

Gujarat University
Choice Based Credit System (CBCS)
Syllabus for Statistics (UG)
B. Sc. Semester III and IV
Effective from June, 2018

Semester -III

| Paper Number | Name of the Paper | Hours per Week | Credit |
|---------------------|---|-----------------------|---------------|
| STA-201 | Distribution Theory - I | 4 | 4 |
| STA-202 | Descriptive Statistics - II | 4 | 4 |
| STA-203 | Practical Paper (Based on STA 201 and STA202) Part A- Manual Part B – MS Excel | 3 + 3 | 2.5 |

Semester -IV

| Paper Number | Name of the Paper | Hours per Week | Credit |
|---------------------|---|-----------------------|---------------|
| STA-204 | Distribution Theory - II | 4 | 4 |
| STA-205 | Applied Statistics | 4 | 4 |
| STA-206 | Practical Paper (Based on STA 204 and STA205) Part A- Manual Part B – MS Excel | 3 + 3 | 2.5 |

Semester III
Paper: STA 201 - Distribution Theory – I

Lectures per week: 4

Credit of this paper: 4

Unit:1

Discrete Distribution and their properties

Uniform (Rectangular), Bernoulli distribution, Binomial distribution, Poisson distribution. Truncated Binomial distribution (Truncated at $X=0$), Truncated Poisson distribution (Truncated at $X=0$).

Unit: 2

Continuous distributions and their properties:

Uniform (Rectangular) distribution, beta type I and type II distributions, exponential distribution, gamma distribution.

Unit:3

Distributions of functions of one and two dimensional random variables

Basic idea and concept of Jacobian in derivation of distribution of function of random variables

use of Jacobian 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.

Unit 4

Order Statistics and Compound distribution

Definition and application of order statistics, distribution of the smallest and the largest ordered statistics, Joint distribution of the smallest and largest ordered statistics (statement only),

Concept and distribution of sample range, Related examples from uniform $U(a,b)$ distribution and exponential distribution,

Definition of compound distribution, compound distribution of Poisson and Gamma, Binomial and Poisson, binomial and beta type I distributions.

Books:

1. Mukhopadhyay, P. (2006): Mathematical Statistics, 3-ed., Books and Allied(P) Ltd.
2. Mukhopadhyay, N.(2000): Probability and Statistical inference, Marcel Dekker.
3. Rohatgi, V.K. & A.K. Md.E. Saleh (2001) : An Introduction to Probability & Statistics, John Wiley, 2nd Edition
4. Biswas, S. and Sriwastav, G. L. (2011): Mathematical Statistics- a Textbook, Narosa.
5. Ross, S.M.: Introduction to Probability and Statistics for Engineers and Scientists, Elsevier.
6. Gupta, S. C. and Kapoor, V. K. (2005): Fundamental of Mathematical Statistics, Sulatan Chand and Sons.

Semester III
Paper: STA 202 - Descriptive Statistics – II

Lectures per week: 4

Credit of this paper: 4

Unit:1

Bivariate data, plotting of bivariate data, Principle of Least squares, fitting of Linear, Parabolic, exponential and geometric curves;

Unit:2

Scatter diagram, Product moment correlation coefficient and its properties, coefficient of determination, rank correlation, correlation ratio, concept of regression, fitting of linear regression and related results.

Unit:3

Concept of partial and multiple correlation, Regression in three variables, their measures and related results.

Unit:4

Independence and association of attributes, various measures of association for two way and three way classified data.

Books:

1. Mukhopadhyay, P. (2006): Mathematical Statistics, 3-ed., Books and Allied(P) Ltd.
2. Mukhopadhyay, N.(2000): Probability and Statistical inference, Marcel Dekker.
3. Rohatgi, V.K. & A.K. Md.E. Saleh (2001) : An Introduction to Probability & Statistics, John Wiley, 2nd Edition
4. Biswas, S. and Sriwastav, G. L. (2011): Mathematical Statistics- a Textbook, Narosa.
5. Ross, S.M.: Introduction to Probability and Statistics for Engineers and Scientists, Elsevier.
6. Gupta, S. C. and Kapoor, V. K. (2005): Fundamental of Mathematical Statistics, Sulatan Chand and Sons.

Semester III

Paper: STA-203 – Practical Paper based on STA -201 and 202

6 hours per week

Credit: 2.5

Part-A (Manual)

1. Drawing of random sample from Binomial and Poisson distributions
2. Drawing of random sample from Normal, Beta type-I and II, Exponential, Gamma distributions.
3. Fitting of Binomial and Poisson distributions.
4. Fitting of truncated Binomial and Poisson distributions.
5. Fitting of normal distribution.
6. Fitting of Linear, Parabolic, exponential and geometric curves;
7. Correlation and regression.
8. Rank correlation and correlation ratio.
9. Multiple and partial correlation and regression.
10. Association of attributes.

Part-B (MS Excel)

1. Drawing of random sample from Binomial and Poisson distributions
2. Drawing of random sample from Normal, Beta type-I and II, Exponential, Gamma distributions.
3. Fitting of Binomial and Poisson distributions.
4. Fitting of truncated Binomial and Poisson distributions.
5. Fitting of normal distribution.
6. Fitting of Linear, Parabolic, exponential and geometric curves;
7. Correlation and regression.
8. Rank correlation and correlation ratio.
9. Multiple and partial correlation and regression.
10. Association of attributes.

Semester IV

Paper: STA 204 - Distribution Theory – II

Lectures per week: 4

Credit of this paper: 4

Unit:1

Discrete Distribution:

Hypergeometric distribution, Geometric distribution, Negative binomial distribution and their properties.

Unit: 2

Continuous distribution:

Weibull distribution (two parameter case only), Laplace distribution, Cauchy distribution, Lognormal distributions.

Unit: 3

Normal and Bivariate Normal Distributions with their properties

Unit: 4

Characteristic function with its properties, Inversion Theorem with proof, use of inversion theorem in deriving different discrete and continuous distributions; Definition of Convergence, Convergence in probability and Convergence in distribution, weak law of large numbers: Chebyshev's form and Bernoulli form and examples.

Central Limit Theorem (proof of Lindberg Levy's form only), Statement of Liapounoff's form of CLT. Examples based on CLT.

Books:

1. Mukhopadhyay, P. (2006): Mathematical Statistics, 3-ed., Books and Allied(P) Ltd.
2. Mukhopadhyay, N.(2000): Probability and Statistical inference, Marcel Dekker.
3. Rohatgi, V.K. & A.K. Md.E. Saleh (2001) : An Introduction to Probability & Statistics, John Wiley, 2nd Edition
4. Biswas, S. and Sriwastav, G. L. (2011): Mathematical Statistics- a Textbook, Narosa.
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6. Gupta, S. C. and Kapoor, V. K. (2005): Fundamental of Mathematical Statistics, Sulatan Chand and Sons.

Semester IV

Paper: STA 205 - Applied Statistics

4 Lectures per week

Credit of this paper: 4

Unit: 1

Index numbers – 1

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

Unit : 2

Index Numbers – 2

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 and link relative methods.

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.

Concept of life table, meaning and interrelationships of different terms of life table, uses of life table

Books:

1. Gupta, S. C. And Kapoor, V. K.(2005): Fundamentals of Applied Statistics, Sultan Chand & Sons.
2. Mukhopadhyay P. (1999): Applied Statistics
3. Gupta, S. C.(2005): Business Statistics, Himalaya Publishing House.

Semester IV

Paper: STA- 206 – Practical Paper Based on STA-204 & STA-205

6 Lectures per week

Credit of this paper: 2.5

Part - A (Manual)

1. Drawing of random samples from geometric and negative binomial distributions.
2. Fitting of geometric, negative binomial and log normal distributions.
3. Drawing of random samples from Weibull, Laplace, Normal. Log normal and Bivariate normal distributions.
4. Fitting of Normal Distribution
5. Application of Central Limit Distribution
6. Problems on fixed and chain based index numbers
7. Calculation of indices using Laspeyer's, Paasche, Fisher's and Marshal Edgeworth formula.
8. Tests of Index numbers for Laspeyer's, Paasche, Fisher's and Marshal Edgeworth formula.
9. Calculation of cost of living index number.
10. Time series - calculation of trend using least square and moving average methods. Calculation of seasonal indices using ratio to trend and link and link relative methods.
11. Calculation of mortality and fertility rates.
12. Problems based on life tables.

Part - B (MS Excel)

1. Drawing of random samples from geometric and negative binomial distributions.
2. Drawing of random samples from Laplace, Log normal and Bivariate normal distributions.
3. Fitting of geometric, negative binomial, normal and log normal distributions.
4. Calculation of indices using Laspeyer's, Paasche, Fisher's and Marshal Edgeworth formula.
5. Tests of Index numbers for Laspeyer's, Paasche, Fisher's and Marshal Edgeworth formula.
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 and link relative methods.
8. Calculation of mortality and fertility rates.