

Gujarat University
B. Sc. Semester – IV – 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

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 the mathematical model and with numerical data set its necessity of checking whether it is appropriate or not. Also, the concept of exact sampling distribution is introduced to derive probability distribution of different statistics defined on random samples and to verify whether they possess property of asymptotic normality or not.

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 that suits probability distributions introduced in Semester IV syllabus.

Course

Outcomes

Statistics DSC- C – STA - 241T Probability Distributions - II

This course is designed to enable students to acquire basic understanding of advanced statistical probability distributions, their properties and applications.

The outcomes are:

1. Develop an understanding of advanced statistical probability distributions.
2. Students Shall learn the properties of advanced statistical probability distributions.
3. Students would be able to develop an understanding of solving the problems based on these probability distributions.
4. Interrelationships of discrete probability distributions
5. Applications of discrete probability distributions.
6. Introduction of few applications oriented continuous distributions
7. Interrelationship of exponential family of distributions
8. Applications of this distributions in life testing and reliability, insurance claim analysis, quality control and capability analysis and other areas

Statistics DSC- C – STA - 242T Applied Statistics

This course is designed to enable students to acquire basic understanding of Application of statistics in economics. The course contains different aspects of

- The Theory of Demand and Supply helps in understanding the Economic system and its function. The quantity demanded of a good or service is the amount that consumers plan to buy during a particular time period, and at a particular price.
- To check how the concept of supply and demand are related to each other and how they affect each other
- index numbers and its utility in understanding of economic activities
- Time series and its importance in business forecasting
- Shall learn Index number, its computation and interpretation.
- Time series data, its components, curve fitting, various smoothing methods, Students would be able to analyse time series data,
- Demography and its importance in wellbeing of human population. compute different measures of vital events that have influence on human population.

Statistics
DSC-C- STA-243P
(Practical)

- At the end of the semester, students can identify nature of the probability distributions through mean, variance and other measures.
- Random sampling and fitting of probability distributions
- Test whether a particular probability distribution is applicable for the data gathered.
- Can ably obtain certain summary statistics in order to understand and analyze random phenomena through probability distributions.
- Demand and Price function, Demand curve, elasticity of demand and its interpretation, market equilibrium and other results,
- Use of different formulas of finding indices, chain and fixed based indices, whole sale and consumer price index numbers.
- Determination of Trend, Short term variations, seasonal indices, tests for index number formulas
- statistics of vital events, interpretations of Net and Gross Reproduction Rates.

This paper is based on Theory papers DSC – C – STA – 241T and DSC – C – STA – 242T

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 - 241T	Probability Distribution –II	4	4	2.5	50	50	100
DSC- C – STA - 242T	Applied Statistics	4	4	2.5	50	50	100
DSC- C – STA – 243P	Practical	4	8	2.5	50	50	100

Gujarat University
NEP (2020)
Syllabus for B.Sc. Semester IV (Statistics – Major)
DSC-C-STA-241 T
Probability Distributions - II
Effective from June, 2024

HOURS: 4 / week

CREDIT: 4

Unit – I Discrete Probability Distributions – II

- Geometric Distribution
- Negative Binomial 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 Distributions – II

- Gamma Distribution
- Weibull Distribution
- Log Normal Distribution
- Derivation, basic properties of these distributions – Mean, Variance, moment generating function and moments, cumulant generating function,

Unit – III SAMPLING AND SAMPLING DISTRIBUTION

Random Sample Techniques, Non-random Sampling, Sampling and Non-sampling Errors, Sampling Distribution of sample Means, sample Proportion. Sampling Distribution of Difference of Two Sample Means, sampling distribution of difference of two population proportions.

Unit – IV Basics of Statistical Hypothesis and Large Sample Tests

Null hypothesis, Alternative hypothesis, simple and composite hypothesis, critical region, Type- I & type-II Errors, level of significance, power of the test, Test of significance of population Mean, Test of Significance of difference between two means, Test of significance of Population Proportion, Test of Significance of difference between two proportions.

Gujarat University
NEP (2020)
Syllabus for B.Sc. Semester IV (Statistics – Major)
DSC-C-STA-242 T
Applied Statistics

Effective from June, 2024

HOURS: 4 / week

CREDIT: 4

Unit: 1 Economic Statistics

Concept of demand and supply, formulation of demand and supply function, market equilibrium, determination of demand and supply curves from time series data
Elasticity of demand and supply and cost function, revenue, average revenue, marginal revenue and their relationship with elasticity. Optimisation of revenue for a given demand law, use of elasticity in classification of goods. Problems of monopoly.

Unit : 2 Index numbers

Concept of index numbers, use of index numbers, Construction of index numbers, concept of price, quantity and value index numbers, Fixed base and chain-based index numbers – concept and uses with examples, Whole sale price index numbers and its economic importance. Aggregate and weighted index numbers - Laspeyer, Paasche's, Fisher's and Marshall-Edgeworth formula of index numbers.
Tests for index numbers – Circular test, Time Reversal Test and Factor Reversal Test, Ideal index number, Construction of cost of living index number, Brief idea about Base shifting and base splicing and its application.

Unit: 3 Time series

Idea of time series, Components of time series, additive and multiplicative models of time series, measurement of trend by method of moving average, polynomial up to second degree.
Computation of seasonal indices using ratio to trend method.

Unit: 4 Vital Statistics

Brief note on vital statistics, Role of vital events, methods of data collection on vital events,
Measurement of mortality – Crude Death Rate, Specific Death Rate, Standardized Death Rate. Measurements of fertility – Crude Birth Rate, General Fertility Rate, Total Fertility Rate, Gross and Net Reproduction Rate.

Books:

1. Gupta, S. C. And Kapoor, V. K.(2005): Fundamentals of Applied Statistics, Sultan Chand & Sons.
2. Mukhopadhyay P. (1999): Applied Statistics
3. Hogg, R.V. and Craig, A.T. (1972): Introduction to Mathematical Statistics, Amerind Publishing Co.
4. Mood, A.M., Greybill, F.A. and Bose, D.C. (1974): Introduction to the Theory of
5. Statistics, McGraw Hill.
6. Mukhopadhyay, P. (1996): Mathematical Statistics, New Central Book Agency.
7. Rohtagi, V.K. (1967): An Introduction to Probability Theory and Mathematical Statistics, John Wiley and Sons.
8. Hoel, P.G. (1971): Introduction to Mathematical Statistics, Asia Publishing House.
9. Meyer, P.L. (1970): Introductory Probability and Statistical Applications, Addison Wesley.
10. Gupta, S.C., and Kapoor, V.K. Fundamentals of Mathematical Statistics, Sultan Chand Publications.
11. Goon, A.M., Gupta, M.K. and Das Gupta, B. (1991): Fundamentals of Statistics, Vol. I, WorldPress, Calcutta.
12. A First Course in Probability - Sheldon.M.Ross, (Mc Millian publishing Co.)
13. Introduction to Probability and Statistics for Engineers and Scientists-S.M. Ross (Elsever)

Gujarat University
NEP (2020)
Syllabus for B.Sc. Semester IV (Statistics – Major)
DSC-C-STA-243 P
(Practical based on DSC-C-STA-241 T and DSC-C-STA-242 T)

Part - A (Manual)

1. Drawing of random samples from geometric and negative binomial distributions.
2. Fitting of geometric and negative binomial distributions.
3. Drawing of random samples from Weibull distribution.
4. Problems on fixed and chain-based index numbers
5. Calculation of indices using Laspeyer's, Paasche, Fisher's and Marshal Edgeworth formula. Time reversal and Factor reversal test for Laspeyer's, Paasche, Fisher's and Marshal Edgeworth formulae.
6. Calculation of cost-of-living index number.
7. Time series - calculation of trend using least square and moving average methods.
Calculation of seasonal indices using ratio to trend and link relative methods.
- 8.. Calculation of mortality and fertility rates.
9. Problems based on life tables.
10. Test of significance of single mean for large sample or known SD.
11. Test of significance of difference between two means with known SD.
12. Test of significance of single proportion and difference between two proportions.

Part - B (MS Excel)

1. Drawing of random samples from geometric and negative binomial distributions.
2. Drawing pf random samples from Laplace and Bivariate normal distributions.
3. Fitting of geometric and negative binomial distributions.
4. Drawing of random samples from Weibull and distribution.
5. Calculation of indices using Laspeyer's, Paasche, Fisher's and Marshal Edgeworth formula.
6. Tests of Index numbers for Laspeyer's, Paasche, Fisher's and Marshal Edgeworth formula.
7. Calculation of cost-of-living index number.
8. Time series - calculation of trend using least square and moving average methods,
Calculation of seasonal indices using ratio to trend and link relative methods.
9. Calculation of mortality and fertility rates.
10. Test of significance of single mean for large sample or known SD.
11. Test of significance of difference between two means with known SD.
12. Test of significance of single proportion and difference between two proportions..