Syllabus

Second Semester Courses in Statistics

2023-2024

Contents:

PRINCIPAL
ST. XAVIER'S COLLEGE
(AUTONOMOUS)
MUMBAI - 400 001.

ST. XAVIER'S COLLEGE-AUTONOMOUS MUMBAI-400 001

APPROVED SYLLABUS

First Year BSc in Statistics		
Course Title: Fundamentals of Statistics (B)		**Course Code:USSTA4502CR1**
Credits: Theory (3) = 45 hr		
No.	**Course Objectives** The course aims to explain	
1	all the concepts of probability.	
2	properties of univariate & bivariate distributions.	
3	some standard probability distributions.	
CO	**Course Outcomes** **On completing the course, the learner will be able to**	**Bloom's Taxonomy Level (BT level)**
1	i) define the various concepts and state the theorems on probability, discrete random variables and continuous random variables. ii) state the pdf/pmf of some standard distributions.	Knowledge
2	i) prove theorems and derive properties involved in probability and distributions. ii) obtain/derive the summary statistics for the distributions.	Understanding
3	solve numericals based on the above topics.	Analysis

Unit 1 : Elementary Probability Theory **(15 L)**

Random experiment, Sample space, Sample point, Event, Elementary event, Algebra of events, Equally likely events, Certain events, Impossible events, Mutually exclusive events, Exhaustive events,
Classical, Empirical, and Axiomatic definitions of probability.
Conditional probability, Independence of n events. (n = 2,3)
Theorems on Addition and Multiplication of probabilities,
Bayes' theorem (with proof).

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Unit 2 : Discrete & Continuous Distributions **(15 L)**

a) Univariate:

Random variable. Definition and properties of the Probability mass function, Probability density function & Cumulative distribution function. Expectation and variance of a random variable & their properties. Theorems on Expectation and Variance. First four raw and central moments and their relationship. Concept of Skewness and Kurtosis.

b) Bivariate:

Joint probability mass function, joint probability density function, marginal and conditional probability distribution. Independence of two random variables. Theorems on Expectation and Variance. Conditional expectation and conditional variance. Covariance & Correlation coefficient between two variables.

Unit 3 : Some Standard Distributions **(15 L)**

Degenerate, Discrete uniform, Bernoulli, Binomial, Poisson, Hypergeometric, Continuous Uniform and Exponential distributions.

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. – Schaum's Publishing Series, Tata McGraw - Hill. First edition
5. Probability & 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

Evaluation (Theory, USSTA4502CR1): Total marks per course - 100.

I. Formative Assessment for Learning
(continuous internal assessment - CIA to improve learning).
CIA: 40 marks
CIA 1: Written test: 20 marks
CIA 2: Written test/Assignment: 20 marks

II. Summative Assessment of Learning
(focus on outcomes, quantitative data for outcomes of instruction).
End Semester Examination: 60 marks
One question from each unit for 20 marks, with internal choice.
Total marks per question with choice: 25 to 27.

Distribution of Bloom's Taxonomy levels for the course assessment:

Learning Levels	Knowledge	Understanding	Analysis
% Weightage	10-20%	60-80%	10-20%

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First Year BSc in Statistics		
Course Title: Fundamentals of Statistics (B)(Practical) **Course Code:USSTA4502CR1PR**		
Credits: Practical (1) = 30 hr		
No.	**Course Objectives** The course aims to	
1	enable students to solve numericals based on probability, discrete and continuous probability distributions.	
CO	**Course Outcomes** **On completing the course, the learner will be able to**	**Bloom's Taxonomy Level (BT level)**
1	solve problems based on probability, discrete and continuous probability distributions.	Analysis

List of Practicals:

1. Probability
2. Discrete/Continuous Random Variables
3. Bivariate Probability Distributions
4. Standard Discrete/Continuous Distributions

Evaluation (Practical, USSTA4502CR1PR) **Total marks practical course - 50**

CIA (Written test /Project): 15 marks,
Journal: 5 marks,
End Semester Examination: 30 marks.

Distribution of Bloom's Taxonomy levels for the practical assessment:

Learning Levels	Analysis
Percentage	100%

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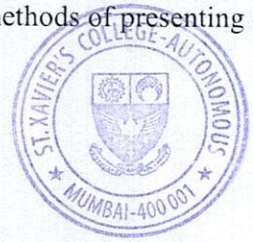
First Year BSc in Statistics		
Course Title: Data Collection and Visualization		**Course Code:USSTA4501VS1**
Credits: Theory (1) = 15 hr & Practical(1) = 30 hr		
No.	**Course Objectives** The course aims to	
1	introduce techniques of data collection & presentation.	
2	equip students with basic skills in Excel to present data.	
CO	**Course Outcomes** **On completing the course, the learner will be able to**	**Bloom's Taxonomy Level (BT level)**
1	know the various methods of data collection and visualization.	Knowledge
2	draw graphs & diagrams and process data.	Analysis
3	create an excel dashboard.	Create

Unit 1 : QUESTIONNAIRE & PRESENTATION OF DATA, DATA PRE-PROCESSING & VISUALIZATION USING EXCEL : **(15 L)**

Designing a questionnaire/schedule, and distinguishing between them. Likert scale for data collection.
Concept of validation of the questionnaire.
Problems faced when collecting data through the questionnaire.
Graphical representation of frequency distribution by Histogram, Frequency polygon, Frequency curve and Ogives.
Diagrams: Bar diagrams and Pie charts.
Stem and Leaf diagram, Dot plot.
Box-Whisker Plot.
Excel Basics: Data entry, formatting, editing, use of functions.
Design of data collection formats, data quality issues, cleaning & treatment of missing data,
Principles of data visualization & different methods of presenting data.
Pivot table functionality.
Creating an Excel dashboard.



List of Recommended Reference Books:

1. Kothari, C.R.: Research Methodology, Methods and Techniques, Wiley Eastern Limited. First Edition.
2. Shah R.J.:Descriptive Statistics, Seth Publications. Eighth edition.
3. https://www.pdfdrive.com/excel-2019-bible-d184084426.html
4. https://trumpexcel.com/learn-excel/

Evaluation (USSTA4501VS1): Total marks per course - 50.

I. Formative Assessment for Learning
(continuous internal assessment - CIA to improve learning).
CIA: 20 marks

II. Summative Assessment of Learning
(focus on outcomes, quantitative data for outcomes of instruction).
End Semester Examination: 30 marks

Distribution of Bloom's Taxonomy levels for the course assessment:

Learning Levels	Knowledge	Analysis	Create
% Weightage	30-40%	30-40%	20-40%

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First Year BSc in Statistics		
Course Title: Descriptive Statistics (A)		**Course Code: USSTA4501OE1**
Credits: Theory (2) = 30 hr (for Arts who have not taken Statistics.)		
No.	**Course Objectives** The course aims to	
1	orient students to understand and present data.	
2	familiarize students with data summarizing techniques.	
CO	**Course Outcomes** **On completing the course, the learner will be able to**	**Bloom's Taxonomy Level (BT level)**
1	identify and define different types of data and measurement scales, define various terms used in summary statistics.	Knowledge
2	explain the procedure/concept involved in summary statistics.	Understanding
3	solve numericals based on the above topics.	Analysis

Unit 1 : Data Types and Presentation **(15 L)**

a) Types of data (Quantitative, Qualitative, Geographical, Time series data, Discrete and Continuous, Prospective and Retrospective data, Longitudinal and Cross-sectional data.

b) Measurement scales: Nominal, Ordinal, Ratio and Interval.

c) Frequency distribution of discrete and continuous variables. Cumulative frequency distribution.

d) 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.

(15 L)

Unit 2: Measures of Central Tendency or Location

a) Arithmetic mean and its properties (simple and weighted), Combined mean.
b) Quantiles (Median, Quartiles, Deciles, Percentiles), Mode. Empirical relationship between mean, median and mode.
c) Merits, Demerits and Uses of Arithmetic mean, Median, Mode.
d) Requisites of a good average.
e) 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, Vol 1, The World Press Private Ltd, Calcutta, fifth edition.
2. Shah R.J, Descriptive Statistics, Seth Publications, Eighth Edition.
3. Welling, Khandeparkar, Pawar, Naralkar, Descriptive Statistics, Manan Publication.
4. https://youtu.be/7kPqESo1vRw
5. https://www.youtube.com/c/BrandonFoltz/search?query=statistics%2010
6. Gholba, Phatak, Jardosh: Descriptive Statistics -I Vipul Prakashan

Evaluation (Theory, USSTA4501OE1): Total marks per course - 50.

I. Formative Assessment for Learning
(continuous internal assessment - CIA to improve learning).
CIA: 20 marks
II. Summative Assessment of Learning
(focus on outcomes, quantitative data for outcomes of instruction).
End Semester Examination: 30 marks

Distribution of Bloom's Taxonomy levels for the course assessment:

Learning Levels	Knowledge	Understanding	Analysis
% Weightage	10-20%	60-80%	10-20%

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