Gujarat University
B. Sc. Semester – III – Statistics (Major)
Effective from June - 2024

Prerequisite:

B.Sc. 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 cleared semesters I and II with statistics subject as major, minor or multidisciplinary. A fundamentally sound knowledge of probability theory, random variables and probability distributions is desirable. Knowledge and exposure to any statistical tool 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 necessary. Knowledge and basic understanding of MS – Office is recommended.

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

	Students will demonstrate an understanding of major concepts in statistics.
Programme Outcome	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 - 231T** **Probability Distribution – I**	This course is designed to enable students to acquire basic understanding of statistical probability distributions, properties and applications in different fields. The outcomes are 1. Develop an understanding of observable characteristics and in context to that understanding and classification of different discrete and continuous probability distributions. 2. Shall learn the properties of different probability distributions. 3. Student would be able develop an understanding of solving the problems based on different probability distributions 4. helps students understand applicability of different probability distributions in different fields.
Statistics **DSC- C – STA - 232T** **Descriptive Statistics II**	This course is designed to enable students to understand the purpose of extension of one dimensional random variables to Two or Three or Multi- dimensional random variables. At under graduate level, study is restricted to Three random variables. The students can establish association among variables and its measure in terms of correlation. The outcomes are 1. Develop understanding about bivariate data, association through scatter diagram, least square principle for error minimization, correlation coefficient 2. Multiple and partial correlation coefficient Independent and dependent variable, and establish the relation between them by computing correlation coefficient and association of attributes.
Statistics **DSC-C- STA-233P** **(Practical)**	At the end of the semester, students can identify nature of the problem and type of data to be collected and test whether a particular probability distribution is applicable for the data gathered. Also, He/She can ably obtain certain summary statistics in order to understand and analyze random phenomena through probability distributions. To understand and identify association as linear or curvilinear, measure of correlation and its coefficient, lines of regression and other related aspects are

introduced and discussed through numerical data. They learn how to analyse and interpret results for a valid data set.

This paper is based on Theory papers DSC- C – STA - 231T and DSC- C – STA - 232T.

Course Structure with Credits, Lecture Hours and Marks

Course Code	Course Title	Credit	Lecture Hours Per Week	Exam Hours	Marks		
					Internal	**External**	**Total**
DSC- C – STA - 231T	Probability Distribution – I	**4**	**4**	**2.5**	**50**	**50**	**100**
DSC- C – STA - 232T	Descriptive Statistics II	**4**	**4**	**2.5**	**50**	**50**	**100**
DSC- C – STA – 233P	Practical	**4**	**8**	**2.5**	**50**	**50**	**100**

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Syllabus for B.Sc. Semester III (Statistics - Major)
DSC-C-STA-231T
Probability Distribution – I

HOURS: 4 / week ***CREDIT: 4***

Unit I: Discrete Probability Distribution– I

Bernoulli distribution,
Binomial distribution
Poisson distribution
Hyper geometric distribution

- Derivation, basic properties of these distributions – Mean, Variance, moment generating function and moments, cumulant generating function,
- Applications and examples of these distributions.

Unit II: Continuous Probability Distribution-I

Uniform / Rectangular Distribution
Exponential Distribution
Beta type I and type II distribution

- Derivation, basic properties of these distributions – Mean, Variance, moment generating function and moments, cumulant generating function,
- Applications and examples of these distributions.

Unit III: Normal Distribution and Central Limit Theorems

Normal Distribution: Derivation, basic properties of Normal distribution: Mean, Variance, MGF, CGF. Application and examples of Normal Distribution.

Unit IV: Truncated distributions

- Truncation Meaning and use, types of truncations
- Truncated distribution as conditional distribution, truncation to the right, left and on both sides.
- Binomial distribution B(n p) left truncated at X = 0, (value zero not observable), its p.m.f, mean, variance.
- Poisson distribution P(λ) left truncated at X = 0 (value zero not observable), its p.m.f, mean, variance.
- Examples and problems. Truncated Binomial Distribution and Truncated Poisson Distribution,

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Descriptive Statistics – II

HOURS: 4 / week ***CREDIT: 4***

Unit:1 Review of Bivariate Distribution

Concept of joint distribution, marginal and conditional probability functions, conditional expectation and conditional variance, product moments and Karl Pearson, Correlation Coefficient.

Bivariate Normal Distribution (without proof-statements only): Derivation, Marginal distribution, Conditional distribution, Mean, variance, MGF, Conditional mean, Conditional Variance

Regression as conditional expectation.

Unit II: Correlation

Bivariate data, plotting of bivariate data, Scatter diagram, Karl Pearson correlation coefficient for bivariate data, its properties, coefficient of determination, rank correlation, correlation ratio and related results.

Unit III: Regression

Principle of Least squares, fitting of Linear, Parabolic, exponential and geometric curves. concept of regression, Determination of equation of regression lines for two random variables, properties of regression coefficients and related results.

Unit: IV: Multiple and Partial Correlation and Regression

Concept of Yule's notation, plane of equation of regression line involving three variables, concept of residue and its properties, multiple and partial correlation, inter-relationships, related results and Examples.

Reference Books:

1. Hogg, R.V. and Craig, A.T. (1972): Introduction to Mathematical Statistics, Amerind Publishing Co.
2. Mood, A.M., Greybill, F.A. and Bose, D.C. (1974): Introduction to the Theory of Statistics, McGraw Hill.
3. Mukhopadhyay, P. (1996): Mathematical Statistics, New Central Book Agency.
4. Rohtagi, V.K. (1967): An Introduction to Probability Theory and Mathematical Statistics, John Wiley and Sons.
5. Hoel, P.G. (1971): Introduction to Mathematical Statistics, Asia Publishing House.
6. Meyer, P.L. (1970): Introductory Probability and Statistical Applications, Addison Wesley.
7. Gupta, S.C., and Kapoor, V.K. Fundamentals of Mathematical Statistics, Sultan Chand Publications.
8. Goon, A.M., Gupta, M.K. and Das Gupta, B. (1991): Fundamentals of Statistics, Vol. I, WorldPress, Calcutta.
9. A First Course in Probability - Sheldon.M.Ross, (Mc Millian publishing Co.)

10. Introduction to Probability and Statistics for Engineers and Scientists-S.M. Ross (Elsever)

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.

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Syllabus for B.Sc. Semester III (Statistics - Major)
DSC-C-STA-233 P

HOURS: 8 / week ***CREDIT: 4***

Part A

1. Fitting of binomial, truncated binomial, distributions.
2. Fitting of Poisson, truncated Poisson, distributions.
3. Fitting of normal distribution.
4. Problems based on Karl Pearson correlation coefficient.
5. Problems based on rank correlation coefficient.
6. Fitting of straight line and second-degree parabola.
7. Fitting of curves that are reducible to linear form.
8. Problems based on regression coefficient.
9. Problems based on multiple correlation coefficient and multiple regression.
10. Problems based on partial correlation and partial regression.

Part B: (Computer)

1. Drawing a random sample from: binomial, truncated binomial, distributions.
2. Drawing a random sample from: Poisson, truncated Poisson, distributions.
3. Drawing a random sample from: uniform and exponential distributions.
4. Drawing a random sample from: normal distribution.
5. Fitting of binomial, truncated binomial, distributions.
6. Fitting of Poisson, truncated Poisson, distributions.
7. Fitting of normal distribution.
8. Problems based on Karl Pearson correlation coefficient.
9. Problems based on rank correlation coefficient.
10. Fitting of straight line and second-degree parabola.
11. Fitting of curves that are reducible to linear form.
12. Problems based on regression coefficient.
13. Problems based on multiple correlation coefficient and multiple regression.
14. Problems based on partial correlation and partial regression.