Gujarat University

B. Sc. (Honors)   Semester – I – Statistics (Major)
AS PER NEP 2020   (To be effective from June 2023)

Prerequisite:

BSc Statistics is an undergraduate course that deals primarily with statistics, probability, and permutations. Students who are thinking of pursuing a BSc Statistics must have completed 10+2 in the fields of Mathematics, Physics and Chemistry. A fundamentally sound knowledge of limit and continuity, derivatives - Total and partial, and integration is desirable. Students must have basic know how of numerical or qualitative information, methods of collecting numerical or qualitative information through attributes, graphical presentation and some primary measures, like arithmetic mean, median, mode.

Co-requisite

Fundamental knowledge about use of scientific calculator and functionality of computers is desirable. Knowledge of computer software like MS-Office is also desirable.

Vision and Outcome
The aim of introducing statistics as a subject and scientific tool as well, at an undergraduate level is to provide students a strong theoretical foundation, which is on par with other institutions and colleges with reputation of national level. At the same time, enough care is taken to emphasize on the course contents that enhance the ability of students to gain knowledge of open-source statistical software. This enables students' understanding in dealing with real life problems from statistical viewpoint. The weightage is given to fieldwork and projects that make students develop statistical thinking and work independently.

Outcomes	
Programme Outcome	Students will demonstrate an understanding of major concepts in statistics. Students tend to think critically and apply their understanding to develop ability to design, collection, presentation, analyse and interpret of data based problems of real life situations.
Programme Specific Outcome	The ability to identify type of observable phenomena and probability distributions that are associated with observable phenomena. This helps them to collect the relevant data and to verify different properties of associated probability distribution. The design and execution of the proper statistical analysis reveals their understanding of good analytical skills and proper handling of statistical data.

Course	Outcomes
Statistics **DSC-C-STA-111T** **(Descriptive Statistics-I)**	The main objective of this course is to acquaint students with some basic concepts in Statistics. They will be introduced to some elementary statistical methods of analysis of data. At the end of this course students are expected to be able, 1. to tabulate statistical information given in descriptive form. 2. to use graphical techniques and interpret. 3. to compute various measures of central tendency, dispersion, skewness and kurtosis. 4. to analyze data pertaining to attributes and to interpret the results. 5. to summarize and analyze the data using computer. 6. to apply statistics in the various fields.
Statistics **DSC-C-STA-112P** **(Practical)**	At the end of the semester, students can identify nature of the problem and type of data to be collected. Also, He/She can ably obtain certain summary statistics in order to present the data in meaningful way. This will help them to understand the other associated methods and procedures used in analysis in a better way. The topics for this paper are based on Theory paper **DSC-C-STA –111T**

Course Structure with Credits, Lecture Hours and Marks

Course Code	Course Title	Credit	Lecture Hours Per Week	Exam Hours	Evaluation		
					Internal	External	Total
DSC-C-STA - 111T	Descriptive Statistics-I	4	4	2.5	50	50	100
DSC-C-STA - 112P	Descriptive Statistics-I	4	8	2.5	50	50	100

Syllabus for Statistics (UG)
B. Sc. Semester I

DSC-C-STA-111T - Descriptive Statistics – I

Hours per week: 4   **Credit: 4**

Unit: 1 - Data Types and Classification
Types of data: Primary, Secondary, Internal and External data and their sources.
Designing a questionnaire schedule.
Classification of data: Qualitative, Quantitative: Discrete, Continuous; Chronological
(Time series) data.
Nominal, Ordinal, Interval and Ratio data.
Frequency: grouped and ungrouped data; Construction of frequency and cumulative
frequency distribution.
Presentation of qualitative data: Tabulation (up to four attributes).

Unit: 2 - Data visualisation
Graphical representation of grouped data: Histogram, frequency curve, frequency polygon,
ogives (cumulative frequency curves), Diagrammatic representation of data: Bar diagrams-
simple Bar, multiple bar, sub-divided bar and percentage bar diagrams.
Two dimensional diagrams: Rectangles and Pie diagrams. Stem - Leaf plot.
Bivariate : Frequency distribution, Marginal and Conditional frequency distributions.

Unit: 3 - Measures of Central Tendency
Concept of central tendency, various measures of central tendency and their interrelationship.
Their merits and demerits. Empirical relation between mean, median and mode. Properties and
applications of measures of central tendency. Partition values (quartiles, deciles and
percentiles.)

Unit: 4 - Measures of Dispersion and Moments
Concept of variation/dispersion, quartile deviation, Absolute and relative measures of
dispersion with their merits, demerits and applications.
Moments: raw moments, central moments, factorial moments and their
interrelationship.
Skewness, Kurtosis and their measures. Box plot.

Reference Books for Paper DSC-C-STA-111T

1. Statistical analysis: Graphs and diagrams, S. M. Nair and M. Garg, Spectrum books (P) Ltd, New Delhi.
2. Introduction to the Practice of Statistics, Moore, S. David; McCabe, P. George W. H. Freeman and Company, New York.
3. Basic Statistics, Agarwal, B. L., New Age International (P) Ltd.
4. Introduction to the theory of Statistics, Mood, A. M., Greybill, F.A., Boes, D.C., McGraw Hill.
5. Fundamentals of Mathematical Statistics, S. C. Gupta and V. K. Kapoor, Sultan Chand and Sons, New Delhi.

Websites for secondary data sources

www.actuaries.org.uk

www.actuariesindia.org

www.soa.org

FBLD (Flip Blended Learning Design Template)
- Any One Unit from the above syllabus can be discussed by the faculty through online mode.
- Online mode can be SWAYAM MOOC Course or any other suggested by the UGC or Gujarat University.

Syllabus for Statistics (UG)
B. Sc. Semester I

DSC-C-STA-112P – (Practical Based on DSC-C-STA-111T)

Hours per week: 8   **Credit: 4**

Part A (Manual)

1. Classification of the variable/data in to various category and tabulation.
2. Construction of frequency table (one way and two way).
3. Data visualization: Histogram, Frequency curve, frequency polygon, ogives (cumulative frequency curves), Bar Diagrams, Pie Diagram, Stem - Leaf and box plot.
4. Problems based on measures of central tendency.
5. Problems based on measures of dispersion.

Part B (Computer Using MS Excel)

1. Introduction to MS-EXCEL
2. Preparing data file
3. Import data from different format file.
4. Classification of the variable/data in to various category and tabulation.
5. Construction of frequency table (one way and two way).
6. Data visualization: Histogram, Frequency curve, frequency polygon, ogives (cumulative frequency curves), Bar Diagrams, Pie Diagram, Stem - Leaf and box plot.
7. Problems based on measures of central tendency.
8. Problems based on measures of dispersion.

Note: It is recommended to perform statistics practicals using MS Excel.

B.Sc. Statistics (HONS)
Semester-II

Course	Outcomes
Statistics **DSC-C-STA-121T** **Probability Theory**	The design of this course helps learning basic concept of probability and its application. The paper is about to develop a scientific thinking. Outcomes: 1. Students easily generate sample space, identify its type, define associated events and find probabilities of different events as well. 2. Students can define random variable with prior knowledge of sample space and probability and develop probability distribution. 3. Students can obtain Moments generating functions in order to study properties of probability distributions. 4. Various probability inequalities, idea of bivariate distribution and joint probability distribution will be clear.
Statistics **DSC-C-STA-122P** **(Practical)**	At the end of the semester, students can identify nature of the problem, and can calculate probabilities of different events. Also, students can ably obtain certain summary statistics for probability distributions of random variables. This will help them to understand the other associated methods and procedures used in analysis in a better way. Topics for this paper are based on theory paper **DSC-C-STA – 121T**

Gujarat University

B. Sc. Semester – II – Statistics

Course Structure with Credits, Lecture Hours and Marks

Course Code	Course Title	Credit	Lecture Hours Per Week	Exam Hours	Evaluation		
					Internal	External	Total
DSC-C-STA - 121T	Probability Theory	4	4	2.5	50	50	100
DSC-C-STA - 122P	Probability Theory	4	8	2.5	50	50	100

Syllabus for Statistics (UG)
B. Sc. Semester II

DSC-C-STA-121T - Probability Theory

Hours per week: 4   **Credit: 4**
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Unit: 1 – Probability Theory
Random Experiment, trial, sample point, sample space, definition of equally likely, mutually exclusive and exhaustive events.
Definition of probability: classical, relative and axiomatic approach and its properties.
Conditional probability, multiplicative law of probability, Boole's inequality, Bonferroni's inequality, Chebyshev's Inequality. Independence of events, law of total probability, Bayes theorem and its applications.

Unit: 2 – Random Variable (Univariate and Bivariate)
Random Variable (rv) with its types, probability mass function (pmf), probability density function (pdf), cumulative distribution function (cdf) with illustrations.
Expectation of Random variables with properties,
Concept of Joint Distributions, Joint probability mass function and Joint probability density function. Marginal and conditional distributions, independence of random variables, conditional expectation and conditional variance. Product moments.

Unit: 3 – Generating Functions
moments, factorial moments, measures of location, skewness, kurtosis, probability generating function (pgf), moment generating function (mgf), cumulant generating function (cgf), factorial moment generating function with their properties and uses.

Unit: 4 – Functions of random variables.
Distributions of functions of one- and two-dimensional random variables. Basic idea and concept of Jacobian of transformation in derivation of distribution of function of random variables. Use of Jacobian of transformation in distribution deriving distribution of function of two random variables,
General form of distribution of sum of two independent random variables, difference between two independent random variables, product of two independent random variables, quotient (ratio) of two independent random variables.

Reference Books for DSC-C-STA-121T

1. Introduction to the Practice of Statistics, Moore, S. David; McCabe, P. George W. H. Freeman and Company, New York.
2. Basic Statistics, Agarwal, B. L., New Age International (P) Ltd.
3. Introduction to the theory of Statistics, Mood, A. M., Greybill, F.A., Boes, D.C., Mc Graw Hill.
4. Fundamentals of Mathematical Statistics, S. C. Gupta and V. K. Kapoor, Sultan Chand and Sons, New Delhi.
5. Mathematical Statistics, P. Mukhopadhyay, New Central Book Agency (P) Ltd, Calcutta
6. An Introduction to Probability and Statistics, V. K. Rohatgi and A.K.Md. Ehsanes Saleh, Wiley Series.
7. K. V. S. Sarma: Statistics Made Simple : Do it yourself on PC. Prentice Hall of India Pvt. Ltd., New Delhi.
8. Amir D. Aczel and Jayael Soundarpandiyan, Complete Business Statistic : McGraw Hill Education (6th Edition).
9. Kothari C.R. : Research Methodology, Wiley Eastern Limited.
10. Hogg R.V. and Tannis E.P. : Probability and Statistical Inference. McMillan Publishing Co. Inc
11. Pitan Jim : Probability, Narosa Publishing House.
12. A First Course in Probability - Sheldon.M.Ross (Mc Millian publishing Co.)

Syllabus for Statistics (UG)
B. Sc. Semester II

DSC-C-STA-122P – (Practical based on DSC-C-STA-121T)

Hours per week: 8   **Credit: 4**

Part-A (Manual)

1. Practical based on probability from the given data and bivariate table.
2. Practical based on Bayes theorem
3. Practical based on skewness and kurtosis.
4. Practical based on marginal and conditional distributions.
5. Practical based on moments of joint, marginal and conditional distributions.

Part-B (Computer Using MS Excel)

1. Practical based on probability from the given data and bivariate table.
2. Practical based on Bayes theorem
3. Practical based on skewness and kurtosis.
4. Practical based on marginal and conditional distributions.
5. Practical based on moments of joint, marginal and conditional distributions.