St. Xavier's College – Autonomous Mumbai

S.Y.B.A.
Syllabus
For 3rd Semester Courses in STATISTICS
(June 2018 onwards)

Contents:
Theory Syllabus for Courses:

ASTA0301– Descriptive Statistics (B).
ASTA0302– Operations Research.

Practical Course Syllabus for: ASTA03PR

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

S.Y.B.A. STATISTICS   **COURSE CODE:** ASTA0301

DESCRIPTIVE STATISTICS (B)   **(45 L)**

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

Unit-1: 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-2 : 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.

Unit-3 : TIME SERIES   **(15 L)**

Definition of Time series. Its components. Models of Time Series.
Estimation of trend by i) Freehand curve method. ii) Method of semi averages. iii) Method of moving averages iv)   Method of least squares v) Exponential smoothing method
Estimation of seasonal component by i) Method of simple averages
ii) Ratio to moving average method iii) Ratio to trend method.

List of Practicals:

1   Correlation Analysis
2   Regression Analysis.
3   Curve fitting by the Method of Least Squares.
4   Index Numbers.
5   Time-Series

REFRENCES:
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 Publications. 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
10. S.C.Gupta ,V.K.Kapoor: Fundamentals of Applied Statistics, Third edition, Sultan Chand & Sons.

S.Y.B.A. STATISTICS   **COURSE CODE:** ASTA0302

Title: Operations Research

Learning Objectives:
To provide students with an insight into
1. **The structures and processes that Operations Research can offer and the practical utility of its techniques.**
2. **Techniques of Operations Research used for scheduling and controlling projects.**

No. of lectures: 45

Unit 1   **(15L)**
Linear Programming Problem (L.P.P.):
Definition, Mathematical Formulation. Concepts of Solution, Feasible Solution,
Basic Feasible Solution, Optimal solution, Slack, Surplus & Artificial variable,
Standard form, Canonical form
Graphical Method & Simplex Algorithm to obtain the solution to an L.P.P. Problems
involving Unique Solution, Multiple Solution, Unbounded Solution
 and Infeasible Solution

Unit 2   **(15 L)**

Transportation Model
Definition, Mathematical Formulation Concepts of Feasible solution, Basic feasible solution Optimal and multiple solution.
Initial Basic Feasible Solution using
 (i)   Vogel's Approximation Method.
 (ii)   MODI Method for optimality.
Problems involving unique solution, multiple solutions, degeneracy, maximization, prohibited route(s) and production costs.
Unbalanced Transportation problems.
 Assignment model
Definition, Mathematical formulation. Solution by Hungarian Method.
Unbalanced Assignment problems.
Problems involving Maximization & prohibited assignments.

Unit 3.   **(15 L)**
Network Analysis
Concept of project as an organized effort with time management.
Objective and Outline of the techniques.
Diagrammatic representation of activities in a project
Gnatt Chart and Network Diagram.
Slack time and Float times. Determination of Critical path.
Probability consideration in project scheduling.
Project cost analysis, Resource leveling, Resource allocation

List of Practicals:

 1. Linear Programming Problem
 2. Transportation Problem
 3. Assignment Problem.
 4. Network Analysis
 5. Introduce a practical for solving LPP using EXCEL

List Of Recommended Reference Books
 1. PERT and CPM, Principles and Applications: Srinath., 2nd edition, East West Press Pvt Ltd
 2. Operations Research: Kantiswaroop, P.K. Gupta and Manmohan Gupta.4th edition, Sultan Chand and Sons
 3. Operations Research: S.D. Sharma, 11th edition Kedarnath, Ramnath & Co
 4. Operations Research: H.A.Taha, 6th edition, Prentice Hall of India

St. Xavier's College – Autonomous Mumbai

S Y B A

Syllabus
For 4ᵗʰ   Semester Courses in STATISTICS
(June 2018 onwards)

Contents:
Theory Syllabus for Courses:
      ASTA0401 – Statistical Method (B).
      ASTA0402 – Data Analysis.

Practical Course Syllabus for: ASTA04PR

Cross faculty Course: **SPC0401DS (DESCRIPTIVE STATISTICS)**
(Effective June 2015 onwards)

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

S.Y.B.A. STATISTICS   **COURSE:** ASTA0401

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.   **(15 L)**
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.   **(15L)**
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.

REFERENCES:
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

SEMESTER 4   **COURSE:** ASTA0402

<u>**DATA ANALYSIS**</u>   **[45 LECTURES]**

<u>**LEARNING OBJECTIVES:**</u>

1. **Techniques for data collection and its analysis.**
2. **Basic techniques of forecasting.**

Unit 1   <u>Sampling:</u>   **(15 L)**
Concepts of population, population unit, sample, sample size, parameter, statistic, estimator, unbiasedness, bias, mean square error (M.S.E.) and standard error.
Census and Sample Surveys:
Steps in conducting sample survey
Concepts of Sampling errors and non-sampling errors.
Concepts of non-probability sampling and probability sampling.
Sampling with replacement: Sampling without replacement.
Simple random sample (SRS)
Drawing Simple random sample (SRS) using
(a) Lottery Method and

(b) Random numbers
Estimation of Population mean
Introduction to: Stratified sampling, Systematic sampling, Cluster sampling, Two stage sampling.
Application to Market Research in various fields.
NSSO, CSO and their functions.

Unit 2   Application of chi-square distribution & measures of association   **(15 L)**
Definition of Chi-square distribution.
Applications of chi-square distribution:
(1) Test of significance for specified value of variance from a normal population
(2) Test of goodness of fit
(3) Independence of Attributes for:
(i) 2 x 2 contingency table. (With Derivation of Test statistic)
(ii) r x c contingency table (Without Derivation of Test statistic)
Measures of association
(i) Yule's coefficient (ii) Coefficient of Colligation (iii)   Phi-coefficient
Prospective study and retrospective study
Relative risk & Odds ratio.

Unit 3   Applications using R software
Introduction to R. Creation of vectors using various functions.
 Arithmetic operations of vectors. Accessing vectors. Various numerical functions.
Creation of data frames. Subset and Transform commands.
  Import CSV file into R. Computing various measures of central tendency, dispersion, skewness and kurtosis.
Computing pdf, cdf, quantile points.
Drawing a random sample from discrete and continuous distributions.

Correlation and Regression with one independent variable.

TOPICS FOR PRACTICALS:
1. Sampling Techniques
2. Chi-Square distribution.
3. Practical using R.

REFERENCE:
1. S.C.Gupta and V.K. Kapoor: Fundamentals of Applied Statistics Sultan.Chand Publication, 3rd edition
2. Cochran: Sampling Techniques, Wiley Publication, 3rd edition
3. Naresh Malhotra: Market Research, 5th edition
4. Kothari C.R.: Quantitative Techniques, Wiley Eastern Limited ,5th edition
5. R.J Shah: Statistical Methods,10th edition, Sage publications.
6. S.C.Gupta, V.K.Kapoor: Fundamentals of Mathematical Statistics, 11th Edition Sultan Chand & Sons.

7. Vishwas R. Pawgi & Saroj A. Ranade: Statistical Methods Using R Software 1st edition, Nirali Prakashan.
8. Michael J. Crawley: The R Book, 2nd edition, Wiley Publications

SEMESTER 4   **COURSE:** ASPC0401 DS

DESCRIPTIVE STATISTICS   **[45 LECTURES]**

LEARNING OBJECTIVES:

To orient students in techniques of Data Analysis.

Unit – 1: Data: Types , Collection and Management.   **(11 lectures)**
Types of data from a population:
Qualitative and Quantitative data; Geographical, Time series data; Discrete and Continuous data,
Different types of scales: Nominal, Ordinal, Ratio and Interval.
Concepts of statistical population and sample.
 Primary data- Idea of questionnaire / schedule, with its merits and demerits.
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 association.

Unit – 2: Presentation of Data   **(11 lectures)**
 Frequency distribution of discrete and continuous variables.
 Cumulative frequency distribution.
Graphical representation of frequency distribution by Histogram, Frequency polygon, Frequency curve and Ogives. Stem and Leaf display
Diagrammatic representation using Bar diagrams and Pie chart.

Unit 3: Measures of Central Tendency or Location.   **(11 lectures)**
Arithmetic mean and its properties (simple and weighted), Combined mean.
Quantiles (Median, Quartiles, Deciles, Percentiles.) Mode.
Empirical relationship between mean, median and mode.
Merits, Demerits and Uses of Mean, Median, Mode.
 Requisites of a good average.

Choice of scale of measurement for each measure of central tendency.

Unit 4 : Absolute and Relative Measures of Dispersion.   (12 lectures)
Range, Interquartile Range, Quartile Deviation, Standard Deviation (Variance) and their relative measures. Combined variance.
Measures of Skewness and concept of Kurtosis.
Box-Whisker Plot.

Simple Linear Correlation
Bivariate Data, Scatter diagram, Product moment correlation coefficient and its properties. Rank correlation- Spearman's measure.

References.
1. Goon A.M, Gupta M.K, Dasgupta B, Fundamentals of Statistics, Vol 1, The World Press Private Ltd, Calcutta, fifth edition.
2. Kothari, C.R: Research Methodology, Methods and Techniques, Willey Eastern Ltd, First Edition.
3. Shah R.J, Descriptive Statistics, Seth Publications, 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 Publication.