St. Xavier's College – Autonomous Mumbai

STATISTICS

F.Y.B.Sc

Syllabus
For 1st Semester Courses in Statistics
(June 2020 onwards)

Contents:
Theory Syllabus for Courses:
SSTA0101 – Descriptive Statistics (A)
SSTA0102 – Statistical Methods (A)

Practical Course Syllabus for: SSTA01PR

Academic/field/industrial visits and seminars may be organized by the Department, at other venues, as part of the curriculum.

F.Y.B.Sc STATISTICS   **Course: SSTA0101**
Title: Descriptive Statistics (A)

Learning Objectives:
1. **To introduce the technique of data collection and its presentation.**
2. **To emphasize the need for numerical summary measures for data analysis.**

Number of lectures: 45

Unit – 1
Data: Types , Collection and Management.   **(15 L)**
Types of data from a population:
Qualitative and Quantitative data; Geographical, Time series data; Discrete and Continuous data, Panel and Cross Section data.
Different types of scales: Nominal, Ordinal, Ratio and Interval.
Illustrations of Likert scale.
Collection of Data:
Concepts of statistical population and sample.
Primary data- designing a questionnaire / schedule, distinction between them.
Concept of validation of questionnaire.
Problems faced when collecting data through the questionnaire.
Secondary data– its major sources including   some government publications.
Elementary Categorical Data Analysis
Preparation of tables with two or three factors (variable /attributes) of classification. Requisites of a good table. Independence and Association for 2 attributes in a 2 x 2 table using Yule's coefficient of colligation and coefficient of association. Relationship between the two coefficients.

Unit 2
Presentation of Data.   **(15 L)**
Univariate: Frequency distribution of discrete and continuous variables. Cumulative frequency distribution.
Graphical representation of frequency distribution by Histogram, Frequency polygon, Frequency curve and Ogives.
Data Presentation and Visualization using Bar diagrams and Pie chart.
Exploratory data analysis: Stem and Leaf diagram, Dot plot.
Bivariate: Frequency distribution, Marginal and Conditional frequency distributions.

Unit 3
Measures of Central Tendency or Location.   **(15 L)**
Arithmetic mean and its properties (simple and weighted), Combined mean. Geometric mean and Harmonic mean. Quantiles (Median, Quartiles, Deciles, Percentiles.) Mode.

(Grouping Method not expected). Empirical relationship between mean, median and mode. Merits, Demerits and Uses of Mean, Median, Mode, G.M. and H.M.
 Requisites of a good average.
Choice of scale of measurement for each measure of central tendency.

List Of Recommended Reference Books

1. Goon A.M., Gupta M.K., Dasgupta B. Fundamentals of Statistics, Volume I, The World Press Private Limited, Calcutta. Fifth edition.
2. Kothari, C.R.: Research Methodology, Methods and Techniques, Wiley Eastern Limited. First Edition.
3. Shah R.J.:Descriptive Statistics, Seth Puplications. Eighth edition.
4. Spiegel, M.R.: Theory and Problems of Statistics, Schaum's Publishing Series. Tata McGraw-Hill. First edition.
5. Welling, Khandeparkar, Pawar, Naralkar: Descriptive Statistics: Manan Prakashan
6. S.P. Gupta: Statistical Methods, Sultan Chand & Sons. First edition.
7. Richard. I. Levin, David.S. Rubin: Statistics for Management. Fifth edition
8. Prem. S. Mann (2007). Introductory Statistics (6th edition) John Wiley & Sons.
9. Allan Bluman (2009) Introductory Statistics. A step-by-step approach (7th edition). McGraw-Hill

List of Practicals:
1. Collection of Data from Secondary source (including Internet sites) / Primary source.
2. Tabulation of data (Quantitative and Categorical)
3. Classification of data.
4. Graphs and Diagrams
5. Measures of Central Tendency.

F.Y.B.Sc STATISTICS   **Course: SSTA0102**
Title: Statistical Methods (A)

Learning Objectives:
To study
1. Concept of probability
2. Probability distribution
3. Testing of hypotheses.

Number of lectures: 45

<u>Unit 1</u>   **(15 L)**
<u>Elementary probability theory.</u>
Random Experiment, Sample Point & Sample Space.
Discrete Sample Space, Definition of Event, Elementary Event, Algebra of Events.
Mutually exclusive events, Exhaustive events. Subjective Probability.
Classical, Empirical and Axiomatic definitions of probability.
Conditional Probability, Independence of n Events. (n = 2, 3).
Theorems on Addition & Multiplication of Probabilities,
Bayes' Theorem (All theorems with proofs).

<u>Unit 2</u>
<u>Discrete Random variable</u>:   **(15 L)**
<u>Univariate</u>:
Random variable. Definition, Properties of Probability Mass Function & Cumulative
Distribution Function. Expectation and variance of a random variable. Theorems on
Expectation and Variance.
Raw & Central Moments and their relationship (without proof). Concept of Skewness
and Kurtosis.
<u>Bivariate</u>:
Joint Probability Mass Function of two Discrete Random Variables, Marginal and
Conditional Probability Distributions, Independence of Two Random Variables.
Theorems on Expectation, Variance.
Covariance, Correlation coefficient between two random variables

<u>Unit 3</u>
<u>Standard Discrete Probability Distributions</u>:   (**15 L**)
Degenerate distribution, Bernoulli distribution, Binomial Distribution, Poisson
Distribution, Hypergeometric Distribution. Uniform Distribution Derivation of mean, &
variance, Calculation of Expected frequencies.
Binomial approximation to Poisson and Hypergeometric approximation to Binomial
Distribution (statement only).

List Of Recommended Reference Books
1. Statistical Methods: Welling, Khandeparkar, Pawar, Naralkar Manan Publications. First edition.
2. Statistical Methods: R.J. Shah – Seth Publications. Tenth edition.
3. Basic Statistics: B.L. Agarwal – New Age International Ltd. Fifth edition
4. Theory and Problems of Statistics: Spiegel M.R. – Schaums Publishing Series, Tata Mcgraw - Hill. First edition
5. Probability and Statistical Inference: Hogg R.V, Tanis E.P. – Macmillan Publishing Co. Inc.
6. Fundamentals of Mathematical Statistics: S. C. Gupta, V.K.Kapoor – Sultan Chand & Sons. Eleventh edition.
7. Statistical Methods: S.P. Gupta – Sultan Chand & Sons. Thirty third edition.
8. Fundamentals of Statistics, Volume II, - Goon A.M., Gupta M.K., Dasgupta B. – The World Press Pvt. Ltd, Calcutta. Fifth edition.
9. Richard. I. Levin, David.S. Rubin: Statistics for Management Fifth edition
10. Prem. S. Mann (2007). Introductory Statistics (6th edition) John Wiley & Sons.
11. Allan Bluman (2009) Introductory Statistics. A step-by-step approach (7th edition). McGraw-Hill

List of Practicals:
1. Probability
2. Discrete Random Variable
3. Bivariate Probability Distributions.
4. Binomial, Poisson and Hypergeometric Distributions.
5. Calculation of Expected frequency from a conducted experiment

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F.Y.B.Sc

Syllabus
For 2nd Semester Courses in Statistics
(June 2020 onwards)

Contents:
Theory Syllabus for Courses:
  SSTA0201 – Descriptive Statistics (B).
  SSTA0202– Statistical Methods (B).

Practical Course Syllabus for: SSTA02PR

Academic/field/industrial visits and seminars may be organized by the Department, at other venues, as part of the curriculum.

F.Y.B.Sc
(STATISTICS)

SEMESTER 2 **COURSE:** SSTA0201

DESCRIPTIVE STATISTICS (B) **[45 LECTURES]**

LEARNING OBJECTIVE: To orient students on techniques of data analysis.

Unit –1 : Measures of Dispersion, Skewness & Kurtosis (15 L)

Range, Interquartile Range, Quartile Deviation, Mean Absolute Deviation, Standard Deviation (Variance) and their relative measures. Combined variance. Raw and Central moments up to fourth order and the relationship between them (with proof). Measures of Skewness and Kurtosis
Box-Whisker Plot.

Unit-2 : Analysis of Bivariate Data. (15 L)
Scatter diagram. Product Moment correlation coefficient and its properties. Rank correlation- Spearman's measure. Concept of linear regression. Principle of least squares. Fitting of straight line by method of least squares. Relation between regression coefficients and correlation coefficient. Coefficient of determination. Fitting of curves reducible to linear form by transformation. Fitting of quadratic curve using least squares.

Unit-3 : Index Numbers. (15 L)
Index number as a comparative tool. Stages in the construction of Index Numbers.
Simple and Composite Index Numbers.
Fixed base Index Numbers. Chain Base Index Numbers, Base shifting, Splicing and Deflating. Price and Quantity Index Numbers - Laspeyres', Paasche's, Marshal-Edgeworth's, Dorbisch-Bowley's and Fisher's Index Numbers. Value Index Number. Time reversal test. Factor reversal test, Circular test. Cost of Living Index Number. Concept of Real Income based on the Consumer Price Index Number. Problems in the construction of Consumer Price Index Number.

List of Practicals:

1.Measures of Dispersion.
2. Skewness and Kurtosis.
3. Correlation Analysis
4. Regression Analysis.
5. Curve fitting by the Method of Least Squares.
6. Index Numbers.

REFRENCES:

1. Goon A.M., Gupta M.K., Dasgupta B. Fundamentals of Statistics,
     Volume I, The World Press Private Limited, Calcutta. Fifth edition.
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F.Y.B.Sc. STATISTICS   **COURSE: SSTA0202**

STATISTICAL   METHODS (B)   **[45 LECTURES]**

LEARNING OBJECTIVES:
 To study: 1) Continuous probability distributions
            2) Testing of hypotheses.

 Unit 1 :   Continuous Random variable   **(15 L)**

Concept and properties of Probability Density Function and Cumulative Probability distribution Function. Expectation and variance of a random variable and its properties. Measures of location, dispersion, skewness and kurtosis. Raw and Central Moments. (Simple illustrations.),

Unit 2: Some Standard Continuous Probability Distributions.   (15L)

Rectangular Distribution, Exponential Distribution and Normal Distribution. Derivation of mean, median and variance for Rectangular and Exponential distribution. Properties of Normal Distribution and Normal Curve (without proof). Normal Approximation to Binomial and Poisson Distributions (without proof).
and using graph / probability histogram

Unit 3 : Sampling Distribution.   (15 L)
Concept of Parameter, Statistic, Estimator and bias. Sampling distribution of estimator. Standard error and M.S.E. of an estimator.
Central Limit Theorem (Statement only).
Sampling distribution of sample mean and sample proportion for large samples.
Point and interval estimation of single mean and single proportion, for large sample only.
Statistical tests - Concept of Hypotheses. (Null and Alternative Hypotheses.). Types of Errors, Critical Region, Level of Significance, p-value,
Large Sample Tests using Central Limit Theorem, if necessary.
- For testing specified value of population mean
- For testing specified value in difference of two population means
- For testing specified value of population proportion
- For testing specified value in difference of two population proportions.

TOPICS FOR PRACTICALS.
1. Continuous Random Variables.
2. Uniform, Exponential Distributions.
3. Normal Distribution
4. Testing of Hypotheses
5. Estimation
6. Large Sample Tests.

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● Statistical Methods: Welling, Khandeparkar, Pawar, Naralkar Manan Publications. First edition.
● Statistical Methods: R.J. Shah – Seth Publications. Tenth edition.
● Basic Statistics: B.L. Agarwal – New Age International Ltd. Fifth edition
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