construction of Histogram , Frequency polygon, and Frequency Curve
6. Construction of Ogive Curve
7. Computation of Mean, Median and Mode
8. Computation of Quartile , Mean and Standard Deviations
9. Non-central and Central moments for grouped data.
10. Non-central and Central moments for grouped data by using Sheppard Corrections.
11. Karl Pearson's and Bowley's Coefficients of Skewness.

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.

III. References

1. S. C. Gupta & V. K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. O. P. Gupta: Mathematical Statistics, Kedarnath Ram nath & Co.
3. P. N. Arora & S. Arora: Quantitative Aptitude Statistics – Vol II, S. Chand & Company Ltd.
4. K. Rohatgi & Ehsanes Saleh: An Introduction to Probability and Statistics, John Wiley & Sons.

IV. Suggested Co-curricular Activities:

1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc. on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photoes of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

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COURSE 3: DESCRIPTIVE STATISTICS

MODEL PAPER

Time : 3 Hours

Max. Marks :75

Electronic Scientific Calculators will be permitted

SECTION – A

Attempt any FIVE Questions
Each question carry FIVE Marks
5 X 5 = 25 Marks

- 1). Distinguish between Classification and Tabulation ?
- 2). Give the limitations of statistics ?
- 3). Explain about Diagrammatic Representation ?
- 4). Prove that $A.M \geq G.M \geq H.M$
- 5). Calculate Geometric Mean from the following data ?

Classes	5-10	10-15	15-20	20-25	25-30	30-35	35-40
Frequency	16	25	34	50	41	11	3

- 6). Describe about Sheppard Corrections for moments ?
- 7). With usual notations Prove that $\beta_2 \geq 1$?
- 8). A bag contains 3 Red 8 White and 5 Black bolls. If a person draw 4 balls at random then what is the probability that there is at least one ball of each colour among the balls drawn.

SECTION – B

Attempt any ALL Questions
Each question carry TEN Marks
10 x 5 = 50 Marks

UNIT – I

9. a) Define Statistics and explain importance of statistics ?

(Or)

- b) Describe various methods for collecting Primary data and Secondary data ?

UNIT – II

10. a) Describe Graphical Representation of Statistical Data and also explain different types of Graphical Representation ?

(Or)

b) Construct Ogive curve to the following data and find Median , First and Third Quartiles from it ?

Class Interval	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	24-27	27-30
Frequency	17	4	22	30	15	10	18	34	41	17

UNIT –III

11. a) Explain Mean, Median and Mode along with their merits and demerits ?

(Or)

b) If the mean is 1.46 then find Missing frequencies from the following data ?

No. Of Accidents	0	1	2	3	4	5	Total
No. Of days	46	?	10	25	?	5	200

UNIT – IV

12. a) Define Measure of Dispersion and explain about various measures of dispersion ?

(Or)

b) Derive first four Central Moments in terms of Raw Moments ?

UNIT – V

13. a) State and Prove Addition theorem on probability for 'n' events

(Or)

b) State and Prove Boole's Inequality for 'n' events ?

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FIRST YEAR – II SEMESTER (W.E.F. Academic Year 2023 - 24)
COURSE 4: RANDOM VARIABLES AND MATHEMATICAL EXPECTATIONS

Theory Credits: 3

3 hrs/week

I. Learning Outcomes

After successful completion of the course students will be able to:

1. To acquaint with the role of statistics in dealing with the univariate random variables.
2. To learn the extension of the univariate data to bivariate data.
3. To learn the measure of randomness mathematically by using expectations.
4. To get the familiarity about the generating functions, law of large numbers and central limit theorem, further to apply in research and allied fields.

Unit – 1: Univariate Random Variables:

Definition of random variable (r.v.), Discrete and Continuous random variables, Properties - Probability mass function, Probability density function, Distribution function and its properties. Calculation of moments, Coefficient of skewness and kurtosis for a given (pmf) and (pdf).

Unit – 2: Mathematical Expectation

Mathematical expectation of function a random variable. Addition and Multiplication theorems on expectation. Properties of expectations, variance- Properties - Chebyshev and Cauchy - Schwartz inequalities and their applications

Unit – 3: Bivariate Random Variables:

Bivariate random variable - meaning, joint, marginal and conditional Distributions, independence of random variables - Joint Distribution Function - Properties – Covariance – Properties and simple problems.

Unit – 4: Generating functions:

Definitions of Moment Generating Function(MGF), Cumulant Generating Function(CGF), Characteristic Function(CF) and Probability Generating Function(PGF) and their properties. Weak Law of Large Numbers (WLLN), Strong Law of Large Numbers (SLLN).

Unit – 5: Limit Theorems:

Fundamental Concepts : Population, Sample, Parameter, statistic, Sampling distribution, Standard error - Convergence in probability and convergence in distribution - concept of Central limit theorems – Statements of De Moivre and Lindberg - Levy Central Limit Theorems and its applications, Statement of Liapunov's CLT - Relationship between CLT and WLLN.

SEMESTER-II
COURSE 4: RANDOM VARIABLES AND MATHEMATICAL EXPECTATIONS
PRACTICALS

Practical Credits: 1

2 hrs/week

1. Calculation of moments of univariate random variable to the given pmf.
2. Calculation of coefficient of skewness and kurtosis of univariate random variable to the given pmf.
3. Calculation of moments of univariate random variable to the given pdf.
4. Calculation of coefficient of skewness and kurtosis of univariate random variable to the given pdf.
5. Problem related to joint pmf, marginal pmf and conditional pmf and its independence.
6. Chebyshev's inequality application oriented problems.

III. References:

1. S. C. Gupta & V. K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
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COURSE 4: RANDOM VARIABLE AND MATHEMATICAL EXPECTATION

MODEL PAPER

Time : 3 Hours

Max. Marks :75

Electronic Scientific Calculators will be permitted

SECTION – A

Attempt any FIVE Questions

Each question carry FIVE Marks

5 X 5 = 25 Marks

- 1). **Distinguish between the properties of discrete and continuous random variables ?**
- 2). **State and prove Addition theorem on Mathematical Expectation ?**
- 3). **Prove that Characteristic function depends upon both origin and scale ?**
- 4). **If $f(x) = Kx^2(1-x^3), 0 \leq x \leq 1$ then find constant 'K' and write real density function ?**
- 5). **If two unbiased dice are rolled then find mean and variance of random variable ?**
- 6). **Explain probability Mass & Density functions ?**
- 7). **State Weak Law and Strong Law of Large Numbers ?**
- 8). **Explain Marginal and Conditional probability functions ?**

SECTION – B

Attempt any ALL Questions

Each question carry TEN Marks

10 x 5 = 50 Marks

UNIT – I

9. a) **From the following probability distribution find(i) Constant K (ii) Mean (iii) Variance (iv) $P(x < 6)$ and $P(X \geq 6)$?**

X	0	1	2	3	4	5	6	7
P(x)	0	k	2k	2k	3k	K^2	$2K^2$	$7K^2 + K$

(Or)

- b) **Define Distribution function of a random variable with discrete and continuous cases also mention its properties ?**

UNIT – II

10. a) If $F(x) = f(x) = \frac{3}{4}x(2-x), 0 \leq x \leq 2$ then find Mean and Variance of the random variable ?

(Or)

b) State and Prove Chebychev's inequality ?

UNIT –III

11. a) If $f(xy) = 4xy e^{-xy}$ $0 \leq x < \infty, 0 \leq y < \infty$ then verify the two variables x and y are independent or not ?

(Or)

b) Define covariance and give its properties ? If $F(xy) = (1 - e^{-x})(1 - e^{-y})$ then find the Joint probability density function of (x, y)

UNIT – IV

12. a) Define Moment generating function and describe its properties ?

(Or)

b) Derive the relationship between Moments and cumulants of a distribution ?

UNIT – V

13. a) Explain Sampling Distribution, Standard error of a Statistic ? Also give the properties of standard error?

(Or)

b) State Lindberg – Levy and De-Movire Central Limit Theorems ? Also give their applications, ?

