

**COMMON POOL OF GENERIC ELECTIVES (GE) COURSES
OFFERED BY DEPARTMENT OF STATISTICS
CATEGORY-IV**

GENERIC ELECTIVES: INTRODUCTION TO STATISTICS

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Introduction to Statistics	4	3	0	1	Class XII pass with Mathematics	NIL

Learning Objectives

The Learning Objectives of this course is as follows:

- Acquainting the students with descriptive data analysis.
- To introduce students to different measurement scales, qualitative and quantitative and discrete and continuous data.
- To help students to organise data into frequency distribution graphs, including bar graphs, histograms, polygons and ogives.
- Students should be able to understand the purpose for measuring central tendency, dispersion, skewness and kurtosis and should be able to compute them as well.
- Students should be able to understand theory of attributes, independence and association of attributes.

Learning Outcomes

The Learning Outcomes of this course are as follows:

- Introduction to Statistics, definitions and data classification
- Employ graphical displays of data, frequency distributions, analysing graphs.
- Apply numerical descriptions of data, measures of center tendency, measures of dispersion, skewness and kurtosis.
- Understand theory of attributes.

SYLLABUS OF GE

Theory

Unit – 1

(15 hours)

Introduction to Statistics and Data

Introduction: Definition and scope of Statistics, concepts of statistical population and sample. Data: quantitative and qualitative, attributes, variables, scales of measurement -nominal, ordinal, interval and ratio. Presentation: tabular and graphic, including histogram and ogives.

Unit – 2

(15 hours)

Descriptive Statistics

Measures of Central Tendency: Arithmetic mean, median, mode, geometric mean, harmonic mean, partition values. Measures of Dispersion: Range, quartile deviation, mean deviation, standard deviation, variance, coefficient of dispersion: coefficient of variation. Moments, Measure of skewness and kurtosis.

Unit – 3

(15 hours)

Theory of Attributes

Theory of Attributes: Consistency of data, independence of attributes, association of attributes, Yule's coefficient of association, coefficient of colligation.

Practical – 30 Hours

List of Practicals:

1. Tabular representation of data
2. Graphical representation of data using histogram
3. Graphical representation of data using ogives
4. Problems based on arithmetic mean
5. Problems based on geometric mean
6. Problems based on harmonic mean
7. Problems based on median
8. Problems based on mode
9. Problems based on partition values
10. Verifying the relationship between arithmetic mean, geometric mean and harmonic mean
11. Problems based on range and quartile deviation.
12. Problems based on mean deviation
13. Problems based on standard deviation and variance
14. Problems based on combined mean and combined variance
15. Problems based on coefficient of variation.
16. Problems based on moments,
17. Problems based on skewness
18. Problems based on kurtosis
19. Checking consistency of data.
20. Checking the independence of attributes
21. Measuring the association between the attributes

Essential Readings

- Goon, A.M., Gupta, M.K. and Dasgupta, B. (2002). Fundamentals of Statistics, 8th Ed. Vol. I & II, The World Press, Kolkata.
- Mood, A.M. Graybill, F.A. and Boes, D.C. (2007). Introduction to the Theory of Statistics,

3rd Ed., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.

- Gupta, S.C., and Kapoor, V.K. (2014). Fundamental of Mathematical Statistics, 11th Ed., Sultan Chand.

Suggestive Reading

- Miller, I. and Miller, M. (2006). John E. Freund's Mathematical Statistics with Applications, 7th Ed., Pearson Education, Asia.
- Ross, Sheldon M. (2010): Introductory Statistics, 3rd Edition, Academic Press

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

GENERIC ELECTIVES: TIME SERIES ANALYSIS AND INDEX NUMBERS

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Time Series Analysis and Index Numbers	4	3	0	1	Class XII pass with Mathematics	NIL

Learning Objectives

The Learning Objectives of this course are as follows:

- Introduce the concept of time series, its components, and their estimation.
- Introduce the application of time series.
- Introduce the concept, formulation, and application of index numbers.

Learning outcomes

After completion of this course, the students will be able to:

- Understand the concepts of time series and index numbers.
- Formulate, solve, and analyze the use of time series and index numbers for real-world problems.

SYLLABUS OF GE

Theory

Unit - 1

(15 hours)

Components of Time Series

Introduction to Time Series, Components of time series, Decomposition of time series- Additive and multiplicative model with their merits and demerits, Illustrations of time series, Measurement of trend by method of free-hand curve, method of semi-averages and method of least squares (linear, quadratic and exponential).

Unit - 2

(15 hours)

Trend and Seasonality

Fitting of modified exponential, Gompertz and logistic curve, Moving average method, Measurement of seasonal variations by method of simple averages, ratio to trend method, and ratio to moving average method.

Unit - 3

(15 hours)

Index Numbers

Introduction to Index numbers, Problems in the construction of index numbers, Construction of price and quantity index numbers: simple aggregate, weighted aggregate (Laspeyres, Paasche's, Drobish-Bowley, Marshall-Edgeworth's, Walsch and Fisher's Formula), simple and weighted average of price relatives, and chain base method, Criteria for a good index number, Errors in the measurement of price and quantity index numbers, Consumer price index number, its construction and uses, Uses and limitations of index numbers.

Practical – 30 Hours

List of Practicals:

- a. Fitting of linear trend
- b. Fitting of quadratic trend
- c. Fitting of an exponential curve
- d. Fitting of modified exponential curve by the method of
 - Three selected points
 - Partial sums
- e. Fitting of Gompertz curve by the method of
 - Three selected points
 - Partial sums
- f. Fitting of logistic curve by the method of three selected points
- g. Fitting of trend by moving average method (for n even and odd)
- h. Measurement of seasonal indices by
 - Method of simple averages
 - Ratio-to-trend method
 - Ratio-to-moving-average method
- i. Construction of price and quantity index numbers by simple aggregate method.
4. Construction of price and quantity index numbers by Laspeyres, Paasche's, Drobish-Bowley, Marshall-Edgeworth, Walsch and Fisher's Formula.
5. Construction of price and quantity index numbers by simple and weighted average of price relatives.
6. Construction of index number by Chain base method.
7. Construction of consumer price index number by
 - a. Family budget method
 - b. Aggregate expenditure method

14. Time Reversal Test and Factor Reversal Test

Essential Readings

- Croxton, Fredrick E, Cowden, Dudley J. and Klein, S. (1973): Applied General Statistics, 3rd edition, Prentice Hall of India Pvt. Ltd.
- Gun, A.M., Gupta, M.K. and Dasgupta, B. (2008). Fundamentals of Statistics, Vol. II, 9th Ed., World Press, Kolkata.
- Gupta, S.C. and Kapoor, V.K. (2014). Applied Statistics, 11th Ed., Sultan Chand.

Suggestive Reading

- Allen R.G.D. (1975): Index Numbers in Theory and Practice, Macmillan
- Mukhopadhyay, P. (1999). Applied Statistics, New Central Book Agency, Calcutta.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

GENERIC ELECTIVES: BASIC STATISTICS

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Basic Statistics	4	3	0	1	Class XII pass with Mathematics	NIL

Learning Objectives

The Learning Objectives of this course are as follows:

- To summarize the data and to obtain its salient features from the vast mass of original data.
- To understand the concepts of probability and its applications.
- To understand the concept of random variables, probability distributions and expectation..

Learning outcomes

After completion of this course, the students will be able to:

- Apply the concepts of statistical population and sample, variables and attributes.
- Present tabular and graphical representation of data based on variables.
- Measures of central tendency, Dispersion, Skewness and Kurtosis.
- Employ moments and their use in studying various characteristics of data.
- Employ correlation and regression analysis of bivariate data.

SYLLABUS OF GE

Theory

Unit - 1 (15 hours)

Elementary Statistics

Concepts of a statistical population and sample from a population, quantitative and qualitative data, nominal, ordinal and time-series data, discrete and continuous data. Presentation of data by tables and by diagrams, frequency distributions for discrete and continuous data, graphical representation of a frequency distribution by histogram and frequency polygon, cumulative frequency distributions (inclusive and exclusive methods).

Unit - 2 (15 hours)

Descriptive Statistics

Measures of location (or central tendency) and dispersion, moments, measures of skewness and kurtosis, cumulants. Bi-variate data: Scatter diagram, principle of least-squares and fitting of polynomials and exponential curves.

Unit - 3 (15 hours)

Correlation and Regression

Bivariate data: Definition, scatter diagram, simple, partial and multiple correlation (3 variables only), rank correlation. Simple linear regression, principle of least squares and fitting of polynomials and exponential curves.

Practical - 30 Hours

List of Practicals:

1. Problems based on graphical representation of data.
2. Problems based on measures of central tendency using raw data, grouped data and for change of origin and scale.
3. Problems based on measures of dispersion using raw data, grouped data and for change of origin and scale.
4. Problems based on combined mean and variance and coefficient of variation.
5. Problems based on Moments using raw data, grouped data and for change of origin and scale.
6. Problems based on relationships between moments about origin and central moments.
7. Problems based on Skewness and kurtosis.
8. Problems based on Karl Pearson correlation coefficient (with/without change of scale and origin).
9. Problems based on Lines of regression, angle between two lines of regression
10. Problems based on Spearman rank correlation.
11. Fitting of polynomials and exponential curves.

Essential Readings

- Goon, A. M., Gupta, M. K. and Dasgupta, B. (2003). An Outline of Statistical Theory (4th ed., Vol. I). World Press, Kolkata.

- Gupta, S. C. and Kapoor, V. K. (2021). Fundamentals of Mathematical Statistics (60th ed.). Sultan Chand and Sons.
- Hogg, R. V., Craig, A. T. and Mckean, J. W. (2005). Introduction to Mathematical Statistics (6th ed.). Pearson Education.

Suggestive Reading

- Miller, I. and Miller, M. (2006). John E. Freund's Mathematical Statistics with Applications, 7th Ed., Pearson Education, Asia
- Elhance, D. N. , Elhance, V. and Agrawal, B. M. (2021), Kitab Mahal

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.