Syllabus

First Semester Courses in Statistics

2023-2024

Contents:

- Syllabus for Core Course:
  - USSTA4501CR1 : Fundamentals of Statistics (A)

- Syllabus for Vocational Skill Courses:
  - USSTA4501VS1 : Data Collection & Visualization

- Evaluation and Assessment guidelines

F.Y.B.Sc. **USSTA4501CR1**
Title: Fundamentals of Statistics (A)

Credits: 4 (for Science)
Theory: 3 (Total 45 hr) and
Practical: 1 (Total 30 hr)

Course Objectives:
1. To introduce various types of data.
2. To introduce techniques of organization of data.
3. To emphasize the need for summary measures for data analysis.
4. To orient students on simple techniques of data analysis.

Course Outcomes (COs):
On completion of the course, the learner should be able to:
1. Choose appropriate scales of measurement for different types of data.
2. Understand different summary measures (Location & dispersion) used for data analysis & basis for their selection.
3. Use of statistical tools to carry out elementary categorical data analysis.
4. Measure simple correlation & regression in bivariate datasets.

Unit 1 : **(15 Lectures)**
TYPES OF DATA & MEASURES OF CENTRAL TENDENCY.
Qualitative and Quantitative data; Geographical, Time series data; Discrete and Continuous data,
Panel and Cross section data.
Different types of measurement scales: Nominal, Ordinal, Interval, and Ratio.
Illustrations of Likert scale.
Concepts of statistical population and sample.
Primary & Secondary data.
Secondary data – its major sources including some government publications.
Tabulation and Classification of data. Requisites of a good table.
Univariate frequency distribution of discrete and continuous variables.
Cumulative frequency distribution. (Raw data, ungrouped frequency distribution, grouped frequency distribution.)
Bivariate frequency distribution, Marginal and Conditional frequency distributions.
Arithmetic mean (A.M.) and its properties (simple and weighted), Combined mean. Geometric mean (G.M.) and Harmonic mean (H.M.).
Quantiles (Median, Quartiles, Deciles, Percentiles), Mode (Grouping Method not expected). Empirical relationship between A.M., median and mode.
Merits, Demerits and Uses of A.M., Median, Mode, G.M. and H.M.
Requisites of a good average.
Choice of the scale of measurement for each measure of central tendency.

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Unit 2 :   (15 Lectures)
MEASURES OF DISPERSION.
Absolute measure: Range, Interquartile range, Quartile deviation, Mean Absolute deviation, Standard deviation (Variance) and their relative measures. Combined variance. Raw and Central moments up to the fourth order and the relationship between them (with proof). Measures of Skewness and Kurtosis.

Unit 3 :   (15 Lectures)

MEASURES OF ASSOCIATION, CORRELATION & REGRESSION.
Categorical data analysis for Association in a table using Yule's coefficient of Association.
Scatter diagram. Product moment correlation coefficient and its properties. Rank correlation Spearman's measure. Concept of Spurious correlation & causation. Concept of Simple linear regression. Principle of least square. Fitting of a straight line by the method of least square. Relation between regression coefficient and correlation coefficient. Coefficient of determination. Fitting of curves reducible to linear form by transformation. Fitting of the quadratic curve using least squares.

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 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. https://corporatefinanceinstitute.com/resources/data-science/descriptive-statistics/

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Topics for Practicals:
1. Collection of data from Secondary source & Primary source.
2. Classification & Tabulation of data (Quantitative and Categorical)
3. Measures of Central tendency.
4. Measures of Dispersion.
5. Theory of Association, Correlation & Regression.
6. Curve fitting.

Evaluation (Core Theory): 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.

Evaluation of (Practical) Total marks Practical course - 50.
  CIA (Written test /Project): 15 marks,
  Journal: 5 marks,
  End Semester Examination: 30 marks.

Grid Template (Approximate) – End Semester Examination (Theory)

Unit	Knowledge	Understanding & Application	Total Marks Per unit
1	15	05	20
2	15	05	20
3	15	05	20
Total Per Objective	45	15	60
% Weightage	75%	25%	100%

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F.Y.BSc.
Title: Data Collection and Visualization

USSTA4501VS1

Credits: 2 (for Science)
Theory: 1 (Total 15 hr) and
Practical: 1 (Total 30 hr)

Course Objectives:
1. To introduce techniques of data collection & presentation.
2. To equip students with basic skills in Excel to present data.

Course Outcomes (COs):
On completing the course, the student will be able to:
1. Use appropriate techniques of data collection and presentation.
2. Use Excel effectively for data pre-processing & data visualization.

Unit 1 :
QUESTIONNAIRE & PRESENTATION OF DATA, DATA PRE-PROCESSING & VISUALIZATION USING EXCEL :

(15 Lectures)

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.

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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/

Topics for Practicals:
1. Questionnaire designing
2. Diagrams
3. Graphs
4. Data formatting
5. Excel functions
6. Descriptive statistics using Excel
7. Pivot table & Pivot charts
8. Excel dashboards

Evaluation (Vocational Skill Course): 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

Grid Template (Approximate) – End Semester Examination (Theory)

Unit	Knowledge	Understanding & Application	Total Marks Per unit
1	30	20	50
% Weightage	67%	33%	100%

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Syllabus

Second Semester Courses in Statistics

2023-2024

Contents:

- Syllabus for Core Course:
  - USSTA4502CR1 : Fundamentals of Statistics (B)

- Syllabus for Vocational Skill Courses:
  - USSTA4501VS1 : Data Collection & Visualization

- Evaluation and Assessment guidelines

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F.Y.BSc.   **USSTA4502CR1**
Title: Fundamentals of Statistics (B)

Credits: 4 (for Science)
Theory: 3 (Total 45 hr) and
Practical: 1 (Total 30 hr)

Course Objectives:
To study 1. Concept of probability
        2. Properties of univariate & bivariate distributions
        3. Some standard probability distributions

Course Outcomes (COs):
On completing the course, the student will be able to:
1. Comprehend the concept of probability and random variables.
2. Understand & distinguish between discrete & continuous distributions.
3. Understand properties and uses of some standard discrete & continuous distributions.

Unit 1 :   **(15 Lectures)**
ELEMENTARY PROBABILITY THEORY
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).

Unit 2 :   **(15 Lectures)**

DISCRETE & CONTINUOUS DISTRIBUTIONS

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.

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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 :   **(15 Lectures)**

SOME STANDARD DISTRIBUTIONS

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

Topics for Practicals:
1. Probability
2. Discrete Random Variables
3. Continuous Random Variables
4. Bivariate Probability Distributions.
5. Standard Discrete Distributions.
6. Standard Continuous Distributions.

Evaluation (Core Theory): 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
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F.Y.BSc.
Title: Data Collection and Visualization   **USSTA4501VS1**

Credits: 2 (for Science)
Theory: 1 (Total 15 hr) and
Practical: 1 (Total 30 hr)

Course Objectives:
1. To introduce techniques of data collection & presentation.
2. To equip students with basic skills in Excel to present data.

Course Outcomes (COs):
On completing the course, the student will be able to:
1. Use appropriate techniques of data collection and presentation.
2. Use Excel effectively for data pre-processing & data visualization.

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

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.
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3. https://www.pdfdrive.com/excel-2019-bible-d184084426.html
4. https://trumpexcel.com/learn-excel/

Topics for Practicals:
1. Questionnaire designing
2. Diagrams
3. Graphs
4. Data formatting
5. Excel functions
6. Descriptive statistics using Excel
7. Pivot table & Pivot charts
8. Excel dashboards

Evaluation (Vocational Skill Course): 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

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