

F.Y.B. Sc. Statistics
Major/Minor Syllabus
(As per NEP Guidelines)

From
Academic year
2023-24

F.Y. B. Sc. (STATISTICS) SEMESTER I

Core Course- I

COURSE TITLE: Descriptive Statistics-I

COURSE CODE: 23US1STCC1DES1 [CREDITS - 02]

Course Learning Outcomes		
<p>After the successful completion of the Course, the learner will be able to:</p> <ol style="list-style-type: none"> 1. Identify the data type, classify, tabulate and represent it graphically 2. Compute appropriate measure of central tendency to be used 		
Module 1	Data: Types, Collection and Management	[15L]
<p>Learning Objectives:</p> <p>The module is intended to</p> <ol style="list-style-type: none"> 1. Understand the importance of the data and different data types. 2. Summarise and present the data in tabular / diagrammatic manner. 		
<p>Learning Outcomes:</p> <p>After the successful completion of the module, the learner will be able to:</p> <ol style="list-style-type: none"> 1. Identify the data type, classify, tabulate and represent it graphically. 		
1.1	<p>Types of data: Qualitative and Quantitative data, Time series and Cross Sectional data, Discrete and Continuous data.</p> <p>Scale of Measurement: Nominal scale, Ordinal scale, Interval scale, Ratio scale</p>	[3L]
1.2	<p>Analysis of Categorical Data: Introduction to classes, Notations used, dichotomous classification, contingency tables for two and three attributes, order of the frequency, proof of total number of frequencies in case of 'k' attributes is 3^k</p> <p>Consistency: Derivations of conditions of consistency of the data in case of two and three attributes</p> <p>Independence of the attributes: Derivations of the conditions of the independence of the two attributes.</p> <p>Conditions for positive and negative association</p>	[6L]

	Association of the two attributes: Coefficient of association, Yule's coefficient of colligation. Derivation of relationship between the two coefficients.	
1.3	Frequency Distribution: Univariate Frequency distribution for continuous and discrete variable, Relative frequency, cumulative frequencies Bivariate frequency distribution, marginal and conditional frequency distribution Graphical representation: Histogram, Frequency polygon, Frequency curve and Ogives. Diagrammatic representation: Bar, Rectangle, Square, Pyramid, Stem and Leaf diagram.	[6L]
Module 2	Measures of Central Tendency or Location	[15L]
Learning Objective:		
This module is intended to:		
1. Introduce various measures of central tendencies		
Learning Outcomes:		
After the successful completion of the module, the learner will be able to		
1. Compute appropriate measure of central tendency to be used.		
2.1	Introduction to Measure of Central Tendency, Requisites of good measure of central tendency	[2L]
2.2	Arithmetic mean (A.M) and its properties, simple A.M, weighted A.M., Combined mean, merits and demerits	[4L]
2.3	Geometric Mean (G.M.), Harmonic Mean (H.M.), merits and demerits of G.M. and H.M. Relationship between A.M., G.M. and H.M.	[3L]
2.4	Positional Averages: Quantiles (Median, Quartiles, Deciles, Percentiles), Mode. Locating these averages graphically	[4L]
2.5	Empirical relationship between mean, median and mode, proper selection of an average.	[2L]

References:

- Goon Gupta and Das Gupta: Fundamentals of Statistics, Vol. 1, The World Press Pvt. Ltd., Kolkata.
- Miller and Freund: Modern Elementary Statistics.
- Spiegel M.R.: Theory and Problems of Statistics, Schaum's Publications series Tata McGraw-Hill.
- Neil Weiss: Introductory Statistics : Pearson Publishers
- Surinder Kundu: Business Statistics
- K. V. S. Sarma: Statistics Made Simple: Do it yourself on PC. Prentice Hall of India Pvt. Ltd., New Delhi.
- Agarwal B.L. : Basic Statistics, New Age International Ltd.

F.Y. B. Sc. (STATISTICS) SEMESTER I

Core Course- II

COURSE TITLE: Introduction To Probability and Random Variables

COURSE CODE: 23US1STCC2PRT [CREDITS - 02]

Course Learning Outcomes

After the successful completion of the Course, the learner will be able to:

1. Explain different hierarchical approaches to be used to calculate probability in a given scenario.
2. Compute probability using addition and multiplication rules.
3. Distinguish between discrete and continuous random variables.
4. Define probability function and cumulative distribution function of discrete and continuous random variables
5. Apply various properties of expectations of discrete random variables

Module I

Elementary Probability Theory

[15L]

Learning Objectives:

The module is intended to

1. Explain basic concepts in probability and different types of events
2. Compute probability using addition and multiplication rules.

Learning Outcomes:

After the successful completion of the module, the learner will be able to

1. Differentiate between different types of events.
2. Compute probability using different approaches such as Classical, Empirical and Axiomatic.
3. Apply probability rules such as addition, multiplication and Bayes' rule

1.1	Random Experiment, Sample Point & Sample Space, Definition of Event, Elementary Event, Algebra of Events (occurrence of at least one, none, all, exactly one event), mutually exclusive events, exhaustive events	[3L]
1.2	Classical, Empirical and Axiomatic definitions of probability.	[3L]
1.3	Conditional Probability, Independence of n Events ($n = 2, 3$), examples of pair-wise and complete independence.	[5L]

	Addition theorem with proof.	
1.4	Multiplication Theorem and Bayes' rule (All theorems with proofs)	[4L]
Module 2	Random Variables and Properties of Expectations of Random Variables	[15L]
<p>Learning Objectives:</p> <p>This module is intended to:</p> <ol style="list-style-type: none"> 1. Define different types of random variables. 2. Obtain probability function and cumulative distribution function for discrete and continuous random variables. 3. Explain properties of expectations of discrete and continuous random variables. 		
<p>Learning Outcomes:</p> <p>After the successful completion of the module, the learner will be able to:</p> <ol style="list-style-type: none"> 1. Distinguish between discrete and continuous random variables. 2. Apply properties of probability function and cumulative distribution function of discrete and continuous random variables. 3. Apply various properties of expectations of discrete random variables. 		
2.1	Definition: Univariate discrete and continuous random variables, probability function, cumulative distribution function of discrete and continuous random variables	[5L]
2.2	Theorems on Expectation and variance of univariate discrete and continuous random variables, Raw and Central Moments and their relationships (with proof).	[5L]
2.3	Bivariate discrete random variable, Joint probability mass function of two random variables, Marginal and Conditional probability distributions, Independence of two random variables.	[5L]
<p>References:</p> <ul style="list-style-type: none"> • Goon Gupta and Das Gupta: Fundamentals of Statistics, Vol. 1, The World 		

Press Pvt. Ltd. Kolkata.

- M. N. Welling, P. P. Khandeparkar, R. J. Pawar and S. S. Naralkar: Descriptive Statistics, Manan Prakashan, 2nd Revised Edition 2014.
- Gupta Sc and V. K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons Publications, 10th Revised Edition 2000

F.Y. B. Sc. (STATISTICS) SEMESTER II

Core Course- I

COURSE TITLE: Descriptive Statistics-II

COURSE CODE: 23US2STCC1DES2 [CREDITS - 02]

Course Learning Outcomes		
<p>After the successful completion of the Course, the learner will be able to</p> <ol style="list-style-type: none"> 1. Calculate various measures of absolute and relative dispersion 2. Measure the degree of correlation between two variables 3. Fit different types of curves to the data using the method of least square 		
Module 1	Absolute and Relative Measures of Dispersion	[15L]
<p>Learning Objectives: The module is intended to</p> <ol style="list-style-type: none"> 1. Introduce various measures of variation 		
<p>Learning Outcomes: After the successful completion of the module, the learner will be able to</p> <ol style="list-style-type: none"> 1. Calculate appropriate measure of variation. 		
1.1	Range, Interquartile Range, Quartile Deviation, Mean Absolute Deviation, Standard Deviation (Variance) and their relative measures, Combined variance	[5L]
1.2	Raw and Central moments up to fourth order and the relationship between them (with proof)	[5L]
1.3	Measures of Skewness and Kurtosis	[5L]
Module 2	Bivariate Correlation and Linear Regression	[15L]
<p>Learning Objectives: This module is intended to:</p> <ol style="list-style-type: none"> 1. Interpret the relationship between two variables using graphical and analytical methods. 2. Establish the relationship between the variables using regression analysis 3. Evaluate various properties of the regression and correlation coefficient. 4. Fit various curves using method of least squares 		

Learning Outcomes:

After the successful completion of the module, the learner will be able to:

1. Compute degree of relationship between the two variables using different methods
2. Fit different types of curves to the data using the method of least square.

2.1	Scatter diagram, Covariance between two variables, Relationship between variance and covariance	[3L]
2.2	Product Moment correlation coefficient and its properties, graphical interpretation, Rank correlation Spearman's measure.	[3L]
2.3	Principle of least square fitting of a straight line, fitting of curves reducible to linear form by transformation and fitting of quadratic curve using method of least squares.	[4L]
2.4	Concept of linear regression, fitting of a linear regression line by method of least square. Relation between regression coefficients and correlation coefficient.	[5L]

References:

- Goon Gupta and Das Gupta: Fundamentals of Statistics, Vol. 1, The World Press Pvt. Ltd., Kolkata.
- Miller and Freund: Modern Elementary Statistics.
- Spiegel M.R.: Theory and Problems of Statistics, Schaum's Publications series Tata McGraw-Hill.
- Neil Weiss: Introductory Statistics : Pearson Publishers
- Surinder Kundu: Business Statistics
- K. V. S. Sarma: Statistics Made Simple: Do it yourself on PC. Prentice Hall of India Pvt. Ltd., New Delhi.
- Agarwal B.L. : Basic Statistics, New Age International Ltd.

F.Y. B. Sc. (STATISTICS) SEMESTER II

Core Course- II

COURSE TITLE: Probability Distributions - I

COURSE CODE: 23US2STCC2PRD1 [CREDITS - 02]

Course Learning Outcomes		
<p>After the successful completion of the Course, the learner will be able to:</p> <ol style="list-style-type: none"> 1. Compute probabilities using various discrete probability distributions 2. Compute probabilities using various continuous probability distributions 		
Module 1	Standard Univariate Discrete Probability Distributions	[15L]
<p>Learning Objectives:</p> <p>The module is intended to</p> <ol style="list-style-type: none"> 1. Identify appropriate discrete probability distributions. 2. Explain the relationship amongst various discrete probability distributions. 3. Compute expected frequencies by estimating appropriate parameters of the given distribution. 		
<p>Learning Outcomes:</p> <p>After the successful completion of the module, the learner will be able to:</p> <ol style="list-style-type: none"> 1. Construct various discrete probability distributions 2. Examine properties, applications and relationships amongst various discrete probability distributions 3. Fit discrete probability distribution by estimating appropriate parameters 		
1.1	<p>Degenerate distribution, Bernoulli distribution, binomial distribution, hypergeometric distribution, derivation of its expectation and variance. Relation between binomial and hypergeometric distribution (With proof). Derivation of its recurrence relation to calculate binomial probabilities.</p>	[6L]
1.2	<p>Poisson distribution, derivation of its expectation and variance, Relation between binomial and poisson distribution (With proof), Derivation of its recurrence relation to calculate binomial probabilities.</p>	[5L]

1.3	Uniform distribution, derivation of its expectation and variance.	[2L]
1.4	Fitting of binomial and poisson distributions	[2L]
Module 2	Standard Univariate Continuous Probability Distributions	[15L]

Learning Objectives:

This module is intended to:

1. Compute probabilities using Rectangular, Exponential probability distributions.
2. Explain the properties of Normal and standard normal distributions.
3. Compute probabilities of normal random variables using standard normal probability tables.

Learning Outcomes:

After the successful completion of the module, the learner will be able to:

1. Compute probabilities using Rectangular, Exponential probability distributions.
2. Calculate normal probabilities using standard normal probability table.
3. Apply additive property of independent normal variates and Central limit theorem.
4. Apply normal approximation to binomial and Poisson distribution.

2.1	Rectangular distribution: Derivation of cumulative distribution function, mean, median and variance.	[3L]
2.2	exponential distribution: Derivation of cumulative distribution function, mean, median and variance	[4L]
2.2	Properties of normal distribution, normal curve (without proof), Normal Approximation to binomial and Poisson distributions (without proof).	[8L]

References:

- Goon Gupta and Das Gupta: Fundamentals of Statistics, Vol. 1, The World Press Pvt. Ltd., Kolkata.
- Surinder Kundu: Business Statistics

- Gupta Sc and V. K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons Publications, 10th Revised Edition 2000
- R. J. Shah: Statistical Methods, Sheth Publication, 1st Edition 2010