LECTURE

LECTURE PLAN

CREDIT BASED SEMESTER AND GRADING SYSTEM

OF

UNIVERSITY OF MUMBAI

FIRST YEAR B.SC

DESCRIPTIVE STATISTICS

COURSE

SEMESTER I

2018-19

LECTURE PLAN

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER: **Kritika Dave**
DEPARTMENT: **STATISTICS**
CLASS: **F.Y.B.Sc.** SUBJECT: **DESCRIPTIVE STATISTICS (Paper-I)**
UNIT NO.: **I** UNIT TITLE: - **Types of Data and Data Condensation**

Lecture 1: Introduction to Types of Data and Sampling

- Definition of population and sample in statistics
- Explanation of finite and infinite populations
- Introduction to different sampling methods: Simple Random Sampling (SRS), SRS without replacement (SRSWOR), and SRS with replacement (SRSWR)

Lecture 2: Types of Characteristics and Scales of Measurement

- Overview of different types of characteristics: qualitative and quantitative
- Explanation of nominal, ordinal, interval, and ratio scales of measurement
- Understanding the properties and uses of each type of scale

Lecture 3: Collection of Primary Data

- Explanation of primary data collection methods: questionnaires and schedules
- Introduction to the concept of secondary data and its sources
- Discussion on the advantages and limitations of primary and secondary data

Lecture 4: Types of Data: Qualitative and Quantitative

- Definition and characteristics of qualitative and quantitative data
- Understanding the distinction between qualitative and quantitative variables
- Examples illustrating different types of data in various fields

Lecture 5: Types of Data: Time Series and Cross Section Data

- Definition and examples of time series data and cross-sectional data
- Explanation of the differences between time series and cross-sectional data
- Understanding the applications and analysis techniques for each type of data

Lecture 6: Types of Data: Discrete and Continuous

- Definition and characteristics of discrete and continuous data
- Understanding the distinction between discrete and continuous variables

- Examples illustrating different types of data in various contexts

Lecture 7: Tabulation of Data

- Explanation of tabulation as a method of summarizing and organizing data
- Introduction to frequency distributions and frequency tables
- Demonstration of techniques for tabulating qualitative and quantitative data

Lecture 8: Dichotomous Classification

- Definition and examples of dichotomous classification for two and three attributes
- Explanation of verification techniques for consistency in dichotomous classification
- Understanding the importance of consistent classification in data analysis

Lecture 9: Association of Attributes

- Introduction to measures of association for qualitative data
- Explanation of Yule's coefficient of association (Q) and Yule's coefficient of colligation
- Application of association measures to analyze relationships between attributes

Lecture 10: Examples and Problem Solving

- Solving problems and exercises related to types of data and data condensation
- Application of classification and association techniques to analyze real-world datasets
- Group activities and discussions to reinforce understanding of concepts

Lecture 11: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of data classification and association techniques
- Peer-to-peer learning and collaboration to deepen understanding of data condensation principles

Lecture 12: Advanced Topics in Data Condensation

- Exploration of advanced topics and extensions in data condensation techniques
- Analysis of non-standard data types and specialized data summarization methods
- Discussion of recent developments and research trends in data condensation

Lecture 13: Case Studies and Applications

- Analysis of real-world case studies using data condensation techniques
- Examination of how data condensation is applied in various fields such as marketing, finance, and healthcare
- Discussion of the practical implications and limitations of data condensation analysis

Lecture 14: Review and Practice

- Review of key concepts, definitions, and techniques related to types of data and data condensation

- Practice problems and exercises to reinforce understanding and mastery of concepts
- Q&A session to address any lingering doubts or questions about the material

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on types of data and data condensation
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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Jogeshwari (E), Mumbai

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER: **Kritika Dave**
DEPARTMENT: **STATISTICS**
CLASS: **F.Y.B.Sc.** SUBJECT: **DESCRIPTIVE STATISTICS (Paper-I)**
UNIT NO.: **II** UNIT TITLE: - **Classification of Data and Measures of central tendency**

Lecture 1: Introduction to Classification of Data

- Definition of univariate frequency distribution for discrete and continuous variables
- Explanation of cumulative frequency distribution and its importance in data analysis
- Overview of different graphical representation techniques: Histogram, frequency polygon, cumulative frequency curve, and stem-and-leaf diagram

Lecture 2: Univariate Frequency Distribution

- Detailed explanation of univariate frequency distribution for discrete variables
- Demonstration of how to construct frequency tables and histograms for discrete variables
- Examples illustrating the interpretation of frequency distributions for discrete variables

Lecture 3: Univariate Frequency Distribution (contd.)

- Explanation of univariate frequency distribution for continuous variables
- Techniques for constructing frequency tables and histograms for continuous variables
- Interpretation of frequency distributions for continuous variables and their applications

Lecture 4: Cumulative Frequency Distribution

- Definition and significance of cumulative frequency distribution
- Explanation of how to construct cumulative frequency tables and curves
- Understanding the cumulative frequency distribution as a summary measure of data distribution

Lecture 5: Graphical Representation of Frequency Distribution

- Introduction to various graphical representation techniques: Histogram, frequency polygon, cumulative frequency curve, and stem-and-leaf diagram
- Demonstration of how to create and interpret each type of graph
- Comparison of different graphical representations for different types of data

Lecture 6: Measures of Central Tendency

- Concept of central tendency and its importance in summarizing data
- Requirements of a good measure of central tendency
- Overview of different types of locational averages: median, mode, quartiles, deciles, and percentiles

Lecture 7: Median and Mode

- Detailed explanation of median as a measure of central tendency
- Definition and interpretation of mode
- Understanding the applications and limitations of median and mode in data analysis

Lecture 8: Partition Values: Quartiles, Deciles, and Percentiles

- Definition and calculation of quartiles, deciles, and percentiles
- Explanation of how partition values divide the data into equal parts
- Interpretation of quartiles, deciles, and percentiles in data analysis

Lecture 9: Mathematical Averages: Arithmetic Mean

- Definition and calculation of arithmetic mean
- Explanation of simple, weighted, and combined mean
- Demonstration of how to calculate arithmetic mean for different types of data

Lecture 10: Mathematical Averages: Geometric Mean

- Definition and calculation of geometric mean
- Understanding the geometric mean as a measure of central tendency for skewed distributions
- Applications of geometric mean in various fields such as finance and biology

Lecture 11: Mathematical Averages: Harmonic Mean

- Definition and calculation of harmonic mean
- Explanation of harmonic mean as a measure of central tendency for rates and ratios
- Examples illustrating the calculation and interpretation of harmonic mean

Lecture 12: Empirical Relation between Mean, Median, and Mode

- Exploration of the empirical relationship between mean, median, and mode
- Understanding how the measures of central tendency relate to each other in different types of distributions
- Analysis of real-world datasets to demonstrate the relationship between mean, median, and mode

Lecture 13: Merits and Demerits of Different Measures

- Discussion on the advantages and disadvantages of using different measures of central tendency
- Understanding the applicability of each measure in different contexts and scenarios
- Comparison of measures of central tendency based on their robustness and sensitivity to outliers

Lecture 14: Examples and Problem Solving

- Solving problems and exercises related to classification of data and measures of central tendency
- Application of different measures of central tendency to analyze and interpret real-world datasets
- Group activities and discussions to reinforce understanding of concepts

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on classification of data and measures of central tendency
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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GOVERNMENT OF MAHARASHTRA'S
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LECTURE PLAN

NAME OF THE LECTURER: **Kritika Dave**
DEPARTMENT: **STATISTICS**
CLASS: **F.Y.B.Sc.** SUBJECT: **DESCRIPTIVE STATISTICS (Paper-I)**
UNIT NO.: **III** UNIT TITLE: - **Measures of Dispersion, Skewness & Kurtosis**

Lecture 1: Introduction to Measures of Dispersion

- Definition of dispersion and its importance in describing the spread of data
- Explanation of the requirements of a good measure of dispersion
- Overview of different types of measures of dispersion: absolute and relative

Lecture 2: Range

- Explanation of the range as a measure of dispersion
- Calculation of the range and interpretation of its significance
- Understanding the limitations of the range as a measure of dispersion

Lecture 3: Quartile Deviation

- Definition and calculation of quartile deviation
- Explanation of quartile deviation as a measure of dispersion based on quartiles
- Interpretation of quartile deviation in relation to the spread of data

Lecture 4: Mean Absolute Deviation

- Introduction to mean absolute deviation as a measure of dispersion
- Calculation of mean absolute deviation and its interpretation
- Comparison of mean absolute deviation with other measures of dispersion

Lecture 5: Standard Deviation

- Definition and calculation of standard deviation
- Understanding the concept of variance and its relation to standard deviation

- Interpretation of standard deviation as a measure of dispersion and its applications

Lecture 6: Variance and Combined Variance

- Explanation of variance and combined variance as measures of dispersion
- Calculation of variance and combined variance for different types of data
- Analysis of variance and combined variance in relation to the spread of data

Lecture 7: Moments

- Definition and calculation of raw moments and central moments
- Understanding the properties of moments and their significance in data analysis
- Exploration of the relationship between raw moments and central moments

Lecture 8: Skewness

- Introduction to skewness as a measure of asymmetry in a distribution
- Explanation of different measures of skewness: Karl Pearson's, Bowley's, and coefficient of skewness based on moments
- Interpretation of skewness measures and their applications

Lecture 9: Measures of Skewness (contd.)

- Calculation of skewness measures using different formulas
- Analysis of skewness measures to determine the shape of a distribution
- Understanding the implications of positive and negative skewness

Lecture 10: Kurtosis

- Definition and calculation of kurtosis as a measure of the peakedness of a distribution
- Interpretation of kurtosis measures and their significance in data analysis
- Comparison of different measures of kurtosis and their applicability

Lecture 11: Box Plot

- Introduction to box plots as a graphical representation of data dispersion
- Explanation of how to create and interpret box plots

- Understanding the advantages of box plots in visualizing the spread of data

Lecture 12: Examples and Problem Solving

- Solving problems and exercises related to measures of dispersion, skewness, and kurtosis
- Application of dispersion measures to analyze and interpret real-world datasets
- Group activities and discussions to reinforce understanding of concepts

Lecture 13: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of skewness and kurtosis measures through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of dispersion, skewness, and kurtosis principles

Lecture 14: Advanced Topics

- Exploration of advanced topics and extensions in measures of dispersion, skewness, and kurtosis
- Analysis of non-standard distributions and specialized measures of dispersion
- Discussion of recent developments and research trends in dispersion, skewness, and kurtosis analysis

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on measures of dispersion, skewness, and kurtosis
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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FIRST YEAR B.SC

DESCRIPTIVE STATISTICS

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SEMESTER II

2018-19

LECTURE PLAN

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE : _____
NAME OF THE LECTURER: **Kritika Dave**
DEPARTMENT: **STATISTICS**
CLASS: **F.Y.B.Sc.** SUBJECT: **DESCRIPTIVE STATISTICS (Paper-I)**
UNIT NO.: **I** UNIT TITLE: **Correlation and regression analysis**

Lecture 1: Introduction to Correlation Analysis

- Definition of correlation and its importance in statistics
- Explanation of scatter diagrams as a graphical representation of the relationship between two variables
- Introduction to the product moment correlation coefficient (Pearson's correlation coefficient) and its properties

Lecture 2: Product Moment Correlation Coefficient

- Detailed explanation of the product moment correlation coefficient
- Calculation of the correlation coefficient using sample data
- Interpretation of the correlation coefficient and its significance in data analysis

Lecture 3: Properties of Correlation Coefficient

- Discussion on the properties of the correlation coefficient, including range and interpretation
- Analysis of the strength and direction of correlation based on the correlation coefficient
- Understanding the limitations and assumptions of correlation analysis

Lecture 4: Spearman's Rank Correlation

- Introduction to Spearman's rank correlation coefficient
- Explanation of the rank correlation coefficient and its interpretation
- Calculation of Spearman's rank correlation coefficient for ranked data with and without ties

Lecture 5: Concept of Linear Regression

- Definition of linear regression and its applications
- Introduction to the principle of least squares as a method for fitting a regression line
- Understanding the components of a linear regression model

Lecture 6: Fitting a Straight Line by Least Squares Method

- Detailed explanation of the least squares method for fitting a straight line
- Calculation of regression coefficients using the least squares approach
- Interpretation of regression coefficients and the fitted regression line

Lecture 7: Relation between Regression Coefficients and Correlation Coefficient

- Understanding the relationship between regression coefficients and correlation coefficient
- Explanation of how the correlation coefficient influences the slope of the regression line
- Analysis of the implications of correlation on regression analysis

Lecture 8: Fitting of Curves Reducible to Linear Form

- Introduction to curves reducible to linear form by transformation
- Explanation of how to transform nonlinear relationships into linear relationships
- Application of the least squares method to fit curves reducible to linear form

Lecture 9: Concept and Use of Coefficient of Determination (R^2)

- Definition of the coefficient of determination (R^2) and its interpretation
- Calculation of R^2 to assess the goodness of fit of a regression model
- Understanding the significance of R^2 in regression analysis

Lecture 10: Fitting a Quadratic Curve by Least Squares Method

- Introduction to fitting a quadratic curve using the least squares method
- Explanation of how to model quadratic relationships between variables
- Calculation of regression coefficients for quadratic regression models

Lecture 11: Examples and Problem Solving

- Solving problems and exercises related to correlation and regression analysis
- Application of correlation and regression techniques to analyze real-world datasets
- Group activities and discussions to reinforce understanding of concepts

Lecture 12: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of correlation and regression analysis through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of correlation and regression principles

Lecture 13: Advanced Topics

- Exploration of advanced topics and extensions in correlation and regression analysis
- Analysis of non-linear regression models and specialized regression techniques
- Discussion of recent developments and research trends in correlation and regression analysis

Lecture 14: Case Studies and Applications

- Analysis of real-world case studies using correlation and regression analysis
- Examination of how correlation and regression analysis is applied in various fields such as economics, social sciences, and business
- Discussion of the practical implications and limitations of correlation and regression analysis

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on correlation and regression analysis
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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GOVERNMENT OF MAHARASHTRA'S
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LECTURE PLAN

DATE : _____
NAME OF THE LECTURER: **Kritika Dave**
DEPARTMENT: **STATISTICS**
CLASS: **F.Y.B.Sc.** SUBJECT: **DESCRIPTIVE STATISTICS (Paper-I)**
UNIT NO.: **II** UNIT TITLE: **Time series**

Lecture 1: Introduction to Time Series Analysis

- Definition of time series and its importance in statistics
- Explanation of the components of a time series: trend, seasonal variation, cyclical variation, and irregular variation
- Overview of different models used in time series analysis

Lecture 2: Trend Estimation

- Introduction to trend estimation in time series analysis
- Explanation of various methods for estimating trend: freehand curve method, method of semi-average, method of moving average, and method of least squares (linear trend only)
- Calculation of trend using each method and interpretation of results

Lecture 3: Freehand Curve Method

- Detailed explanation of the freehand curve method for trend estimation
- Demonstration of how to draw a freehand curve to estimate the trend in a time series
- Analysis of the advantages and limitations of the freehand curve method

Lecture 4: Method of Semi-Average

- Introduction to the method of semi-average for trend estimation
- Explanation of how to calculate semi-averages and use them to estimate the trend

- Understanding the concept of centered moving averages and their application in trend estimation

Lecture 5: Method of Moving Average

- Definition and explanation of the method of moving average for trend estimation
- Calculation of moving averages and interpretation of results
- Analysis of the effectiveness of moving averages in smoothing out fluctuations in a time series

Lecture 6: Method of Least Squares (Linear Trend)

- Introduction to the method of least squares for estimating linear trends in time series
- Explanation of how to fit a straight line to the data using the least squares approach
- Calculation of regression coefficients and interpretation of the fitted trend line

Lecture 7: Estimation of Seasonal Component

- Introduction to seasonal variation in time series analysis
- Explanation of various methods for estimating seasonal component: method of simple average, ratio to moving average, and ratio to trend method
- Calculation of seasonal indices using each method and interpretation of results

Lecture 8: Method of Simple Average

- Detailed explanation of the method of simple average for estimating seasonal variation
- Demonstration of how to calculate seasonal averages and seasonal indices
- Analysis of the strengths and weaknesses of the method of simple average

Lecture 9: Ratio to Moving Average

- Introduction to the ratio to moving average method for estimating seasonal variation

- Explanation of how to calculate seasonal ratios and use them to adjust the data for seasonal effects
- Understanding the concept of deseasonalization and its application in time series analysis

Lecture 10: Ratio to Trend Method

- Definition and explanation of the ratio to trend method for estimating seasonal variation
- Calculation of seasonal ratios relative to the trend and their interpretation
- Comparison of the ratio to trend method with other methods of seasonal adjustment

Lecture 11: Examples and Problem Solving

- Solving problems and exercises related to time series analysis
- Application of trend estimation and seasonal adjustment techniques to analyze real-world time series data
- Group activities and discussions to reinforce understanding of concepts

Lecture 12: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of time series analysis through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of time series analysis principles

Lecture 13: Advanced Topics

- Exploration of advanced topics and extensions in time series analysis
- Analysis of non-linear trends and seasonal patterns in time series data
- Discussion of recent developments and research trends in time series analysis

Lecture 14: Case Studies and Applications

- Analysis of real-world case studies using time series analysis techniques
- Examination of how time series analysis is applied in various fields such as finance, economics, and meteorology
- Discussion of the practical implications and limitations of time series analysis

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on time series analysis
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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LECTURE PLAN

DATE : _____
NAME OF THE LECTURER: **Kritika Dave**
DEPARTMENT: **STATISTICS**
CLASS: **F.Y.B.Sc.** SUBJECT: **DESCRIPTIVE STATISTICS (Paper-I)**
UNIT NO.: **III** UNIT TITLE: **Index Numbers**

Lecture No. : 1

- Introduce the concept of Index Number.
- Explain the Stages in the construction of price index numbers.

Comparative tool

Lecture No. : 2

- Introduce the concept for comparative tool.
- Describe the various steps involved in comparative tool.

Simple and composite index number

Lecture No. : 3

- Define and explain simple and composite index number.
- Also solved few examples for the same.

Lasperay's and Paasche's index numbers

Lecture No. : 4

- Introduce and brief the concept of Lasperay's & Paasche's Index Numbers.
- ***INNOVATIVE PRACTICES:*** Home Assignment.

Edgeworth's and Bowley's index Numbers

Lecture No. : 5

- Introduce and brief the concept of Edgeworth's & Bowley's Index Numbers.
  INNOVATIVE PRACTICES: Home Assignment.

Drobisch's and fisher's index Numbers

Lecture No. : 6

- Introduce and brief the concept of Drobisch's & Fisher's Index Numbers.
- ***INNOVATIVE PRACTICES:*** Home Assignment.

Quantity & value Index Numbers

Lecture No. : 7

- Explain the Quantity Index Numbers and Values Index Numbers.
- Define the difference between them.
- Solved few examples for the same.
-

Types of test for INDEX NUMBER

Lecture No. : 8

- Define and explain the concept of types of tests for index number.
- Time reversal test
- Factor reversal test
- Circular test.

INNOVATIVE PRACTICES: Practice Problems.

FIXED BASE Index Numbers

Lecture No. : 9

- Define and explain the concept of fixed base index number.
- Also state few examples on the same.

INNOVATIVE PRACTICES: Practice Problems

CHAIN BASE Index Numbers

Lecture No. : 10

- Define and explain the concept of Chain base index numbers.
- Also state few examples on the same.

INNOVATIVE PRACTICES: Practice Problems.

BASE SHIFTING & DEFLATING Index Numbers

Lecture No. : 11.

- Define and explain the concept and difference for base shifting , splicing & deflating.
- Also state few examples on the same.
-
- ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 12

- Define and explain the concept of real income based on wholesale price numbers.
- Also state few examples on the same.

- ***INNOVATIVE PRACTICES:*** Practice Problems.

COST OF LIVING Index Numbers

Lecture No. : 13

- Explain the concept for cost of living index numbers.
- Merits and Demerits for the same.

Lecture No. : 14

- Continue with the derivation and solve the problems based on it.

- ***INNOVATIVE PRACTICES:*** Practice Problems.

Class Test

Lecture No. : 15

- A revision of all important concepts, terms and definitions.
- A short class test on the same.

- ***INNOVATIVE PRACTICES:*** Class tests

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credit BASED semester AND GRADING SYSTEM

of

UNIVERSITY OF MUMBAI

SECOND YEAR B.SC

sTATISTICS PAPER III

COURSE

SEMESTER III

2018-19

Lecture plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: S.Y.B.SC. **SUBJECT:** STATISTICS
PAPER :III
UNIT NO.: 1 **UNIT TITLE:** operation research

NAME OF THE TOPIC: linear programming problem

Lecture No. : 1

- Introduce the concept of L.P.P. as one of the major branches of Operation Research, its importance and necessity.
- Begin at the very beginning by introducing and defining concepts integral to the study of L.P.P. such as Maximization & Minimization.

Lecture No. : 2

- Concepts of Solution: namely, Feasible Solution, Basic Feasible solution, Optimal Solution.
- Give a few examples of Solutions.
- Mathematical Formulation of the given problem.

❖ ***INNOVATIVE PRACTICES:*** Classroom presentations.

NAME OF THE TOPIC: Graphical problem

Lecture No. : 3

- Solving Linear Programming Problem by Graphical Method for Maximization Objective Function.
- Finding Feasible Solution using Graphical Method.

❖ ***CASE STUDY/EXAMPLES: Solving Examples based on Graphical methods.***

❖ ***INNOVATIVE PRACTICES :*** Home Assignments

Lecture No. : 4

- Solving Linear Programming Problem by Graphical Method for Minimization Objective Function.
- Finding Feasible Solution using Graphical Method.

❖ ***CASE STUDY/EXAMPLES: Solving Examples based on Graphical methods.***

❖ ***INNOVATIVE PRACTICES :*** Home Assignments

NAME OF THE TOPIC: simplex method

Lecture No. : 5

- Solving Linear Programming Problem by Simplex Method for Maximization Objective Function for two variables.
- Finding Optimal Solution using Simplex Method.

❖ ***CASE STUDY/EXAMPLES:*** Practical Problems

❖ ***INNOVATIVE PRACTICES:*** Home Assignments

Lecture No. : 6

- Solving Linear Programming Problem by Simplex Method for Maximization Objective Function for more than two variables.
- Finding Optimal Solution using Simplex Method.

❖ ***CASE STUDY/EXAMPLES:*** Practical Problems

❖ ***INNOVATIVE PRACTICES:*** Home Assignments

Lecture No. : 7

- Solving Linear Programming Problem by Simplex Method for Minimization Objective Function for two variables.

- Finding Optimal Solution using Simplex Method.

❖ ***CASE STUDY/EXAMPLES:*** Practical Problems

❖ ***INNOVATIVE PRACTICES:*** Home Assignments

Lecture No. : 8

- Solving Linear Programming Problem by Simplex Method for Minimization Objective Function for more than two variables.
- Finding Optimal Solution using Simplex Method.

❖ ***CASE STUDY/EXAMPLES:*** Practical Problems

❖ ***INNOVATIVE PRACTICES:*** Home Assignments

NAME OF THE TOPIC: big m method

Lecture No. : 9

- Solving Linear Programming Problem by Simplex Method for Minimization Objective Function for two variables.
- Finding Optimal Solution using Big M Method.

❖ ***CASE STUDY/EXAMPLES:*** Practical Problems

❖ ***INNOVATIVE PRACTICES:*** Home Assignments

Lecture No. : 10

- Solving Linear Programming Problem by Big M Method for Minimization Objective Function for more than two variables.
- Finding Optimal Solution using Big M Method.

❖ ***CASE STUDY/EXAMPLES:*** Practical Problems

❖ ***INNOVATIVE PRACTICES:*** Home Assignments

NAME OF THE TOPIC: primal &duality

Lecture No. : 11.

- Introduction of Primal, its advantages and Limitation.

Lecture No. : 12

- Introduction of Dual, its advantages and Limitation.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 13

- Use of Duality in solving Linear Programming Problem.

Lecture No. : 14

- Relationship between optimum solution to Primal and Dual.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 15

- A revision of all important concepts, terms and definitions, and all formulae.
- A short class test on the same.

❖ ***INNOVATIVE PRACTICES:*** Class tests

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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER : SONALI THIK
DEPARTMENT: STATISTICS
CLASS : S.Y.B.SC. **SUBJECT :** STATISTICS
PAPER : III
UNIT NO.: 2 **UNIT TITLE :** operation research

NAME OF THE TOPIC: transportation Problem

Lecture No. : 1

- Introduce concept of need for Transportation Problem by giving suitable examples
- Formally define Transportation Problem.

Lecture No. : 2

- Illustrate the Mathematical Formulation of Transportation Problem.
- Different types of Solutions possible in Transportation Problem.

Lecture No. : 3

- Stating the different methods for solving the Transportation Problem: North – West Corner Rule, Matrix Minima Method, Vogel's Approximation Method.

Lecture No. : 4

- Explain the procedure of North – west Corner Rule.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 5

- Explain the procedure of Matrix Minima Method.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 6

- Explain the procedure of Vogel's Approximation Method.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 7

- Comparison on the method of Transportation Problem, between North West Corner Rule, Matrix Maxima Method, Vogel's Approximation Method

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

NAME OF THE TOPIC: modi method

Lecture No. : 8

- Explain the procedure for obtaining optimal solution for the transportation problem by MODI Method.

Lecture No. : 9

- Obtaining optimal solution for the transportation problem by MODI Method for North – West Corner Rule.

Lecture No. : 10

- Obtaining optimal solution for the transportation problem by MODI Method for Matrix Maxima Method.

Lecture No. : 11

- Obtaining optimal solution for the transportation problem by MODI Method for Vogel's Approximation Method.

NAME OF THE TOPIC: transportation problem

Lecture No. : 12.

- Introduction of Optimality Test, its advantages and Limitation.

Lecture No. : 13

- Finding any Improvement procedure for solving the Transportation Problem.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 14

- Variants in Transportation Problem: Unbalanced and Maximization type.

Lecture No. : 15

- A revision of all important concepts, terms and definitions, and all formulae.
- A short class test on the same.

❖ ***INNOVATIVE PRACTICES:*** Class tests

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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER : SONALI THIK
DEPARTMENT: STATISTICS
CLASS : S.Y.B.SC. **SUBJECT** : STATISTICS
PAPER: III
UNIT NO.: 3 **UNIT TITLE :** operation research
NAME OF THE TOPIC: assignment problem

NAME OF THE TOPIC: assignment problem

Lecture No. : 1

- Explain the concept of Assignment Problem.
- Situation where Sequencing Problem can be applied.

Lecture No. : 2

- Formulation of Assignment Problem with different situations.

❖ ***INNOVATIVE PRACTICES : Assignments***

Lecture No. : 3

- Stating different method for getting the solution for the Assignment Problem.

Lecture No. : 4

- Explain the concept and procedure for obtaining solution for Assignment Problem by Complete Enumeration Method.

Lecture No. : 5

- Explain the concept and procedure for obtaining solution for Assignment Problem by Hungarian Method.

❖ ***CASE STUDY/EXAMPLES: Practice problems from Reference books***

Lecture No. : 6

- Explain the concept and procedure for obtaining solution for Assignment Problem in Unbalanced type.
- To see the variants in Assignment problem of unbalanced type.

Lecture No. : 7

- Explain the concept and procedure for obtaining solution for Assignment Problem in Maximization type.
- To see the variants in Assignment problem of Maximization type.

❖ ***CASE STUDY/EXAMPLES: Practice problems from Reference books***
❖ ***INNOVATIVE PRACTICES: Assignments***

Lecture No. : 8

- Explain the concept and procedure for obtaining solution for Assignment Problem in Travelling Salesman Problem

Lecture No. : 9

- Explain the concept and procedure for obtaining solution for Assignment Problem in Travelling Salesman Problem.
- To see the variants in Assignment problem of Maximization type.

❖ ***CASE STUDY/EXAMPLES: Practice problems from Reference books***

❖ ***INNOVATIVE PRACTICES: Assignments***

Lecture No. : 10

- A revision of all important concepts, terms and definitions, theorems and proofs and all formulae.

- A short class test on the same
  ❖ ***INNOVATIVE PRACTICES: Class test***

NAME OF THE TOPIC: sequencing problem

Lecture No. : 11

- Introduction to the concept of Sequencing Problem.

- Situation where Sequencing Problem can be applied.

Lecture No. : 12

- Processing n jobs through ' 2 ' machines procedure and examples based on it.

❖ **INNOVATIVE PRACTICES**: Assignments.

Lecture No. : 13

- Processing n jobs through ' 3 ' machines procedure and examples based on it.

❖ **INNOVATIVE PRACTICES**: Assignments.

Lecture No. : 14

- Processing n jobs through ' m ' machines procedure and examples based on it.

❖ **INNOVATIVE PRACTICES**: Assignments.

Lecture No. : 15

- A revision of all important concepts, terms and definitions, theorems and proofs and all formulae.
- A short class test on the same

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credit BASED semester AND GRADING SYSTEM

of

UNIVERSITY OF MUMBAI

SECOND YEAR B.SC sTATISTICS PAPER III COURSE

SEMESTER IV

2018-19

Lecture plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER : SONALI THIK
DEPARTMENT: STATISTICS
CLASS : S.Y.B.SC. **SUBJECT :** STATISTICS
PAPER :III
UNIT NO.: 1
UNIT TITLE : CPM AND PERT

NAME OF THE TOPIC: Cpm

Lecture No. : 1

- Introduce the concept of Critical Path Method as one of the major branches of Project Management, its importance and necessity.
- Begin at the very beginning by introducing and defining concepts integral to the Objective of the techniques.

Lecture No. : 2

- Rules and regulation for drawing the network diagram.
- Diagrammatic representation of activities in a project by Gantt Chart.

❖ ***INNOVATIVE PRACTICES:*** Classroom presentations.

Lecture No. : 3

- Rules and regulation for drawing the network diagram.
- Diagrammatic representation of activities in a project by Network Diagram.

❖ ***INNOVATIVE PRACTICES:*** Classroom presentations.

Lecture No. : 4

- Stating different types of float, Slack time.
- Steps for obtaining float, and slack time.
- Importance of slack time.

Lecture No. : 5

- Procedure for determining the critical path for the given network diagram.
- Determining the project duration .

❖ ***INNOVATIVE PRACTICES:*** Practical problem from reference book.

NAME OF THE TOPIC: pert

Lecture No. : 6

- Introduce the concept of Project Evaluation Review Technique as one of the major branches of Project Management, its importance and necessity.
- Begin at the very beginning by introducing and defining concepts integral to the Objective of the techniques.

Lecture No. : 7

- Rules and regulation for drawing the network diagram.
- Diagrammatic representation of activities in a project by Gantt Chart.

❖ ***INNOVATIVE PRACTICES:*** Classroom presentations.

Lecture No. : 8

- Rules and regulation for drawing the network diagram.
- Diagrammatic representation of activities in a project by Network Diagram.

❖ ***INNOVATIVE PRACTICES:*** Classroom presentations.

Lecture No. : 9

- Stating different types of float, Slack time.
- Steps for obtaining float, and slack time.
- Importance of slack time.

Lecture No. : 10

- Procedure for determining the critical path for the given network diagram And comparing the difference between CPM and PERT.
- Determining the project duration.

❖ ***INNOVATIVE PRACTICES:*** Practical problem from reference book.

Lecture No. : 11

- Procedure for determining the probability consideration in project scheduling..
- Determining the project duration.

❖ ***INNOVATIVE PRACTICES:*** Practical problem from reference book.

Lecture No. : 12

- Objective of Project cost analysis.
- Steps for finding the crash time.

❖ ***INNOVATIVE PRACTICES:*** Practical problem from reference book.

Lecture No. : 13

- Continuation of Project cost analysis.
- Steps for finding the crash time.

❖ ***INNOVATIVE PRACTICES:*** Practical problem from reference book.

Lecture No. : 14

- Objective of Updating
- Steps for Updating the network diagram.

❖ ***INNOVATIVE PRACTICES:*** Presentation.

Lecture No. : 15

- A revision of all important concepts, terms and definitions, and all formulae.
- A short class test on the same.

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GOVERNMENT OF MAHARASHTRA'S
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LECTURE PLAN

NAME OF THE LECTURER : SONALI THIK
DEPARTMENT: STATISTICS
CLASS : S.Y.B.SC. **SUBJECT :** STATISTICS
PAPER :III
UNIT NO.: 2
UNIT TITLE : GAME THEORY

Lecture 1: Introduction to Game Theory

- Definition and importance of game theory in economics and decision-making
- -Overview of the basic concepts including players, strategies, payoffs, and equilibrium

Lecture 2: Two-Person Zero Sum Game

- Definition and characteristics of a two-person zero-sum game
- Explanation of the concept of a saddle point and its significance in game theory

Lecture 3: Value of the Game

- Understanding the value of the game and its calculation in two-person zero-sum games
- Discussion on the optimal strategies for players to maximize their payoffs

Lecture 4: Pure and Mixed Strategies

- Definition and explanation of pure and mixed strategies in game theory
- Understanding the concept of Nash equilibrium and its application in strategic decision-making

Lecture 5: Optimal Solution of Two-Person Zero Sum Games

- Explanation of the dominance property and its role in identifying optimal strategies
- Derivation of formulae for solving (2x2) games using dominance property

and linear programming

Lecture 6: Graphical Solution of (2xn) Games

- Introduction to graphical methods for solving (2xn) games
- Understanding the graphical representation of payoff matrices and identifying optimal strategies

Lecture 7: Graphical Solution of (mx2) Games

- Explanation of graphical methods for solving (mx2) games
- Application of graphical techniques to analyze and solve (mx2) games efficiently

Lecture 8: Reduction of Game Theory to Linear Programming Problems

- Introduction to the concept of reducing game theory problems to linear programming problems
- Understanding the mathematical formulation and solution methods for converting game theory to linear programming

Lecture 9: Linear Programming Formulation

- Detailed explanation of the linear programming formulation for game theory problems
- Solving examples and exercises to illustrate the conversion of game theory problems to linear programming

Lecture 10: Applications of Game Theory

- Analysis of real-world applications of game theory in various fields such as economics, politics, and biology
- Examination of strategic interactions and decision-making processes using game theory models

Lecture 11: Extensive Form Games

- Introduction to extensive form games and their representation using game trees
- Understanding the concepts of subgame perfection and backward induction in extensive form games

Lecture 12: Evolutionary Game Theory

- Explanation of evolutionary game theory and its application in modeling biological and social systems
- Understanding the dynamics of strategy evolution and stability in evolutionary game theory

Lecture 13: Cooperative Game Theory

- Introduction to cooperative game theory and its focus on coalition formation and cooperative behavior
- Understanding solution concepts such as the core, Shapley value, and Nash bargaining solution in cooperative games

Lecture 14: Behavioral Game Theory

- Overview of behavioral game theory and its integration with insights from psychology and neuroscience
- Analysis of bounded rationality, fairness, and other behavioral factors in strategic decision-making

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in Unit II: Game Theory
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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LECTURE PLAN

NAME OF THE LECTURER : SONALI THIK
DEPARTMENT: STATISTICS

CLASS : S.Y.B.SC. **SUBJECT** : STATISTICS
PAPER :III
UNIT NO.: 3
UNIT TITLE : decision THEORY

Lecture 1: Introduction to Decision Theory

- Definition and importance of decision theory in decision-making under uncertainty and risk
- Overview of the basic concepts including decision criteria and decision-making frameworks

Lecture 2: Decision Making under Uncertainty

- Explanation of decision-making under uncertainty and its challenges
- Introduction to Laplace criterion, Maximax (Minimin) criterion, and Maximin (Minimax) criterion for decision-making

Lecture 3: Laplace Criterion

- Detailed explanation of the Laplace criterion and its application in decision-making
- Understanding the principle of equal probabilities and its role in the Laplace criterion

Lecture 4: Maximax and Maximin Criterion

- Explanation of the Maximax and Maximin criteria for decision-making under uncertainty
- Understanding the principles of optimism and pessimism in decision-making

Lecture 5: Hurwicz and Minimax Regret Criteria

- Introduction to the Hurwicz criterion and its interpretation in decision-making
- Explanation of the Minimax Regret criterion and its application in minimizing potential regrets

Lecture 6: Decision Making under Risk

- Explanation of decision-making under risk and its characteristics
- Introduction to the Expected Monetary Value (EMV) criterion and Expected Opportunity Loss (EOL) criterion

Lecture 7: Expected Monetary Value (EMV)

- Detailed explanation of the EMV criterion and its calculation in decision-making
- Understanding how to calculate the expected payoff for each decision alternative

Lecture 8: Expected Opportunity Loss (EOL)

- Explanation of the EOL criterion and its application in evaluating decision alternatives
- Understanding how to calculate the expected loss associated with each decision alternative

Lecture 9: EPPI and EVPI

- Introduction to Expected Posterior Probability of Improvement (EPPI) and Expected Value of Perfect Information (EVPI)
- Understanding the concepts of uncertainty reduction and information value in decision-making

Lecture 10: Bayesian Decision Rule for Posterior Analysis

- Explanation of the Bayesian decision rule and its application in decision-making under uncertainty
- Understanding how to incorporate prior probabilities and likelihoods into decision-making.

Lecture 11: Decision Tree Analysis

- Introduction to decision tree analysis and its use in structuring decision problems
- Explanation of how to construct and analyze decision trees for decision-making under uncertainty and risk

Lecture 12: Posterior Probabilities in Decision Trees

- Understanding the concept of posterior probabilities and their role in decision tree analysis
- Calculation of posterior probabilities and their incorporation into decision-making

Lecture 13: Case Studies and Examples

- Analysis of real-world case studies and examples illustrating the application of decision theory concepts
- Examination of decision-making processes in various contexts including business, finance, and healthcare

Lecture 14: Advanced Topics

- Exploration of advanced topics and extensions in decision theory
- Discussion of topics such as decision theory applications in game theory, behavioral economics, and machine learning

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in Unit III: Decision Theory
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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credit BASED semester AND GRADING SYSTEM

of

UNIVERSITY OF MUMBAI

FIRST YEAR B.SC

statistical methods COURSE

SEMESTER I

2018-19

Lecture plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____

NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: F.Y.B.SC.
SUBJECT: statistical methods (Paper-ii)
UNIT NO.: I
UNIT TITLE: elementary probability theory

NAME OF THE TOPIC: basic concepts in probability

Lecture no. 1:

- Basic concepts: experiment, outcome, trial, sample space, sample point.
- Types of experiment with examples.

NAME OF THE TOPIC: events

Lecture no. 2:

- Events and its types with examples.

NAME OF THE TOPIC: probability definitions and limitations

Lecture no. 3:

- Definitions of probability and its limitations.

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 4:

- Examples based on previous lecture topics.

❖ INNOVATIVE PRACTICES: Home Assignment.

NAME OF THE TOPIC: probability counting rules

Lecture no. 5:

- Principle of sequential counting.

Lecture no. 6:

- Simple random sampling
  - SRS with replacement
  - SRS without replacement

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 7:

- Examples based on previous lecture topics.

❖ INNOVATIVE PRACTICES: Home Assignment.

NAME OF THE TOPIC: axioms of probability

Lecture no. 8:

- Explain axioms of probability.
- Theorems based on axioms.

NAME OF THE TOPIC: addition theorem

Lecture no. 9:

- State and prove addition theorem of probability (Total probability theorem).

Lecture no. 10:

- Theorems: (i) $P(A \cup B) = P(A) + P(B)$, if A and B are mutually exclusive events.
  (ii) Boole's inequality
  (iii) Addition theorem for 3 events
  (iv) $P(A') = 1 - P(A)$

NAME OF THE TOPIC: CONDITIONAL PROBABILITY

Lecture no. 11:

- Introduction about conditional probability with the help of various examples.

❖ INNOVATIVE PRACTICES: Home Assignment.

NAME OF THE TOPIC: independent events

Lecture no. 12:

- Brief explanation about independent events with day-to-day life examples.
- Definition of independent events.

NAME OF THE TOPIC: examples based on CONDITIONAL PROBABILITY and independent events

Lecture no. 13:

- Examples based on conditional probability and independent events.

❖ INNOVATIVE PRACTICES: Home Assignment.

NAME OF THE TOPIC: theorems

Lecture no. 14:

- Explain theorems: (i) $0 \le P(A/B) \le 1$
  (ii) $P(S/B) = 1$
  (iii) $P[(A \cup B)/C] = P(A/C) + P(B/C)$, if A, B and C are mutually exclusive.
  (iv) $P[(A \cup B)/C] = P(A/C) + P(B/C) - P[(A \cap B)/C]$
  (v) $P(A'/B) = 1 - P(A/B)$

NAME OF THE TOPIC: multiplication and bayes theorem

Lecture no. 15:

- State and prove multiplication theorem.
- State and prove bayes theorem.

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GOVERNMENT OF MAHARASHTRA'S
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LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: F.Y.B.SC. **SUBJECT:** statistical methods (Paper-ii)
UNIT NO.: ii
UNIT TITLE: concept of discrete random variable and properties of its probability distribution

NAME OF THE TOPIC: random variable

Lecture no. 1:

- Explain random variable with examples.
- Explain discrete random variable with various examples.

NAME OF THE TOPIC: probability mass function

Lecture no. 2:

- Define probability mass function with its properties.
- Examples based on p.m.f.

NAME OF THE TOPIC: conditional probability distribution function

Lecture no. 3:

- Define conditional probability distribution function with its properties.
- Define median and mode of the distribution.

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 4:

- Examples based on c.d.f.

❖ INNOVATIVE PRACTICES: Home Assignment.

NAME OF THE TOPIC: expectation

Lecture no. 5:

- Expectation definition and properties.

NAME OF THE TOPIC: moments

Lecture no. 6:

- Explain central and row moments
- Relationship between central and row moments

NAME OF THE TOPIC: skewness and kurtosis

Lecture no. 7:

- Explain skewness and kurtosis

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 8:

- Examples based on previous lecture topics.

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: discrete bivariate random variables

Lecture no. 9:

- Joint probability mass function
- Marginal probability mass function

- Conditional probability mass function

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 10:

- Examples based on previous lecture topics.

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: expectations of bivariate random variables

Lecture no. 11:

- Concept of expectation
- Addition theorem of expectation

Lecture no. 12:

- Multiplication theorem of expectation

NAME OF THE TOPIC: covariance

Lecture no. 13:

- Define covariance
- State and prove properties of covariance

NAME OF THE TOPIC: variance

Lecture no. 14:

- Theorem: variance of linear combination of two variables
- Some special cases based on same theorem

NAME OF THE TOPIC: correlation coefficient

Lecture no. 15:

- Define correlation coefficient and its properties
- Some examples based on it

❖ INNOVATIVE PRACTICES: Home Assignments

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ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: F.Y.B.SC. **SUBJECT:** statistical methods (Paper-ii)
UNIT NO.: iii **UNIT TITLE:** standard discrete distributions

NAME OF THE TOPIC: discrete uniform distribution

Lecture no. 1:

- Definition of uniform distribution
- Define its p.m.f. and c.d.f.

Lecture no. 2:

- Properties of uniform distribution: mean, variance, skewness and kurtosis

NAME OF THE TOPIC: binomial distribution

Lecture no. 3:

- Definition of Bernoulli distribution and binomial distribution with its p.m.f.

Lecture no. 4:

- Properties of binomial distribution: mean, variance, mode

Lecture no. 5:

- Properties of uniform distribution: skewness and kurtosis, central moments, recurrence relationship between probabilities

NAME OF THE TOPIC: examples based on uniform and binomial distribution

Lecture no. 6:

- Examples based on uniform distribution

Lecture no. 7:

- Examples based on binomial distribution
- INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: Poisson distribution

Lecture no. 8:

- Definition of Poisson distribution
- Define its p.m.f.
- Properties of Poisson distribution: mean, variance

Lecture no. 9:

- Properties of Poisson distribution: mode, skewness and kurtosis, recurrence relationship between probabilities

Lecture no. 10:

- Comparison between binomial and Poisson distribution
- Examples based on Poisson distribution

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: hypergeometric distribution

Lecture no. 11:

- Definition of hypergeometric distribution
- Define its p.m.f.

Lecture no. 12:

- Properties of hypergeometric distribution: mean, variance

Lecture no. 13:

- Approximation of hypergeometric to binomial distribution

Lecture no. 14:

- Examples based on hypergeometric distribution

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: real life applications of the distributions

Lecture no. 15:

- Real life applications of the binomial distribution
- Real life applications of the Poisson distribution
- Real life applications of the hypergeometric distribution

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credit BASED semester AND GRADING SYSTEM

of

UNIVERSITY OF MUMBAI

FIRST YEAR B.SC

statistical methods COURSE

SEMESTER II

2018-19

Lecture plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: F.Y.B.SC. **SUBJECT:** statistical methods (Paper-ii)
UNIT NO.: I **UNIT TITLE:** continuous random variable

NAME OF THE TOPIC: continuous random variable

Lecture no. 1:

- Explain the concept of continuous random variable with examples.

NAME OF THE TOPIC: continuous probability density function

Lecture no. 2:

- Explain continuous probability density function with its properties.

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 3:

- Examples based on continuous probability density function

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: cumulative distribution function

Lecture no. 4:

- Explain the concept cumulative distribution function
- Properties of cumulative distribution function

NAME OF THE TOPIC: graphical representation

Lecture no. 5:

- Graphical representation of probability density function and cumulative distribution function with the help of example

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 6:

- Examples based on cumulative distribution function

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: measures associated with continuous random variable

Lecture no. 7:

- Expectation of a random variable and its properties.

Lecture no. 8:

- Raw and Central moments

Lecture no. 9:

- Variance
- Median

Lecture no. 10:

- Mode
- Quartiles

Lecture no. 11:

- Deciles
- Percentiles

Lecture no. 12:

- Skewness
- kurtosis

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 13:

- Examples based on Expectation and Variance

❖ INNOVATIVE PRACTICES: Home Assignments

Lecture no. 14:

- Examples based on mean and median

❖ INNOVATIVE PRACTICES: Home Assignments

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Lecture no. 15:

- Examples based on quartiles and percentiles

❖ INNOVATIVE PRACTICES: Home Assignments

ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: F.Y.B.SC. **SUBJECT:** statistical methods (Paper-ii)
UNIT NO.: ii **UNIT TITLE:** standard continuous distribution

NAME OF THE TOPIC: uniform distribution

Lecture no. 1:
- Definition of uniform distribution and its pdf with the help of graph
- Explain cdf of uniform distribution with the help of graph

Lecture no. 2:
- Mean and variance of uniform distribution

Lecture no. 3:
- Median, Mode, skewness and kurtosis
- Some particular cases of uniform distribution

Lecture no. 4:
- Examples based on uniform distribution and its properties
- INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: exponential distribution

Lecture no. 5:
- Definition of exponential distribution and its pdf, cdf

Lecture no. 6:
- Characteristics of exponential p.d.f and its curve.
- Mean of exponential distribution

Lecture no. 7:
- Variance and median of exponential distribution

NAME OF THE TOPIC: memoryless property

Lecture no. 8:
- State and prove memoryless property

Lecture no. 9:
- Examples based on exponential distribution

- INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: normal distribution

Lecture no. 10:

- Definition of normal distribution and its pdf
- Probability curve of normal distribution

Lecture no. 11:

- Properties of normal distribution and normal curve

Lecture no. 12:

- Properties of standard normal distribution and its curve

Lecture no. 13:

- Addition property of normal distribution
- Example based on Addition property of normal distribution

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: normal approximation to binomial and poisson

Lecture no. 14:

- Statement of Laplace DeMoivre theorem
- Example based on normal distribution

❖ INNOVATIVE PRACTICES: Home Assignments

Lecture no. 15:

- Example based on normal approximation to binomial and poisson

❖ INNOVATIVE PRACTICES: Home Assignments

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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: F.Y.B.SC. **SUBJECT:** statistical methods (Paper-ii)
UNIT NO.: iii
UNIT TITLE: estimation and testing of hypothesis

NAME OF THE TOPIC: basic concepts of sampling from distribution

Lecture no. 1:

- Basic concept: population, sample, estimation, statistic, parameter, estimator, estimate, sampling error, bias in estimator, unbiased estimator

NAME OF THE TOPIC: sampling distribution

Lecture no. 2:

- Basic concept: sampling distribution, standard error
- Statement of central limit theorem, some results based on CLT

Lecture no. 3:

- Example based on central limit theorem

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: sampling distribution of mean

Lecture no. 4:

- Brief explanation about sampling distribution of mean

NAME OF THE TOPIC: sampling distribution of sample proportion

Lecture no. 5:

- Brief explanation about sampling distribution of sample proportion

Lecture no. 6:

- Example based on sampling distribution of sample proportion

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: types of estimation

Lecture no. 7:

- Types of estimation: point estimation, interval estimation
- Some results based on Types of estimation

NAME OF THE TOPIC: confidence interval

Lecture no. 8:

- Confidence interval for population mean from large samples
- Confidence interval for population proportion from large samples

Lecture no. 9:

- Examples based on confidence interval

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: concepts of hypothesis

Lecture no. 10:

- Definitions: statistical hypothesis, null hypothesis, alternative hypothesis, simple and composite hypothesis

Lecture no. 11:

- Concepts: Types of errors, size of the error, test statistic, critical region, critical values

Lecture no. 12:

- Concepts: level of significance and test of significance, power function (power of the test), uniformly most powerful test.
- Examples based on hypothesis

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: large sample test

Lecture no. 13:

- Six step procedure of testing of hypothesis
- Significant test for testing population mean

Lecture no. 14:

- Significant test for testing difference of two means
- Significant test for testing population proportion

Lecture no. 15:

- Significant test for testing difference in population proportion

- Examples based on large samples

  - ❖ INNOVATIVE PRACTICES: Home Assignments

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Credit BASED semester AND GRADING SYSTEM OF

UNIVERSITY OF MUMBAI

THIRD YEAR B.SC

Descriptive Statistics COURSE

SEMESTER V

Lecture Plan

Academic Year: 2018-19

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE
LECTURE PLAN

NAME OF THE LECTURER: **Ms. Sonali Thik**

DEPARTMENT: **STATISTICS**

CLASS: **T.Y.B.Sc.**

SUBJECT: **PROBABILITY AND DISTRIBUTION THEORY (Paper-I)**

UNIT NO.: I UNIT TITLE: - Probability

Lecture 1: Introduction to Probability

- Definition of a random experiment
- Understanding outcomes and events
- Introduction to sample space and its significance
- Basic properties of events: complementary, mutually exclusive, exhaustive, and equally likely events

Lecture 2: Types of Probability

- Mathematical probability: Definition and examples
- Statistical probability: Introduction and differences from mathematical probability
- Axiomatic probability: Foundations and principles
- Subjective probability: Understanding subjective judgments and applications

Lecture 3: Addition Theorem

- Addition theorem for two events: Definition and proof
- Application of addition theorem in probability calculations
- Examples and exercises demonstrating addition theorem for two events

Lecture 4: Addition Theorem (contd.)

- Addition theorem for three events: Definition and proof
- Application of addition theorem in probability calculations for three events
- Examples and exercises demonstrating addition theorem for three events

Lecture 5: Conditional Probability

- Introduction to conditional probability
- Multiplication theorem for two events: Definition and proof
- Application of multiplication theorem in probability calculations
- Examples and exercises demonstrating multiplication theorem for two events

Lecture 6: Conditional Probability (contd.)

- Multiplication theorem for three events: Definition and proof
- Application of multiplication theorem in probability calculations for three events
- Examples and exercises demonstrating multiplication theorem for three events

Lecture 7: Bayes' Theorem

- Introduction to Bayes' theorem
- Understanding the formula and its derivation
- Application of Bayes' theorem in real-life scenarios
- Examples and exercises applying Bayes' theorem

Lecture 8: Theorems on Probability of Realization

- Theorem on probability of realization of at least one event
- Theorem on probability of realization of exactly m events
- Theorem on probability of realization of at least m of N events
- Application of theorems in classical occupancy problems, matching, and guessing problems

Lecture 9: Theorems on Probability of Realization (contd.)

- Further examples and exercises on theorems of probability realization
- Application of theorems in practical scenarios and problem-solving

Lecture 10: Classical Occupancy Problems

- Introduction to classical occupancy problems
- Understanding the concept and its relevance in probability theory
- Solving classical occupancy problems using probability theorems

Lecture 11: Matching and Guessing Problems

- Introduction to matching and guessing problems
- Understanding different types of problems and their variations

- Solving matching and guessing problems using probability concepts

Lecture 12: Examples and Problem Solving

- Review of concepts covered in previous lectures
- Solving a variety of problems integrating multiple probability concepts
- Class discussion and problem-solving sessions

Lecture 13: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios
- Application of probability concepts in real-world situations
- Group activities and discussions to enhance understanding

Lecture 14: Review and Practice

- Review of key concepts, theorems, and formulas covered throughout the unit
- Practice problems and exercises for reinforcement
- Q&A session to address any lingering doubts or questions

Lecture 15: Final Assessment

- Comprehensive assessment covering all topics discussed in the unit
- Evaluation of students' understanding and application of probability concepts
- Feedback session and discussion on areas for improvement

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GOVERNMENT OF MAHARASHTRA'S
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LECTURE PLAN

NAME OF THE LECTURER: **Ms. Sonali Thik**

DEPARTMENT: **STATISTICS**

CLASS: **T.Y.B.Sc.**

SUBJECT: **PROBABILITY AND DISTRIBUTION THEORY (Paper-I)**

UNIT NO.: II UNIT TITLE: - Inequality and law of large numbers

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Lecture 1: Introduction to Inequalities

- Overview of the importance of inequalities in probability theory and statistics
- Introduction to various types of inequalities and their applications
- Outline of the topics to be covered in the unit

Lecture 2: Markov Inequality

- Definition and statement of Markov's inequality
- Derivation and proof of Markov's inequality
- Applications of Markov's inequality in probability and statistics
- Examples illustrating the use of Markov's inequality in real-world scenarios

Lecture 3: Tchebyshev's Inequality

- Introduction to Tchebyshev's inequality
- Derivation and proof of Tchebyshev's inequality
- Comparison of Tchebyshev's inequality with Markov's inequality
- Practical applications of Tchebyshev's inequality in probability and statistics

Lecture 4: Boole's Inequality

- Definition and statement of Boole's inequality
- Explanation of Boole's inequality in terms of probabilities of union events
- Derivation and proof of Boole's inequality
- Examples demonstrating the use of Boole's inequality in probability calculations

Lecture 5: Cauchy-Schwarz's Inequality

- Introduction to Cauchy-Schwarz's inequality
- Statement and proof of Cauchy-Schwarz's inequality
- Applications of Cauchy-Schwarz's inequality in probability and statistics
- Illustrative examples showcasing the utility of Cauchy-Schwarz's inequality

Lecture 6: Weak Law of Large Numbers

- Overview of the law of large numbers and its significance in probability theory
- Statement and explanation of the weak law of large numbers
- Proof and understanding of the weak law of large numbers
- Real-world implications and applications of the weak law of large numbers

Lecture 7: Applications of Inequalities

- Review of the inequalities covered so far: Markov, Tchebyshev, Boole, Cauchy-Schwarz
- Practical applications of inequalities in various statistical and probabilistic scenarios
- Case studies and examples demonstrating the use of inequalities in data analysis and inference

Lecture 8: Examples and Problem Solving

- Solving problems and exercises related to Markov, Tchebyshev, Boole, and Cauchy-Schwarz inequalities
- Application of inequalities to analyze and interpret real-world data
- Group activities and discussions to reinforce understanding of inequality concepts

Lecture 9: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of inequalities through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of inequality principles

Lecture 10: Review and Practice

- Review of key concepts, definitions, and theorems related to inequalities

- Practice problems and exercises to reinforce understanding and mastery of inequality concepts
- Q&A session to address any lingering doubts or questions about inequalities

Lecture 11: Review and Practice (contd.)

- Continued review and practice session, focusing on areas where students may need additional reinforcement
- Application of inequalities to solve practical problems and case studies
- Individualized assistance and feedback to support students' learning goals

Lecture 12: Case Studies and Applications

- Analysis of real-world case studies using inequalities
- Examination of how inequalities are applied in various fields such as finance, economics, and engineering
- Discussion of the limitations and assumptions of inequalities in practical applications

Lecture 13: Advanced Topics in Inequalities

- Exploration of advanced topics in inequalities, such as the Jensen's inequality and Holder's inequality
- Statement, proof, and application of Jensen's inequality
- Statement, proof, and application of Hölder's inequality
- Comparison of these advanced inequalities with the ones previously covered

Lecture 14: Advanced Applications and Extensions

- Application of advanced inequalities to solve complex problems and analyze data
- Extensions of inequality concepts to higher dimensions and more general scenarios
- Discussion of recent developments and research trends in inequality theory

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on inequalities and the law of large numbers
- Final assessment to evaluate students' understanding and mastery of inequality concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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GOVERNMENT OF MAHARASHTRA'S
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LECTURE PLAN

NAME OF THE LECTURER: **Ms. Sonali Thik**

DEPARTMENT: **STATISTICS**

CLASS: **T.Y.B.Sc.**

SUBJECT: **PROBABILITY AND DISTRIBUTION THEORY (Paper-I)**

UNIT NO.: III UNIT TITLE: - Joint moment generating function, trinomial distribution and multinomial Distribution

Lecture 1: Introduction to Moment Generating Function (MGF)

- Definition and properties of Moment Generating Function (MGF) for two random variables of discrete and continuous type
- Understanding the role of MGF in characterizing probability distributions
- Necessary and Sufficient conditions for the independence of two random variables
- Concept and definition of Bivariate MGF

Lecture 2: Joint Moment Generating Function (MGF)

- Introduction to Bivariate MGF and its significance in analyzing joint distributions
- Derivation and properties of Joint Moment Generating Function
- Application of Bivariate MGF in determining moments and other statistical properties
- Examples illustrating the computation and interpretation of Bivariate MGF

Lecture 3: Trinomial Distribution

- Definition and characteristics of the trinomial distribution
- Joint probability distribution of (X, Y) in trinomial distribution
- Calculation of joint moment generating function and moments
- Analysis of marginal and conditional distributions, means, and variances

Lecture 4: Trinomial Distribution (contd.)

- Continued discussion on the trinomial distribution
- Exploration of the correlation coefficient between (X, Y)
- Distribution of the sum X+Y in trinomial distribution
- Application of trinomial distribution in real-world scenarios

Lecture 5: Multinomial Distribution

- Introduction to Multinomial distribution with parameters (n, (p_1), (p_2), ..., (p_{k-1})) where (p_1 + p_2 + ... + p_{k-1} + p_k = 1)
- Definition and characteristics of the multinomial distribution
- Expression for joint MGF in multinomial distribution
- Derivation of joint probability distribution of ((X_i), (X_j)) in multinomial distribution

Lecture 6: Multinomial Distribution (contd.)

- Continued discussion on the multinomial distribution
- Calculation of conditional probability distribution of (X_i) given (X_j)
- Analysis of the relationship between different categories in multinomial experiments
- Examples demonstrating the application of multinomial distribution in practical situations

Lecture 7: Applications of Joint MGF, Trinomial, and Multinomial Distributions

- Review of concepts covered in previous lectures
- Practical applications of joint moment generating function, trinomial, and multinomial distributions in statistics, finance, and engineering
- Case studies and examples showcasing the utility of these distributions in data analysis and modeling

Lecture 8: Examples and Problem Solving

- Solving problems and exercises related to joint moment generating function, trinomial, and multinomial distributions
- Application of distributions to analyze and interpret data from experiments and surveys
- Group activities and discussions to reinforce understanding of distribution concepts

Lecture 9: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of joint moment generating function, trinomial, and multinomial distributions through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of distribution principles

Lecture 10: Review and Practice

- Review of key concepts, definitions, and theorems related to joint moment generating function, trinomial, and multinomial distributions
- Practice problems and exercises to reinforce understanding and mastery of distribution concepts
- Q&A session to address any lingering doubts or questions about distributions

Lecture 11: Review and Practice (contd.)

- Continued review and practice session, focusing on areas where students may need additional reinforcement
- Application of distributions to solve practical problems and case studies
- Individualized assistance and feedback to support students' learning goals

Lecture 12: Advanced Topics in Joint MGF and Multinomial Distribution

- Exploration of advanced topics in joint moment generating function and multinomial distribution
- Analysis of special cases and extensions of these distributions
- Discussion of recent developments and research trends in joint MGF and multinomial distribution theory

Lecture 13: Advanced Applications and Extensions

- Application of advanced concepts in joint moment generating function and multinomial distribution to solve complex problems and analyze data
- Extensions of distribution concepts to higher dimensions and more general scenarios
- Exploration of open research questions and areas for future study

Lecture 14: Practical Examples

- Analysis of real-world case studies using joint moment generating function, trinomial, and multinomial distributions
- Discussion of the limitations and assumptions of these distributions in practical applications

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on joint moment generating function, trinomial, and multinomial distributions

- Final assessment to evaluate students' understanding and mastery of distribution concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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GOVERNMENT OF MAHARASHTRA'S
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LECTURE PLAN

NAME OF THE LECTURER: **Ms. Sonali Thik**

DEPARTMENT: **STATISTICS**

CLASS: **T.Y.B.Sc.**

SUBJECT: **PROBABILITY AND DISTRIBUTION THEORY (Paper-I)**

UNIT NO.: IV UNIT TITLE: - Order Statistics

Lecture 1: Introduction to Order Statistics

- Overview of order statistics and their importance in statistical analysis
- Definition of order statistics based on a random sample
- Explanation of the role of order statistics in understanding the distribution of sample data

Lecture 2: Cumulative Distribution Function of the r^{th} Order Statistic

- Derivation of the cumulative distribution function (CDF) of the order statistic
- Interpretation of the r^{th} order statistic's CDF in terms of probability of observing values less than or equal to a given value
- Examples illustrating the computation and interpretation of the CDF for various distributions

Lecture 3: Probability Density Function of r^{th} Order Statistic

- Derivation of the probability density function (PDF) of the r^{th} order statistic
- Understanding the relationship between the PDF and the CDF of order statistics
- Application of the PDF in calculating probabilities and expected values for order statistics

Lecture 4: Joint Probability Density Function of r^{th} and s^{th} Order Statistic ($r < s$)

- Derivation of the joint probability density function (PDF) of the r^{th} and s^{th} order statistics, where ($r < s$)
- Analysis of the dependence structure between different order statistics
- Illustrative examples demonstrating the computation and interpretation of joint PDFs

Lecture 5: Joint Probability Density Functions of All (n) Ordered Statistics

- Derivation of the joint probability density function (PDF) of all (n) ordered statistics
- Understanding the multivariate nature of joint PDFs for order statistics
- Application of joint PDFs in analyzing the distribution of entire sample data sets

Lecture 6: Distribution of Maximum and Minimum Observations

- Analysis of the distribution of the maximum (nth order statistic) and minimum (first order statistic) observations
- Special cases of uniform and exponential distributions for maximum and minimum observations
- Derivation and interpretation of distribution functions for maximum and minimum observations

Lecture 7: Distribution of Maximum and Minimum Observations (contd.)

- Continued discussion on the distribution of maximum and minimum observations
- Comparison of distribution properties between different types of distributions
- Examples illustrating the application of distribution functions for maximum and minimum observations

Lecture 8: Probability Density Function of the Difference Between r^{th} and s^{th} Order Statistic ($r < s$)

Derivation of the probability density function (PDF) of the difference between the r^{th} and s^{th} order statistics, where ($r < s$)

Understanding the distribution of differences between order statistics

Application of PDFs for differences in analyzing variability and spread within a sample

Lecture 9: Probability Density Function of the Difference Between r^{th} and s^{th} Order Statistic ($r < s$) (contd.)

- Continued discussion on the PDF of the difference between order statistics
- Exploration of special cases and properties of PDFs for differences
- Examples demonstrating the computation and interpretation of PDFs for differences

Lecture 10: Applications of Order Statistics

- Review of concepts covered in previous lectures

- Practical applications of order statistics in various fields such as finance, engineering, and medicine
- examples showcasing the utility of order statistics in data analysis and inference

Lecture 11: Examples and Problem Solving

- Solving problems and exercises related to order statistics
- Application of order statistics to analyze and interpret real-world data sets
- Group activities and discussions to reinforce understanding of order statistic concepts

Lecture 12: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of order statistics through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of order statistic principles

Lecture 13: Review and Practice

- Review of key concepts, definitions, and theorems related to order statistics
- Practice problems and exercises to reinforce understanding and mastery of order statistic concepts
- Q&A session to address any lingering doubts or questions about order statistics

Lecture 14: Review and Practice (contd.)

- Continued review and practice session, focusing on areas where students may need additional reinforcement
- Application of order statistics to solve practical problems and case studies
- Individualized assistance and feedback to support students' learning goals

Lecture 15: Advanced Topics and Extensions

- Exploration of advanced topics and extensions in order statistics
- Analysis of special cases and applications in non-standard distributions
- Discussion of recent developments and research trends in order statistics theory

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sTATISTICS PAPER Iv

COURSE

SEMESTER v

2019-20

Lecture plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK

DEPARTMENT: STATISTICS
CLASS: t.Y.B.SC. **SUBJECT:** STATISTICS **PAPER** : Iv
UNIT NO.: 1 **UNIT TITLE:** FUNDAMENTALS OF R

NAME OF THE TOPIC:introduction about R

Lecture No. : 1

- Introduction to R
- Features of R
- Installation of R
- Starting and ending R session
- Getting help in R
- Value assigning to variables

NAME OF THE TOPIC: Basic Operations

Lecture No. : 2

- Addition
- Subtraction
- Multiplication
- Division
- Power
- Square root

NAME OF THE TOPIC: Numerical functions

Lecture No. : 3

- log 10
- log
- sort
- max
- unique
- dim

NAME OF THE TOPIC:problem solving

Lecture No. : 4

- Based on previous lectures solved some examples

  - ❖ CASE STUDY/EXAMPLES:Solving Examples based on previous lectures
  - ❖ INNOVATIVE PRACTICES : Home Assignments

Lecture No. : 5

- range
- length
- var
- prod
- sum
- summary

NAME OF THE TOPIC: Data Types

Lecture No. : 6

- Vector
- List
- Matrices
- Array
- Data frame

NAME OF THE TOPIC: Variable Type

Lecture No. : 7

- Logical
- Numeric
- Integer
- Complex
- Character and factor

NAME OF THE TOPIC:problem solving

Lecture No. : 8

- Based on previous lectures solved some examples
  - ❖ CASE STUDY/EXAMPLES:Solving Examples based on previous lectures
  - ❖ INNOVATIVE PRACTICES : Home Assignments

NAME OF THE TOPIC: Data Manipulation

Lecture No. : 9

- Selecting random N rows
- Removing duplicate row(s)
- Dropping a variable(s)

- Renaming variable(s)
- Sub setting data

Lecture No. : 10

- Creating a new variable(s)
- Selecting of random fraction of row(s)
- Appending of row(s) and column(s)
- Simulation of variables.

NAME OF THE TOPIC: Data Processing

Lecture No. : 11

- Data import and export
- Setting working directory
- Checking structure of Data :Str(), Class(), Changing type of variable

NAME OF THE TOPIC:problem solving

Lecture No. : 12

- Based on previous lectures solved some examples

❖ CASE STUDY/EXAMPLES:Solving Examples based on previous lectures

❖ INNOVATIVE PRACTICES : Home Assignments

NAME OF THE TOPIC: Data Visualization using ggplot

Lecture No. : 13

- Simple bar diagram
- subdivided bar diagram
- multiple bar diagram pie diagram

Lecture No. : 14

- Box plot for one and more variables
- Histogram
- frequency polygon

- scatter plot

NAME OF THE TOPIC:problem solving

Lecture No. : 15

- Based on previous lectures solved some examples
  - ❖ CASE STUDY/EXAMPLES:Solving Examples based on previous lectures
  - ❖ INNOVATIVE PRACTICES : Home Assignments

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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: I.Y.B.SC. **SUBJECT:** STATISTICS **PAPER :** IV
UNIT NO.: 2 **UNIT TITLE:** simple linear regression model

NAME OF THE TOPIC: introduction

Lecture No. : 1

- Explanation about correlation
- Nature of correlation
- Interpretation
- Graphical representation

Lecture No. : 2

- Explanation about Regression analysis with examples
- Explain concept of Linearity with examples

NAME OF THE TOPIC: Simple linear regression model

Lecture No. : 3

- Briefly explanation about the simple linear regression model
- Deterministic model
- Residuals
- Homoscedasticity
- Multicollinearity

NAME OF THE TOPIC: assumptions and properties of the model

Lecture No. : 4

- Assumption of the linear regression model
- Properties of the OLS estimates
- Expectation and variance of Y

NAME OF THE TOPIC: estimation of regression coefficients

Lecture No. : 5

- Derivation to obtain estimation of regression coefficients

Lecture No. : 6

- Concept of sum of squares

Lecture No. : 7

- Concept of degrees of freedom

NAME OF THE TOPIC: relationship between total, regression and error sum of squares

Lecture No. : 8

- Mathematical expression to show the relationship between total, regression and error sum of squares

NAME OF THE TOPIC: estimation of population variance

Lecture No. : 9

- Derivation to find out estimated value of the variance.

NAME OF THE TOPIC: Coefficient of determination and adjusted R^2

Lecture No. : 10

- Coefficient of determination R^2
- Adjusted R^2

NAME OF THE TOPIC: Procedure of testing significance

Lecture No. : 11, 12

Procedure of testing

a) Overall significance of the models

b) Significance of individual coefficients

c) Confidence intervals for the regression coefficients

NAME OF THE TOPIC: Data Pre-processing

Lecture No. : 13, 14 , 15

- Detection and treatment of missing value(s) and outliers
- Variable selection and Model building
- Interpretation of output produced by lm command in R.

- CASE STUDY/EXAMPLES: Solving Examples based on previous lectures
- INNOVATIVE PRACTICES : Home Assignments

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GOVERNMENT OF MAHARASHTRA'S
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LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: t.Y.B.SC. **SUBJECT:** STATISTICS **PAPER :** Iv
UNIT NO.: 3 **UNIT TITLE:** multiple linear regression model

NAME OF THE TOPIC: multiple linear regression model

Lecture No. :1, 2

- Derivation of ordinary least square (OLS) estimators of regression coefficients for multiple regression models

Lecture No. :3

- Coefficient of determination R^2
- Adjusted R^2

NAME OF THE TOPIC: Procedure of testing significance

Lecture No. :4, 5

- Overall significance of the models

❖ CASE STUDY/EXAMPLES: Solving Examples based on previous lectures

❖ INNOVATIVE PRACTICES : Home Assignments

Lecture No. :6

- Significance of individual coefficients

Lecture No. :7

- Confidence intervals for the regression coefficients

❖ CASE STUDY/EXAMPLES: Solving Examples based on previous lectures

❖ INNOVATIVE PRACTICES : Home Assignments

NAME OF THE TOPIC: Data Pre-processing

Lecture No. :8, 9

- Detection and treatment of missing value(s) and outliers

Lecture No. :10

- Variable selection

❖ CASE STUDY/EXAMPLES: Solving Examples based on previous lectures

❖ INNOVATIVE PRACTICES : Home Assignments

Lecture No. :11

- Model building

Lecture No. :12,13

- Interpretation of output produced by lm command in R.

Lecture No. :14, 15

- ❖ CASE STUDY/EXAMPLES: Solving Examples based on previous lectures
- ❖ INNOVATIVE PRACTICES : Home Assignments

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GOVERNMENT OF MAHARASHTRA'S
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LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: t.Y.B.SC. **SUBJECT:** STATISTICS **PAPER :** Iv
UNIT NO.: 4 **UNIT TITLE:** Validity of Assumptions

NAME OF THE TOPIC: Residual Diagnostics

Lecture No. :1

- Explanation about Residual

Lecture No. : 2

- Standardized residuals

Lecture No. : 3

- Studentized residuals

Lecture No. :5, 6

- Residual plots

Lecture No. :7

- Interpretation of four plots

lecture No. : 8, 9

- Interpretation output produced by plot command in R and corrective measures such as transformation of response variable

lecture No. : 10

- Testing normality of data .

NAME OF THE TOPIC: autocorrelation

lecture No. : 11

- Autocorrelation: Concept and detection using Durbin Watson Test
- Interpretation of output produced by DW-test function in R

NAME OF THE TOPIC: Heteroscedasticity

lecture No. : 12

- Heteroscedasticity: Concept and detection using Breusch –Pagan-Godfrey Test
- Interpretation of output produced by bptest function in R,

NAME OF THE TOPIC: Multicollinearity

lecture No. : 12, 13

- Multicollinearity: Concept and detection using R
  - i) t-ratios
  - ii) pairwise correlation between repressors
  - iii) Variance Inflation Factor(VIF)

NAME OF THE TOPIC: Interpretation

lecture No. : 14

- Interpretation of output produced by mctest function in R,
- Consequences of using OLS estimators in presence of Autocorrelation,

lecture No. : 15

- Heteroscedasticity and Multicollinearity, Remedial measures,
- Ridge Regression : Concept and case study using R,

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PAPER Iv COURSE

SEMESTER vi

2019-20

Lecture plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: t.Y.B.SC. **SUBJECT:** STATISTICS **PAPER :** Iv
UNIT NO.: 1 **UNIT TITLE:** MORTALITY TABLES

NAME OF THE TOPIC: mortality functions

lecture No. : 1

- Various mortality functions
- Probabilities of living and dying

lecture No. : 2

- The force of mortality
- Central Mortality Rate

NAME OF THE TOPIC: Estimation of μ_x

lecture No. : 3

- Estimation of μ_x from the mortality table

NAME OF THE TOPIC: Laws of mortality

lecture No. : 4,5

- Gompertz's Laws of mortality

lecture No. : 6, 7, 8

- Makeham's first law of mortality

lecture No. : 9, 10

- ❖ CASE STUDY/EXAMPLES: Solving Examples based on previous lectures
- ❖ INNOVATIVE PRACTICES : Home Assignments

NAME OF THE TOPIC: mortality tables

lecture No. : 11, 12

- Select, Ultimate and Aggregate mortality tables

NAME OF THE TOPIC: Stationary population

lecture No. : 13

- Stationary population

lecture No. : 14, 15

- Expectation of life and Average life at death
  - ❖ CASE STUDY/EXAMPLES: Solving Examples based on previous lectures
  - ❖ INNOVATIVE PRACTICES : Home Assignments

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ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: I.Y.B.SC. **SUBJECT:** STATISTICS **PAPER** : Iv
UNIT NO.: 2 **UNIT TITLE:** COMPOUND INTEREST AND ANNUITIES CERTAIN

NAME OF THE TOPIC: basic introduction

lecture No. : 1

- Accumulated value
- Present value

NAME OF THE TOPIC: rates of interest

lecture No. : 2

- Nominal and effective rates of interest
- Varying rates of interest

NAME OF THE TOPIC: Equation of value

lecture No. : 3

- Equation of value
- Equated time of payment

NAME OF THE TOPIC: Present and accumulated values of annuity without deferment period

lecture No. : 4

- Present and accumulated values of immediate annuity certain

lecture No. : 5

- Present and accumulated values of annuity due certain

NAME OF THE TOPIC: Present value for perpetuity (immediate and due) with and without deferment Period

lecture No. : 6,7

- Present value of immediate perpetuity with and without deferment Period
- Present value of due perpetuity with and without deferment Period

NAME OF THE TOPIC: Present and accumulated values

lecture No. : 8

- Present and accumulated values of increasing annuity

lecture No. : 9

- Present and accumulated values of increasing annuity when successive installments form arithmetic progression

lecture No. : 10, 11

- Present and accumulated values of annuity with frequency different from that with which interest is convertible

NAME OF THE TOPIC: Redemption of loan

lecture No. : 12

- Redemption of loan

NAME OF THE TOPIC: examples

lecture No. : 13,14, 15

- CASE STUDY/EXAMPLES: Solving Examples based on previous lectures
- INNOVATIVE PRACTICES : Home Assignments

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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: t.Y.B.SC. SUBJECT: STATISTICS PAPER : Iv
UNIT NO.: 3 UNIT TITLE: LIFE ANNUITIES

NAME OF THE TOPIC: Present value in terms of commutation functions of Life annuities with deferment period.

lecture No. : 1, 2

- Present value in terms of commutation functions of Life annuities with deferment period.
  - Immediate

lecture No. : 3, 4

- Present value in terms of commutation functions of Life annuities with deferment period.
  - Due

lecture No. : 5, 6

- Present value in terms of commutation functions of Life annuities with deferment period.
  - Immediate Due

NAME OF THE TOPIC: Present value in terms of commutation functions of Life annuities without deferment period.

lecture No. : 7, 8

- Present value in terms of commutation functions of Life annuities without deferment period.
  - Immediate

lecture No. : 9, 10

- Present value in terms of commutation functions of Life annuities without deferment period.
  - Due

lecture No. : 11, 12

- Present value in terms of commutation functions of Life annuities without deferment period.
  - Immediate Due

NAME OF THE TOPIC: Present value

lecture No. : 13

- Present values of Variable

lecture No. : 14, 15

- Present values of Increasing life annuities and increasing Temporary life annuities (immediate and due).

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LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: t.Y.B.SC. **SUBJECT:** STATISTICS **PAPER :** Iv
UNIT NO.: 4 **UNIT TITLE:** ASSURANCE BENEFITS

NAME OF THE TOPIC: Present value of Assurance

benefits in terms of commutation functions

lecture No. : 1

- Present value of Assurance benefits in terms of commutation functions pure endowment assurance.

lecture No. : 2

- Present value of Assurance benefits in terms of commutation functions temporary assurance

lecture No. : 3

- Present value of Assurance benefits in terms of commutation functions endowment assurance

lecture No. : 4

- Present value of Assurance benefits in terms of commutation functions whole life assurance

lecture No. : 5

- Present value of Assurance benefits in terms of commutation functions double endowment assurance

lecture No. : 6

- Present value of Assurance benefits in terms of commutation functions special endowment assurance

lecture No. : 7

- Present value of Assurance benefits in terms of commutation functions deferred temporary assurance

NAME OF THE TOPIC: Net premiums

lecture No. : 8, 9, 10, 11, 12, 13

- Net level annual premiums (including limited period of payment) for various assurance plans

NAME OF THE TOPIC: Examples

lecture No. : 14,15

❖ CASE STUDY/EXAMPLES: Solving Examples based on previous lectures

❖ INNOVATIVE PRACTICES : Home Assignments

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Credit BASED semester AND GRADING SYSTEM OF UNIVERSITY OF MUMBAI

THIRD YEAR B.SC

Descriptive Statistics COURSE

SEMESTER V

Academic Year: 2019-20

Lecture Plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE
LECTURE PLAN

Academic Year 2019-20

NAME OF THE LECTURER: **Ms. Sonali Thik**

DEPARTMENT: **STATISTICS**

CLASS: **T.Y.B.Sc.**

SUBJECT: **PROBABILITY AND DISTRIBUTION THEORY (Paper-I)**

UNIT NO.: 1 UNIT TITLE: - Probability

Lecture 1: Introduction to Probability

- Definition of a random experiment
- Understanding outcomes and events
- Introduction to sample space and its significance
- Basic properties of events: complementary, mutually exclusive, exhaustive, and equally likely events

Lecture 2: Types of Probability

- Mathematical probability: Definition and examples
- Statistical probability: Introduction and differences from mathematical probability
- Axiomatic probability: Foundations and principles
- Subjective probability: Understanding subjective judgments and applications

Lecture 3: Addition Theorem

- Addition theorem for two events: Definition and proof
- Application of addition theorem in probability calculations
- Examples and exercises demonstrating addition theorem for two events

Lecture 4: Addition Theorem (contd.)

- Addition theorem for three events: Definition and proof
- Application of addition theorem in probability calculations for three events
- Examples and exercises demonstrating addition theorem for three events

Lecture 5: Conditional Probability

- Introduction to conditional probability
- Multiplication theorem for two events: Definition and proof
- Application of multiplication theorem in probability calculations
- Examples and exercises demonstrating multiplication theorem for two events

Lecture 6: Conditional Probability (contd.)

- Multiplication theorem for three events: Definition and proof
- Application of multiplication theorem in probability calculations for three events
- Examples and exercises demonstrating multiplication theorem for three events

Lecture 7: Bayes' Theorem

- Introduction to Bayes' theorem
- Understanding the formula and its derivation
- Application of Bayes' theorem in real-life scenarios
- Examples and exercises applying Bayes' theorem

Lecture 8: Theorems on Probability of Realization

- Theorem on probability of realization of at least one event
- Theorem on probability of realization of exactly m events
- Theorem on probability of realization of at least m of N events
- Application of theorems in classical occupancy problems, matching, and guessing problems

Lecture 9: Theorems on Probability of Realization (contd.)

- Further examples and exercises on theorems of probability realization
- Application of theorems in practical scenarios and problem-solving

Lecture 10: Classical Occupancy Problems

- Introduction to classical occupancy problems
- Understanding the concept and its relevance in probability theory
- Solving classical occupancy problems using probability theorems

Lecture 11: Matching and Guessing Problems

- Introduction to matching and guessing problems
- Understanding different types of problems and their variations

- Solving matching and guessing problems using probability concepts

Lecture 12: Examples and Problem Solving

- Review of concepts covered in previous lectures
- Solving a variety of problems integrating multiple probability concepts
- Class discussion and problem-solving sessions

Lecture 13: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios
- Application of probability concepts in real-world situations
- Group activities and discussions to enhance understanding

Lecture 14: Review and Practice

- Review of key concepts, theorems, and formulas covered throughout the unit
- Practice problems and exercises for reinforcement
- Q&A session to address any lingering doubts or questions

Lecture 15: Final Assessment

- Comprehensive assessment covering all topics discussed in the unit
- Evaluation of students' understanding and application of probability concepts
- Feedback session and discussion on areas for improvement

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GOVERNMENT OF MAHARASHTRA'S
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LECTURE PLAN

NAME OF THE LECTURER: **Ms. Sonali Thik**

DEPARTMENT: **STATISTICS**

CLASS: **T.Y.B.Sc.**

SUBJECT: **PROBABILITY AND DISTRIBUTION THEORY (Paper-I)**

UNIT NO.: II UNIT TITLE: - Inequality and law of large numbers

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Lecture 1: Introduction to Inequalities

- Overview of the importance of inequalities in probability theory and statistics
- Introduction to various types of inequalities and their applications
- Outline of the topics to be covered in the unit

Lecture 2: Markov Inequality

- Definition and statement of Markov's inequality
- Derivation and proof of Markov's inequality
- Applications of Markov's inequality in probability and statistics
- Examples illustrating the use of Markov's inequality in real-world scenarios

Lecture 3: Tchebyshev's Inequality

- Introduction to Tchebyshev's inequality
- Derivation and proof of Tchebyshev's inequality
- Comparison of Tchebyshev's inequality with Markov's inequality
- Practical applications of Tchebyshev's inequality in probability and statistics

Lecture 4: Boole's Inequality

- Definition and statement of Boole's inequality
- Explanation of Boole's inequality in terms of probabilities of union events
- Derivation and proof of Boole's inequality
- Examples demonstrating the use of Boole's inequality in probability calculations

Lecture 5: Cauchy-Schwarz's Inequality

- Introduction to Cauchy-Schwarz's inequality
- Statement and proof of Cauchy-Schwarz's inequality
- Applications of Cauchy-Schwarz's inequality in probability and statistics
- Illustrative examples showcasing the utility of Cauchy-Schwarz's inequality

Lecture 6: Weak Law of Large Numbers

- Overview of the law of large numbers and its significance in probability theory
- Statement and explanation of the weak law of large numbers
- Proof and understanding of the weak law of large numbers
- Real-world implications and applications of the weak law of large numbers

Lecture 7: Applications of Inequalities

- Review of the inequalities covered so far: Markov, Tchebyshev, Boole, Cauchy-Schwarz
- Practical applications of inequalities in various statistical and probabilistic scenarios
- Case studies and examples demonstrating the use of inequalities in data analysis and inference

Lecture 8: Examples and Problem Solving

- Solving problems and exercises related to Markov, Tchebyshev, Boole, and Cauchy-Schwarz inequalities
- Application of inequalities to analyze and interpret real-world data
- Group activities and discussions to reinforce understanding of inequality concepts

Lecture 9: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of inequalities through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of inequality principles

Lecture 10: Review and Practice

- Review of key concepts, definitions, and theorems related to inequalities



- Practice problems and exercises to reinforce understanding and mastery of inequality concepts
- Q&A session to address any lingering doubts or questions about inequalities

Lecture 11: Review and Practice (contd.)

- Continued review and practice session, focusing on areas where students may need additional reinforcement
- Application of inequalities to solve practical problems and case studies
- Individualized assistance and feedback to support students' learning goals

Lecture 12: Case Studies and Applications

- Analysis of real-world case studies using inequalities
- Examination of how inequalities are applied in various fields such as finance, economics, and engineering
- Discussion of the limitations and assumptions of inequalities in practical applications

Lecture 13: Advanced Topics in Inequalities

- Exploration of advanced topics in inequalities, such as the Jensen's inequality and Holder's inequality
- Statement, proof, and application of Jensen's inequality
- Statement, proof, and application of Hölder's inequality
- Comparison of these advanced inequalities with the ones previously covered

Lecture 14: Advanced Applications and Extensions

- Application of advanced inequalities to solve complex problems and analyze data
- Extensions of inequality concepts to higher dimensions and more general scenarios
- Discussion of recent developments and research trends in inequality theory

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on inequalities and the law of large numbers
- Final assessment to evaluate students' understanding and mastery of inequality concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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LECTURE PLAN

NAME OF THE LECTURER: **Ms. Sonali Thik**

DEPARTMENT: **STATISTICS**

CLASS: **T.Y.B.Sc.**

SUBJECT: **PROBABILITY AND DISTRIBUTION THEORY (Paper-I)**

UNIT NO.: III UNIT TITLE: - Joint moment generating function, trinomial distribution and multinomial Distribution

Lecture 1: Introduction to Moment Generating Function (MGF)

- Definition and properties of Moment Generating Function (MGF) for two random variables of discrete and continuous type
- Understanding the role of MGF in characterizing probability distributions
- Necessary and Sufficient conditions for the independence of two random variables
- Concept and definition of Bivariate MGF

Lecture 2: Joint Moment Generating Function (MGF)

- Introduction to Bivariate MGF and its significance in analyzing joint distributions
- Derivation and properties of Joint Moment Generating Function
- Application of Bivariate MGF in determining moments and other statistical properties
- Examples illustrating the computation and interpretation of Bivariate MGF

Lecture 3: Trinomial Distribution

- Definition and characteristics of the trinomial distribution
- Joint probability distribution of (X, Y) in trinomial distribution
- Calculation of joint moment generating function and moments
- Analysis of marginal and conditional distributions, means, and variances

Lecture 4: Trinomial Distribution (contd.)

- Continued discussion on the trinomial distribution
- Exploration of the correlation coefficient between (X, Y)
- Distribution of the sum X+Y in trinomial distribution
- Application of trinomial distribution in real-world scenarios

Lecture 5: Multinomial Distribution

- Introduction to Multinomial distribution with parameters (n, (p_1), (p_2), ..., (p_{k-1})) where (p_1 + p_2 + ... + p_{k-1} + p_k = 1)
- Definition and characteristics of the multinomial distribution
- Expression for joint MGF in multinomial distribution
- Derivation of joint probability distribution of ((X_i), (X_j)) in multinomial distribution

Lecture 6: Multinomial Distribution (contd.)

- Continued discussion on the multinomial distribution
- Calculation of conditional probability distribution of (X_i) given (X_j)
- Analysis of the relationship between different categories in multinomial experiments
- Examples demonstrating the application of multinomial distribution in practical situations

Lecture 7: Applications of Joint MGF, Trinomial, and Multinomial Distributions

- Review of concepts covered in previous lectures
- Practical applications of joint moment generating function, trinomial, and multinomial distributions in statistics, finance, and engineering
- Case studies and examples showcasing the utility of these distributions in data analysis and modeling

Lecture 8: Examples and Problem Solving

- Solving problems and exercises related to joint moment generating function, trinomial, and multinomial distributions
- Application of distributions to analyze and interpret data from experiments and surveys
- Group activities and discussions to reinforce understanding of distribution concepts

Lecture 9: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of joint moment generating function, trinomial, and multinomial distributions through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of distribution principles

Lecture 10: Review and Practice

- Review of key concepts, definitions, and theorems related to joint moment generating function, trinomial, and multinomial distributions
- Practice problems and exercises to reinforce understanding and mastery of distribution concepts
- Q&A session to address any lingering doubts or questions about distributions

Lecture 11: Review and Practice (contd.)

- Continued review and practice session, focusing on areas where students may need additional reinforcement
- Application of distributions to solve practical problems and case studies
- Individualized assistance and feedback to support students' learning goals

Lecture 12: Advanced Topics in Joint MGF and Multinomial Distribution

- Exploration of advanced topics in joint moment generating function and multinomial distribution
- Analysis of special cases and extensions of these distributions
- Discussion of recent developments and research trends in joint MGF and multinomial distribution theory

Lecture 13: Advanced Applications and Extensions

- Application of advanced concepts in joint moment generating function and multinomial distribution to solve complex problems and analyze data
- Extensions of distribution concepts to higher dimensions and more general scenarios
- Exploration of open research questions and areas for future study

Lecture 14: Practical Examples

- Analysis of real-world case studies using joint moment generating function, trinomial, and multinomial distributions
- Discussion of the limitations and assumptions of these distributions in practical applications

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on joint moment generating function, trinomial, and multinomial distributions

- Final assessment to evaluate students' understanding and mastery of distribution concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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LECTURE PLAN

NAME OF THE LECTURER: Ms. Sonali Thik

DEPARTMENT: **STATISTICS**

CLASS: **T.Y.B.Sc.**

SUBJECT: **PROBABILITY AND DISTRIBUTION THEORY (Paper-I)**

UNIT NO.: IV UNIT TITLE: - Order Statistics

Lecture 1: Introduction to Order Statistics

- Overview of order statistics and their importance in statistical analysis
- Definition of order statistics based on a random sample
- Explanation of the role of order statistics in understanding the distribution of sample data

Lecture 2: Cumulative Distribution Function of the r^{th} Order Statistic

- Derivation of the cumulative distribution function (CDF) of the order statistic
- Interpretation of the r^{th} order statistic's CDF in terms of probability of observing values less than or equal to a given value
- Examples illustrating the computation and interpretation of the CDF for various distributions

Lecture 3: Probability Density Function of r^{th} Order Statistic

- Derivation of the probability density function (PDF) of the r^{th} order statistic
- Understanding the relationship between the PDF and the CDF of order statistics
- Application of the PDF in calculating probabilities and expected values for order statistics

Lecture 4: Joint Probability Density Function of r^{th} and s^{th} Order Statistic ($r < s$)

- Derivation of the joint probability density function (PDF) of the r^{th} and s^{th} order statistics, where ($r < s$)
- Analysis of the dependence structure between different order statistics
- Illustrative examples demonstrating the computation and interpretation of joint PDFs

Lecture 5: Joint Probability Density Functions of All (n) Ordered Statistics

- Derivation of the joint probability density function (PDF) of all (n) ordered statistics
- Understanding the multivariate nature of joint PDFs for order statistics
- Application of joint PDFs in analyzing the distribution of entire sample data sets

Lecture 6: Distribution of Maximum and Minimum Observations

- Analysis of the distribution of the maximum (nth order statistic) and minimum (first order statistic) observations
- Special cases of uniform and exponential distributions for maximum and minimum observations
- Derivation and interpretation of distribution functions for maximum and minimum observations

Lecture 7: Distribution of Maximum and Minimum Observations (contd.)

- Continued discussion on the distribution of maximum and minimum observations
- Comparison of distribution properties between different types of distributions
- Examples illustrating the application of distribution functions for maximum and minimum observations

Lecture 8: Probability Density Function of the Difference Between r^{th} and s^{th} Order Statistic ($r < s$)

Derivation of the probability density function (PDF) of the difference between the r^{th} and s^{th} order statistics, where ($r < s$)

Understanding the distribution of differences between order statistics

Application of PDFs for differences in analyzing variability and spread within a sample

Lecture 9: Probability Density Function of the Difference Between r^{th} and s^{th} Order Statistic ($r < s$) (contd.)

- Continued discussion on the PDF of the difference between order statistics
- Exploration of special cases and properties of PDFs for differences
- Examples demonstrating the computation and interpretation of PDFs for differences

Lecture 10: Applications of Order Statistics

- Review of concepts covered in previous lectures

- Practical applications of order statistics in various fields such as finance, engineering, and medicine
- examples showcasing the utility of order statistics in data analysis and inference

Lecture 11: Examples and Problem Solving

- Solving problems and exercises related to order statistics
- Application of order statistics to analyze and interpret real-world data sets
- Group activities and discussions to reinforce understanding of order statistic concepts

Lecture 12: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of order statistics through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of order statistic principles

Lecture 13: Review and Practice

- Review of key concepts, definitions, and theorems related to order statistics
- Practice problems and exercises to reinforce understanding and mastery of order statistic concepts
- Q&A session to address any lingering doubts or questions about order statistics

Lecture 14: Review and Practice (contd.)

- Continued review and practice session, focusing on areas where students may need additional reinforcement
- Application of order statistics to solve practical problems and case studies
- Individualized assistance and feedback to support students' learning goals

Lecture 15: Advanced Topics and Extensions

- Exploration of advanced topics and extensions in order statistics
- Analysis of special cases and applications in non-standard distributions
- Discussion of recent developments and research trends in order statistics theory

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credit BASED semester AND GRADING SYSTEM

of

UNIVERSITY OF MUMBAI

SECOND YEAR B.SC

sTATISTICS PAPER III

COURSE

SEMESTER III

2019-20

Lecture plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: S.Y.B.SC. **SUBJECT:** STATISTICS
PAPER :III
UNIT NO.: 1 **UNIT TITLE:** operation research

NAME OF THE TOPIC: linear programming problem

Lecture No. : 1

- Introduce the concept of L.P.P. as one of the major branches of Operation Research, its importance and necessity.
- Begin at the very beginning by introducing and defining concepts integral to the study of L.P.P. such as Maximization & Minimization.

Lecture No. : 2

- Concepts of Solution: namely, Feasible Solution, Basic Feasible solution, Optimal Solution.
- Give a few examples of Solutions.
- Mathematical Formulation of the given problem.

❖ ***INNOVATIVE PRACTICES:*** Classroom presentations.

NAME OF THE TOPIC: Graphical problem

Lecture No. : 3

- Solving Linear Programming Problem by Graphical Method for Maximization Objective Function.
- Finding Feasible Solution using Graphical Method.

❖ ***CASE STUDY/EXAMPLES: Solving Examples based on Graphical methods.***

❖ ***INNOVATIVE PRACTICES :*** Home Assignments

Lecture No. : 4

- Solving Linear Programming Problem by Graphical Method for Minimization Objective Function.
- Finding Feasible Solution using Graphical Method.

❖ ***CASE STUDY/EXAMPLES: Solving Examples based on Graphical methods.***

❖ ***INNOVATIVE PRACTICES :*** Home Assignments

NAME OF THE TOPIC: simplex method

Lecture No. : 5

- Solving Linear Programming Problem by Simplex Method for Maximization Objective Function for two variables.
- Finding Optimal Solution using Simplex Method.

❖ ***CASE STUDY/EXAMPLES:*** Practical Problems

❖ ***INNOVATIVE PRACTICES:*** Home Assignments

Lecture No. : 6

- Solving Linear Programming Problem by Simplex Method for Maximization Objective Function for more than two variables.
- Finding Optimal Solution using Simplex Method.

❖ ***CASE STUDY/EXAMPLES:*** Practical Problems

❖ ***INNOVATIVE PRACTICES:*** Home Assignments

Lecture No. : 7

- Solving Linear Programming Problem by Simplex Method for Minimization Objective Function for two variables.

- Finding Optimal Solution using Simplex Method.

❖ ***CASE STUDY/EXAMPLES:*** Practical Problems

❖ ***INNOVATIVE PRACTICES:*** Home Assignments

Lecture No. : 8

- Solving Linear Programming Problem by Simplex Method for Minimization Objective Function for more than two variables.
- Finding Optimal Solution using Simplex Method.

❖ ***CASE STUDY/EXAMPLES:*** Practical Problems

❖ ***INNOVATIVE PRACTICES:*** Home Assignments

NAME OF THE TOPIC: big m method

Lecture No. : 9

- Solving Linear Programming Problem by Simplex Method for Minimization Objective Function for two variables.
- Finding Optimal Solution using Big M Method.

❖ ***CASE STUDY/EXAMPLES:*** Practical Problems

❖ ***INNOVATIVE PRACTICES:*** Home Assignments

Lecture No. : 10

- Solving Linear Programming Problem by Big M Method for Minimization Objective Function for more than two variables.
- Finding Optimal Solution using Big M Method.

❖ ***CASE STUDY/EXAMPLES:*** Practical Problems

❖ ***INNOVATIVE PRACTICES:*** Home Assignments

NAME OF THE TOPIC: primal &duality

Lecture No. : 11

- Introduction of Primal, its advantages and Limitation.

Lecture No. : 12

- Introduction of Dual, its advantages and Limitation.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 13

- Use of Duality in solving Linear Programming Problem.

Lecture No. : 14

- Relationship between optimum solution to Primal and Dual.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 15

- A revision of all important concepts, terms and definitions, and all formulae.
- A short class test on the same.

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❖ ***INNOVATIVE PRACTICES:*** Class tests

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LECTURE PLAN

NAME OF THE LECTURER : SONALI THIK
DEPARTMENT: STATISTICS
CLASS : S.Y.B.SC.
PAPER : III
UNIT NO.: 2
research

SUBJECT : STATISTICS

UNIT TITLE : operation

NAME OF THE TOPIC: transportation Problem

Lecture No. : 1

- Introduce concept of need for Transportation Problem by giving suitable examples
- Formally define Transportation Problem.

Lecture No. : 2

- Illustrate the Mathematical Formulation of Transportation Problem.
- Different types of Solutions possible in Transportation Problem.

Lecture No. : 3

- Stating the different methods for solving the Transportation Problem: North – West Corner Rule, Matrix Minima Method, Vogel's Approximation Method.

Lecture No. : 4

- Explain the procedure of North – west Corner Rule.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 5

- Explain the procedure of Matrix Minima Method.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 6

- Explain the procedure of Vogel's Approximation Method.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 7

- Comparison on the method of Transportation Problem, between North West Corner Rule, Matrix Maxima Method, Vogel's Approximation Method

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

NAME OF THE TOPIC: modi method

Lecture No. : 8

- Explain the procedure for obtaining optimal solution for the transportation problem by MODI Method.

Lecture No. : 9

- Obtaining optimal solution for the transportation problem by MODI Method for North – West Corner Rule.

Lecture No. : 10

- Obtaining optimal solution for the transportation problem by MODI Method for Matrix Maxima Method.

Lecture No. : 11

- Obtaining optimal solution for the transportation problem by MODI Method for Vogel's Approximation Method.

NAME OF THE TOPIC: transportation problem

Lecture No. : 12.

- Introduction of Optimality Test, its advantages and Limitation.

Lecture No. : 13

- Finding any Improvement procedure for solving the Transportation Problem.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 14

- Variants in Transportation Problem: Unbalanced and Maximization type.

Lecture No. : 15

- A revision of all important concepts, terms and definitions, and all formulae.
- A short class test on the same.

❖ ***INNOVATIVE PRACTICES:*** Class tests

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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER : SONALI THIK
DEPARTMENT: STATISTICS
CLASS : S.Y.B.SC. **SUBJECT** : STATISTICS
PAPER: III
UNIT NO.: 3 **UNIT TITLE** : operation research
NAME OF THE TOPIC: assignment problem

NAME OF THE TOPIC: assignment problem

Lecture No. : 1

- Explain the concept of Assignment Problem.
- Situation where Sequencing Problem can be applied.

Lecture No. : 2

- Formulation of Assignment Problem with different situations.

❖ ***INNOVATIVE PRACTICES : Assignments***

Lecture No. : 3

- Stating different method for getting the solution for the Assignment Problem.

Lecture No. : 4

- Explain the concept and procedure for obtaining solution for Assignment Problem by Complete Enumeration Method.

Lecture No. : 5

- Explain the concept and procedure for obtaining solution for Assignment Problem by Hungarian Method.

❖ ***CASE STUDY/EXAMPLES: Practice problems from Reference books***

Lecture No. : 6

- Explain the concept and procedure for obtaining solution for Assignment Problem in Unbalanced type.
- To see the variants in Assignment problem of unbalanced type.

Lecture No. : 7

- Explain the concept and procedure for obtaining solution for Assignment Problem in Maximization type.
- To see the variants in Assignment problem of Maximization type.

❖ ***CASE STUDY/EXAMPLES: Practice problems from Reference books***
❖ ***INNOVATIVE PRACTICES: Assignments***

Lecture No. : 8

- Explain the concept and procedure for obtaining solution for Assignment Problem in Travelling Salesman Problem

Lecture No. : 9

- Explain the concept and procedure for obtaining solution for Assignment Problem in Travelling Salesman Problem.
- To see the variants in Assignment problem of Maximization type.

❖ ***CASE STUDY/EXAMPLES: Practice problems from Reference books***

❖ ***INNOVATIVE PRACTICES: Assignments***

Lecture No. : 10

- A revision of all important concepts, terms and definitions, theorems and proofs and all formulae.

- A short class test on the same
  ❖ ***INNOVATIVE PRACTICES: Class test***

NAME OF THE TOPIC: sequencing problem

Lecture No. : 11

- Introduction to the concept of Sequencing Problem.

- Situation where Sequencing Problem can be applied.

Lecture No. : 12

- Processing n jobs through ' 2 ' machines procedure and examples based on it.

❖ **INNOVATIVE PRACTICES**: Assignments.

Lecture No. : 13

- Processing n jobs through ' 3 ' machines procedure and examples based on it.

❖ **INNOVATIVE PRACTICES**: Assignments.

Lecture No. : 14

- Processing n jobs through ' m ' machines procedure and examples based on it.

❖ **INNOVATIVE PRACTICES**: Assignments.

Lecture No. : 15

- A revision of all important concepts, terms and definitions, theorems and proofs and all formulae.
- A short class test on the same

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Ismail Yusuf College Of
Arts, Sc & Commerce
Jogeshwari (E), Mumbai

credit BASED semester AND GRADING SYSTEM

of

UNIVERSITY OF MUMBAI

SECOND YEAR B.SC sTATISTICS PAPER III COURSE

SEMESTER IV

2019-20

Lecture plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER : SONALI THIK
DEPARTMENT: STATISTICS
CLASS : S.Y.B.SC. **SUBJECT :** STATISTICS
PAPER :III
UNIT NO.: 1
UNIT TITLE : CPM AND PERT

NAME OF THE TOPIC: Cpm

Lecture No. : 1

- Introduce the concept of Critical Path Method as one of the major branches of Project Management, its importance and necessity.
- Begin at the very beginning by introducing and defining concepts integral to the Objective of the techniques.

Lecture No. : 2

- Rules and regulation for drawing the network diagram.
- Diagrammatic representation of activities in a project by Gantt Chart.

❖ ***INNOVATIVE PRACTICES:*** Classroom presentations.

Lecture No. : 3

- Rules and regulation for drawing the network diagram.
- Diagrammatic representation of activities in a project by Network Diagram.

❖ ***INNOVATIVE PRACTICES:*** Classroom presentations.

Lecture No. : 4

- Stating different types of float, Slack time.
- Steps for obtaining float, and slack time.
- Importance of slack time.

Lecture No. : 5

- Procedure for determining the critical path for the given network diagram.
- Determining the project duration .

❖ ***INNOVATIVE PRACTICES:*** Practical problem from reference book.

NAME OF THE TOPIC: pert

Lecture No. : 6

- Introduce the concept of Project Evaluation Review Technique as one of the major branches of Project Management, its importance and necessity.
- Begin at the very beginning by introducing and defining concepts integral to the Objective of the techniques.

Lecture No. : 7

- Rules and regulation for drawing the network diagram.
- Diagrammatic representation of activities in a project by Gantt Chart.

❖ ***INNOVATIVE PRACTICES:*** Classroom presentations.

Lecture No. : 8

- Rules and regulation for drawing the network diagram.
- Diagrammatic representation of activities in a project by Network Diagram.

❖ ***INNOVATIVE PRACTICES:*** Classroom presentations.

Lecture No. : 9

- Stating different types of float, Slack time.
- Steps for obtaining float, and slack time.
- Importance of slack time.

Lecture No. : 10

- Procedure for determining the critical path for the given network diagram And comparing the difference between CPM and PERT.
- Determining the project duration.

❖ ***INNOVATIVE PRACTICES:*** Practical problem from reference book.

Lecture No. : 11

- Procedure for determining the probability consideration in project scheduling..
- Determining the project duration.

❖ ***INNOVATIVE PRACTICES:*** Practical problem from reference book.

Lecture No. : 12

- Objective of Project cost analysis.
- Steps for finding the crash time.

❖ ***INNOVATIVE PRACTICES:*** Practical problem from reference book.

Lecture No. : 13

- Continuation of Project cost analysis.
- Steps for finding the crash time.

❖ ***INNOVATIVE PRACTICES:*** Practical problem from reference book.

Lecture No. : 14

- Objective of Updating
- Steps for Updating the network diagram.

❖ ***INNOVATIVE PRACTICES:*** Presentation.

Lecture No. : 15

- A revision of all important concepts, terms and definitions, and all formulae.
- A short class test on the same.

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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER : SONALI THIK
DEPARTMENT: STATISTICS
CLASS : S.Y.B.SC. **SUBJECT :** STATISTICS
PAPER :III
UNIT NO.: 2
UNIT TITLE : GAME THEORY

Lecture 1: Introduction to Game Theory

- Definition and importance of game theory in economics and decision-making
- -Overview of the basic concepts including players, strategies, payoffs, and equilibrium

Lecture 2: Two-Person Zero Sum Game

- Definition and characteristics of a two-person zero-sum game
- Explanation of the concept of a saddle point and its significance in game theory

Lecture 3: Value of the Game

- Understanding the value of the game and its calculation in two-person zero-sum games
- Discussion on the optimal strategies for players to maximize their payoffs

Lecture 4: Pure and Mixed Strategies

- Definition and explanation of pure and mixed strategies in game theory
- Understanding the concept of Nash equilibrium and its application in strategic decision-making

Lecture 5: Optimal Solution of Two-Person Zero Sum Games

- Explanation of the dominance property and its role in identifying optimal strategies
- Derivation of formulae for solving (2x2) games using dominance property

and linear programming

Lecture 6: Graphical Solution of (2xn) Games

- Introduction to graphical methods for solving (2xn) games
- Understanding the graphical representation of payoff matrices and identifying optimal strategies

Lecture 7: Graphical Solution of (mx2) Games

- Explanation of graphical methods for solving (mx2) games
- Application of graphical techniques to analyze and solve (mx2) games efficiently

Lecture 8: Reduction of Game Theory to Linear Programming Problems

- Introduction to the concept of reducing game theory problems to linear programming problems
- Understanding the mathematical formulation and solution methods for converting game theory to linear programming

Lecture 9: Linear Programming Formulation

- Detailed explanation of the linear programming formulation for game theory problems
- Solving examples and exercises to illustrate the conversion of game theory problems to linear programming

Lecture 10: Applications of Game Theory

- Analysis of real-world applications of game theory in various fields such as economics, politics, and biology
- Examination of strategic interactions and decision-making processes using game theory models

Lecture 11: Extensive Form Games

- Introduction to extensive form games and their representation using game trees
- Understanding the concepts of subgame perfection and backward induction in extensive form games

Lecture 12: Evolutionary Game Theory

- Explanation of evolutionary game theory and its application in modeling biological and social systems
- Understanding the dynamics of strategy evolution and stability in evolutionary game theory

Lecture 13: Cooperative Game Theory

- Introduction to cooperative game theory and its focus on coalition formation and cooperative behavior
- Understanding solution concepts such as the core, Shapley value, and Nash bargaining solution in cooperative games

Lecture 14: Behavioral Game Theory

- Overview of behavioral game theory and its integration with insights from psychology and neuroscience
- Analysis of bounded rationality, fairness, and other behavioral factors in strategic decision-making

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in Unit II: Game Theory
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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LECTURE PLAN

NAME OF THE LECTURER : SONALI THIK
DEPARTMENT: STATISTICS

CLASS : S.Y.B.SC.
PAPER : III
UNIT NO.: 3
UNIT TITLE : decision THEORY

SUBJECT : STATISTICS

Lecture 1: Introduction to Decision Theory

- Definition and importance of decision theory in decision-making under uncertainty and risk
- Overview of the basic concepts including decision criteria and decision-making frameworks

Lecture 2: Decision Making under Uncertainty

- Explanation of decision-making under uncertainty and its challenges
- Introduction to Laplace criterion, Maximax (Minimin) criterion, and Maximin (Minimax) criterion for decision-making

Lecture 3: Laplace Criterion

- Detailed explanation of the Laplace criterion and its application in decision-making
- Understanding the principle of equal probabilities and its role in the Laplace criterion

Lecture 4: Maximax and Maximin Criterion

- Explanation of the Maximax and Maximin criteria for decision-making under uncertainty
- Understanding the principles of optimism and pessimism in decision-making

Lecture 5: Hurwicz and Minimax Regret Criteria

- Introduction to the Hurwicz criterion and its interpretation in decision-making
- Explanation of the Minimax Regret criterion and its application in minimizing potential regrets

Lecture 6: Decision Making under Risk

- Explanation of decision-making under risk and its characteristics
- Introduction to the Expected Monetary Value (EMV) criterion and Expected Opportunity Loss (EOL) criterion

Lecture 7: Expected Monetary Value (EMV)

- Detailed explanation of the EMV criterion and its calculation in decision-making
- Understanding how to calculate the expected payoff for each decision alternative

Lecture 8: Expected Opportunity Loss (EOL)

- Explanation of the EOL criterion and its application in evaluating decision alternatives
- Understanding how to calculate the expected loss associated with each decision alternative

Lecture 9: EPPI and EVPI

- Introduction to Expected Posterior Probability of Improvement (EPPI) and Expected Value of Perfect Information (EVPI)
- Understanding the concepts of uncertainty reduction and information value in decision-making

Lecture 10: Bayesian Decision Rule for Posterior Analysis

- Explanation of the Bayesian decision rule and its application in decision-making under uncertainty
- Understanding how to incorporate prior probabilities and likelihoods into decision-making

Lecture 11: Decision Tree Analysis

- Introduction to decision tree analysis and its use in structuring decision problems
- Explanation of how to construct and analyze decision trees for decision-making under uncertainty and risk

Lecture 12: Posterior Probabilities in Decision Trees

- Understanding the concept of posterior probabilities and their role in decision tree analysis
- Calculation of posterior probabilities and their incorporation into decision-making

Lecture 13: Case Studies and Examples

- Analysis of real-world case studies and examples illustrating the application of decision theory concepts
- Examination of decision-making processes in various contexts including business, finance, and healthcare

Lecture 14: Advanced Topics

- Exploration of advanced topics and extensions in decision theory
- Discussion of topics such as decision theory applications in game theory, behavioral economics, and machine learning

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in Unit III: Decision Theory
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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Credit BASED semester AND GRADING SYSTEM

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FIRST YEAR B.SC

Descriptive statistics

COURSE

SEMESTER I

2019-20

Lecture Plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER: Vijay Narkhede
DEPARTMENT: **STATISTICS**
CLASS: **F.Y.B.Sc.** SUBJECT: **DESCRIPTIVE STATISTICS (Paper-I)**
UNIT NO.: I UNIT TITLE: - **Types of Data and Data Condensation**

Lecture 1: Introduction to Types of Data and Sampling

- Definition of population and sample in statistics
- Explanation of finite and infinite populations
- Introduction to different sampling methods: Simple Random Sampling (SRS), SRS without replacement (SRSWOR), and SRS with replacement (SRSWR)

Lecture 2: Types of Characteristics and Scales of Measurement

- Overview of different types of characteristics: qualitative and quantitative
- Explanation of nominal, ordinal, interval, and ratio scales of measurement
- Understanding the properties and uses of each type of scale

Lecture 3: Collection of Primary Data

- Explanation of primary data collection methods: questionnaires and schedules
- Introduction to the concept of secondary data and its sources
- Discussion on the advantages and limitations of primary and secondary data

Lecture 4: Types of Data: Qualitative and Quantitative

- Definition and characteristics of qualitative and quantitative data
- Understanding the distinction between qualitative and quantitative variables
- Examples illustrating different types of data in various fields

Lecture 5: Types of Data: Time Series and Cross Section Data

- Definition and examples of time series data and cross-sectional data
- Explanation of the differences between time series and cross-sectional data
- Understanding the applications and analysis techniques for each type of data

Lecture 6: Types of Data: Discrete and Continuous

- Definition and characteristics of discrete and continuous data
- Understanding the distinction between discrete and continuous variables
- Examples illustrating different types of data in various contexts

Lecture 7: Tabulation of Data

- Explanation of tabulation as a method of summarizing and organizing data
- Introduction to frequency distributions and frequency tables
- Demonstration of techniques for tabulating qualitative and quantitative data

Lecture 8: Dichotomous Classification

- Definition and examples of dichotomous classification for two and three attributes
- Explanation of verification techniques for consistency in dichotomous classification
- Understanding the importance of consistent classification in data analysis

Lecture 9: Association of Attributes

- Introduction to measures of association for qualitative data
- Explanation of Yule's coefficient of association (Q) and Yule's coefficient of colligation
- Application of association measures to analyze relationships between attributes

Lecture 10: Examples and Problem Solving

- Solving problems and exercises related to types of data and data condensation
- Application of classification and association techniques to analyze real-world datasets
- Group activities and discussions to reinforce understanding of concepts

Lecture 11: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of data classification and association techniques
- Peer-to-peer learning and collaboration to deepen understanding of data condensation principles

Lecture 12: Advanced Topics in Data Condensation

- Exploration of advanced topics and extensions in data condensation techniques
- Analysis of non-standard data types and specialized data summarization methods
- Discussion of recent developments and research trends in data condensation

Lecture 13: Case Studies and Applications

- Analysis of real-world case studies using data condensation techniques
- Examination of how data condensation is applied in various fields such as marketing, finance, and healthcare
- Discussion of the practical implications and limitations of data condensation analysis

Lecture 14: Review and Practice

- Review of key concepts, definitions, and techniques related to types of data and data condensation
- Practice problems and exercises to reinforce understanding and mastery of concepts
- Q&A session to address any lingering doubts or questions about the material

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on types of data and data condensation
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER: Vijay Narkhede
DEPARTMENT: **STATISTICS**
CLASS: **F.Y.B.Sc.** SUBJECT: **DESCRIPTIVE STATISTICS (Paper-I)**
UNIT NO.: **II** UNIT TITLE: - **Classification of Data and Measures of central tendency**

Lecture 1: Introduction to Classification of Data

- Definition of univariate frequency distribution for discrete and continuous variables
- Explanation of cumulative frequency distribution and its importance in data analysis
- Overview of different graphical representation techniques: Histogram, frequency polygon, cumulative frequency curve, and stem-and-leaf diagram

Lecture 2: Univariate Frequency Distribution

- Detailed explanation of univariate frequency distribution for discrete variables
- Demonstration of how to construct frequency tables and histograms for discrete variables
- Examples illustrating the interpretation of frequency distributions for discrete variables

Lecture 3: Univariate Frequency Distribution (contd.)

- Explanation of univariate frequency distribution for continuous variables
- Techniques for constructing frequency tables and histograms for continuous variables
- Interpretation of frequency distributions for continuous variables and their applications

Lecture 4: Cumulative Frequency Distribution

- Definition and significance of cumulative frequency distribution
- Explanation of how to construct cumulative frequency tables and curves
- Understanding the cumulative frequency distribution as a summary measure of data distribution

Lecture 5: Graphical Representation of Frequency Distribution

- Introduction to various graphical representation techniques: Histogram, frequency polygon, cumulative frequency curve, and stem-and-leaf diagram
- Demonstration of how to create and interpret each type of graph
- Comparison of different graphical representations for different types of data

Lecture 6: Measures of Central Tendency

- Concept of central tendency and its importance in summarizing data
- Requirements of a good measure of central tendency
- Overview of different types of locational averages: median, mode, quartiles, deciles, and percentiles

Lecture 7: Median and Mode

- Detailed explanation of median as a measure of central tendency
- Definition and interpretation of mode
- Understanding the applications and limitations of median and mode in data analysis

Lecture 8: Partition Values: Quartiles, Deciles, and Percentiles

- Definition and calculation of quartiles, deciles, and percentiles
- Explanation of how partition values divide the data into equal parts
- Interpretation of quartiles, deciles, and percentiles in data analysis

Lecture 9: Mathematical Averages: Arithmetic Mean

- Definition and calculation of arithmetic mean
- Explanation of simple, weighted, and combined mean
- Demonstration of how to calculate arithmetic mean for different types of data

Lecture 10: Mathematical Averages: Geometric Mean

- Definition and calculation of geometric mean
- Understanding the geometric mean as a measure of central tendency for skewed distributions
- Applications of geometric mean in various fields such as finance and biology

Lecture 11: Mathematical Averages: Harmonic Mean

- Definition and calculation of harmonic mean
- Explanation of harmonic mean as a measure of central tendency for rates and ratios
- Examples illustrating the calculation and interpretation of harmonic mean

Lecture 12: Empirical Relation between Mean, Median, and Mode

- Exploration of the empirical relationship between mean, median, and mode
- Understanding how the measures of central tendency relate to each other in different types of distributions
- Analysis of real-world datasets to demonstrate the relationship between mean, median, and mode

Lecture 13: Merits and Demerits of Different Measures

- Discussion on the advantages and disadvantages of using different measures of central tendency
- Understanding the applicability of each measure in different contexts and scenarios
- Comparison of measures of central tendency based on their robustness and sensitivity to outliers

Lecture 14: Examples and Problem Solving

- Solving problems and exercises related to classification of data and measures of central tendency
- Application of different measures of central tendency to analyze and interpret real-world datasets
- Group activities and discussions to reinforce understanding of concepts

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on classification of data and measures of central tendency
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER: Vijay Narkhede
DEPARTMENT: **STATISTICS**
CLASS: **F.Y.B.Sc.** SUBJECT: **DESCRIPTIVE STATISTICS (Paper-I)**
UNIT NO.: **III** UNIT TITLE: - Measures of Dispersion, Skewness & Kurtosis

Lecture 1: Introduction to Measures of Dispersion

- Definition of dispersion and its importance in describing the spread of data
- Explanation of the requirements of a good measure of dispersion
- Overview of different types of measures of dispersion: absolute and relative

Lecture 2: Range

- Explanation of the range as a measure of dispersion
- Calculation of the range and interpretation of its significance
- Understanding the limitations of the range as a measure of dispersion

Lecture 3: Quartile Deviation

- Definition and calculation of quartile deviation
- Explanation of quartile deviation as a measure of dispersion based on quartiles
- Interpretation of quartile deviation in relation to the spread of data

Lecture 4: Mean Absolute Deviation

- Introduction to mean absolute deviation as a measure of dispersion
- Calculation of mean absolute deviation and its interpretation
- Comparison of mean absolute deviation with other measures of dispersion

Lecture 5: Standard Deviation

- Definition and calculation of standard deviation
- Understanding the concept of variance and its relation to standard deviation
- Interpretation of standard deviation as a measure of dispersion and its applications

Lecture 6: Variance and Combined Variance

- Explanation of variance and combined variance as measures of dispersion
- Calculation of variance and combined variance for different types of data
- Analysis of variance and combined variance in relation to the spread of data

Lecture 7: Moments

- Definition and calculation of raw moments and central moments
- Understanding the properties of moments and their significance in data analysis
- Exploration of the relationship between raw moments and central moments

Lecture 8: Skewness

- Introduction to skewness as a measure of asymmetry in a distribution
- Explanation of different measures of skewness: Karl Pearson's, Bowley's, and coefficient of skewness based on moments
- Interpretation of skewness measures and their applications

Lecture 9: Measures of Skewness (contd.)

- Calculation of skewness measures using different formulas
- Analysis of skewness measures to determine the shape of a distribution
- Understanding the implications of positive and negative skewness

Lecture 10: Kurtosis

- Definition and calculation of kurtosis as a measure of the peakedness of a distribution
- Interpretation of kurtosis measures and their significance in data analysis
- Comparison of different measures of kurtosis and their applicability

Lecture 11: Box Plot

- Introduction to box plots as a graphical representation of data dispersion
- Explanation of how to create and interpret box plots
- Understanding the advantages of box plots in visualizing the spread of data

Lecture 12: Examples and Problem Solving

- Solving problems and exercises related to measures of dispersion, skewness, and kurtosis
- Application of dispersion measures to analyze and interpret real-world datasets
- Group activities and discussions to reinforce understanding of concepts

Lecture 13: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of skewness and kurtosis measures through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of dispersion, skewness, and kurtosis principles

Lecture 14: Advanced Topics

- Exploration of advanced topics and extensions in measures of dispersion, skewness, and kurtosis
- Analysis of non-standard distributions and specialized measures of dispersion
- Discussion of recent developments and research trends in dispersion, skewness, and kurtosis analysis

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on measures of dispersion, skewness, and kurtosis
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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Credit BASED semester AND GRADING SYSTEM Of UNIVERSITY OF MUMBAI

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Jogeshwari (E), Mumbai

FIRST YEAR B.SC
Descriptive statistics
COURSE
SEMESTER II
2019-20

Lecture Plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE : _____
NAME OF THE LECTURER: **Vijay Narkhede**
DEPARTMENT: **STATISTICS**
CLASS: **F.Y.B.Sc.** SUBJECT: **DESCRIPTIVE STATISTICS (Paper-I)**
UNIT NO.: **I** UNIT TITLE: **Correlation and regression analysis**

Lecture 1: Introduction to Correlation Analysis

- Definition of correlation and its importance in statistics
- Explanation of scatter diagrams as a graphical representation of the relationship between two variables
- Introduction to the product moment correlation coefficient (Pearson's correlation coefficient) and its properties

Lecture 2: Product Moment Correlation Coefficient

- Detailed explanation of the product moment correlation coefficient
- Calculation of the correlation coefficient using sample data
- Interpretation of the correlation coefficient and its significance in data analysis

Lecture 3: Properties of Correlation Coefficient

- Discussion on the properties of the correlation coefficient, including range and interpretation
- Analysis of the strength and direction of correlation based on the correlation coefficient
- Understanding the limitations and assumptions of correlation analysis

Lecture 4: Spearman's Rank Correlation

- Introduction to Spearman's rank correlation coefficient
- Explanation of the rank correlation coefficient and its interpretation
- Calculation of Spearman's rank correlation coefficient for ranked data with and without ties

Lecture 5: Concept of Linear Regression

- Definition of linear regression and its applications
- Introduction to the principle of least squares as a method for fitting a regression line
- Understanding the components of a linear regression model

Lecture 6: Fitting a Straight Line by Least Squares Method

- Detailed explanation of the least squares method for fitting a straight line
- Calculation of regression coefficients using the least squares approach
- Interpretation of regression coefficients and the fitted regression line

Lecture 7: Relation between Regression Coefficients and Correlation Coefficient

- Understanding the relationship between regression coefficients and correlation coefficient
- Explanation of how the correlation coefficient influences the slope of the regression line
- Analysis of the implications of correlation on regression analysis

Lecture 8: Fitting of Curves Reducible to Linear Form

- Introduction to curves reducible to linear form by transformation
- Explanation of how to transform nonlinear relationships into linear relationships
- Application of the least squares method to fit curves reducible to linear form

Lecture 9: Concept and Use of Coefficient of Determination (R^2)

- Definition of the coefficient of determination (R^2) and its interpretation
- Calculation of R^2 to assess the goodness of fit of a regression model
- Understanding the significance of R^2 in regression analysis

Lecture 10: Fitting a Quadratic Curve by Least Squares Method

- Introduction to fitting a quadratic curve using the least squares method
- Explanation of how to model quadratic relationships between variables
- Calculation of regression coefficients for quadratic regression models

Lecture 11: Examples and Problem Solving

- Solving problems and exercises related to correlation and regression analysis
- Application of correlation and regression techniques to analyze real-world datasets
- Group activities and discussions to reinforce understanding of concepts

Lecture 12: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of correlation and regression analysis through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of correlation and regression principles

Lecture 13: Advanced Topics

- Exploration of advanced topics and extensions in correlation and regression analysis
- Analysis of non-linear regression models and specialized regression techniques
- Discussion of recent developments and research trends in correlation and regression analysis

Lecture 14: Case Studies and Applications

- Analysis of real-world case studies using correlation and regression analysis
- Examination of how correlation and regression analysis is applied in various fields such

as economics, social sciences, and business
- Discussion of the practical implications and limitations of correlation and regression analysis

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on correlation and regression analysis
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE : _____
NAME OF THE LECTURER: **Vijay Narkhede**
DEPARTMENT: **STATISTICS**
CLASS: **F.Y.B.Sc.** SUBJECT: **DESCRIPTIVE STATISTICS (Paper-I)**
UNIT NO.: **II** UNIT TITLE: **Time series**

Lecture 1: Introduction to Time Series Analysis

- Definition of time series and its importance in statistics
- Explanation of the components of a time series: trend, seasonal variation, cyclical variation, and irregular variation
- Overview of different models used in time series analysis

Lecture 2: Trend Estimation

- Introduction to trend estimation in time series analysis
- Explanation of various methods for estimating trend: freehand curve method, method of semi-average, method of moving average, and method of least squares (linear trend only)
- Calculation of trend using each method and interpretation of results

Lecture 3: Freehand Curve Method

- Detailed explanation of the freehand curve method for trend estimation
- Demonstration of how to draw a freehand curve to estimate the trend in a time series
- Analysis of the advantages and limitations of the freehand curve method

Lecture 4: Method of Semi-Average

- Introduction to the method of semi-average for trend estimation
- Explanation of how to calculate semi-averages and use them to estimate the trend
- Understanding the concept of centered moving averages and their application in trend estimation

Lecture 5: Method of Moving Average

- Definition and explanation of the method of moving average for trend estimation
- Calculation of moving averages and interpretation of results
- Analysis of the effectiveness of moving averages in smoothing out fluctuations in a time series

Lecture 6: Method of Least Squares (Linear Trend)

- Introduction to the method of least squares for estimating linear trends in time series
- Explanation of how to fit a straight line to the data using the least squares approach
- Calculation of regression coefficients and interpretation of the fitted trend line

Lecture 7: Estimation of Seasonal Component

- Introduction to seasonal variation in time series analysis
- Explanation of various methods for estimating seasonal component: method of simple average, ratio to moving average, and ratio to trend method
- Calculation of seasonal indices using each method and interpretation of results

Lecture 8: Method of Simple Average

- Detailed explanation of the method of simple average for estimating seasonal variation
- Demonstration of how to calculate seasonal averages and seasonal indices
- Analysis of the strengths and weaknesses of the method of simple average

Lecture 9: Ratio to Moving Average

- Introduction to the ratio to moving average method for estimating seasonal variation
- Explanation of how to calculate seasonal ratios and use them to adjust the data for seasonal effects
- Understanding the concept of deseasonalization and its application in time series analysis

Lecture 10: Ratio to Trend Method

- Definition and explanation of the ratio to trend method for estimating seasonal variation
- Calculation of seasonal ratios relative to the trend and their interpretation
- Comparison of the ratio to trend method with other methods of seasonal adjustment

Lecture 11: Examples and Problem Solving

- Solving problems and exercises related to time series analysis
- Application of trend estimation and seasonal adjustment techniques to analyze real-world time series data
- Group activities and discussions to reinforce understanding of concepts

Lecture 12: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of time series analysis through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of time series analysis principles

Lecture 13: Advanced Topics

- Exploration of advanced topics and extensions in time series analysis
- Analysis of non-linear trends and seasonal patterns in time series data
- Discussion of recent developments and research trends in time series analysis

Lecture 14: Case Studies and Applications

- Analysis of real-world case studies using time series analysis techniques
- Examination of how time series analysis is applied in various fields such as finance, economics, and meteorology
- Discussion of the practical implications and limitations of time series analysis

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on time series analysis
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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Ismail Yusuf College Of
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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE : _____
NAME OF THE LECTURER: **Vijay Narkhede**
DEPARTMENT: **STATISTICS**
CLASS: **F.Y.B.Sc.** SUBJECT: **DESCRIPTIVE STATISTICS (Paper-I)**
UNIT NO.: **III** UNIT TITLE: **Index Numbers**

Lecture No. : 1

- Introduce the concept of Index Number.
- Explain the Stages in the construction of price index numbers.

Comparative tool

Lecture No. : 2

- Introduce the concept for comparative tool.
- Describe the various steps involved in comparative tool.

Simple and composite index number

Lecture No. : 3

- Define and explain simple and composite index number.
- Also solved few examples for the same.

Lasperay's and Paasche's index numbers

Lecture No. : 4

- Introduce and brief the concept of Lasperay's & Paasche's Index Numbers.
- *INNOVATIVE PRACTICES:* Home Assignment.

Edgeworth's and Bowley's index Numbers

Lecture No. : 5

- Introduce and brief the concept of Edgeworth's & Bowley's Index Numbers.

INNOVATIVE PRACTICES: Home Assignment.

Drobisch's and fisher's index Numbers

Lecture No. : 6

- Introduce and brief the concept of Drobisch's & Fisher's Index Numbers.
- *INNOVATIVE PRACTICES:* Home Assignment.

Quantity & value Index Numbers

Lecture No. : 7

- Explain the Quantity Index Numbers and Values Index Numbers.
- Define the difference between them.
- Solved few examples for the same.

Types of test for INDEX NUMBER

Lecture No. : 8

- Define and explain the concept of types of tests for index number.
- Time reversal test
- Factor reversal test
- Circular test.

INNOVATIVE PRACTICES: Practice Problems.

FIXED BASE Index Numbers

Lecture No. : 9

- Define and explain the concept of fixed base index number.
- Also state few examples on the same.

INNOVATIVE PRACTICES: Practice Problems

CHAIN BASE Index Numbers

Lecture No. : 10

- Define and explain the concept of Chain base index numbers.
- Also state few examples on the same.

INNOVATIVE PRACTICES: Practice Problems.

BASE SHIFTING & DEFLATING Index Numbers

Lecture No. : 11.

- Define and explain the concept and difference for base shifting , splicing & deflating.
- Also state few examples on the same.
- ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 12

- Define and explain the concept of real income based on wholesale price numbers.
- Also state few examples on the same.
- ***INNOVATIVE PRACTICES:*** Practice Problems.

OST OF LIVING Index Numbers

Lecture No. : 13

- Explain the concept for cost of living index numbers.
- Merits and Demerits for the same.

Lecture No. : 14

- Continue with the derivation and solve the problems based on it.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

Class Test

Lecture No. : 15

❖ A revision of all important concepts, terms and definitions.
❖ A short class test on the same.

❖ ***INNOVATIVE PRACTICES:*** Class tests

****

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Jogeshwari (E), Mumbai

credit BASED semester AND GRADING SYSTEM

of

UNIVERSITY OF MUMBAI

FIRST YEAR B.SC

statistical methods COURSE

SEMESTER I

2019-20

Lecture plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____

NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: F.Y.B.SC.
UNIT NO.: i
SUBJECT: statistical methods (Paper-ii)
UNIT TITLE: elementary probability theory

NAME OF THE TOPIC: basic concepts in probability

Lecture no. 1:

- Basic concepts: experiment, outcome, trial, sample space, sample point.
- Types of experiment with examples.

NAME OF THE TOPIC: events

Lecture no. 2:

- Events and its types with examples.

NAME OF THE TOPIC: probability definitions and limitations

Lecture no. 3:

- Definitions of probability and its limitations.

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 4:

- Examples based on previous lecture topics.

❖ INNOVATIVE PRACTICES: Home Assignment.

NAME OF THE TOPIC: probability counting rules

Lecture no. 5:

- Principle of sequential counting.

Lecture no. 6:

- Simple random sampling
  - SRS with replacement
  - SRS without replacement

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 7:

- Examples based on previous lecture topics.

❖ INNOVATIVE PRACTICES: Home Assignment.

NAME OF THE TOPIC: axioms of probability

Lecture no. 8:

- Explain axioms of probability.
- Theorems based on axioms.

NAME OF THE TOPIC: addition theorem

Lecture no. 9:

- State and prove addition theorem of probability (Total probability theorem).

Lecture no. 10:

- Theorems: (i) $P(A\,B) = P(A) + P(B)$, if A and B are mutually exclusive events.
  (ii) Boole's inequality
  (iii) Addition theorem for 3 events
  (iv) $P(A') = 1 - P(A)$

NAME OF THE TOPIC: CONDITIONAL PROBABILITY

Lecture no. 11:

- Introduction about conditional probability with the help of various examples.

❖ INNOVATIVE PRACTICES: Home Assignment.

NAME OF THE TOPIC: independent events

Lecture no. 12:

- Brief explanation about independent events with day-to-day life examples.
- Definition of independent events.

NAME OF THE TOPIC: examples based on CONDITIONAL PROBABILITY and independent events

Lecture no. 13:

- Examples based on conditional probability and independent events.

❖ INNOVATIVE PRACTICES: Home Assignment.

NAME OF THE TOPIC: theorems

Lecture no. 14:

- Explain theorems: (i) $0 P(A/B)\ 1$
  (ii) $P(S/B) = 1$
  (iii) $P[(A\,B)/C] = P(A/C) + P(B/C)$, if A, B and C are mutually exclusive.
  (iv) $P[(A\,B)/C] = P(A/C) + P(B/C) - P[(A\ B)/C]$
  (v) $P(A'/B) = 1 - P(A/B)$

NAME OF THE TOPIC: multiplication and bayes theorem

Lecture no. 15:

- State and prove multiplication theorem.
- State and prove bayes theorem.

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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: F.Y.B.SC. **SUBJECT:** statistical methods (Paper-ii)
UNIT NO.: ii
UNIT TITLE: concept of discrete random variable and properties of its probability distribution

Lecture no. 1: **NAME OF THE TOPIC:** random variable

- Explain random variable with examples.
- Explain discrete random variable with various examples.

NAME OF THE TOPIC: probability mass function

Lecture no. 2:

- Define probability mass function with its properties.
- Examples based on p.m.f.

NAME OF THE TOPIC: conditional probability distribution function

Lecture no. 3:

- Define conditional probability distribution function with its properties.
- Define median and mode of the distribution.

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 4:

- Examples based on c.d.f.

❖ INNOVATIVE PRACTICES: Home Assignment.

NAME OF THE TOPIC: expectation

Lecture no. 5:

- Expectation definition and properties.

NAME OF THE TOPIC: moments

Lecture no. 6:

- Explain central and row moments
- Relationship between central and row moments

NAME OF THE TOPIC: skewness and kurtosis

Lecture no. 7:

- Explain skewness and kurtosis

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 8:

- Examples based on previous lecture topics.

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: discrete bivariate random variables

Lecture no. 9:

- Joint probability mass function
- Marginal probability mass function

- Conditional probability mass function

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 10:

- Examples based on previous lecture topics.

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: expectations of bivariate random variables

Lecture no. 11:

- Concept of expectation
- Addition theorem of expectation

Lecture no. 12:

- Multiplication theorem of expectation

NAME OF THE TOPIC: covariance

Lecture no. 13:

- Define covariance
- State and prove properties of covariance

NAME OF THE TOPIC: variance

Lecture no. 14:

- Theorem: variance of linear combination of two variables
- Some special cases based on same theorem

NAME OF THE TOPIC: correlation coefficient

Lecture no. 15:

- Define correlation coefficient and its properties
- Some examples based on it

❖ INNOVATIVE PRACTICES: Home Assignments

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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: F.Y.B.SC.
SUBJECT: statistical methods (Paper-ii)
UNIT NO.: iii
UNIT TITLE: standard discrete distributions

NAME OF THE TOPIC: discrete uniform distribution

Lecture no. 1:

- Definition of uniform distribution
- Define its p.m.f. and c.d.f.

Lecture no. 2:

- Properties of uniform distribution: mean, variance, skewness and kurtosis

NAME OF THE TOPIC: binomial distribution

Lecture no. 3:

- Definition of Bernoulli distribution and binomial distribution with its p.m.f.

Lecture no. 4:

- Properties of binomial distribution: mean, variance, mode

Lecture no. 5:

- Properties of uniform distribution: skewness and kurtosis, central moments, recurrence relationship between probabilities

NAME OF THE TOPIC: examples based on uniform and binomial distribution

Lecture no. 6:

- Examples based on uniform distribution

Lecture no. 7:

- Examples based on binomial distribution
- INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: Poisson distribution

Lecture no. 8:

- Definition of Poisson distribution
- Define its p.m.f.
- Properties of Poisson distribution: mean, variance

Lecture no. 9:

- Properties of Poisson distribution: mode, skewness and kurtosis, recurrence relationship between probabilities

Lecture no. 10:

- Comparison between binomial and Poisson distribution
- Examples based on Poisson distribution

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: hypergeometric distribution

Lecture no. 11:

- Definition of hypergeometric distribution
- Define its p.m.f.

Lecture no. 12:

- Properties of hypergeometric distribution: mean, variance

Lecture no. 13:

- Approximation of hypergeometric to binomial distribution

Lecture no. 14:

- Examples based on hypergeometric distribution

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: real life applications of the distributions

Lecture no. 15:

- Real life applications of the binomial distribution
- Real life applications of the Poisson distribution
- Real life applications of the hypergeometric distribution

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Jogeshwari (E), Mumbai

credit BASED semester AND GRADING SYSTEM

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UNIVERSITY OF MUMBAI

FIRST YEAR B.SC

statistical methods COURSE

SEMESTER II

2019-20

Lecture plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: F.Y.B.SC. **SUBJECT:** statistical methods (Paper-ii)
UNIT NO.: i **UNIT TITLE:** continuous random variable

NAME OF THE TOPIC: continuous random variable

Lecture no. 1:

- Explain the concept of continuous random variable with examples.

NAME OF THE TOPIC: continuous probability density function

Lecture no. 2:

- Explain continuous probability density function with its properties.

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 3:

- Examples based on continuous probability density function

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: cumulative distribution function

Lecture no. 4:

- Explain the concept cumulative distribution function
- Properties of cumulative distribution function

NAME OF THE TOPIC: graphical representation

Lecture no. 5:

- Graphical representation of probability density function and cumulative distribution function with the help of example

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 6:

- Examples based on cumulative distribution function

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: measures associated with continuous random variable

Lecture no. 7:

- Expectation of a random variable and its properties.

Lecture no. 8:

- Raw and Central moments

Lecture no. 9:

- Variance
- Median

Lecture no. 10:

- Mode
- Quartiles

Lecture no. 11:

- Deciles
- Percentiles

Lecture no. 12:

- Skewness
- kurtosis

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 13:

- Examples based on Expectation and Variance

  ❖ INNOVATIVE PRACTICES: Home Assignments

Lecture no. 14:

- Examples based on mean and median

  ❖ INNOVATIVE PRACTICES: Home Assignments

Lecture no. 15:

- Examples based on quartiles and percentiles

  ❖ INNOVATIVE PRACTICES: Home Assignments

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Arts, Sc & Com...
Jogeshwari (E), Mumbai

ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE, LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: F.Y.B.SC. **SUBJECT:** statistical methods (Paper-ii)
UNIT NO.: ii **UNIT TITLE:** standard continuous distribution

NAME OF THE TOPIC: uniform distribution

Lecture no. 1:
- Definition of uniform distribution and its pdf with the help of graph
- Explain cdf of uniform distribution with the help of graph

Lecture no. 2:
- Mean and variance of uniform distribution

Lecture no. 3:
- Median, Mode, skewness and kurtosis
- Some particular cases of uniform distribution

Lecture no. 4:
- Examples based on uniform distribution and its properties
- INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: exponential distribution

Lecture no. 5:
- Definition of exponential distribution and its pdf, cdf

Lecture no. 6:
- Characteristics of exponential p.d.f and its curve.
- Mean of exponential distribution

Lecture no. 7:
- Variance and median of exponential distribution

NAME OF THE TOPIC: memoryless property

Lecture no. 8:
- State and prove memoryless property

Lecture no. 9:
- Examples based on exponential distribution

- INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: normal distribution

Lecture no. 10:

- Definition of normal distribution and its pdf
- Probability curve of normal distribution

Lecture no. 11:

- Properties of normal distribution and normal curve

Lecture no. 12:

- Properties of standard normal distribution and its curve

Lecture no. 13:

- Addition property of normal distribution
- Example based on Addition property of normal distribution

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: normal approximation to binomial and poisson

Lecture no. 14:

- Statement of Laplace DeMoivre theorem
- Example based on normal distribution

❖ INNOVATIVE PRACTICES: Home Assignments

Lecture no. 15:

- Example based on normal approximation to binomial and poisson

❖ INNOVATIVE PRACTICES: Home Assignments

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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: F.Y.B.SC. SUBJECT: statistical methods (Paper-ii)
UNIT NO.: iii
UNIT TITLE: estimation and testing of hypothesis

NAME OF THE TOPIC: basic concepts of sampling from distribution

Lecture no. 1:

- Basic concept: population, sample, estimation, statistic, parameter, estimator, estimate, sampling error, bias in estimator, unbiased estimator

NAME OF THE TOPIC: sampling distribution

Lecture no. 2:

- Basic concept: sampling distribution, standard error
- Statement of central limit theorem, some results based on CLT

Lecture no. 3:

- Example based on central limit theorem

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: sampling distribution of mean

Lecture no. 4:

- Brief explanation about sampling distribution of mean

NAME OF THE TOPIC: sampling distribution of sample proportion

Lecture no. 5:

- Brief explanation about sampling distribution of sample proportion

Lecture no. 6:

- Example based on sampling distribution of sample proportion

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: types of estimation

Lecture no. 7:

- Types of estimation: point estimation, interval estimation
- Some results based on Types of estimation

NAME OF THE TOPIC: confidence interval

Lecture no. 8:

- Confidence interval for population mean from large samples
- Confidence interval for population proportion from large samples

Lecture no. 9:

- Examples based on confidence interval

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: concepts of hypothesis

Lecture no. 10:

- Definitions: statistical hypothesis, null hypothesis, alternative hypothesis, simple and composite hypothesis

Lecture no. 11:

- Concepts: Types of errors, size of the error, test statistic, critical region, critical values

Lecture no. 12:

- Concepts: level of significance and test of significance, power function (power of the test), uniformly most powerful test
- Examples based on hypothesis

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: large sample test

Lecture no. 13:

- Six step procedure of testing of hypothesis
- Significant test for testing population mean

Lecture no. 14:

- Significant test for testing difference of two means
- Significant test for testing population proportion

Lecture no. 15:

- Significant test for testing difference in population proportion

- Examples based on large samples

❖ INNOVATIVE PRACTICES: Home Assignments

HEAD
Department Of Statistics
Ismail Yusuf College Of
Arts, Sc & Commerce
Jogeshwari (E), Mumbai

credit BASED semester AND GRADING SYSTEM

of

UNIVERSITY OF MUMBAI

third YEAR B.SC

sTATISTICS PAPER Iv

COURSE

SEMESTER v

2020-21

Lecture plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK

DEPARTMENT: STATISTICS
CLASS: I.Y.B.SC. **SUBJECT:** STATISTICS **PAPER** : Iv
UNIT NO.: 1 **UNIT TITLE:** FUNDAMENTALS OF R

NAME OF THE TOPIC:introduction about R

Lecture No. : 1

- Introduction to R
- Features of R
- Installation of R
- Starting and ending R session
- Getting help in R
- Value assigning to variables

NAME OF THE TOPIC: Basic Operations

Lecture No. : 2

- Addition
- Subtraction
- Multiplication
- Division
- Power
- Square root

NAME OF THE TOPIC: Numerical functions

Lecture No. : 3

- log 10
- log
- sort
- max
- unique
- dim

NAME OF THE TOPIC:problem solving

Lecture No. : 4

- Based on previous lectures solved some examples

  - ❖ CASE STUDY/EXAMPLES:Solving Examples based on previous lectures
  - ❖ INNOVATIVE PRACTICES : Home Assignments

Lecture No. : 5

- range
- length
- var
- prod
- sum
- summary

NAME OF THE TOPIC: Data Types

Lecture No. : 6

- Vector
- List
- Matrices
- Array
- Data frame

NAME OF THE TOPIC: Variable Type

Lecture No. : 7

- Logical
- Numeric
- Integer
- Complex
- Character and factor

NAME OF THE TOPIC:problem solving

Lecture No. : 8

- Based on previous lectures solved some examples
  - ❖ CASE STUDY/EXAMPLES:Solving Examples based on previous lectures
  - ❖ INNOVATIVE PRACTICES : Home Assignments

NAME OF THE TOPIC: Data Manipulation

Lecture No. : 9

- Selecting random N rows
- Removing duplicate row(s)
- Dropping a variable(s)

- Renaming variable(s)
- Sub setting data

Lecture No. : 10

- Creating a new variable(s)
- Selecting of random fraction of row(s)
- Appending of row(s) and column(s)
- Simulation of variables.

NAME OF THE TOPIC: Data Processing

Lecture No. : 11

- Data import and export
- Setting working directory
- Checking structure of Data :Str(), Class(), Changing type of variable

NAME OF THE TOPIC:problem solving

Lecture No. : 12

- Based on previous lectures solved some examples

  ❖ CASE STUDY/EXAMPLES:Solving Examples based on previous lectures

  ❖ INNOVATIVE PRACTICES : Home Assignments

NAME OF THE TOPIC: Data Visualization using ggplot

Lecture No. : 13

- Simple bar diagram
- subdivided bar diagram
- multiple bar diagram pie diagram

Lecture No. : 14

- Box plot for one and more variables
- Histogram
- frequency polygon

- scatter plot

NAME OF THE TOPIC:problem solving

Lecture No. : 15

- Based on previous lectures solved some examples
  - ❖ CASE STUDY/EXAMPLES:Solving Examples based on previous lectures
  - ❖ INNOVATIVE PRACTICES : Home Assignments

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Department Of Statistics
Ismail Yusuf College Of
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Jogeshwari (E), Mumbai

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: I.Y.B.SC. **SUBJECT:** STATISTICS **PAPER :** Iv
UNIT NO.: 2 **UNIT TITLE:** simple linear regression model

NAME OF THE TOPIC: introduction

Lecture No. : 1

- Explanation about correlation
- Nature of correlation
- Interpretation
- Graphical representation

Lecture No. : 2

- Explanation about Regression analysis with examples
- Explain concept of Linearity with examples

NAME OF THE TOPIC: Simple linear regression model

Lecture No. : 3

- Briefly explanation about the simple linear regression model
- Deterministic model
- Residuals
- Homoscedasticity
- Multicollinearity

NAME OF THE TOPIC: assumptions and properties of the model

Lecture No. : 4

- Assumption of the linear regression model
- Properties of the OLS estimates
- Expectation and variance of Y

NAME OF THE TOPIC: estimation of regression coefficients

Lecture No. : 5

- Derivation to obtain estimation of regression coefficients

Lecture No. : 6

- Concept of sum of squares

Lecture No. : 7

- Concept of degrees of freedom

NAME OF THE TOPIC: relationship between total, regression and error sum of squares

Lecture No. : 8

- Mathematical expression to show the relationship between total, regression and error sum of squares

NAME OF THE TOPIC: estimation of population variance

Lecture No. : 9

- Derivation to find out estimated value of the variance.

NAME OF THE TOPIC: Coefficient of determination and adjusted R^2

Lecture No. : 10

- Coefficient of determination R^2
- Adjusted R^2

NAME OF THE TOPIC: Procedure of testing significance

Lecture No. : 11, 12

Procedure of testing

a) Overall significance of the models

b) Significance of individual coefficients

c) Confidence intervals for the regression coefficients

NAME OF THE TOPIC: Data Pre-processing

Lecture No. : 13, 14 , 15

- Detection and treatment of missing value(s) and outliers
- Variable selection and Model building
- Interpretation of output produced by lm command in R.

- ❖ CASE STUDY/EXAMPLES: Solving Examples based on previous lectures
- ❖ INNOVATIVE PRACTICES : Home Assignments

Dept. of Statistics
Ismail Yusuf College Of
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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: t.Y.B.SC. **SUBJECT:** STATISTICS **PAPER :** Iv
UNIT NO.: 3 **UNIT TITLE:** multiple linear regression model

NAME OF THE TOPIC: multiple linear regression model

Lecture No. :1, 2

- Derivation of ordinary least square (OLS) estimators of regression coefficients for multiple regression models

Lecture No. :3

- Coefficient of determination R^2
- Adjusted R^2

NAME OF THE TOPIC: Procedure of testing significance

Lecture No. :4, 5

- Overall significance of the models

❖ CASE STUDY/EXAMPLES: Solving Examples based on previous lectures

❖ INNOVATIVE PRACTICES : Home Assignments

Lecture No. :6

- Significance of individual coefficients

Lecture No. :7

- Confidence intervals for the regression coefficients

❖ CASE STUDY/EXAMPLES: Solving Examples based on previous lectures

❖ INNOVATIVE PRACTICES : Home Assignments

NAME OF THE TOPIC: Data Pre-processing

Lecture No. :8, 9

- Detection and treatment of missing value(s) and outliers

Lecture No. :10

- Variable selection

❖ CASE STUDY/EXAMPLES: Solving Examples based on previous lectures

❖ INNOVATIVE PRACTICES : Home Assignments

Lecture No. :11

- Model building

Lecture No. :12,13

- Interpretation of output produced by lm command in R.

Lecture No. :14, 15

- ❖ CASE STUDY/EXAMPLES: Solving Examples based on previous lectures
- ❖ INNOVATIVE PRACTICES : Home Assignments

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: I.Y.B.SC. **SUBJECT:** STATISTICS **PAPER** : Iv
UNIT NO.: 4 **UNIT TITLE:** Validity of Assumptions

NAME OF THE TOPIC: Residual Diagnostics

Lecture No. :1

- Explanation about Residual

Lecture No. : 2

- Standardized residuals

Lecture No. : 3

- Studentized residuals

Lecture No. :5, 6

- Residual plots

Lecture No. :7

- Interpretation of four plots

lecture No. : 8, 9

- Interpretation output produced by plot command in R and corrective measures such as transformation of response variable

lecture No. : 10

- Testing normality of data .

NAME OF THE TOPIC: autocorrelation

lecture No. : 11

- Autocorrelation: Concept and detection using Durbin Watson Test
- Interpretation of output produced by DW-test function in R

NAME OF THE TOPIC: Heteroscedasticity

lecture No. : 12

- Heteroscedasticity: Concept and detection using Breusch –Pagan-Godfrey Test
- Interpretation of output produced by bptest function in R,

NAME OF THE TOPIC: Multicollinearity

lecture No. : 12, 13

- Multicollinearity: Concept and detection using R
  - i) t-ratios
  - ii) pairwise correlation between repressors
  - iii) Variance Inflation Factor(VIF)

NAME OF THE TOPIC: Interpretation

lecture No. : 14

- Interpretation of output produced by mctest function in R,
- Consequences of using OLS estimators in presence of Autocorrelation,

lecture No. : 15

- Heteroscedasticity and Multicollinearity, Remedial measures,
- Ridge Regression : Concept and case study using R,

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credit BASED semester
AND GRADING SYSTEM

of

UNIVERSITY OF MUMBAI

third YEAR B.SC statistics
PAPER Iv COURSE

SEMESTER vi

2020-21

Lecture plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: t.Y.B.SC. **SUBJECT:** STATISTICS **PAPER** : Iv
UNIT NO.: 1 **UNIT TITLE:** MORTALITY TABLES

NAME OF THE TOPIC: mortality functions

lecture No. : 1

- Various mortality functions
- Probabilities of living and dying

lecture No. : 2

- The force of mortality
- Central Mortality Rate

NAME OF THE TOPIC: Estimation of μ_x

lecture No. : 3

- Estimation of μ_x from the mortality table

NAME OF THE TOPIC: Laws of mortality

lecture No. : 4,5

- Gompertz's Laws of mortality

lecture No. : 6, 7, 8

- Makeham's first law of mortality

lecture No. : 9, 10

❖ CASE STUDY/EXAMPLES: Solving Examples based on previous lectures

❖ INNOVATIVE PRACTICES : Home Assignments

NAME OF THE TOPIC: mortality tables

lecture No. : 11, 12

- Select, Ultimate and Aggregate mortality tables

NAME OF THE TOPIC: Stationary population

lecture No. : 13

- Stationary population

lecture No. : 14, 15

- Expectation of life and Average life at death
    - ❖ CASE STUDY/EXAMPLES: Solving Examples based on previous lectures
    - ❖ INNOVATIVE PRACTICES : Home Assignments

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GOVERNMENT OF MAHARASHTRA'S
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LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: t.Y.B.SC. **SUBJECT:** STATISTICS **PAPER** : Iv
UNIT NO.: 2 **UNIT TITLE:** COMPOUND INTEREST AND ANNUITIES CERTAIN

NAME OF THE TOPIC: basic introduction

lecture No. : 1

- Accumulated value
- Present value

NAME OF THE TOPIC: rates of interest

lecture No. : 2

- Nominal and effective rates of interest
- Varying rates of interest

NAME OF THE TOPIC: Equation of value

lecture No. : 3

- Equation of value
- Equated time of payment

NAME OF THE TOPIC: Present and accumulated values of annuity without deferment period

lecture No. : 4

- Present and accumulated values of immediate annuity certain

lecture No. : 5

- Present and accumulated values of annuity due certain

NAME OF THE TOPIC: Present value for perpetuity (immediate and due) with and without deferment Period

lecture No. : 6,7

- Present value of immediate perpetuity with and without deferment Period
- Present value of due perpetuity with and without deferment Period

NAME OF THE TOPIC: Present and accumulated values

lecture No. : 8

- Present and accumulated values of increasing annuity

lecture No. : 9

- Present and accumulated values of increasing annuity when successive installments form arithmetic progression

lecture No. : 10, 11

- Present and accumulated values of annuity with frequency different from that with which interest is convertible

NAME OF THE TOPIC: Redemption of loan

lecture No. : 12

- Redemption of loan

NAME OF THE TOPIC: examples

lecture No. : 13,14, 15

- ❖ CASE STUDY/EXAMPLES: Solving Examples based on previous lectures
- ❖ INNOVATIVE PRACTICES : Home Assignments

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GOVERNMENT OF MAHARASHTRA'S
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LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: t.Y.B.SC. SUBJECT: STATISTICS PAPER : Iv
UNIT NO.: 3 UNIT TITLE: LIFE ANNUITIES

NAME OF THE TOPIC: Present value in terms of commutation functions of Life annuities with deferment period.

lecture No. : 1, 2

- Present value in terms of commutation functions of Life annuities with deferment period.
  - Immediate

lecture No. : 3, 4

- Present value in terms of commutation functions of Life annuities with deferment period.
  - Due

lecture No. : 5, 6

- Present value in terms of commutation functions of Life annuities with deferment period.
  - Immediate Due

NAME OF THE TOPIC: Present value in terms of commutation functions of Life annuities without deferment period.

lecture No. : 7, 8

- Present value in terms of commutation functions of Life annuities without deferment period.
  - Immediate

lecture No. : 9, 10

- Present value in terms of commutation functions of Life annuities without deferment period.
  - Due

lecture No. : 11, 12

- Present value in terms of commutation functions of Life annuities without deferment period.
  - Immediate Due

NAME OF THE TOPIC: Present value

lecture No. : 13

- Present values of Variable

lecture No. : 14, 15

- Present values of Increasing life annuities and increasing Temporary life annuities (immediate and due).

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GOVERNMENT OF MAHARASHTRA'S
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LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: t.Y.B.SC. **SUBJECT:** STATISTICS **PAPER** : Iv
UNIT NO.: 4 **UNIT TITLE:** ASSURANCE BENEFITS

NAME OF THE TOPIC: Present value of Assurance

benefits in terms of commutation functions

lecture No. : 1

- Present value of Assurance benefits in terms of commutation functions pure endowment assurance.

lecture No. : 2

- Present value of Assurance benefits in terms of commutation functions temporary assurance

lecture No. : 3

- Present value of Assurance benefits in terms of commutation functions endowment assurance

lecture No. : 4

- Present value of Assurance benefits in terms of commutation functions whole life assurance

lecture No. : 5

- Present value of Assurance benefits in terms of commutation functions double endowment assurance

lecture No. : 6

- Present value of Assurance benefits in terms of commutation functions special endowment assurance

lecture No. : 7

- Present value of Assurance benefits in terms of commutation functions deferred temporary assurance

NAME OF THE TOPIC: Net premiums

lecture No. : 8, 9, 10, 11, 12, 13

- Net level annual premiums (including limited period of payment) for various assurance plans

NAME OF THE TOPIC: Examples

lecture No. : 14,15

❖ CASE STUDY/EXAMPLES: Solving Examples based on previous lectures

❖ INNOVATIVE PRACTICES : Home Assignments

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SECOND YEAR B.SC

sTATISTICS PAPER III

COURSE

SEMESTER III

2020-21

Lecture plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: S.Y.B.SC. **SUBJECT:** STATISTICS
PAPER :III
UNIT NO.: 1 **UNIT TITLE:** operation research

NAME OF THE TOPIC: linear programming problem

Lecture No. : 1

- Introduce the concept of L.P.P. as one of the major branches of Operation Research, its importance and necessity.
- Begin at the very beginning by introducing and defining concepts integral to the study of L.P.P. such as Maximization & Minimization.

Lecture No. : 2

- Concepts of Solution: namely, Feasible Solution, Basic Feasible solution, Optimal Solution.
- Give a few examples of Solutions.
- Mathematical Formulation of the given problem.

❖ ***INNOVATIVE PRACTICES:*** Classroom presentations.

NAME OF THE TOPIC: Graphical problem

Lecture No. : 3

- Solving Linear Programming Problem by Graphical Method for Maximization Objective Function.
- Finding Feasible Solution using Graphical Method.

❖ ***CASE STUDY/EXAMPLES: Solving Examples based on Graphical methods.***

❖ ***INNOVATIVE PRACTICES :*** Home Assignments

Lecture No. : 4

- Solving Linear Programming Problem by Graphical Method for Minimization Objective Function.
- Finding Feasible Solution using Graphical Method.

❖ ***CASE STUDY/EXAMPLES: Solving Examples based on Graphical methods.***

❖ ***INNOVATIVE PRACTICES :*** Home Assignments

NAME OF THE TOPIC: simplex method

Lecture No. : 5

- Solving Linear Programming Problem by Simplex Method for Maximization Objective Function for two variables.
- Finding Optimal Solution using Simplex Method.

❖ ***CASE STUDY/EXAMPLES:*** Practical Problems

❖ ***INNOVATIVE PRACTICES:*** Home Assignments

Lecture No. : 6

- Solving Linear Programming Problem by Simplex Method for Maximization Objective Function for more than two variables.
- Finding Optimal Solution using Simplex Method.

❖ ***CASE STUDY/EXAMPLES:*** Practical Problems

❖ ***INNOVATIVE PRACTICES:*** Home Assignments

Lecture No. : 7

- Solving Linear Programming Problem by Simplex Method for Minimization Objective Function for two variables.

- Finding Optimal Solution using Simplex Method.

❖ ***CASE STUDY/EXAMPLES:*** Practical Problems

❖ ***INNOVATIVE PRACTICES:*** Home Assignments

Lecture No. : 8

- Solving Linear Programming Problem by Simplex Method for Minimization Objective Function for more than two variables.
- Finding Optimal Solution using Simplex Method.

❖ ***CASE STUDY/EXAMPLES:*** Practical Problems

❖ ***INNOVATIVE PRACTICES:*** Home Assignments

NAME OF THE TOPIC: big m method

Lecture No. : 9

- Solving Linear Programming Problem by Simplex Method for Minimization Objective Function for two variables.
- Finding Optimal Solution using Big M Method.

❖ ***CASE STUDY/EXAMPLES:*** Practical Problems

❖ ***INNOVATIVE PRACTICES:*** Home Assignments

Lecture No. : 10

- Solving Linear Programming Problem by Big M Method for Minimization Objective Function for more than two variables.
- Finding Optimal Solution using Big M Method.

❖ ***CASE STUDY/EXAMPLES:*** Practical Problems

❖ ***INNOVATIVE PRACTICES:*** Home Assignments

NAME OF THE TOPIC: primal &duality

Lecture No. : 11.

- Introduction of Primal, its advantages and Limitation.

Lecture No. : 12

- Introduction of Dual, its advantages and Limitation.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 13

- Use of Duality in solving Linear Programming Problem.

Lecture No. : 14

- Relationship between optimum solution to Primal and Dual.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 15

- A revision of all important concepts, terms and definitions, and all formulae.
- A short class test on the same.

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❖ ***INNOVATIVE PRACTICES:*** Class tests

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER : SONALI THIK
DEPARTMENT: STATISTICS
CLASS : S.Y.B.SC. **SUBJECT :** STATISTICS
PAPER : III
UNIT NO.: 2 **UNIT TITLE :** operation research

NAME OF THE TOPIC: transportation Problem

Lecture No. : 1

- Introduce concept of need for Transportation Problem by giving suitable examples
- Formally define Transportation Problem.

Lecture No. : 2

- Illustrate the Mathematical Formulation of Transportation Problem.
- Different types of Solutions possible in Transportation Problem.

Lecture No. : 3

- Stating the different methods for solving the Transportation Problem: North – West Corner Rule, Matrix Minima Method, Vogel's Approximation Method.

Lecture No. : 4

- Explain the procedure of North – west Corner Rule.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 5

- Explain the procedure of Matrix Minima Method.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 6

- Explain the procedure of Vogel's Approximation Method.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 7

- Comparison on the method of Transportation Problem, between North West Corner Rule, Matrix Maxima Method, Vogel's Approximation Method

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

NAME OF THE TOPIC: modi method

Lecture No. : 8

- Explain the procedure for obtaining optimal solution for the transportation problem by MODI Method.

Lecture No. : 9

- Obtaining optimal solution for the transportation problem by MODI Method for North – West Corner Rule.

Lecture No. : 10

- Obtaining optimal solution for the transportation problem by MODI Method for Matrix Maxima Method.

Lecture No. : 11

- Obtaining optimal solution for the transportation problem by MODI Method for Vogel's Approximation Method.

NAME OF THE TOPIC: transportation problem

Lecture No. : 12.

- Introduction of Optimality Test, its advantages and Limitation.

Lecture No. : 13

- Finding any Improvement procedure for solving the Transportation Problem.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 14

- Variants in Transportation Problem: Unbalanced and Maximization type.

Lecture No. : 15

- A revision of all important concepts, terms and definitions, and all formulae.
- A short class test on the same.

❖ ***INNOVATIVE PRACTICES:*** Class tests

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GOVERNMENT OF MAHARASHTRA'S
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LECTURE PLAN

NAME OF THE LECTURER : SONALI THIK
DEPARTMENT: STATISTICS
CLASS : S.Y.B.SC. **SUBJECT :** STATISTICS
PAPER: III
UNIT NO.: 3 **UNIT TITLE :** operation research
NAME OF THE TOPIC: assignment problem

NAME OF THE TOPIC: assignment problem

Lecture No. : 1

- Explain the concept of Assignment Problem.
- Situation where Sequencing Problem can be applied.

Lecture No. : 2

- Formulation of Assignment Problem with different situations.

❖ ***INNOVATIVE PRACTICES : Assignments***

Lecture No. : 3

- Stating different method for getting the solution for the Assignment Problem.

Lecture No. : 4

- Explain the concept and procedure for obtaining solution for Assignment Problem by Complete Enumeration Method.

Lecture No. : 5

- Explain the concept and procedure for obtaining solution for Assignment Problem by Hungarian Method.

❖ ***CASE STUDY/EXAMPLES: Practice problems from Reference books***

Lecture No. : 6

- Explain the concept and procedure for obtaining solution for Assignment Problem in Unbalanced type.
- To see the variants in Assignment problem of unbalanced type.

Lecture No. : 7

- Explain the concept and procedure for obtaining solution for Assignment Problem in Maximization type.
- To see the variants in Assignment problem of Maximization type.

❖ ***CASE STUDY/EXAMPLES: Practice problems from Reference books***
❖ ***INNOVATIVE PRACTICES: Assignments***

Lecture No. : 8

- Explain the concept and procedure for obtaining solution for Assignment Problem in Travelling Salesman Problem

Lecture No. : 9

- Explain the concept and procedure for obtaining solution for Assignment Problem in Travelling Salesman Problem.
- To see the variants in Assignment problem of Maximization type.

❖ ***CASE STUDY/EXAMPLES: Practice problems from Reference books***

❖ ***INNOVATIVE PRACTICES: Assignments***

Lecture No. : 10

- A revision of all important concepts, terms and definitions, theorems and proofs and all formulae.

- A short class test on the same
  ❖ ***INNOVATIVE PRACTICES: Class test***

NAME OF THE TOPIC: sequencing problem

Lecture No. : 11

- Introduction to the concept of Sequencing Problem.

- Situation where Sequencing Problem can be applied.

Lecture No. : 12

- Processing n jobs through ' 2 ' machines procedure and examples based on it.

❖ **INNOVATIVE PRACTICES**: Assignments.

Lecture No. : 13

- Processing n jobs through ' 3 ' machines procedure and examples based on it.

❖ **INNOVATIVE PRACTICES**: Assignments.

Lecture No. : 14

- Processing n jobs through ' m ' machines procedure and examples based on it.

❖ **INNOVATIVE PRACTICES**: Assignments.

Lecture No. : 15

- A revision of all important concepts, terms and definitions, theorems and proofs and all formulae.
- A short class test on the same

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SECOND YEAR B.SC sTATISTICS PAPER III COURSE

SEMESTER IV

2020-21

Lecture plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER : SONALI THIK
DEPARTMENT: STATISTICS
CLASS : S.Y.B.SC.
SUBJECT : STATISTICS
PAPER :III
UNIT NO.: 1
UNIT TITLE : CPM AND PERT

NAME OF THE TOPIC: Cpm

Lecture No. : 1

- Introduce the concept of Critical Path Method as one of the major branches of Project Management, its importance and necessity.
- Begin at the very beginning by introducing and defining concepts integral to the Objective of the techniques.

Lecture No. : 2

- Rules and regulation for drawing the network diagram.
- Diagrammatic representation of activities in a project by Gantt Chart.

❖ ***INNOVATIVE PRACTICES:*** Classroom presentations.

Lecture No. : 3

- Rules and regulation for drawing the network diagram.
- Diagrammatic representation of activities in a project by Network Diagram.

❖ ***INNOVATIVE PRACTICES:*** Classroom presentations.

Lecture No. : 4

- Stating different types of float, Slack time.
- Steps for obtaining float, and slack time.
- Importance of slack time.

Lecture No. : 5

- Procedure for determining the critical path for the given network diagram.
- Determining the project duration .

❖ ***INNOVATIVE PRACTICES:*** Practical problem from reference book.

NAME OF THE TOPIC: pert

Lecture No. : 6

- Introduce the concept of Project Evaluation Review Technique as one of the major branches of Project Management, its importance and necessity.
- Begin at the very beginning by introducing and defining concepts integral to the Objective of the techniques.

Lecture No. : 7

- Rules and regulation for drawing the network diagram.
- Diagrammatic representation of activities in a project by Gantt Chart.

❖ ***INNOVATIVE PRACTICES:*** Classroom presentations.

Lecture No. : 8

- Rules and regulation for drawing the network diagram.
- Diagrammatic representation of activities in a project by Network Diagram.

❖ ***INNOVATIVE PRACTICES:*** Classroom presentations.

Lecture No. : 9

- Stating different types of float, Slack time.
- Steps for obtaining float, and slack time.
- Importance of slack time.

Lecture No. : 10

- Procedure for determining the critical path for the given network diagram And comparing the difference between CPM and PERT.
- Determining the project duration.

❖ ***INNOVATIVE PRACTICES:*** Practical problem from reference book.

Lecture No. : 11

- Procedure for determining the probability consideration in project scheduling..
- Determining the project duration.

❖ ***INNOVATIVE PRACTICES:*** Practical problem from reference book.

Lecture No. : 12

- Objective of Project cost analysis.
- Steps for finding the crash time.

❖ ***INNOVATIVE PRACTICES:*** Practical problem from reference book.

Lecture No. : 13

- Continuation of Project cost analysis.
- Steps for finding the crash time.

❖ ***INNOVATIVE PRACTICES:*** Practical problem from reference book.

Lecture No. : 14

- Objective of Updating
- Steps for Updating the network diagram.

❖ ***INNOVATIVE PRACTICES:*** Presentation.

Lecture No. : 15

- A revision of all important concepts, terms and definitions, and all formulae.
- A short class test on the same.

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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER : SONALI THIK
DEPARTMENT: STATISTICS
CLASS : S.Y.B.SC. **SUBJECT :** STATISTICS
PAPER :III
UNIT NO.: 2
UNIT TITLE : GAME THEORY

Lecture 1: Introduction to Game Theory

- Definition and importance of game theory in economics and decision-making
- -Overview of the basic concepts including players, strategies, payoffs, and equilibrium

Lecture 2: Two-Person Zero Sum Game

- Definition and characteristics of a two-person zero-sum game
- Explanation of the concept of a saddle point and its significance in game theory

Lecture 3: Value of the Game

- Understanding the value of the game and its calculation in two-person zero-sum games
- Discussion on the optimal strategies for players to maximize their payoffs

Lecture 4: Pure and Mixed Strategies

- Definition and explanation of pure and mixed strategies in game theory
- Understanding the concept of Nash equilibrium and its application in strategic decision-making

Lecture 5: Optimal Solution of Two-Person Zero Sum Games

- Explanation of the dominance property and its role in identifying optimal strategies
- Derivation of formulae for solving (2x2) games using dominance property

and linear programming

Lecture 6: Graphical Solution of (2xn) Games

- Introduction to graphical methods for solving (2xn) games
- Understanding the graphical representation of payoff matrices and identifying optimal strategies

Lecture 7: Graphical Solution of (mx2) Games

- Explanation of graphical methods for solving (mx2) games
- Application of graphical techniques to analyze and solve (mx2) games efficiently

Lecture 8: Reduction of Game Theory to Linear Programming Problems

- Introduction to the concept of reducing game theory problems to linear programming problems
- Understanding the mathematical formulation and solution methods for converting game theory to linear programming

Lecture 9: Linear Programming Formulation

- Detailed explanation of the linear programming formulation for game theory problems
- Solving examples and exercises to illustrate the conversion of game theory problems to linear programming

Lecture 10: Applications of Game Theory

- Analysis of real-world applications of game theory in various fields such as economics, politics, and biology
- Examination of strategic interactions and decision-making processes using game theory models

Lecture 11: Extensive Form Games

- Introduction to extensive form games and their representation using game trees
- Understanding the concepts of subgame perfection and backward induction in extensive form games

Lecture 12: Evolutionary Game Theory

- Explanation of evolutionary game theory and its application in modeling biological and social systems
- Understanding the dynamics of strategy evolution and stability in evolutionary game theory

Lecture 13: Cooperative Game Theory

- Introduction to cooperative game theory and its focus on coalition formation and cooperative behavior
- Understanding solution concepts such as the core, Shapley value, and Nash bargaining solution in cooperative games

Lecture 14: Behavioral Game Theory

- Overview of behavioral game theory and its integration with insights from psychology and neuroscience
- Analysis of bounded rationality, fairness, and other behavioral factors in strategic decision-making

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in Unit II: Game Theory
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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LECTURE PLAN

NAME OF THE LECTURER : SONALI THIK
DEPARTMENT: STATISTICS

CLASS : S.Y.B.SC.
PAPER : III
UNIT NO.: 3
UNIT TITLE : decision THEORY

SUBJECT : STATISTICS

Lecture 1: Introduction to Decision Theory

- Definition and importance of decision theory in decision-making under uncertainty and risk
- Overview of the basic concepts including decision criteria and decision-making frameworks

Lecture 2: Decision Making under Uncertainty

- Explanation of decision-making under uncertainty and its challenges
- Introduction to Laplace criterion, Maximax (Minimin) criterion, and Maximin (Minimax) criterion for decision-making

Lecture 3: Laplace Criterion

- Detailed explanation of the Laplace criterion and its application in decision-making
- Understanding the principle of equal probabilities and its role in the Laplace criterion

Lecture 4: Maximax and Maximin Criterion

- Explanation of the Maximax and Maximin criteria for decision-making under uncertainty
- Understanding the principles of optimism and pessimism in decision-making

Lecture 5: Hurwicz and Minimax Regret Criteria

- Introduction to the Hurwicz criterion and its interpretation in decision-making
- Explanation of the Minimax Regret criterion and its application in minimizing potential regrets

Lecture 6: Decision Making under Risk

- Explanation of decision-making under risk and its characteristics
- Introduction to the Expected Monetary Value (EMV) criterion and Expected Opportunity Loss (EOL) criterion

Lecture 7: Expected Monetary Value (EMV)

- Detailed explanation of the EMV criterion and its calculation in decision-making
- Understanding how to calculate the expected payoff for each decision alternative

Lecture 8: Expected Opportunity Loss (EOL)

- Explanation of the EOL criterion and its application in evaluating decision alternatives
- Understanding how to calculate the expected loss associated with each decision alternative

Lecture 9: EPPI and EVPI

- Introduction to Expected Posterior Probability of Improvement (EPPI) and Expected Value of Perfect Information (EVPI)
- Understanding the concepts of uncertainty reduction and information value in decision-making

Lecture 10: Bayesian Decision Rule for Posterior Analysis

- Explanation of the Bayesian decision rule and its application in decision-making under uncertainty
- Understanding how to incorporate prior probabilities and likelihoods into decision-making

Lecture 11: Decision Tree Analysis

- Introduction to decision tree analysis and its use in structuring decision problems
- Explanation of how to construct and analyze decision trees for decision-making under uncertainty and risk

Lecture 12: Posterior Probabilities in Decision Trees

- Understanding the concept of posterior probabilities and their role in decision tree analysis
- Calculation of posterior probabilities and their incorporation into decision-making

Lecture 13: Case Studies and Examples

- Analysis of real-world case studies and examples illustrating the application of decision theory concepts
- Examination of decision-making processes in various contexts including business, finance, and healthcare

Lecture 14: Advanced Topics

- Exploration of advanced topics and extensions in decision theory
- Discussion of topics such as decision theory applications in game theory, behavioral economics, and machine learning

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in Unit III: Decision Theory
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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Department Of Statistics
Ismail Yusuf College Of
Arts, Sc & Commerce
Jogeshwari (E), Mumbai

credit BASED semester AND GRADING SYSTEM

of

UNIVERSITY OF MUMBAI

SECOND YEAR B.SC sTATISTICS PAPER III COURSE

SEMESTER III

2021-22

Lecture plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: S.Y.B.SC. SUBJECT: STATISTICS
PAPER :III
UNIT NO.: 1 UNIT TITLE: operation research

NAME OF THE TOPIC: linear programming problem

Lecture No. : 1

- Introduce the concept of L.P.P. as one of the major branches of Operation Research, its importance and necessity.
- Begin at the very beginning by introducing and defining concepts integral to the study of L.P.P. such as Maximization & Minimization.

Lecture No. : 2

- Concepts of Solution: namely, Feasible Solution, Basic Feasible solution, Optimal Solution.
- Give a few examples of Solutions.
- Mathematical Formulation of the given problem.

❖ *INNOVATIVE PRACTICES:* Classroom presentations.

NAME OF THE TOPIC: Graphical problem

Lecture No. : 3

- Solving Linear Programming Problem by Graphical Method for Maximization Objective Function.
- Finding Feasible Solution using Graphical Method.

❖ *CASE STUDY/EXAMPLES: Solving Examples based on Graphical methods.*

❖ *INNOVATIVE PRACTICES :* Home Assignments

Lecture No. : 4

- Solving Linear Programming Problem by Graphical Method for Minimization Objective Function.
- Finding Feasible Solution using Graphical Method.

❖ *CASE STUDY/EXAMPLES: Solving Examples based on Graphical methods.*

❖ *INNOVATIVE PRACTICES :* Home Assignments

NAME OF THE TOPIC: simplex method

Lecture No. : 5

- Solving Linear Programming Problem by Simplex Method for Maximization Objective Function for two variables.
- Finding Optimal Solution using Simplex Method.

❖ *CASE STUDY/EXAMPLES:* Practical Problems

❖ *INNOVATIVE PRACTICES:* Home Assignments

Lecture No. : 6

- Solving Linear Programming Problem by Simplex Method for Maximization Objective Function for more than two variables.
- Finding Optimal Solution using Simplex Method.

❖ *CASE STUDY/EXAMPLES:* Practical Problems

❖ *INNOVATIVE PRACTICES:* Home Assignments

Lecture No. : 7

- Solving Linear Programming Problem by Simplex Method for Minimization Objective Function for two variables.

- Finding Optimal Solution using Simplex Method.

❖ ***CASE STUDY/EXAMPLES:*** Practical Problems

❖ ***INNOVATIVE PRACTICES:*** Home Assignments

Lecture No. : 8

- Solving Linear Programming Problem by Simplex Method for Minimization Objective Function for more than two variables.
- Finding Optimal Solution using Simplex Method.

❖ ***CASE STUDY/EXAMPLES:*** Practical Problems

❖ ***INNOVATIVE PRACTICES:*** Home Assignments

NAME OF THE TOPIC: big m method

Lecture No. : 9

- Solving Linear Programming Problem by Simplex Method for Minimization Objective Function for two variables.
- Finding Optimal Solution using Big M Method.

❖ ***CASE STUDY/EXAMPLES:*** Practical Problems

❖ ***INNOVATIVE PRACTICES:*** Home Assignments

Lecture No. : 10

- Solving Linear Programming Problem by Big M Method for Minimization Objective Function for more than two variables.
- Finding Optimal Solution using Big M Method.

❖ ***CASE STUDY/EXAMPLES:*** Practical Problems

❖ ***INNOVATIVE PRACTICES:*** Home Assignments

NAME OF THE TOPIC: primal &duality

Lecture No. : 11.

- Introduction of Primal, its advantages and Limitation.

Lecture No. : 12

- Introduction of Dual, its advantages and Limitation.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 13

- Use of Duality in solving Linear Programming Problem.

Lecture No. : 14

- Relationship between optimum solution to Primal and Dual.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 15

- A revision of all important concepts, terms and definitions, and all formulae.
- A short class test on the same.

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❖ *INNOVATIVE PRACTICES:* Class tests

GOVERNMENT OF MAHARASHTRA'S
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LECTURE PLAN

NAME OF THE LECTURER : SONALI THIK
DEPARTMENT: STATISTICS
CLASS : S.Y.B.SC.
PAPER : III
UNIT NO.: 2
research

SUBJECT : STATISTICS

UNIT TITLE : operation

Credit BASED semester

NAME OF THE TOPIC: transportation Problem

Lecture No. : 1

- Introduce concept of need for Transportation Problem by giving suitable examples
- Formally define Transportation Problem.

Lecture No. : 2

- Illustrate the Mathematical Formulation of Transportation Problem.
- Different types of Solutions possible in Transportation Problem.

Lecture No. : 3

- Stating the different methods for solving the Transportation Problem: North – West Corner Rule, Matrix Minima Method, Vogel's Approximation Method.

Lecture No. : 4

- Explain the procedure of North – west Corner Rule.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 5

- Explain the procedure of Matrix Minima Method.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 6

- Explain the procedure of Vogel's Approximation Method.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 7

- Comparison on the method of Transportation Problem, between North West Corner Rule, Matrix Maxima Method, Vogel's Approximation Method

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

NAME OF THE TOPIC: modi method

Lecture No. : 8

- Explain the procedure for obtaining optimal solution for the transportation problem by MODI Method.

Lecture No. : 9

- Obtaining optimal solution for the transportation problem by MODI Method for North – West Corner Rule.

Lecture No. : 10

- Obtaining optimal solution for the transportation problem by MODI Method for Matrix Maxima Method.

Lecture No. : 11

- Obtaining optimal solution for the transportation problem by MODI Method for Vogel's Approximation Method.

NAME OF THE TOPIC: transportation problem

Lecture No. : 12.

- Introduction of Optimality Test, its advantages and Limitation.

Lecture No. : 13

- Finding any Improvement procedure for solving the Transportation Problem.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 14

- Variants in Transportation Problem: Unbalanced and Maximization type.

Lecture No. : 15

- A revision of all important concepts, terms and definitions, and all formulae.
- A short class test on the same.

❖ ***INNOVATIVE PRACTICES:*** Class tests

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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER : SONALI THIK
DEPARTMENT: STATISTICS
CLASS : S.Y.B.SC. **SUBJECT :** STATISTICS
PAPER: III
UNIT NO.: 3 **UNIT TITLE :** operation research
NAME OF THE TOPIC: assignment problem

NAME OF THE TOPIC: assignment problem

Lecture No. : 1

- Explain the concept of Assignment Problem.
- Situation where Sequencing Problem can be applied.

Lecture No. : 2

- Formulation of Assignment Problem with different situations.

❖ ***INNOVATIVE PRACTICES : Assignments***

Lecture No. : 3

- Stating different method for getting the solution for the Assignment Problem.

Lecture No. : 4

- Explain the concept and procedure for obtaining solution for Assignment Problem by Complete-Enumeration Method.

Lecture No. : 5

- Explain the concept and procedure for obtaining solution for Assignment Problem by Hungarian Method.

❖ ***CASE STUDY/EXAMPLES: Practice problems from Reference books***

Lecture No. : 6

- Explain the concept and procedure for obtaining solution for Assignment Problem in Unbalanced type.
- To see the variants in Assignment problem of unbalanced type.

Lecture No. : 7

- Explain the concept and procedure for obtaining solution for Assignment Problem in Maximization type.
- To see the variants in Assignment problem of Maximization type.

❖ *CASE STUDY/EXAMPLES: Practice problems from Reference books*
❖ *INNOVATIVE PRACTICES: Assignments*

Lecture No. : 8

- Explain the concept and procedure for obtaining solution for Assignment Problem in Travelling Salesman Problem

Lecture No. : 9

- Explain the concept and procedure for obtaining solution for Assignment Problem in Travelling Salesman Problem.
- To see the variants in Assignment problem of Maximization type.

❖ *CASE STUDY/EXAMPLES: Practice problems from Reference books*

❖ *INNOVATIVE PRACTICES: Assignments*

Lecture No. : 10

- A revision of all important concepts, terms and definitions, theorems and proofs and all formulae.

- A short class test on the same
  ❖ *INNOVATIVE PRACTICES: Class test*

NAME OF THE TOPIC: sequencing problem

Lecture No. : 11

- Introduction to the concept of Sequencing Problem.

- Situation where Sequencing Problem can be applied.

Lecture No. : 12

- Processing n jobs through ' 2 ' machines procedure and examples based on it.

❖ **INNOVATIVE PRACTICES**: Assignments.

Lecture No. : 13

- Processing n jobs through ' 3 ' machines procedure and examples based on it.

❖ **INNOVATIVE PRACTICES**: Assignments.

Lecture No. : 14

- Processing n jobs through ' m ' machines procedure and examples based on it.

❖ **INNOVATIVE PRACTICES**: Assignments.

Lecture No. : 15

- A revision of all important concepts, terms and definitions, theorems and proofs and all formulae.
- A short class test on the same

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SECOND YEAR B.SC sTATISTICS PAPER III COURSE

SEMESTER IV

2021-22

Lecture plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER : SONALI THIK
DEPARTMENT: STATISTICS
CLASS : S.Y.B.SC.
SUBJECT : STATISTICS
PAPER :III
UNIT NO.: 1
UNIT TITLE : CPM AND PERT

NAME OF THE TOPIC: Cpm

Lecture No. : 1

- Introduce the concept of Critical Path Method as one of the major branches of Project Management, its importance and necessity.
- Begin at the very beginning by introducing and defining concepts integral to the Objective of the techniques.

Lecture No. : 2

- Rules and regulation for drawing the network diagram.
- Diagrammatic representation of activities in a project by Gantt Chart.

❖ ***INNOVATIVE PRACTICES:*** Classroom presentations.

Lecture No. : 3

- Rules and regulation for drawing the network diagram.
- Diagrammatic representation of activities in a project by Network Diagram.

❖ ***INNOVATIVE PRACTICES:*** Classroom presentations.

Lecture No. : 4

- Stating different types of float, Slack time.
- Steps for obtaining float, and slack time.
- Importance of slack time.

Lecture No. : 5

- Procedure for determining the critical path for the given network diagram.
- Determining the project duration .

❖ ***INNOVATIVE PRACTICES:*** Practical problem from reference book.

NAME OF THE TOPIC: pert

Lecture No. : 6

- Introduce the concept of Project Evaluation Review Technique as one of the major branches of Project Management, its importance and necessity.
- Begin at the very beginning by introducing and defining concepts integral to the Objective of the techniques.

Lecture No. : 7

- Rules and regulation for drawing the network diagram.
- Diagrammatic representation of activities in a project by Gantt Chart.

❖ ***INNOVATIVE PRACTICES:*** Classroom presentations.

Lecture No. : 8

- Rules and regulation for drawing the network diagram.
- Diagrammatic representation of activities in a project by Network Diagram.

❖ ***INNOVATIVE PRACTICES:*** Classroom presentations.

Lecture No. : 9

- Stating different types of float, Slack time.
- Steps for obtaining float, and slack time.
- Importance of slack time.

Lecture No. : 10

- Procedure for determining the critical path for the given network diagram And comparing the difference between CPM and PERT.
- Determining the project duration.

❖ ***INNOVATIVE PRACTICES:*** Practical problem from reference book.

Lecture No. : 11

- Procedure for determining the probability consideration in project scheduling..
- Determining the project duration.

❖ ***INNOVATIVE PRACTICES:*** Practical problem from reference book.

Lecture No. : 12

- Objective of Project cost analysis.
- Steps for finding the crash time.

❖ ***INNOVATIVE PRACTICES:*** Practical problem from reference book.

Lecture No. : 13

- Continuation of Project cost analysis.
- Steps for finding the crash time.

❖ ***INNOVATIVE PRACTICES:*** Practical problem from reference book.

Lecture No. : 14

- Objective of Updating
- Steps for Updating the network diagram.

❖ ***INNOVATIVE PRACTICES:*** Presentation.

Lecture No. : 15

- A revision of all important concepts, terms and definitions, and all formulae.
- A short class test on the same.

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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER : SONALI THIK
DEPARTMENT: STATISTICS
CLASS : S.Y.B.SC. **SUBJECT :** STATISTICS
PAPER :III
UNIT NO.: 2
UNIT TITLE : GAME THEORY

Lecture 1: Introduction to Game Theory

- Definition and importance of game theory in economics and decision-making
- -Overview of the basic concepts including players, strategies, payoffs, and equilibrium

Lecture 2: Two-Person Zero Sum Game

- Definition and characteristics of a two-person zero-sum game
- Explanation of the concept of a saddle point and its significance in game theory

Lecture 3: Value of the Game

- Understanding the value of the game and its calculation in two-person zero-sum games
- Discussion on the optimal strategies for players to maximize their payoffs

Lecture 4: Pure and Mixed Strategies

- Definition and explanation of pure and mixed strategies in game theory
- Understanding the concept of Nash equilibrium and its application in strategic decision-making

Lecture 5: Optimal Solution of Two-Person Zero Sum Games

- Explanation of the dominance property and its role in identifying optimal strategies
- Derivation of formulae for solving (2x2) games using dominance property

and linear programming

Lecture 6: Graphical Solution of (2xn) Games

- Introduction to graphical methods for solving (2xn) games
- Understanding the graphical representation of payoff matrices and identifying optimal strategies

Lecture 7: Graphical Solution of (mx2) Games

- Explanation of graphical methods for solving (mx2) games
- Application of graphical techniques to analyze and solve (mx2) games efficiently

Lecture 8: Reduction of Game Theory to Linear Programming Problems

- Introduction to the concept of reducing game theory problems to linear programming problems
- Understanding the mathematical formulation and solution methods for converting game theory to linear programming

Lecture 9: Linear Programming Formulation

- Detailed explanation of the linear programming formulation for game theory problems
- Solving examples and exercises to illustrate the conversion of game theory problems to linear programming

Lecture 10: Applications of Game Theory

- Analysis of real-world applications of game theory in various fields such as economics, politics, and biology
- Examination of strategic interactions and decision-making processes using game theory models

Lecture 11: Extensive Form Games

- Introduction to extensive form games and their representation using game trees
- Understanding the concepts of subgame perfection and backward induction in extensive form games

Lecture 12: Evolutionary Game Theory

- Explanation of evolutionary game theory and its application in modeling biological and social systems
- Understanding the dynamics of strategy evolution and stability in evolutionary game theory

Lecture 13: Cooperative Game Theory

- Introduction to cooperative game theory and its focus on coalition formation and cooperative behavior
- Understanding solution concepts such as the core, Shapley value, and Nash bargaining solution in cooperative games

Lecture 14: Behavioral Game Theory

- Overview of behavioral game theory and its integration with insights from psychology and neuroscience
- Analysis of bounded rationality, fairness, and other behavioral factors in strategic decision-making

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in Unit II: Game Theory
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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LECTURE PLAN

NAME OF THE LECTURER : SONALI THIK
DEPARTMENT: STATISTICS

CLASS : S.Y.B.SC.
PAPER :III
UNIT NO.: 3
UNIT TITLE : decision THEORY

SUBJECT : STATISTICS

Lecture 1: Introduction to Decision Theory

- Definition and importance of decision theory in decision-making under uncertainty and risk
- Overview of the basic concepts including decision criteria and decision-making frameworks

Lecture 2: Decision Making under Uncertainty

- Explanation of decision-making under uncertainty and its challenges
- Introduction to Laplace criterion, Maximax (Minimin) criterion, and Maximin (Minimax) criterion for decision-making

Lecture 3: Laplace Criterion

- Detailed explanation of the Laplace criterion and its application in decision-making
- Understanding the principle of equal probabilities and its role in the Laplace criterion

Lecture 4: Maximax and Maximin Criterion

- Explanation of the Maximax and Maximin criteria for decision-making under uncertainty
- Understanding the principles of optimism and pessimism in decision-making

Lecture 5: Hurwicz and Minimax Regret Criteria

- Introduction to the Hurwicz criterion and its interpretation in decision-making
- Explanation of the Minimax Regret criterion and its application in minimizing potential regrets

Lecture 6: Decision Making under Risk

- Explanation of decision-making under risk and its characteristics
- Introduction to the Expected Monetary Value (EMV) criterion and Expected Opportunity Loss (EOL) criterion

Lecture 7: Expected Monetary Value (EMV)

- Detailed explanation of the EMV criterion and its calculation in decision-making
- Understanding how to calculate the expected payoff for each decision alternative

Lecture 8: Expected Opportunity Loss (EOL)

- Explanation of the EOL criterion and its application in evaluating decision alternatives
- Understanding how to calculate the expected loss associated with each decision alternative

Lecture 9: EPPI and EVPI

- Introduction to Expected Posterior Probability of Improvement (EPPI) and Expected Value of Perfect Information (EVPI)
- Understanding the concepts of uncertainty reduction and information value in decision-making

Lecture 10: Bayesian Decision Rule for Posterior Analysis

- Explanation of the Bayesian decision rule and its application in decision-making under uncertainty
- Understanding how to incorporate prior probabilities and likelihoods into decision-making

Lecture 11: Decision Tree Analysis

- Introduction to decision tree analysis and its use in structuring decision problems
- Explanation of how to construct and analyze decision trees for decision-making under uncertainty and risk

Lecture 12: Posterior Probabilities in Decision Trees

- Understanding the concept of posterior probabilities and their role in decision tree analysis
- Calculation of posterior probabilities and their incorporation into decision-making

Lecture 13: Case Studies and Examples

- Analysis of real-world case studies and examples illustrating the application of decision theory concepts
- Examination of decision-making processes in various contexts including business, finance, and healthcare

Lecture 14: Advanced Topics

- Exploration of advanced topics and extensions in decision theory
- Discussion of topics such as decision theory applications in game theory, behavioral economics, and machine learning

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in Unit III: Decision Theory
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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Credit BASED semester AND GRADING SYSTEM OF UNIVERSITY OF MUMBAI

THIRD YEAR B.SC

Descriptive Statistics COURSE

SEMESTER V

Academic Year: 2021-22

Lecture Plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE
LECTURE PLAN

Academic Year 2021-22

NAME OF THE LECTURER: Ms. Sonali Thik

DEPARTMENT: STATISTICS

CLASS: T.Y.B.Sc.

SUBJECT: PROBABILITY AND DISTRIBUTION THEORY (Paper-I)

UNIT NO.: I UNIT TITLE: - Probability

Lecture 1: Introduction to Probability

- Definition of a random experiment
- Understanding outcomes and events
- Introduction to sample space and its significance
- Basic properties of events: complementary, mutually exclusive, exhaustive, and equally likely events

Lecture 2: Types of Probability

- Mathematical probability: Definition and examples
- Statistical probability: Introduction and differences from mathematical probability
- Axiomatic probability: Foundations and principles
- Subjective probability: Understanding subjective judgments and applications

Lecture 3: Addition Theorem

- Addition theorem for two events: Definition and proof
- Application of addition theorem in probability calculations
- Examples and exercises demonstrating addition theorem for two events

Lecture 4: Addition Theorem (contd.)

- Addition theorem for three events: Definition and proof
- Application of addition theorem in probability calculations for three events
- Examples and exercises demonstrating addition theorem for three events

Lecture 5: Conditional Probability

- Introduction to conditional probability
- Multiplication theorem for two events: Definition and proof
- Application of multiplication theorem in probability calculations
- Examples and exercises demonstrating multiplication theorem for two events

Lecture 6: Conditional Probability (contd.)

- Multiplication theorem for three events: Definition and proof
- Application of multiplication theorem in probability calculations for three events
- Examples and exercises demonstrating multiplication theorem for three events

Lecture 7: Bayes' Theorem

- Introduction to Bayes' theorem
- Understanding the formula and its derivation
- Application of Bayes' theorem in real-life scenarios
- Examples and exercises applying Bayes' theorem

Lecture 8: Theorems on Probability of Realization

- Theorem on probability of realization of at least one event
- Theorem on probability of realization of exactly m events
- Theorem on probability of realization of at least m of N events
- Application of theorems in classical occupancy problems, matching, and guessing problems

Lecture 9: Theorems on Probability of Realization (contd.)

- Further examples and exercises on theorems of probability realization
- Application of theorems in practical scenarios and problem-solving

Lecture 10: Classical Occupancy Problems

- Introduction to classical occupancy problems
- Understanding the concept and its relevance in probability theory
- Solving classical occupancy problems using probability theorems

Lecture 11: Matching and Guessing Problems

- Introduction to matching and guessing problems
- Understanding different types of problems and their variations

- Solving matching and guessing problems using probability concepts

Lecture 12: Examples and Problem Solving

- Review of concepts covered in previous lectures
- Solving a variety of problems integrating multiple probability concepts
- Class discussion and problem-solving sessions

Lecture 13: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios
- Application of probability concepts in real-world situations
- Group activities and discussions to enhance understanding

Lecture 14: Review and Practice

- Review of key concepts, theorems, and formulas covered throughout the unit
- Practice problems and exercises for reinforcement
- Q&A session to address any lingering doubts or questions

Lecture 15: Final Assessment

- Comprehensive assessment covering all topics discussed in the unit
- Evaluation of students' understanding and application of probability concepts
- Feedback session and discussion on areas for improvement

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GOVERNMENT OF MAHARASHTRA'S
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LECTURE PLAN

NAME OF THE LECTURER: Ms. Sonali Thik

DEPARTMENT: **STATISTICS**

CLASS: **T.Y.B.Sc.**

SUBJECT: **PROBABILITY AND DISTRIBUTION THEORY (Paper-I)**

UNIT NO.: II UNIT TITLE: - Inequality and law of large numbers

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Lecture 1: Introduction to Inequalities

- Overview of the importance of inequalities in probability theory and statistics
- Introduction to various types of inequalities and their applications
- Outline of the topics to be covered in the unit

Lecture 2: Markov Inequality

- Definition and statement of Markov's inequality
- Derivation and proof of Markov's inequality
- Applications of Markov's inequality in probability and statistics
- Examples illustrating the use of Markov's inequality in real-world scenarios

Lecture 3: Tchebyshev's Inequality

- Introduction to Tchebyshev's inequality
- Derivation and proof of Tchebyshev's inequality
- Comparison of Tchebyshev's inequality with Markov's inequality
- Practical applications of Tchebyshev's inequality in probability and statistics

Lecture 4: Boole's Inequality

- Definition and statement of Boole's inequality
- Explanation of Boole's inequality in terms of probabilities of union events
- Derivation and proof of Boole's inequality
- Examples demonstrating the use of Boole's inequality in probability calculations

Lecture 5: Cauchy-Schwarz's Inequality

- Introduction to Cauchy-Schwarz's inequality
- Statement and proof of Cauchy-Schwarz's inequality
- Applications of Cauchy-Schwarz's inequality in probability and statistics
- Illustrative examples showcasing the utility of Cauchy-Schwarz's inequality

Lecture 6: Weak Law of Large Numbers

- Overview of the law of large numbers and its significance in probability theory
- Statement and explanation of the weak law of large numbers
- Proof and understanding of the weak law of large numbers
- Real-world implications and applications of the weak law of large numbers

Lecture 7: Applications of Inequalities

- Review of the inequalities covered so far: Markov, Tchebyshev, Boole, Cauchy-Schwarz
- Practical applications of inequalities in various statistical and probabilistic scenarios
- Case studies and examples demonstrating the use of inequalities in data analysis and inference

Lecture 8: Examples and Problem Solving

- Solving problems and exercises related to Markov, Tchebyshev, Boole, and Cauchy-Schwarz inequalities
- Application of inequalities to analyze and interpret real-world data
- Group activities and discussions to reinforce understanding of inequality concepts

Lecture 9: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of inequalities through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of inequality principles

Lecture 10: Review and Practice

- Review of key concepts, definitions, and theorems related to inequalities

- Practice problems and exercises to reinforce understanding and mastery of inequality concepts
- Q&A session to address any lingering doubts or questions about inequalities

Lecture 11: Review and Practice (contd.)

- Continued review and practice session, focusing on areas where students may need additional reinforcement
- Application of inequalities to solve practical problems and case studies
- Individualized assistance and feedback to support students' learning goals

Lecture 12: Case Studies and Applications

- Analysis of real-world case studies using inequalities
- Examination of how inequalities are applied in various fields such as finance, economics, and engineering
- Discussion of the limitations and assumptions of inequalities in practical applications

Lecture 13: Advanced Topics in Inequalities

- Exploration of advanced topics in inequalities, such as the Jensen's inequality and Holder's inequality
- Statement, proof, and application of Jensen's inequality
- Statement, proof, and application of Hölder's inequality
- Comparison of these advanced inequalities with the ones previously covered

Lecture 14: Advanced Applications and Extensions

- Application of advanced inequalities to solve complex problems and analyze data
- Extensions of inequality concepts to higher dimensions and more general scenarios
- Discussion of recent developments and research trends in inequality theory

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on inequalities and the law of large numbers
- Final assessment to evaluate students' understanding and mastery of inequality concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE
LECTURE PLAN

NAME OF THE LECTURER: Ms. Sonali Thik

DEPARTMENT: **STATISTICS**

CLASS: **T.Y.B.Sc.**

SUBJECT: **PROBABILITY AND DISTRIBUTION THEORY (Paper-I)**

UNIT NO.: III UNIT TITLE: - Joint moment generating function, trinomial distribution and multinomial Distribution

Lecture 1: Introduction to Moment Generating Function (MGF)

- Definition and properties of Moment Generating Function (MGF) for two random variables of discrete and continuous type
- Understanding the role of MGF in characterizing probability distributions
- Necessary and Sufficient conditions for the independence of two random variables
- Concept and definition of Bivariate MGF

Lecture 2: Joint Moment Generating Function (MGF)

- Introduction to Bivariate MGF and its significance in analyzing joint distributions
- Derivation and properties of Joint Moment Generating Function
- Application of Bivariate MGF in determining moments and other statistical properties
- Examples illustrating the computation and interpretation of Bivariate MGF

Lecture 3: Trinomial Distribution

- Definition and characteristics of the trinomial distribution
- Joint probability distribution of (X, Y) in trinomial distribution
- Calculation of joint moment generating function and moments
- Analysis of marginal and conditional distributions, means, and variances

Lecture 4: Trinomial Distribution (contd.)

- Continued discussion on the trinomial distribution
- Exploration of the correlation coefficient between (X, Y)
- Distribution of the sum X+Y in trinomial distribution
- Application of trinomial distribution in real-world scenarios

Lecture 5: Multinomial Distribution

- Introduction to Multinomial distribution with parameters (n, (p_1), (p_2), ..., (p_{k-1})) where (p_1 + p_2 + ... + p_{k-1} + p_k = 1)
- Definition and characteristics of the multinomial distribution
- Expression for joint MGF in multinomial distribution
- Derivation of joint probability distribution of ((X_i), (X_j)) in multinomial distribution

Lecture 6: Multinomial Distribution (contd.)

- Continued discussion on the multinomial distribution
- Calculation of conditional probability distribution of (X_i) given (X_j)
- Analysis of the relationship between different categories in multinomial experiments
- Examples demonstrating the application of multinomial distribution in practical situations

Lecture 7: Applications of Joint MGF, Trinomial, and Multinomial Distributions

- Review of concepts covered in previous lectures
- Practical applications of joint moment generating function, trinomial, and multinomial distributions in statistics, finance, and engineering
- Case studies and examples showcasing the utility of these distributions in data analysis and modeling

Lecture 8: Examples and Problem Solving

- Solving problems and exercises related to joint moment generating function, trinomial, and multinomial distributions
- Application of distributions to analyze and interpret data from experiments and surveys
- Group activities and discussions to reinforce understanding of distribution concepts

Lecture 9: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of joint moment generating function, trinomial, and multinomial distributions through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of distribution principles

Lecture 10: Review and Practice

- Review of key concepts, definitions, and theorems related to joint moment generating function, trinomial, and multinomial distributions
- Practice problems and exercises to reinforce understanding and mastery of distribution concepts
- Q&A session to address any lingering doubts or questions about distributions

Lecture 11: Review and Practice (contd.)

- Continued review and practice session, focusing on areas where students may need additional reinforcement
- Application of distributions to solve practical problems and case studies
- Individualized assistance and feedback to support students' learning goals

Lecture 12: Advanced Topics in Joint MGF and Multinomial Distribution

- Exploration of advanced topics in joint moment generating function and multinomial distribution
- Analysis of special cases and extensions of these distributions
- Discussion of recent developments and research trends in joint MGF and multinomial distribution theory

Lecture 13: Advanced Applications and Extensions

- Application of advanced concepts in joint moment generating function and multinomial distribution to solve complex problems and analyze data
- Extensions of distribution concepts to higher dimensions and more general scenarios
- Exploration of open research questions and areas for future study

Lecture 14: Practical Examples

- Analysis of real-world case studies using joint moment generating function, trinomial, and multinomial distributions
- Discussion of the limitations and assumptions of these distributions in practical applications

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on joint moment generating function, trinomial, and multinomial distributions

- Final assessment to evaluate students' understanding and mastery of distribution concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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LECTURE PLAN

NAME OF THE LECTURER: Ms. Sonali Thik

DEPARTMENT: STATISTICS

CLASS: T.Y.B.Sc.

SUBJECT: PROBABILITY AND DISTRIBUTION THEORY (Paper-I)

UNIT NO.: IV UNIT TITLE: - Order Statistics

Lecture 1: Introduction to Order Statistics

- Overview of order statistics and their importance in statistical analysis
- Definition of order statistics based on a random sample
- Explanation of the role of order statistics in understanding the distribution of sample data

Lecture 2: Cumulative Distribution Function of the r^{th} Order Statistic

- Derivation of the cumulative distribution function (CDF) of the order statistic
- Interpretation of the r^{th} order statistic's CDF in terms of probability of observing values less than or equal to a given value
- Examples illustrating the computation and interpretation of the CDF for various distributions

Lecture 3: Probability Density Function of r^{th} Order Statistic

- Derivation of the probability density function (PDF) of the r^{th} order statistic
- Understanding the relationship between the PDF and the CDF of order statistics
- Application of the PDF in calculating probabilities and expected values for order statistics

Lecture 4: Joint Probability Density Function of r^{th} and s^{th} Order Statistic ($r < s$)

- Derivation of the joint probability density function (PDF) of the r^{th} and s^{th} order statistics, where ($r < s$)
- Analysis of the dependence structure between different order statistics
- Illustrative examples demonstrating the computation and interpretation of joint PDFs

Lecture 5: Joint Probability Density Functions of All (n) Ordered Statistics

- Derivation of the joint probability density function (PDF) of all (n) ordered statistics
- Understanding the multivariate nature of joint PDFs for order statistics
- Application of joint PDFs in analyzing the distribution of entire sample data sets

Lecture 6: Distribution of Maximum and Minimum Observations

- Analysis of the distribution of the maximum (nth order statistic) and minimum (first order statistic) observations
- Special cases of uniform and exponential distributions for maximum and minimum observations
- Derivation and interpretation of distribution functions for maximum and minimum observations

Lecture 7: Distribution of Maximum and Minimum Observations (contd.)

- Continued discussion on the distribution of maximum and minimum observations
- Comparison of distribution properties between different types of distributions
- Examples illustrating the application of distribution functions for maximum and minimum observations

Lecture 8: Probability Density Function of the Difference Between r^{th} and s^{th} Order Statistic ($r < s$)

Derivation of the probability density function (PDF) of the difference between the r^{th} and s^{th} order statistics, where ($r < s$)

Understanding the distribution of differences between order statistics

Application of PDFs for differences in analyzing variability and spread within a sample

Lecture 9: Probability Density Function of the Difference Between r^{th} and s^{th} Order Statistic ($r < s$) (contd.)

- Continued discussion on the PDF of the difference between order statistics
- Exploration of special cases and properties of PDFs for differences
- Examples demonstrating the computation and interpretation of PDFs for differences

Lecture 10: Applications of Order Statistics

- Review of concepts covered in previous lectures

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- Practical applications of order statistics in various fields such as finance, engineering, and medicine
- examples showcasing the utility of order statistics in data analysis and inference

Lecture 11: Examples and Problem Solving

- Solving problems and exercises related to order statistics
- Application of order statistics to analyze and interpret real-world data sets
- Group activities and discussions to reinforce understanding of order statistic concepts

Lecture 12: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of order statistics through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of order statistic principles

Lecture 13: Review and Practice

- Review of key concepts, definitions, and theorems related to order statistics
- Practice problems and exercises to reinforce understanding and mastery of order statistic concepts
- Q&A session to address any lingering doubts or questions about order statistics

Lecture 14: Review and Practice (contd.)

- Continued review and practice session, focusing on areas where students may need additional reinforcement
- Application of order statistics to solve practical problems and case studies
- Individualized assistance and feedback to support students' learning goals

Lecture 15: Advanced Topics and Extensions

- Exploration of advanced topics and extensions in order statistics
- Analysis of special cases and applications in non-standard distributions
- Discussion of recent developments and research trends in order statistics theory

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third YEAR B.SC

sTATISTICS PAPER Iv

COURSE

SEMESTER v

2021-22

Lecture plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK

DEPARTMENT: STATISTICS
CLASS: I.Y.B.SC. **SUBJECT:** STATISTICS **PAPER :** Iv
UNIT NO.: 1 **UNIT TITLE:** FUNDAMENTALS OF R

NAME OF THE TOPIC:introduction about R

Lecture No. : 1

- Introduction to R
- Features of R
- Installation of R
- Starting and ending R session
- Getting help in R
- Value assigning to variables

NAME OF THE TOPIC: Basic Operations

Lecture No. : 2

- Addition
- Subtraction
- Multiplication
- Division
- Power
- Square root

NAME OF THE TOPIC: Numerical functions

Lecture No. : 3

- log 10
- log
- sort
- max
- unique
- dim

NAME OF THE TOPIC:problem solving

Lecture No. : 4

- Based on previous lectures solved some examples

  ❖ CASE STUDY/EXAMPLES:Solving Examples based on previous lectures

  ❖ INNOVATIVE PRACTICES : Home Assignments

Lecture No. : 5

- range
- length
- var
- prod
- sum
- summary

NAME OF THE TOPIC: Data Types

Lecture No. : 6

- Vector
- List
- Matrices
- Array
- Data frame

NAME OF THE TOPIC: Variable Type

Lecture No. : 7

- Logical
- Numeric
- Integer
- Complex
- Character and factor

NAME OF THE TOPIC:problem solving

Lecture No. : 8

- Based on previous lectures solved some examples
  - ❖ CASE STUDY/EXAMPLES:Solving Examples based on previous lectures
  - ❖ INNOVATIVE PRACTICES : Home Assignments

NAME OF THE TOPIC: Data Manipulation

Lecture No. : 9

- Selecting random N rows
- Removing duplicate row(s)
- Dropping a variable(s)

- Renaming variable(s)
- Sub setting data

Lecture No. : 10

- Creating a new variable(s)
- Selecting of random fraction of row(s)
- Appending of row(s) and column(s)
- Simulation of variables.

NAME OF THE TOPIC: Data Processing

Lecture No. : 11

- Data import and export
- Setting working directory
- Checking structure of Data :Str(), Class(), Changing type of variable

NAME OF THE TOPIC:problem solving

Lecture No. : 12

- Based on previous lectures solved some examples

  ❖ CASE STUDY/EXAMPLES:Solving Examples based on previous lectures

  ❖ INNOVATIVE PRACTICES : Home Assignments

NAME OF THE TOPIC: Data Visualization using ggplot

Lecture No. : 13

- Simple bar diagram
- subdivided bar diagram
- multiple bar diagram pie diagram

Lecture No. : 14

- Box plot for one and more variables
- Histogram
- frequency polygon

- scatter plot

NAME OF THE TOPIC:problem solving

Lecture No. : 15

- Based on previous lectures solved some examples
  - ❖ CASE STUDY/EXAMPLES:Solving Examples based on previous lectures
  - ❖ INNOVATIVE PRACTICES : Home Assignments

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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: I.Y.B.SC. **SUBJECT:** STATISTICS **PAPER** : Iv
UNIT NO.: 2 **UNIT TITLE:** simple linear regression model

NAME OF THE TOPIC: introduction

Lecture No. : 1

- Explanation about correlation
- Nature of correlation
- Interpretation
- Graphical representation

Lecture No. : 2

- Explanation about Regression analysis with examples
- Explain concept of Linearity with examples

NAME OF THE TOPIC: Simple linear regression model

Lecture No. : 3

- Briefly explanation about the simple linear regression model
- Deterministic model
- Residuals
- Homoscedasticity
- Multicollinearity

NAME OF THE TOPIC: assumptions and properties of the model

Lecture No. : 4

- Assumption of the linear regression model
- Properties of the OLS estimates
- Expectation and variance of Y

NAME OF THE TOPIC: estimation of regression coefficients

Lecture No. : 5

- Derivation to obtain estimation of regression coefficients

Lecture No. : 6

- Concept of sum of squares

Lecture No. : 7

- Concept of degrees of freedom

NAME OF THE TOPIC: relationship between total, regression and error sum of squares

Lecture No. : 8

- Mathematical expression to show the relationship between total, regression and error sum of squares

NAME OF THE TOPIC: estimation of population variance

Lecture No. : 9

- Derivation to find out estimated value of the variance.

NAME OF THE TOPIC: Coefficient of determination and adjusted R^2

Lecture No. : 10

- Coefficient of determination R^2
- Adjusted R^2

NAME OF THE TOPIC: Procedure of testing significance

Lecture No. : 11, 12

Procedure of testing

a) Overall significance of the models

b) Significance of individual coefficients

c) Confidence intervals for the regression coefficients

NAME OF THE TOPIC: Data Pre-processing

Lecture No. : 13, 14 , 15

- Detection and treatment of missing value(s) and outliers
- Variable selection and Model building
- Interpretation of output produced by lm command in R.

- CASE STUDY/EXAMPLES: Solving Examples based on previous lectures
- INNOVATIVE PRACTICES : Home Assignments

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GOVERNMENT OF MAHARASHTRA'S
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LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: I.Y.B.SC. **SUBJECT:** STATISTICS **PAPER :** Iv
UNIT NO.: 3 **UNIT TITLE:** multiple linear regression model

NAME OF THE TOPIC: multiple linear regression model

Lecture No. :1, 2

- Derivation of ordinary least square (OLS) estimators of regression coefficients for multiple regression models

Lecture No. :3

- Coefficient of determination R^2
- Adjusted R^2

NAME OF THE TOPIC: Procedure of testing significance

Lecture No. :4, 5

- Overall significance of the models

❖ CASE STUDY/EXAMPLES: Solving Examples based on previous lectures

❖ INNOVATIVE PRACTICES : Home Assignments

Lecture No. :6

- Significance of individual coefficients

Lecture No. :7

- Confidence intervals for the regression coefficients

❖ CASE STUDY/EXAMPLES: Solving Examples based on previous lectures

❖ INNOVATIVE PRACTICES : Home Assignments

NAME OF THE TOPIC: Data Pre-processing

Lecture No. :8, 9

- Detection and treatment of missing value(s) and outliers

Lecture No. :10

- Variable selection

❖ CASE STUDY/EXAMPLES: Solving Examples based on previous lectures

❖ INNOVATIVE PRACTICES : Home Assignments

Lecture No. :11

- Model building

Lecture No. :12,13

- Interpretation of output produced by lm command in R.

Lecture No. :14, 15

- ❖ CASE STUDY/EXAMPLES: Solving Examples based on previous lectures
- ❖ INNOVATIVE PRACTICES : Home Assignments

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GOVERNMENT OF MAHARASHTRA'S
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LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: t.Y.B.SC. **SUBJECT:** STATISTICS **PAPER :** Iv
UNIT NO.: 4 **UNIT TITLE:** Validity of Assumptions

NAME OF THE TOPIC: Residual Diagnostics

Lecture No. :1

- Explanation about Residual

Lecture No. : 2

- Standardized residuals

Lecture No. : 3

- Studentized residuals

Lecture No. :5, 6

- Residual plots

Lecture No. :7

- Interpretation of four plots

lecture No. ; 8, 9

- Interpretation output produced by plot command in R and corrective measures such as transformation of response variable

lecture No. : 10

- Testing normality of data .

NAME OF THE TOPIC: autocorrelation

lecture No. : 11

- Autocorrelation: Concept and detection using Durbin Watson Test
- Interpretation of output produced by DW-test function in R

NAME OF THE TOPIC: Heteroscedasticity

lecture No. : 12

- Heteroscedasticity: Concept and detection using Breusch –Pagan-Godfrey Test
- Interpretation of output produced by bptest function in R,

NAME OF THE TOPIC: Multicollinearity

lecture No. : 12, 13

- Multicollinearity: Concept and detection using R
  - i) t-ratios
  - ii) pairwise correlation between repressors
  - iii) Variance Inflation Factor(VIF)

NAME OF THE TOPIC: Interpretation

lecture No. : 14

- Interpretation of output produced by mctest function in R,
- Consequences of using OLS estimators in presence of Autocorrelation,

lecture No. : 15

- Heteroscedasticity and Multicollinearity, Remedial measures,
- Ridge Regression : Concept and case study using R,

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PAPER Iv COURSE

SEMESTER vi

2021-22

Lecture plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: I.Y.B.SC. **SUBJECT:** STATISTICS **PAPER :** Iv
UNIT NO.: 1 **UNIT TITLE:** MORTALITY TABLES

NAME OF THE TOPIC: mortality functions

lecture No. : 1

- Various mortality functions
- Probabilities of living and dying

lecture No. : 2

- The force of mortality
- Central Mortality Rate

NAME OF THE TOPIC: Estimation of μ_x

lecture No. : 3

- Estimation of μ_x from the mortality table

NAME OF THE TOPIC: Laws of mortality

lecture No. : 4,5

- Gompertz's Laws of mortality

lecture No. : 6, 7, 8

- Makeham's first law of mortality

lecture No. : 9, 10

❖ CASE STUDY/EXAMPLES: Solving Examples based on previous lectures

❖ INNOVATIVE PRACTICES : Home Assignments

NAME OF THE TOPIC: mortality tables

lecture No. : 11, 12

- Select, Ultimate and Aggregate mortality tables

NAME OF THE TOPIC: Stationary population

lecture No. : 13

- Stationary population

lecture No. : 14, 15

- Expectation of life and Average life at death
  - ❖ CASE STUDY/EXAMPLES: Solving Examples based on previous lectures
  - ❖ INNOVATIVE PRACTICES : Home Assignments

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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: t.Y.B.SC. **SUBJECT:** STATISTICS **PAPER :** Iv
UNIT NO.: 2 **UNIT TITLE:** COMPOUND INTEREST AND ANNUITIES CERTAIN

NAME OF THE TOPIC: basic introduction

lecture No. : 1

- Accumulated value
- Present value

NAME OF THE TOPIC: rates of interest

lecture No. : 2

- Nominal and effective rates of interest
- Varying rates of interest

NAME OF THE TOPIC: Equation of value

lecture No. : 3

- Equation of value
- Equated time of payment

NAME OF THE TOPIC: Present and accumulated values of annuity without deferment period

lecture No. : 4

- Present and accumulated values of immediate annuity certain

lecture No. : 5

- Present and accumulated values of annuity due certain

NAME OF THE TOPIC: Present value for perpetuity

(immediate and due) with and without deferment Period

lecture No. : 6,7

- Present value of immediate perpetuity with and without deferment Period
- Present value of due perpetuity with and without deferment Period

NAME OF THE TOPIC: Present and accumulated values

lecture No. : 8

- Present and accumulated values of increasing annuity

lecture No. : 9

- Present and accumulated values of increasing annuity when successive installments form arithmetic progression

lecture No. : 10, 11

- Present and accumulated values of annuity with frequency different from that with which interest is convertible

NAME OF THE TOPIC: Redemption of loan

lecture No. : 12

- Redemption of loan

NAME OF THE TOPIC: examples

lecture No. : 13,14, 15

- ❖ CASE STUDY/EXAMPLES: Solving Examples based on previous lectures
- ❖ INNOVATIVE PRACTICES : Home Assignments

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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: I.Y.B.SC. **SUBJECT:** STATISTICS **PAPER** : Iv
UNIT NO.: 3 **UNIT TITLE:** LIFE ANNUITIES

NAME OF THE TOPIC: Present value in terms of commutation functions of Life annuities with deferment period.

lecture No. : 1, 2

- Present value in terms of commutation functions of Life annuities with deferment period.
  - Immediate

lecture No. : 3, 4

- Present value in terms of commutation functions of Life annuities with deferment period.
  - Due

lecture No. : 5, 6

- Present value in terms of commutation functions of Life annuities with deferment period.
  - Immediate Due

NAME OF THE TOPIC: Present value in terms of commutation functions of Life annuities without deferment period.

lecture No. ; 7, 8

- Present value in terms of commutation functions of Life annuities without deferment period.
  - Immediate

lecture No. : 9, 10

- Present value in terms of commutation functions of Life annuities without deferment period.
  - Due

lecture No. : 11, 12

- Present value in terms of commutation functions of Life annuities without deferment period.
  - Immediate Due

NAME OF THE TOPIC: Present value

lecture No. ; 13

- Present values of Variable

lecture No. : 14, 15

- Present values of Increasing life annuities and increasing Temporary life annuities (immediate and due).

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GOVERNMENT OF MAHARASHTRA'S
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LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: I.Y.B.SC. **SUBJECT:** STATISTICS **PAPER :** Iv
UNIT NO.: 4 **UNIT TITLE:** ASSURANCE BENEFITS

NAME OF THE TOPIC: Present value of Assurance

benefits in terms of commutation functions

lecture No. : 1

- Present value of Assurance benefits in terms of commutation functions pure endowment assurance.

lecture No. : 2

- Present value of Assurance benefits in terms of commutation functions temporary assurance

lecture No. : 3

- Present value of Assurance benefits in terms of commutation functions endowment assurance

lecture No. : 4

- Present value of Assurance benefits in terms of commutation functions whole life assurance

lecture No. : 5

- Present value of Assurance benefits in terms of commutation functions double endowment assurance

lecture No. : 6

- Present value of Assurance benefits in terms of commutation functions special endowment assurance

lecture No. : 7

- Present value of Assurance benefits in terms of commutation functions deferred temporary assurance

NAME OF THE TOPIC: Net premiums

lecture No. : 8, 9, 10, 11, 12, 13

- Net level annual premiums (including limited period of payment) for various assurance plans

NAME OF THE TOPIC: Examples

lecture No. : 14,15

❖ CASE STUDY/EXAMPLES: Solving Examples based on previous lectures

❖ INNOVATIVE PRACTICES : Home Assignments

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credit BASED semester AND GRADING SYSTEM

of

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FIRST YEAR B.SC

statistical methods

COURSE

SEMESTER I

2021-22

Lecture plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____

NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: F.Y.B.SC. **SUBJECT:** statistical methods (Paper-ii)
UNIT NO.: I **UNIT TITLE:** elementary probability theory

NAME OF THE TOPIC: basic concepts in probability

Lecture no. 1:

- Basic concepts: experiment, outcome, trial, sample space, sample point.
- Types of experiment with examples.

NAME OF THE TOPIC: events

Lecture no. 2:

- Events and its types with examples.

NAME OF THE TOPIC: probability definitions and limitations

Lecture no. 3:

- Definitions of probability and its limitations.

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 4:

- Examples based on previous lecture topics.

❖ INNOVATIVE PRACTICES: Home Assignment.

NAME OF THE TOPIC: probability counting rules

Lecture no. 5:

- Principle of sequential counting.

Lecture no. 6:

- Simple random sampling
  - SRS with replacement
  - SRS without replacement

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 7:

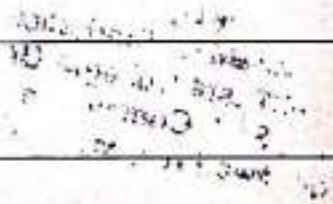
- Examples based on previous lecture topics.

❖ INNOVATIVE PRACTICES: Home Assignment.

NAME OF THE TOPIC: axioms of probability

Lecture no. 8:

- Explain axioms of probability.
- Theorems based on axioms.



NAME OF THE TOPIC: addition theorem

Lecture no. 9:

- State and prove addition theorem of probability (Total probability theorem).

Lecture no. 10:

- Theorems: (i) $P(A\,B) = P(A) + P(B)$, if A and B are mutually exclusive events.
  (ii) Boole's inequality
  (iii) Addition theorem for 3 events
  (iv) $P(A') = 1 - P(A)$

NAME OF THE TOPIC: CONDITIONAL PROBABILITY

Lecture no. 11:

- Introduction about conditional probability with the help of various examples.

❖ INNOVATIVE PRACTICES: Home Assignment.

NAME OF THE TOPIC: independent events

Lecture no. 12:

- Brief explanation about independent events with day-to-day life examples.
- Definition of independent events.

NAME OF THE TOPIC: examples based on CONDITIONAL PROBABILITY and independent events

Lecture no. 13:

- Examples based on conditional probability and independent events.

❖ INNOVATIVE PRACTICES: Home Assignment.

NAME OF THE TOPIC: theorems

Lecture no. 14:

- Explain theorems: (i) $0 P(A/B)\ 1$
  (ii) $P(S/B) = 1$
  (iii) $P[(A\,B)/C] = P(A/C) + P(B/C)$, if A, B and C are mutually exclusive.
  (iv) $P[(A\,B)/C] = P(A/C) + P(B/C) - P[(A\ B)/C]$
  (v) $P(A'/B) = 1 - P(A/B)$

NAME OF THE TOPIC: multiplication and bayes theorem

Lecture no. 15:

- State and prove multiplication theorem.
- State and prove bayes theorem.

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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: F.Y.B.SC. **SUBJECT:** statistical methods (Paper-ii)
UNIT NO.: ii
UNIT TITLE: concept of discrete random variable and properties of its probability distribution

NAME OF THE TOPIC: random variable

Lecture no. 1:

- Explain random variable with examples.
- Explain discrete random variable with various examples.

NAME OF THE TOPIC: probability mass function

Lecture no. 2:

- Define probability mass function with its properties.
- Examples based on p.m.f.

NAME OF THE TOPIC: conditional probability distribution function

Lecture no. 3:

- Define conditional probability distribution function with its properties.
- Define median and mode of the distribution.

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 4:

- Examples based on c.d.f.

❖ INNOVATIVE PRACTICES: Home Assignment.

NAME OF THE TOPIC: expectation

Lecture no. 5:

- Expectation definition and properties.

NAME OF THE TOPIC: moments

Lecture no. 6:

- Explain central and row moments
- Relationship between central and row moments

NAME OF THE TOPIC: skewness and kurtosis

Lecture no. 7:

- Explain skewness and kurtosis

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 8:

- Examples based on previous lecture topics.

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: discrete bivariate random variables

Lecture no. 9:

- Joint probability mass function
- Marginal probability mass function

- Conditional probability mass function

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 10:

- Examples based on previous lecture topics.

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: expectations of bivariate random variables

Lecture no. 11:

- Concept of expectation
- Addition theorem of expectation

Lecture no. 12:

- Multiplication theorem of expectation

NAME OF THE TOPIC: covariance

Lecture no. 13:

- Define covariance
- State and prove properties of covariance

NAME OF THE TOPIC: variance

Lecture no. 14:

- Theorem: variance of linear combination of two variables
- Some special cases based on same theorem

NAME OF THE TOPIC: correlation coefficient

Lecture no. 15:

- Define correlation coefficient and its properties
- Some examples based on it

❖ INNOVATIVE PRACTICES: Home Assignments

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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: F.Y.B.SC. **SUBJECT:** statistical methods (Paper-ii)
UNIT NO.: iii **UNIT TITLE:** standard discrete distributions

NAME OF THE TOPIC: discrete uniform distribution

Lecture no. 1:

- Definition of uniform distribution
- Define its p.m.f. and c.d.f.

Lecture no. 2:

- Properties of uniform distribution: mean, variance, skewness and kurtosis

NAME OF THE TOPIC: binomial distribution

Lecture no. 3:

- Definition of Bernoulli distribution and binomial distribution with its p.m.f.

Lecture no. 4:

- Properties of binomial distribution: mean, variance, mode

Lecture no. 5:

- Properties of uniform distribution: skewness and kurtosis, central moments, recurrence relationship between probabilities

NAME OF THE TOPIC: examples based on uniform and binomial distribution

Lecture no. 6:

- Examples based on uniform distribution

Lecture no. 7:

- Examples based on binomial distribution
- INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: Poisson distribution

Lecture no. 8:

- Definition of Poisson distribution
- Define its p.m.f.
- Properties of Poisson distribution: mean, variance

Lecture no. 9:

- Properties of Poisson distribution: mode, skewness and kurtosis, recurrence relationship between probabilities

Lecture no. 10:

- Comparison between binomial and Poisson distribution
- Examples based on Poisson distribution

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: hypergeometric distribution

Lecture no. 11:

- Definition of hypergeometric distribution
- Define its p.m.f.

Lecture no. 12:

- Properties of hypergeometric distribution: mean, variance

Lecture no. 13:

- Approximation of hypergeometric to binomial distribution

Lecture no. 14:

- Examples based on hypergeometric distribution

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: real life applications of the distributions

Lecture no. 15:

- Real life applications of the binomial distribution
- Real life applications of the Poisson distribution
- Real life applications of the hypergeometric distribution

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credit BASED semester AND GRADING SYSTEM of UNIVERSITY OF MUMBAI FIRST YEAR B.SC statistical methods COURSE

SEMESTER II

2021-22

Lecture plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: F.Y.B.SC. **SUBJECT:** statistical methods (Paper-ii)
UNIT NO.: I **UNIT TITLE:** continuous random variable

NAME OF THE TOPIC: continuous random variable

Lecture no. 1:

- Explain the concept of continuous random variable with examples.

NAME OF THE TOPIC: continuous probability density function

Lecture no. 2:

- Explain continuous probability density function with its properties.

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 3:

- Examples based on continuous probability density function

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: cumulative distribution function

Lecture no. 4:

- Explain the concept cumulative distribution function
- Properties of cumulative distribution function

NAME OF THE TOPIC: graphical representation

Lecture no. 5:

- Graphical representation of probability density function and cumulative distribution function with the help of example

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 6:

- Examples based on cumulative distribution function

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: measures associated with continuous random variable

Lecture no. 7:

- Expectation of a random variable and its properties.

Lecture no. 8:

- Raw and Central moments

Lecture no. 9:

- Variance
- Median

Lecture no. 10:

- Mode
- Quartiles

Lecture no. 11:

- Deciles
- Percentiles

Lecture no. 12:

- Skewness
- kurtosis

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 13:

- Examples based on Expectation and Variance

❖ INNOVATIVE PRACTICES: Home Assignments

Lecture no. 14:

- Examples based on mean and median

❖ INNOVATIVE PRACTICES: Home Assignments

Lecture no. 15:

- Examples based on quartiles and percentiles

❖ INNOVATIVE PRACTICES: Home Assignments

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ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: F.Y.B.SC. **SUBJECT:** statistical methods (Paper-ii)
UNIT NO.: ii **UNIT TITLE:** standard continuous distribution

NAME OF THE TOPIC: uniform distribution

Lecture no. 1:
- Definition of uniform distribution and its pdf with the help of graph
- Explain cdf of uniform distribution with the help of graph

Lecture no. 2:
- Mean and variance of uniform distribution

Lecture no. 3:
- Median, Mode, skewness and kurtosis
- Some particular cases of uniform distribution

Lecture no. 4:
- Examples based on uniform distribution and its properties

- INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: exponential distribution

Lecture no. 5:
- Definition of exponential distribution and its pdf, cdf

Lecture no. 6:
- Characteristics of exponential p.d.f and its curve.
- Mean of exponential distribution

Lecture no. 7:
- Variance and median of exponential distribution

NAME OF THE TOPIC: memoryless property

Lecture no. 8:
- State and prove memoryless property

Lecture no. 9:
- Examples based on exponential distribution

- INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: normal distribution

Lecture no. 10:

- Definition of normal distribution and its pdf
- Probability curve of normal distribution

Lecture no. 11:

- Properties of normal distribution and normal curve

Lecture no. 12:

- Properties of standard normal distribution and its curve

Lecture no. 13:

- Addition property of normal distribution
- Example based on Addition property of normal distribution

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: normal approximation to binomial and poisson

Lecture no. 14:

- Statement of Laplace DeMoivre theorem
- Example based on normal distribution

❖ INNOVATIVE PRACTICES: Home Assignments

Lecture no. 15:

- Example based on normal approximation to binomial and poisson

❖ INNOVATIVE PRACTICES: Home Assignments

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LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: F.Y.B.SC. SUBJECT: statistical methods (Paper-ii)
UNIT NO.: iii
UNIT TITLE: estimation and testing of hypothesis

NAME OF THE TOPIC: basic concepts of sampling from distribution

Lecture no. 1:

- Basic concept: population, sample, estimation, statistic, parameter, estimator, estimate, sampling error, bias in estimator, unbiased estimator

NAME OF THE TOPIC: sampling distribution

Lecture no. 2:

- Basic concept: sampling distribution, standard error
- Statement of central limit theorem, some results based on CLT

Lecture no. 3:

- Example based on central limit theorem

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: sampling distribution of mean

Lecture no. 4:

- Brief explanation about sampling distribution of mean

NAME OF THE TOPIC: sampling distribution of sample proportion

Lecture no. 5:

- Brief explanation about sampling distribution of sample proportion

Lecture no. 6:

- Example based on sampling distribution of sample proportion

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: types of estimation

Lecture no. 7:

- Types of estimation: point estimation, interval estimation
- Some results based on Types of estimation

NAME OF THE TOPIC: confidence interval

Lecture no. 8:

- Confidence interval for population mean from large samples
- Confidence interval for population proportion from large samples

Lecture no. 9:

- Examples based on confidence interval

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: concepts of hypothesis

Lecture no. 10:

- Definitions: statistical hypothesis, null hypothesis, alternative hypothesis, simple and composite hypothesis

Lecture no. 11:

- Concepts; Types of errors, size of the error, test statistic, critical region, critical values

Lecture no. 12:

- Concepts: level of significance and test of significance, power function (power of the test), uniformly most powerful test
- Examples based on hypothesis

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: large sample test

Lecture no. 13:

- Six step procedure of testing of hypothesis
- Significant test for testing population mean

Lecture no. 14:

- Significant test for testing difference of two means
- Significant test for testing population proportion

Lecture no. 15:

- Significant test for testing difference in population proportion

- Examples based on large samples

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Credit BASED semester AND GRADING SYSTEM

Of

UNIVERSITY OF MUMBAI

FIRST YEAR B.SC

Descriptive statistics

COURSE

SEMESTER I

2021-22

Lecture Plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER: Vijay Narkhede

DEPARTMENT: **STATISTICS**
CLASS: **F.Y.B.Sc.** SUBJECT: **DESCRIPTIVE STATISTICS (Paper-I)**
UNIT NO.: I UNIT TITLE: - **Types of Data and Data Condensation**

Lecture 1: Introduction to Types of Data and Sampling

- Definition of population and sample in statistics
- Explanation of finite and infinite populations
- Introduction to different sampling methods: Simple Random Sampling (SRS), SRS without replacement (SRSWOR), and SRS with replacement (SRSWR)

Lecture 2: Types of Characteristics and Scales of Measurement

- Overview of different types of characteristics: qualitative and quantitative
- Explanation of nominal, ordinal, interval, and ratio scales of measurement
- Understanding the properties and uses of each type of scale

Lecture 3: Collection of Primary Data

- Explanation of primary data collection methods: questionnaires and schedules
- Introduction to the concept of secondary data and its sources
- Discussion on the advantages and limitations of primary and secondary data

Lecture 4: Types of Data: Qualitative and Quantitative

- Definition and characteristics of qualitative and quantitative data
- Understanding the distinction between qualitative and quantitative variables
- Examples illustrating different types of data in various fields

Lecture 5: Types of Data: Time Series and Cross Section Data

- Definition and examples of time series data and cross-sectional data
- Explanation of the differences between time series and cross-sectional data
- Understanding the applications and analysis techniques for each type of data

Lecture 6: Types of Data: Discrete and Continuous

- Definition and characteristics of discrete and continuous data
- Understanding the distinction between discrete and continuous variables
- Examples illustrating different types of data in various contexts

Lecture 7: Tabulation of Data

- Explanation of tabulation as a method of summarizing and organizing data
- Introduction to frequency distributions and frequency tables
- Demonstration of techniques for tabulating qualitative and quantitative data

Lecture 8: Dichotomous Classification

- Definition and examples of dichotomous classification for two and three attributes
- Explanation of verification techniques for consistency in dichotomous classification
- Understanding the importance of consistent classification in data analysis

Lecture 9: Association of Attributes

- Introduction to measures of association for qualitative data
- Explanation of Yule's coefficient of association (Q) and Yule's coefficient of colligation
- Application of association measures to analyze relationships between attributes

Lecture 10: Examples and Problem Solving

- Solving problems and exercises related to types of data and data condensation
- Application of classification and association techniques to analyze real-world datasets
- Group activities and discussions to reinforce understanding of concepts

Lecture 11: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of data classification and association techniques
- Peer-to-peer learning and collaboration to deepen understanding of data condensation principles

Lecture 12: Advanced Topics in Data Condensation

- Exploration of advanced topics and extensions in data condensation techniques
- Analysis of non-standard data types and specialized data summarization methods
- Discussion of recent developments and research trends in data condensation

Lecture 13: Case Studies and Applications

- Analysis of real-world case studies using data condensation techniques
- Examination of how data condensation is applied in various fields such as marketing, finance, and healthcare
- Discussion of the practical implications and limitations of data condensation analysis

Lecture 14: Review and Practice

- Review of key concepts, definitions, and techniques related to types of data and data condensation
- Practice problems and exercises to reinforce understanding and mastery of concepts
- Q&A session to address any lingering doubts or questions about the material

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on types of data and data condensation
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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GOVERNMENT OF MAHARASHTRA'S
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LECTURE PLAN

NAME OF THE LECTURER: **Vijay Narkhede**
DEPARTMENT: **STATISTICS**
CLASS: **F.Y.B.Sc.** SUBJECT: **DESCRIPTIVE STATISTICS (Paper-I)**
UNIT NO.: **II** UNIT TITLE: - **Classification of Data and Measures of central tendency**

Lecture 1: Introduction to Classification of Data

- Definition of univariate frequency distribution for discrete and continuous variables

- Explanation of cumulative frequency distribution and its importance in data analysis
- Overview of different graphical representation techniques: Histogram, frequency polygon, cumulative frequency curve, and stem-and-leaf diagram

Lecture 2: Univariate Frequency Distribution

- Detailed explanation of univariate frequency distribution for discrete variables
- Demonstration of how to construct frequency tables and histograms for discrete variables
- Examples illustrating the interpretation of frequency distributions for discrete variables

Lecture 3: Univariate Frequency Distribution (contd.)

- Explanation of univariate frequency distribution for continuous variables
- Techniques for constructing frequency tables and histograms for continuous variables
- Interpretation of frequency distributions for continuous variables and their applications

Lecture 4: Cumulative Frequency Distribution

- Definition and significance of cumulative frequency distribution
- Explanation of how to construct cumulative frequency tables and curves
- Understanding the cumulative frequency distribution as a summary measure of data distribution

Lecture 5: Graphical Representation of Frequency Distribution

- Introduction to various graphical representation techniques: Histogram, frequency polygon, cumulative frequency curve, and stem-and-leaf diagram
- Demonstration of how to create and interpret each type of graph
- Comparison of different graphical representations for different types of data

Lecture 6: Measures of Central Tendency

- Concept of central tendency and its importance in summarizing data
- Requirements of a good measure of central tendency
- Overview of different types of locational averages: median, mode, quartiles, deciles, and percentiles

Lecture 7: Median and Mode

- Detailed explanation of median as a measure of central tendency
- Definition and interpretation of mode
- Understanding the applications and limitations of median and mode in data analysis

Lecture 8: Partition Values: Quartiles, Deciles, and Percentiles

- Definition and calculation of quartiles, deciles, and percentiles
- Explanation of how partition values divide the data into equal parts
- Interpretation of quartiles, deciles, and percentiles in data analysis

Lecture 9: Mathematical Averages: Arithmetic Mean

- Definition and calculation of arithmetic mean
- Explanation of simple, weighted, and combined mean
- Demonstration of how to calculate arithmetic mean for different types of data

Lecture 10: Mathematical Averages: Geometric Mean

- Definition and calculation of geometric mean
- Understanding the geometric mean as a measure of central tendency for skewed distributions
- Applications of geometric mean in various fields such as finance and biology

Lecture 11: Mathematical Averages: Harmonic Mean

- Definition and calculation of harmonic mean
- Explanation of harmonic mean as a measure of central tendency for rates and ratios
- Examples illustrating the calculation and interpretation of harmonic mean

Lecture 12: Empirical Relation between Mean, Median, and Mode

- Exploration of the empirical relationship between mean, median, and mode
- Understanding how the measures of central tendency relate to each other in different types of distributions
- Analysis of real-world datasets to demonstrate the relationship between mean, median, and mode

Lecture 13: Merits and Demerits of Different Measures

- Discussion on the advantages and disadvantages of using different measures of central tendency
- Understanding the applicability of each measure in different contexts and scenarios
- Comparison of measures of central tendency based on their robustness and sensitivity to outliers

Lecture 14: Examples and Problem Solving

- Solving problems and exercises related to classification of data and measures of central tendency
- Application of different measures of central tendency to analyze and interpret real-world datasets
- Group activities and discussions to reinforce understanding of concepts

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on classification of data and measures of central tendency
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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GOVERNMENT OF MAHARASHTRA'S
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LECTURE PLAN

NAME OF THE LECTURER: Vijay Narkhede
DEPARTMENT: STATISTICS
CLASS: F.Y.B.Sc. SUBJECT: DESCRIPTIVE STATISTICS (Paper-I)
UNIT NO.: III UNIT TITLE: - Measures of Dispersion, Skewness & Kurtosis

Lecture 1: Introduction to Measures of Dispersion

- Definition of dispersion and its importance in describing the spread of data
- Explanation of the requirements of a good measure of dispersion
- Overview of different types of measures of dispersion: absolute and relative

Lecture 2: Range

- Explanation of the range as a measure of dispersion
- Calculation of the range and interpretation of its significance
- Understanding the limitations of the range as a measure of dispersion

Lecture 3: Quartile Deviation

- Definition and calculation of quartile deviation
- Explanation of quartile deviation as a measure of dispersion based on quartiles
- Interpretation of quartile deviation in relation to the spread of data

Lecture 4: Mean Absolute Deviation

- Introduction to mean absolute deviation as a measure of dispersion
- Calculation of mean absolute deviation and its interpretation
- Comparison of mean absolute deviation with other measures of dispersion

Lecture 5: Standard Deviation

- Definition and calculation of standard deviation
- Understanding the concept of variance and its relation to standard deviation
- Interpretation of standard deviation as a measure of dispersion and its applications

Lecture 6: Variance and Combined Variance

- Explanation of variance and combined variance as measures of dispersion
- Calculation of variance and combined variance for different types of data
- Analysis of variance and combined variance in relation to the spread of data

Lecture 7: Moments

- Definition and calculation of raw moments and central moments
- Understanding the properties of moments and their significance in data analysis
- Exploration of the relationship between raw moments and central moments

Lecture 8: Skewness

- Introduction to skewness as a measure of asymmetry in a distribution
- Explanation of different measures of skewness: Karl Pearson's, Bowley's, and coefficient of skewness based on moments
- Interpretation of skewness measures and their applications

Lecture 9: Measures of Skewness (contd.)

- Calculation of skewness measures using different formulas
- Analysis of skewness measures to determine the shape of a distribution
- Understanding the implications of positive and negative skewness

Lecture 10: Kurtosis

- Definition and calculation of kurtosis as a measure of the peakedness of a distribution
- Interpretation of kurtosis measures and their significance in data analysis
- Comparison of different measures of kurtosis and their applicability

Lecture 11: Box Plot

- Introduction to box plots as a graphical representation of data dispersion
- Explanation of how to create and interpret box plots
- Understanding the advantages of box plots in visualizing the spread of data

Lecture 12: Examples and Problem Solving

- Solving problems and exercises related to measures of dispersion, skewness, and kurtosis
- Application of dispersion measures to analyze and interpret real-world datasets
- Group activities and discussions to reinforce understanding of concepts

Lecture 13: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of skewness and kurtosis measures through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of dispersion, skewness, and kurtosis principles

Lecture 14: Advanced Topics

- Exploration of advanced topics and extensions in measures of dispersion, skewness, and kurtosis
- Analysis of non-standard distributions and specialized measures of dispersion
- Discussion of recent developments and research trends in dispersion, skewness, and kurtosis analysis

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on measures of dispersion, skewness, and kurtosis
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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Credit BASED semester AND GRADING SYSTEM Of UNIVERSITY OF MUMBAI

FIRST YEAR B.SC
Descriptive statistics
COURSE
SEMESTER II
2021-22
Lecture Plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE : _____
NAME OF THE LECTURER: **Vijay Narkhede**
DEPARTMENT: **STATISTICS**
CLASS: **F.Y.B.Sc.** SUBJECT: **DESCRIPTIVE STATISTICS (Paper-I)**
UNIT NO.: **I** UNIT TITLE: **Correlation and regression analysis**

Lecture 1: Introduction to Correlation Analysis

- Definition of correlation and its importance in statistics
- Explanation of scatter diagrams as a graphical representation of the relationship between two variables
- Introduction to the product moment correlation coefficient (Pearson's correlation coefficient) and its properties

Lecture 2: Product Moment Correlation Coefficient

- Detailed explanation of the product moment correlation coefficient
- Calculation of the correlation coefficient using sample data
- Interpretation of the correlation coefficient and its significance in data analysis

Lecture 3: Properties of Correlation Coefficient

- Discussion on the properties of the correlation coefficient, including range and interpretation
- Analysis of the strength and direction of correlation based on the correlation coefficient
- Understanding the limitations and assumptions of correlation analysis

Lecture 4: Spearman's Rank Correlation

- Introduction to Spearman's rank correlation coefficient
- Explanation of the rank correlation coefficient and its interpretation
- Calculation of Spearman's rank correlation coefficient for ranked data with and without ties

Lecture 5: Concept of Linear Regression

- Definition of linear regression and its applications
- Introduction to the principle of least squares as a method for fitting a regression line
- Understanding the components of a linear regression model

Lecture 6: Fitting a Straight Line by Least Squares Method

- Detailed explanation of the least squares method for fitting a straight line
- Calculation of regression coefficients using the least squares approach
- Interpretation of regression coefficients and the fitted regression line

Lecture 7: Relation between Regression Coefficients and Correlation Coefficient

- Understanding the relationship between regression coefficients and correlation coefficient
- Explanation of how the correlation coefficient influences the slope of the regression line
- Analysis of the implications of correlation on regression analysis

Lecture 8: Fitting of Curves Reducible to Linear Form

- Introduction to curves reducible to linear form by transformation
- Explanation of how to transform nonlinear relationships into linear relationships
- Application of the least squares method to fit curves reducible to linear form

Lecture 9: Concept and Use of Coefficient of Determination (R^2)

- Definition of the coefficient of determination (R^2) and its interpretation
- Calculation of R^2 to assess the goodness of fit of a regression model
- Understanding the significance of R^2 in regression analysis

Lecture 10: Fitting a Quadratic Curve by Least Squares Method

- Introduction to fitting a quadratic curve using the least squares method
- Explanation of how to model quadratic relationships between variables
- Calculation of regression coefficients for quadratic regression models

Lecture 11: Examples and Problem Solving

- Solving problems and exercises related to correlation and regression analysis
- Application of correlation and regression techniques to analyze real-world datasets
- Group activities and discussions to reinforce understanding of concepts

Lecture 12: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of correlation and regression analysis through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of correlation and regression principles

Lecture 13: Advanced Topics

- Exploration of advanced topics and extensions in correlation and regression analysis
- Analysis of non-linear regression models and specialized regression techniques
- Discussion of recent developments and research trends in correlation and regression analysis

Lecture 14: Case Studies and Applications

- Analysis of real-world case studies using correlation and regression analysis
- Examination of how correlation and regression analysis is applied in various fields such

as economics, social sciences, and business
- Discussion of the practical implications and limitations of correlation and regression analysis

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on correlation and regression analysis
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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GOVERNMENT OF MAHARASHTRA'S
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LECTURE PLAN

DATE : _____
NAME OF THE LECTURER: **Vijay Narkhede**
DEPARTMENT: **STATISTICS**
CLASS: **F.Y.B.Sc.** SUBJECT: **DESCRIPTIVE STATISTICS (Paper-I)**
UNIT NO.: **II** UNIT TITLE: **Time series**

Lecture 1: Introduction to Time Series Analysis

- Definition of time series and its importance in statistics
- Explanation of the components of a time series: trend, seasonal variation, cyclical variation, and irregular variation
- Overview of different models used in time series analysis

Lecture 2: Trend Estimation

- Introduction to trend estimation in time series analysis
- Explanation of various methods for estimating trend: freehand curve method, method of semi-average, method of moving average, and method of least squares (linear trend only)
- Calculation of trend using each method and interpretation of results

Lecture 3: Freehand Curve Method

- Detailed explanation of the freehand curve method for trend estimation
- Demonstration of how to draw a freehand curve to estimate the trend in a time series
- Analysis of the advantages and limitations of the freehand curve method

Lecture 4: Method of Semi-Average

- Introduction to the method of semi-average for trend estimation
- Explanation of how to calculate semi-averages and use them to estimate the trend
- Understanding the concept of centered moving averages and their application in trend estimation

Lecture 5: Method of Moving Average

- Definition and explanation of the method of moving average for trend estimation
- Calculation of moving averages and interpretation of results
- Analysis of the effectiveness of moving averages in smoothing out fluctuations in a time series

Lecture 6: Method of Least Squares (Linear Trend)

- Introduction to the method of least squares for estimating linear trends in time series
- Explanation of how to fit a straight line to the data using the least squares approach
- Calculation of regression coefficients and interpretation of the fitted trend line

Lecture 7: Estimation of Seasonal Component

- Introduction to seasonal variation in time series analysis
- Explanation of various methods for estimating seasonal component: method of simple average, ratio to moving average, and ratio to trend method
- Calculation of seasonal indices using each method and interpretation of results

Lecture 8: Method of Simple Average

- Detailed explanation of the method of simple average for estimating seasonal variation
- Demonstration of how to calculate seasonal averages and seasonal indices
- Analysis of the strengths and weaknesses of the method of simple average

Lecture 9: Ratio to Moving Average

- Introduction to the ratio to moving average method for estimating seasonal variation
- Explanation of how to calculate seasonal ratios and use them to adjust the data for seasonal effects
- Understanding the concept of deseasonalization and its application in time series analysis

Lecture 10: Ratio to Trend Method

- Definition and explanation of the ratio to trend method for estimating seasonal variation
- Calculation of seasonal ratios relative to the trend and their interpretation
- Comparison of the ratio to trend method with other methods of seasonal adjustment

Lecture 11: Examples and Problem Solving

- Solving problems and exercises related to time series analysis
- Application of trend estimation and seasonal adjustment techniques to analyze real-world time series data
- Group activities and discussions to reinforce understanding of concepts

Lecture 12: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of time series analysis through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of time series analysis principles

Lecture 13: Advanced Topics

- Exploration of advanced topics and extensions in time series analysis
- Analysis of non-linear trends and seasonal patterns in time series data
- Discussion of recent developments and research trends in time series analysis

Lecture 14: Case Studies and Applications

- Analysis of real-world case studies using time series analysis techniques
- Examination of how time series analysis is applied in various fields such as finance, economics, and meteorology
- Discussion of the practical implications and limitations of time series analysis

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on time series analysis
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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Ismail Yusuf College Of
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Jogeshwari (E), Mum

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE : _____
NAME OF THE LECTURER: **Vijay Narkhede**
DEPARTMENT: **STATISTICS**
CLASS: **F.Y.B.Sc.** SUBJECT: **DESCRIPTIVE STATISTICS (Paper-I)**
UNIT NO.: **III** UNIT TITLE: **Index Numbers**

Lecture No. : 1

- Introduce the concept of Index Number.
- Explain the Stages in the construction of price index numbers.

Comparative tool

Lecture No. : 2

- Introduce the concept for comparative tool.
- Describe the various steps involved in comparative tool.

Simple and composite index number

Lecture No. : 3

- Define and explain simple and composite index number.
- Also solved few examples for the same.

Lasperay's and Paasche's index numbers

Lecture No. : 4

- Introduce and brief the concept of Lasperay's & Paasche's Index Numbers.
- *INNOVATIVE PRACTICES:* Home Assignment.

Edgeworth's and Bowley's index Numbers

Lecture No. : 5

- Introduce and brief the concept of Edgeworth's & Bowley's Index Numbers.

INNOVATIVE PRACTICES: Home Assignment.

Drobisch's and fisher's index Numbers

Lecture No. : 6

- Introduce and brief the concept of Drobisch's & Fisher's Index Numbers.
- *INNOVATIVE PRACTICES:* Home Assignment.

Quantity & value Index Numbers

Lecture No. : 7

- Explain the Quantity Index Numbers and Values Index Numbers.
- Define the difference between them.
- Solved few examples for the same.

Types of test for INDEX NUMBER

Lecture No. : 8

- Define and explain the concept of types of tests for index number.
- Time reversal test
- Factor reversal test
- Circular test.

INNOVATIVE PRACTICES: Practice Problems.

FIXED BASE Index Numbers

Lecture No. : 9

- Define and explain the concept of fixed base index number.
- Also state few examples on the same.

INNOVATIVE PRACTICES: Practice Problems

CHAIN BASE Index Numbers

Lecture No. : 10

- Define and explain the concept of Chain base index numbers.
- Also state few examples on the same.

INNOVATIVE PRACTICES: Practice Problems.

BASE SHIFTING & DEFLATING Index Numbers

Lecture No. : 11.

- Define and explain the concept and difference for base shifting , splicing & deflating.
- Also state few examples on the same.
- ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 12

- Define and explain the concept of real income based on wholesale price numbers.
- Also state few examples on the same.
- ***INNOVATIVE PRACTICES:*** Practice Problems.

OST OF LIVING Index Numbers

Lecture No. : 13

- Explain the concept for cost of living index numbers.
- Merits and Demerits for the same.

Lecture No. : 14

- Continue with the derivation and solve the problems based on it.

❖ *INNOVATIVE PRACTICES:* Practice Problems.

Class Test

Lecture No. : 15

❖ A revision of all important concepts, terms and definitions.
❖ A short class test on the same.

❖ ***INNOVATIVE PRACTICES:*** Class tests

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Credit BASED semester AND GRADING SYSTEM OF

UNIVERSITY OF MUMBAI

THIRD YEAR B.SC

Descriptive Statistics COURSE

SEMESTER V

Academic Year: 2020-21

Lecture Plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE
LECTURE PLAN

NAME OF THE LECTURER: Ms. Sonali Thik

DEPARTMENT: **STATISTICS**

CLASS: **T.Y.B.Sc.**

SUBJECT: **PROBABILITY AND DISTRIBUTION THEORY (Paper-I)**

UNIT NO.: 1 UNIT TITLE: - Probability

Lecture 1: Introduction to Probability

- Definition of a random experiment
- Understanding outcomes and events
- Introduction to sample space and its significance
- Basic properties of events: complementary, mutually exclusive, exhaustive, and equally likely events

Lecture 2: Types of Probability

- Mathematical probability: Definition and examples
- Statistical probability: Introduction and differences from mathematical probability
- Axiomatic probability: Foundations and principles
- Subjective probability: Understanding subjective judgments and applications

Lecture 3: Addition Theorem

- Addition theorem for two events: Definition and proof
- Application of addition theorem in probability calculations
- Examples and exercises demonstrating addition theorem for two events

Lecture 4: Addition Theorem (contd.)

- Addition theorem for three events: Definition and proof
- Application of addition theorem in probability calculations for three events
- Examples and exercises demonstrating addition theorem for three events

Lecture 5: Conditional Probability

- Introduction to conditional probability

- Multiplication theorem for two events: Definition and proof
- Application of multiplication theorem in probability calculations
- Examples and exercises demonstrating multiplication theorem for two events

Lecture 6: Conditional Probability (contd.)

- Multiplication theorem for three events: Definition and proof
- Application of multiplication theorem in probability calculations for three events
- Examples and exercises demonstrating multiplication theorem for three events

Lecture 7: Bayes' Theorem

- Introduction to Bayes' theorem
- Understanding the formula and its derivation
- Application of Bayes' theorem in real-life scenarios
- Examples and exercises applying Bayes' theorem

Lecture 8: Theorems on Probability of Realization

- Theorem on probability of realization of at least one event
- Theorem on probability of realization of exactly m events
- Theorem on probability of realization of at least m of N events
- Application of theorems in classical occupancy problems, matching, and guessing problems

Lecture 9: Theorems on Probability of Realization (contd.)

- Further examples and exercises on theorems of probability realization
- Application of theorems in practical scenarios and problem-solving

Lecture 10: Classical Occupancy Problems

- Introduction to classical occupancy problems
- Understanding the concept and its relevance in probability theory
- Solving classical occupancy problems using probability theorems

Lecture 11: Matching and Guessing Problems

- Introduction to matching and guessing problems
- Understanding different types of problems and their variations
- Solving matching and guessing problems using probability concepts

Lecture 12: Examples and Problem Solving

- Review of concepts covered in previous lectures
- Solving a variety of problems integrating multiple probability concepts
- Class discussion and problem-solving sessions

Lecture 13: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios
- Application of probability concepts in real-world situations
- Group activities and discussions to enhance understanding

Lecture 14: Review and Practice

- Review of key concepts, theorems, and formulas covered throughout the unit
- Practice problems and exercises for reinforcement
- Q&A session to address any lingering doubts or questions

Lecture 15: Final Assessment

- Comprehensive assessment covering all topics discussed in the unit
- Evaluation of students' understanding and application of probability concepts
- Feedback session and discussion on areas for improvement

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LECTURE PLAN

NAME OF THE LECTURER: Ms. Sonali Thik

DEPARTMENT: **STATISTICS**

CLASS: **T.Y.B.Sc.**

SUBJECT: **PROBABILITY AND DISTRIBUTION THEORY (Paper-I)**

UNIT NO.: II UNIT TITLE: - Inequality and law of large numbers

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Lecture 1: Introduction to Inequalities

- Overview of the importance of inequalities in probability theory and statistics
- Introduction to various types of inequalities and their applications
- Outline of the topics to be covered in the unit

Lecture 2: Markov Inequality

- Definition and statement of Markov's inequality
- Derivation and proof of Markov's inequality
- Applications of Markov's inequality in probability and statistics
- Examples illustrating the use of Markov's inequality in real-world scenarios

Lecture 3: Tchebyshev's Inequality

- Introduction to Tchebyshev's inequality
- Derivation and proof of Tchebyshev's inequality
- Comparison of Tchebyshev's inequality with Markov's inequality
- Practical applications of Tchebyshev's inequality in probability and statistics

Lecture 4: Boole's Inequality

- Definition and statement of Boole's inequality
- Explanation of Boole's inequality in terms of probabilities of union events
- Derivation and proof of Boole's inequality
- Examples demonstrating the use of Boole's inequality in probability calculations

Lecture 5: Cauchy-Schwarz's Inequality

- Introduction to Cauchy-Schwarz's inequality
- Statement and proof of Cauchy-Schwarz's inequality
- Applications of Cauchy-Schwarz's inequality in probability and statistics
- Illustrative examples showcasing the utility of Cauchy-Schwarz's inequality

Lecture 6: Weak Law of Large Numbers

- Overview of the law of large numbers and its significance in probability theory
- Statement and explanation of the weak law of large numbers
- Proof and understanding of the weak law of large numbers
- Real-world implications and applications of the weak law of large numbers

Lecture 7: Applications of Inequalities

- Review of the inequalities covered so far: Markov, Tchebyshev, Boole, Cauchy-Schwarz
- Practical applications of inequalities in various statistical and probabilistic scenarios
- Case studies and examples demonstrating the use of inequalities in data analysis and inference

Lecture 8: Examples and Problem Solving

- Solving problems and exercises related to Markov, Tchebyshev, Boole, and Cauchy-Schwarz inequalities
- Application of inequalities to analyze and interpret real-world data
- Group activities and discussions to reinforce understanding of inequality concepts

Lecture 9: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of inequalities through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of inequality principles

Lecture 10: Review and Practice

- Review of key concepts, definitions, and theorems related to inequalities

- Practice problems and exercises to reinforce understanding and mastery of inequality concepts
- Q&A session to address any lingering doubts or questions about inequalities

Lecture 11: Review and Practice (contd.)

- Continued review and practice session, focusing on areas where students may need additional reinforcement
- Application of inequalities to solve practical problems and case studies
- Individualized assistance and feedback to support students' learning goals

Lecture 12: Case Studies and Applications

- Analysis of real-world case studies using inequalities
- Examination of how inequalities are applied in various fields such as finance, economics, and engineering
- Discussion of the limitations and assumptions of inequalities in practical applications

Lecture 13: Advanced Topics in Inequalities

- Exploration of advanced topics in inequalities, such as the Jensen's inequality and Holder's inequality
- Statement, proof, and application of Jensen's inequality
- Statement, proof, and application of Hölder's inequality
- Comparison of these advanced inequalities with the ones previously covered

Lecture 14: Advanced Applications and Extensions

- Application of advanced inequalities to solve complex problems and analyze data
- Extensions of inequality concepts to higher dimensions and more general scenarios
- Discussion of recent developments and research trends in inequality theory

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on inequalities and the law of large numbers
- Final assessment to evaluate students' understanding and mastery of inequality concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE
LECTURE PLAN

NAME OF THE LECTURER: **Ms. Sonali Thik**

DEPARTMENT: **STATISTICS**

CLASS: **T.Y.B.Sc.**

SUBJECT: **PROBABILITY AND DISTRIBUTION THEORY (Paper-I)**

UNIT NO.: III UNIT TITLE: - Joint moment generating function, trinomial distribution and multinomial Distribution

Lecture 1: Introduction to Moment Generating Function (MGF)

- Definition and properties of Moment Generating Function (MGF) for two random variables of discrete and continuous type
- Understanding the role of MGF in characterizing probability distributions
- Necessary and Sufficient conditions for the independence of two random variables
- Concept and definition of Bivariate MGF

Lecture 2: Joint Moment Generating Function (MGF)

- Introduction to Bivariate MGF and its significance in analyzing joint distributions
- Derivation and properties of Joint Moment Generating Function
- Application of Bivariate MGF in determining moments and other statistical properties
- Examples illustrating the computation and interpretation of Bivariate MGF

Lecture 3: Trinomial Distribution

- Definition and characteristics of the trinomial distribution
- Joint probability distribution of (X, Y) in trinomial distribution
- Calculation of joint moment generating function and moments
- Analysis of marginal and conditional distributions, means, and variances

Lecture 4: Trinomial Distribution (contd.)

- Continued discussion on the trinomial distribution
- Exploration of the correlation coefficient between (X, Y)
- Distribution of the sum X+Y in trinomial distribution
- Application of trinomial distribution in real-world scenarios

Lecture 5: Multinomial Distribution

- Introduction to Multinomial distribution with parameters (n, (p_1), (p_2), ..., (p_{k-1})) where (p_1 + p_2 + ... + p_{k-1} + p_k = 1)
- Definition and characteristics of the multinomial distribution
- Expression for joint MGF in multinomial distribution
- Derivation of joint probability distribution of ((X_i), (X_j)) in multinomial distribution

Lecture 6: Multinomial Distribution (contd.)

- Continued discussion on the multinomial distribution
- Calculation of conditional probability distribution of (X_i) given (X_j)
- Analysis of the relationship between different categories in multinomial experiments
- Examples demonstrating the application of multinomial distribution in practical situations

Lecture 7: Applications of Joint MGF, Trinomial, and Multinomial Distributions

- Review of concepts covered in previous lectures
- Practical applications of joint moment generating function, trinomial, and multinomial distributions in statistics, finance, and engineering
- Case studies and examples showcasing the utility of these distributions in data analysis and modeling

Lecture 8: Examples and Problem Solving

- Solving problems and exercises related to joint moment generating function, trinomial, and multinomial distributions
- Application of distributions to analyze and interpret data from experiments and surveys
- Group activities and discussions to reinforce understanding of distribution concepts

Lecture 9: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of joint moment generating function, trinomial, and multinomial distributions through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of distribution principles

Lecture 10: Review and Practice

- Review of key concepts, definitions, and theorems related to joint moment generating function, trinomial, and multinomial distributions
- Practice problems and exercises to reinforce understanding and mastery of distribution concepts
- Q&A session to address any lingering doubts or questions about distributions

Lecture 11: Review and Practice (contd.)

- Continued review and practice session, focusing on areas where students may need additional reinforcement
- Application of distributions to solve practical problems and case studies
- Individualized assistance and feedback to support students' learning goals

Lecture 12: Advanced Topics in Joint MGF and Multinomial Distribution

- Exploration of advanced topics in joint moment generating function and multinomial distribution
- Analysis of special cases and extensions of these distributions
- Discussion of recent developments and research trends in joint MGF and multinomial distribution theory

Lecture 13: Advanced Applications and Extensions

- Application of advanced concepts in joint moment generating function and multinomial distribution to solve complex problems and analyze data
- Extensions of distribution concepts to higher dimensions and more general scenarios
- Exploration of open research questions and areas for future study

Lecture 14: Practical Examples

- Analysis of real-world case studies using joint moment generating function, trinomial, and multinomial distributions
- Discussion of the limitations and assumptions of these distributions in practical applications

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on joint moment generating function, trinomial, and multinomial distributions

- Final assessment to evaluate students' understanding and mastery of distribution concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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GOVERNMENT OF MAHARASHTRA'S
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LECTURE PLAN

NAME OF THE LECTURER: **Ms. Sonali Thik**

DEPARTMENT: **STATISTICS**

CLASS: **T.Y.B.Sc.**

SUBJECT: **PROBABILITY AND DISTRIBUTION THEORY (Paper-I)**

UNIT NO.: IV UNIT TITLE: - Order Statistics

Lecture 1: Introduction to Order Statistics

- Overview of order statistics and their importance in statistical analysis
- Definition of order statistics based on a random sample
- Explanation of the role of order statistics in understanding the distribution of sample data

Lecture 2: Cumulative Distribution Function of the r^{th} Order Statistic

- Derivation of the cumulative distribution function (CDF) of the order statistic
- Interpretation of the r^{th} order statistic's CDF in terms of probability of observing values less than or equal to a given value
- Examples illustrating the computation and interpretation of the CDF for various distributions

Lecture 3: Probability Density Function of r^{th} Order Statistic

- Derivation of the probability density function (PDF) of the r^{th} order statistic
- Understanding the relationship between the PDF and the CDF of order statistics
- Application of the PDF in calculating probabilities and expected values for order statistics

Lecture 4: Joint Probability Density Function of r^{th} and s^{th} Order Statistic ($r < s$)

- Derivation of the joint probability density function (PDF) of the r^{th} and s^{th} order statistics, where ($r < s$)
- Analysis of the dependence structure between different order statistics
- Illustrative examples demonstrating the computation and interpretation of joint PDFs

Lecture 5: Joint Probability Density Functions of All (n) Ordered Statistics

- Derivation of the joint probability density function (PDF) of all (n) ordered statistics
- Understanding the multivariate nature of joint PDFs for order statistics
- Application of joint PDFs in analyzing the distribution of entire sample data sets

Lecture 6: Distribution of Maximum and Minimum Observations

- Analysis of the distribution of the maximum (nth order statistic) and minimum (first order statistic) observations
- Special cases of uniform and exponential distributions for maximum and minimum observations
- Derivation and interpretation of distribution functions for maximum and minimum observations

Lecture 7: Distribution of Maximum and Minimum Observations (contd.)

- Continued discussion on the distribution of maximum and minimum observations
- Comparison of distribution properties between different types of distributions
- Examples illustrating the application of distribution functions for maximum and minimum observations

Lecture 8: Probability Density Function of the Difference Between r^{th} and s^{th} Order Statistic ($r < s$)

Derivation of the probability density function (PDF) of the difference between the r^{th} and s^{th} order statistics, where ($r < s$)

Understanding the distribution of differences between order statistics

Application of PDFs for differences in analyzing variability and spread within a sample

Lecture 9: Probability Density Function of the Difference Between r^{th} and s^{th} Order Statistic ($r < s$) (contd.)

- Continued discussion on the PDF of the difference between order statistics
- Exploration of special cases and properties of PDFs for differences
- Examples demonstrating the computation and interpretation of PDFs for differences

Lecture 10: Applications of Order Statistics

- Review of concepts covered in previous lectures

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- Practical applications of order statistics in various fields such as finance, engineering, and medicine
- examples showcasing the utility of order statistics in data analysis and inference

Lecture 11: Examples and Problem Solving

- Solving problems and exercises related to order statistics
- Application of order statistics to analyze and interpret real-world data sets
- Group activities and discussions to reinforce understanding of order statistic concepts

Lecture 12: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of order statistics through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of order statistic principles

Lecture 13: Review and Practice

- Review of key concepts, definitions, and theorems related to order statistics
- Practice problems and exercises to reinforce understanding and mastery of order statistic concepts
- Q&A session to address any lingering doubts or questions about order statistics

Lecture 14: Review and Practice (contd.)

- Continued review and practice session, focusing on areas where students may need additional reinforcement
- Application of order statistics to solve practical problems and case studies
- Individualized assistance and feedback to support students' learning goals

Lecture 15: Advanced Topics and Extensions

- Exploration of advanced topics and extensions in order statistics
- Analysis of special cases and applications in non-standard distributions
- Discussion of recent developments and research trends in order statistics theory

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credit BASED semester AND GRADING SYSTEM

of

UNIVERSITY OF MUMBAI

FIRST YEAR B.SC

statistical methods COURSE

SEMESTER I

2020-21

Lecture plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____

NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: F.Y.B.SC.
SUBJECT: statistical methods (Paper-ii)
UNIT NO.: i
UNIT TITLE: elementary probability theory

NAME OF THE TOPIC: basic concepts in probability

Lecture no. 1:

- Basic concepts: experiment, outcome, trial, sample space, sample point.
- Types of experiment with examples.

NAME OF THE TOPIC: events

Lecture no. 2:

- Events and its types with examples.

NAME OF THE TOPIC: probability definitions and limitations

Lecture no. 3:

- Definitions of probability and its limitations.

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 4:

- Examples based on previous lecture topics.

❖ INNOVATIVE PRACTICES: Home Assignment.

NAME OF THE TOPIC: probability counting rules

Lecture no. 5:

- Principle of sequential counting.

Lecture no. 6:

- Simple random sampling
  - SRS with replacement
  - SRS without replacement

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 7:

- Examples based on previous lecture topics.

❖ INNOVATIVE PRACTICES: Home Assignment.

NAME OF THE TOPIC: axioms of probability

Lecture no. 8:

- Explain axioms of probability.
- Theorems based on axioms.

NAME OF THE TOPIC: addition theorem

Lecture no. 9:

- State and prove addition theorem of probability (Total probability theorem).

Lecture no. 10:

- Theorems: (i) $P(A \cup B) = P(A) + P(B)$, if A and B are mutually exclusive events.
  (ii) Boole's inequality
  (iii) Addition theorem for 3 events
  (iv) $P(A') = 1 - P(A)$

NAME OF THE TOPIC: CONDITIONAL PROBABILITY

Lecture no. 11:

- Introduction about conditional probability with the help of various examples.

❖ INNOVATIVE PRACTICES: Home Assignment.

NAME OF THE TOPIC: Independent events

Lecture no. 12:

- Brief explanation about independent events with day-to-day life examples.
- Definition of independent events.

NAME OF THE TOPIC: examples based on CONDITIONAL PROBABILITY and independent events

Lecture no. 13:

- Examples based on conditional probability and independent events.

❖ INNOVATIVE PRACTICES: Home Assignment.

NAME OF THE TOPIC: theorems

Lecture no. 14:

- Explain theorems: (i) $0 \le P(A/B) \le 1$
  (ii) $P(S/B) = 1$
  (iii) $P[(A \cup B)/C] = P(A/C) + P(B/C)$, if A, B and C are mutually exclusive.
  (iv) $P[(A \cup B)/C] = P(A/C) + P(B/C) - P[(A \cap B)/C]$
  (v) $P(A'/B) = 1 - P(A/B)$

NAME OF THE TOPIC: multiplication and bayes theorem

Lecture no. 15:

- State and prove multiplication theorem.
- State and prove bayes theorem.

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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: F.Y.B.SC. **SUBJECT:** statistical methods (Paper-ii)
UNIT NO.: ii
UNIT TITLE: concept of discrete random variable and properties of its probability distribution

NAME OF THE TOPIC: random variable

Lecture no. 1:

- Explain random variable with examples.
- Explain discrete random variable with various examples

NAME OF THE TOPIC: probability mass function

Lecture no. 2:

- Define probability mass function with its properties.
- Examples based on point 1

NAME OF THE TOPIC: conditional probability distribution function

Lecture no. 3:

- Define conditional probability distribution function with its properties.
- Define median and mode of the distribution

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 4:

- Examples based on c.d.f.

❖ INNOVATIVE PRACTICES: Home Assignment

NAME OF THE TOPIC: expectation

Lecture no. 5:

- Expectation definition and properties.

NAME OF THE TOPIC: moments

Lecture no. 6:

- Explain central and raw moments
- Relationship between central and raw moments

NAME OF THE TOPIC: skewness and kurtosis

Lecture no. 7:

- Explain skewness and kurtosis

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 8:

- Examples based on previous lecture topics

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: discrete bivariate random variables

Lecture no. 9:

- Joint probability mass function
- Marginal probability mass function

- Conditional probability mass function

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 10:

- Examples based on previous lecture topics.

❖ INNOVATIVE PRACTICES: Home Assignments

NAME OF THE TOPIC: expectations of bivariate random variables

Lecture no. 11:

- Concept of expectation
- Addition theorem of expectation

Lecture no. 12:

- Multiplication theorem of expectation

NAME OF THE TOPIC: covariance

Lecture no. 13:

- Define covariance
- State and prove properties of covariance

NAME OF THE TOPIC: variance

Lecture no. 14:

- Theorem: variance of linear combination of two variables
- Some special cases based on same theorem

NAME OF THE TOPIC: correlation coefficient

Lecture no. 15:

- Define correlation coefficient and its properties
- Some examples based on it

❖ INNOVATIVE PRACTICES: Home Assignments

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Department of Statistics
Ismail Yusuf College Of
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Jogeshwari (E), Mumbai

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: F.Y.B.SC.
SUBJECT: statistical methods (Paper-ii)
UNIT NO.: iii
UNIT TITLE: standard discrete distributions

NAME OF THE TOPIC: discrete uniform distribution

Lecture no. 1:

- Definition of uniform distribution
- Define its p.m.f. and c.d.f.

Lecture no. 2:

- Properties of uniform distribution: mean, variance, skewness and kurtosis

NAME OF THE TOPIC: binomial distribution

Lecture no. 3:

- Definition of Bernoulli distribution and binomial distribution with its p.m.f.

Lecture no. 4:

- Properties of binomial distribution: mean, variance, mode

Lecture no. 5:

- Properties of uniform distribution: skewness and kurtosis, central moments, recurrence relationship between probabilities

NAME OF THE TOPIC: examples based on uniform and binomial distribution

Lecture no. 6:

- Examples based on uniform distribution

Lecture no. 7:

- Examples based on binomial distribution
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NAME OF THE TOPIC: Poisson distribution

Lecture no. 8:

- Definition of Poisson distribution
- Define its p.m.f.
- Properties of Poisson distribution: mean, variance

Lecture no. 9:

- Properties of Poisson distribution: mode, skewness and kurtosis, recurrence relationship between probabilities

Lecture no. 10:

- Comparison between binomial and Poisson distribution
- Examples based on Poisson distribution

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NAME OF THE TOPIC: hypergeometric distribution

Lecture no. 11:

- Definition of hypergeometric distribution
- Define its p.m.f.

Lecture no. 12:

- Properties of hypergeometric distribution: mean, variance

Lecture no. 13:

- Approximation of hypergeometric to binomial distribution

Lecture no. 14:

- Examples based on hypergeometric distribution

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NAME OF THE TOPIC: real life applications of the distributions

Lecture no. 15:

- Real life applications of the binomial distribution
- Real life applications of the Poisson distribution
- Real life applications of the hypergeometric distribution

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of

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FIRST YEAR B.SC

statistical methods COURSE

SEMESTER II

2020-21

Lecture plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: F.Y.B.SC.
SUBJECT: statistical methods (Paper-ii)
UNIT NO.: i
UNIT TITLE: continuous random variable

NAME OF THE TOPIC: continuous random variable

Lecture no. 1:

- Explain the concept of continuous random variable with examples.

NAME OF THE TOPIC: continuous probability density function

Lecture no. 2:

- Explain continuous probability density function with its properties.

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 3:

- Examples based on continuous probability density function

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NAME OF THE TOPIC: cumulative distribution function

Lecture no. 4:

- Explain the concept cumulative distribution function
- Properties of cumulative distribution function

NAME OF THE TOPIC: graphical representation

Lecture no. 5:

- Graphical representation of probability density function and cumulative distribution function with the help of example

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 6:

- Examples based on cumulative distribution function

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NAME OF THE TOPIC: measures associated with continuous random variable

Lecture no. 7:

- Expectation of a random variable and its properties.

Lecture no. 8:

- Raw and Central moments

Lecture no. 9:

- Variance
- Median

Lecture no. 10:

- Mode
- Quartiles

Lecture no. 11:

- Deciles
- Percentiles

Lecture no. 12:

- Skewness
- kurtosis

NAME OF THE TOPIC: examples based on previous lectures

Lecture no. 13:

- Examples based on Expectation and Variance

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Lecture no. 14:

- Examples based on mean and median

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Lecture no. 15:

- Examples based on quartiles and percentiles

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ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE, LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: SONALI THIK
DEPARTMENT: STATISTICS
CLASS: F.Y.B.SC. **SUBJECT:** statistical methods (Paper-ii)
UNIT NO.: ii **UNIT TITLE:** standard continuous distribution

NAME OF THE TOPIC: uniform distribution

Lecture no. 1:
- Definition of uniform distribution and its pdf with the help of graph
- Explain cdf of uniform distribution with the help of graph

Lecture no. 2:
- Mean and variance of uniform distribution

Lecture no. 3:
- Median, Mode, skewness and kurtosis
- Some particular cases of uniform distribution

Lecture no. 4:
- Examples based on uniform distribution and its properties

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NAME OF THE TOPIC: exponential distribution

Lecture no. 5:
- Definition of exponential distribution and its pdf, cdf

Lecture no. 6:
- Characteristics of exponential p.d.f and its curve.
- Mean of exponential distribution

Lecture no. 7:
- Variance and median of exponential distribution

NAME OF THE TOPIC: memoryless property

Lecture no. 8:
- State and prove memoryless property

Lecture no. 9:
- Examples based on exponential distribution

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NAME OF THE TOPIC: normal distribution

Lecture no. 10:

- Definition of normal distribution and its pdf
- Probability curve of normal distribution

Lecture no. 11:

- Properties of normal distribution and normal curve

Lecture no. 12:

- Properties of standard normal distribution and its curve

Lecture no. 13:

- Addition property of normal distribution
- Example based on Addition property of normal distribution

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NAME OF THE TOPIC: normal approximation to binomial and poisson

Lecture no. 14:

- Statement of Laplace DeMoivre theorem
- Example based on normal distribution

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Lecture no. 15:

- Example based on normal approximation to binomial and poisson

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LECTURE PLAN

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Of

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FIRST YEAR B.SC

Descriptive statistics

COURSE

SEMESTER I

2020-21

Lecture Plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER: Vijay Narkhede

DEPARTMENT: STATISTICS
CLASS: F.Y.B.Sc. SUBJECT: DESCRIPTIVE STATISTICS (Paper-I)
UNIT NO.: I UNIT TITLE: - Types of Data and Data Condensation

Lecture 1: Introduction to Types of Data and Sampling

- Definition of population and sample in statistics
- Explanation of finite and infinite populations
- Introduction to different sampling methods: Simple Random Sampling (SRS), SRS without replacement (SRSWOR), and SRS with replacement (SRSWR)

Lecture 2: Types of Characteristics and Scales of Measurement

- Overview of different types of characteristics: qualitative and quantitative
- Explanation of nominal, ordinal, interval, and ratio scales of measurement
- Understanding the properties and uses of each type of scale

Lecture 3: Collection of Primary Data

- Explanation of primary data collection methods: questionnaires and schedules
- Introduction to the concept of secondary data and its sources
- Discussion on the advantages and limitations of primary and secondary data

Lecture 4: Types of Data: Qualitative and Quantitative

- Definition and characteristics of qualitative and quantitative data
- Understanding the distinction between qualitative and quantitative variables
- Examples illustrating different types of data in various fields

Lecture 5: Types of Data: Time Series and Cross Section Data

- Definition and examples of time series data and cross-sectional data
- Explanation of the differences between time series and cross-sectional data
- Understanding the applications and analysis techniques for each type of data

Lecture 6: Types of Data: Discrete and Continuous

- Definition and characteristics of discrete and continuous data
- Understanding the distinction between discrete and continuous variables
- Examples illustrating different types of data in various contexts

Lecture 7: Tabulation of Data

- Explanation of tabulation as a method of summarizing and organizing data
- Introduction to frequency distributions and frequency tables
- Demonstration of techniques for tabulating qualitative and quantitative data

Lecture 8: Dichotomous Classification

- Definition and examples of dichotomous classification for two and three attributes
- Explanation of verification techniques for consistency in dichotomous classification
- Understanding the importance of consistent classification in data analysis

Lecture 9: Association of Attributes

- Introduction to measures of association for qualitative data
- Explanation of Yule's coefficient of association (Q) and Yule's coefficient of colligation
- Application of association measures to analyze relationships between attributes

Lecture 10: Examples and Problem Solving

- Solving problems and exercises related to types of data and data condensation
- Application of classification and association techniques to analyze real-world datasets
- Group activities and discussions to reinforce understanding of concepts

Lecture 11: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of data classification and association techniques
- Peer-to-peer learning and collaboration to deepen understanding of data condensation principles

Lecture 12: Advanced Topics in Data Condensation

- Exploration of advanced topics and extensions in data condensation techniques
- Analysis of non-standard data types and specialized data summarization methods
- Discussion of recent developments and research trends in data condensation

Lecture 13: Case Studies and Applications

- Analysis of real-world case studies using data condensation techniques
- Examination of how data condensation is applied in various fields such as marketing, finance, and healthcare
- Discussion of the practical implications and limitations of data condensation analysis

Lecture 14: Review and Practice

- Review of key concepts, definitions, and techniques related to types of data and data condensation
- Practice problems and exercises to reinforce understanding and mastery of concepts
- Q&A session to address any lingering doubts or questions about the material

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on types of data and data condensation
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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GOVERNMENT OF MAHARASHTRA'S
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LECTURE PLAN

NAME OF THE LECTURER: Vijay Narkhede
DEPARTMENT: STATISTICS
CLASS: F.Y.B.Sc. SUBJECT: DESCRIPTIVE STATISTICS (Paper-I)
UNIT NO.: II UNIT TITLE: - Classification of Data and Measures of central tendency

Lecture 1: Introduction to Classification of Data

- Definition of univariate frequency distribution for discrete and continuous variables

- Explanation of cumulative frequency distribution and its importance in data analysis
- Overview of different graphical representation techniques: Histogram, frequency polygon, cumulative frequency curve, and stem and leaf diagram

Lecture 2: Univariate Frequency Distribution

- Detailed explanation of univariate frequency distribution for discrete variables
- Demonstration of how to construct frequency tables and histograms for discrete variables
- Examples illustrating the interpretation of frequency distributions for discrete variables

Lecture 3: Univariate Frequency Distribution (contd.)

- Explanation of univariate frequency distribution for continuous variables
- Techniques for constructing frequency tables and histograms for continuous variables
- Interpretation of frequency distributions for continuous variables and their applications

Lecture 4: Cumulative Frequency Distribution

- Definition and significance of cumulative frequency distribution
- Explanation of how to construct cumulative frequency tables and curves
- Understanding the cumulative frequency distribution as a summary measure of data distribution

Lecture 5: Graphical Representation of Frequency Distribution

- Introduction to various graphical representation techniques: Histogram, frequency polygon, cumulative frequency curve, and stem-and-leaf diagram
- Demonstration of how to create and interpret each type of graph
- Comparison of different graphical representations for different types of data

Lecture 6: Measures of Central Tendency

- Concept of central tendency and its importance in summarizing data
- Requirements of a good measure of central tendency
- Overview of different types of locational averages: median, mode, quartiles, deciles, and percentiles

Lecture 7: Median and Mode

- Detailed explanation of median as a measure of central tendency
- Definition and interpretation of mode
- Understanding the applications and limitations of median and mode in data analysis

Lecture 8: Partition Values: Quartiles, Deciles, and Percentiles

- Definition and calculation of quartiles, deciles, and percentiles
- Explanation of how partition values divide the data into equal parts
- Interpretation of quartiles, deciles, and percentiles in data analysis

Lecture 9: Mathematical Averages: Arithmetic Mean

- Definition and calculation of arithmetic mean
- Explanation of simple, weighted, and combined mean
- Demonstration of how to calculate arithmetic mean for different types of data

Lecture 10: Mathematical Averages: Geometric Mean

- Definition and calculation of geometric mean
- Understanding the geometric mean as a measure of central tendency for skewed distributions
- Applications of geometric mean in various fields such as finance and biology

Lecture 11: Mathematical Averages: Harmonic Mean

- Definition and calculation of harmonic mean
- Explanation of harmonic mean as a measure of central tendency for rates and ratios
- Examples illustrating the calculation and interpretation of harmonic mean

Lecture 12: Empirical Relation between Mean, Median, and Mode

- Exploration of the empirical relationship between mean, median, and mode
- Understanding how the measures of central tendency relate to each other in different types of distributions
- Analysis of real-world datasets to demonstrate the relationship between mean, median, and mode

Lecture 13: Merits and Demerits of Different Measures

- Discussion on the advantages and disadvantages of using different measures of central tendency
- Understanding the applicability of each measure in different contexts and scenarios
- Comparison of measures of central tendency based on their robustness and sensitivity to outliers

Lecture 14: Examples and Problem Solving

- Solving problems and exercises related to classification of data and measures of central tendency
- Application of different measures of central tendency to analyze and interpret real-world datasets
- Group activities and discussions to reinforce understanding of concepts

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on classification of data and measures of central tendency
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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GOVERNMENT OF MAHARASHTRA'S
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LECTURE PLAN

NAME OF THE LECTURER: Vijay Narkhede
DEPARTMENT: STATISTICS
CLASS: F.Y.B.Sc. SUBJECT: DESCRIPTIVE STATISTICS (Paper-I)
UNIT NO.: III UNIT TITLE: - Measures of Dispersion, Skewness & Kurtosis

Lecture 1: Introduction to Measures of Dispersion

- Definition of dispersion and its importance in describing the spread of data
- Explanation of the requirements of a good measure of dispersion
- Overview of different types of measures of dispersion: absolute and relative

Lecture 2: Range

- Explanation of the range as a measure of dispersion
- Calculation of the range and interpretation of its significance
- Understanding the limitations of the range as a measure of dispersion

Lecture 3: Quartile Deviation

- Definition and calculation of quartile deviation
- Explanation of quartile deviation as a measure of dispersion based on quartiles
- Interpretation of quartile deviation in relation to the spread of data

Lecture 4: Mean Absolute Deviation

- Introduction to mean absolute deviation as a measure of dispersion
- Calculation of mean absolute deviation and its interpretation
- Comparison of mean absolute deviation with other measures of dispersion

Lecture 5: Standard Deviation

- Definition and calculation of standard deviation
- Understanding the concept of variance and its relation to standard deviation
- Interpretation of standard deviation as a measure of dispersion and its applications

Lecture 6: Variance and Combined Variance

- Explanation of variance and combined variance as measures of dispersion
- Calculation of variance and combined variance for different types of data
- Analysis of variance and combined variance in relation to the spread of data

Lecture 7: Moments

- Definition and calculation of raw moments and central moments
- Understanding the properties of moments and their significance in data analysis
- Exploration of the relationship between raw moments and central moments

Lecture 8: Skewness

- Introduction to skewness as a measure of asymmetry in a distribution
- Explanation of different measures of skewness: Karl Pearson's, Bowley's, and coefficient of skewness based on moments
- Interpretation of skewness measures and their applications

Lecture 9: Measures of Skewness (contd.)

- Calculation of skewness measures using different formulas
- Analysis of skewness measures to determine the shape of a distribution
- Understanding the implications of positive and negative skewness

Lecture 10: Kurtosis

- Definition and calculation of kurtosis as a measure of the peakedness of a distribution
- Interpretation of kurtosis measures and their significance in data analysis
- Comparison of different measures of kurtosis and their applicability

Lecture 11: Box Plot

- Introduction to box plots as a graphical representation of data dispersion
- Explanation of how to create and interpret box plots
- Understanding the advantages of box plots in visualizing the spread of data

Lecture 12: Examples and Problem Solving

- Solving problems and exercises related to measures of dispersion, skewness, and kurtosis
- Application of dispersion measures to analyze and interpret real-world datasets
- Group activities and discussions to reinforce understanding of concepts

Lecture 13: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of skewness and kurtosis measures through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of dispersion, skewness, and kurtosis principles

Lecture 14: Advanced Topics

- Exploration of advanced topics and extensions in measures of dispersion, skewness, and kurtosis
- Analysis of non-standard distributions and specialized measures of dispersion
- Discussion of recent developments and research trends in dispersion, skewness, and kurtosis analysis

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on measures of dispersion, skewness, and kurtosis
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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Credit BASED semester AND GRADING SYSTEM Of UNIVERSITY OF MUMBAI

FIRST YEAR B.SC
Descriptive statistics
COURSE
SEMESTER II
2020-21
Lecture Plan

GOVERNMENT OF MAHARASHTRA'S
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LECTURE PLAN

DATE : _____
NAME OF THE LECTURER: **Vijay Narkhede**
DEPARTMENT: **STATISTICS**
CLASS: **F.Y.B.Sc.** SUBJECT: **DESCRIPTIVE STATISTICS (Paper-I)**
UNIT NO.: **I** UNIT TITLE: **Correlation and regression analysis**

Lecture 1: Introduction to Correlation Analysis

- Definition of correlation and its importance in statistics
- Explanation of scatter diagrams as a graphical representation of the relationship between two variables
- Introduction to the product moment correlation coefficient (Pearson's correlation coefficient) and its properties

Lecture 2: Product Moment Correlation Coefficient

- Detailed explanation of the product moment correlation coefficient
- Calculation of the correlation coefficient using sample data
- Interpretation of the correlation coefficient and its significance in data analysis

Lecture 3: Properties of Correlation Coefficient

- Discussion on the properties of the correlation coefficient, including range and interpretation
- Analysis of the strength and direction of correlation based on the correlation coefficient
- Understanding the limitations and assumptions of correlation analysis

Lecture 4: Spearman's Rank Correlation

- Introduction to Spearman's rank correlation coefficient
- Explanation of the rank correlation coefficient and its interpretation
- Calculation of Spearman's rank correlation coefficient for ranked data with and without ties

Lecture 5: Concept of Linear Regression

- Definition of linear regression and its applications
- Introduction to the principle of least squares as a method for fitting a regression line
- Understanding the components of a linear regression model

Lecture 6: Fitting a Straight Line by Least Squares Method

- Detailed explanation of the least squares method for fitting a straight line
- Calculation of regression coefficients using the least squares approach
- Interpretation of regression coefficients and the fitted regression line

Lecture 7: Relation between Regression Coefficients and Correlation Coefficient

- Understanding the relationship between regression coefficients and correlation coefficient
- Explanation of how the correlation coefficient influences the slope of the regression line
- Analysis of the implications of correlation on regression analysis

Lecture 8: Fitting of Curves Reducible to Linear Form

- Introduction to curves reducible to linear form by transformation
- Explanation of how to transform nonlinear relationships into linear relationships
- Application of the least squares method to fit curves reducible to linear form

Lecture 9: Concept and Use of Coefficient of Determination (R^2)

- Definition of the coefficient of determination (R^2) and its interpretation
- Calculation of R^2 to assess the goodness of fit of a regression model
- Understanding the significance of R^2 in regression analysis

Lecture 10: Fitting a Quadratic Curve by Least Squares Method

- Introduction to fitting a quadratic curve using the least squares method
- Explanation of how to model quadratic relationships between variables
- Calculation of regression coefficients for quadratic regression models

Lecture 11: Examples and Problem Solving

- Solving problems and exercises related to correlation and regression analysis
- Application of correlation and regression techniques to analyze real-world datasets
- Group activities and discussions to reinforce understanding of concepts

Lecture 12: Examples and Problem Solving (cont.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of correlation and regression analysis through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of correlation and regression principles

Lecture 13: Advanced Topics

- Exploration of advanced topics and extensions in correlation and regression analysis
- Analysis of non-linear regression models and specialized regression techniques
- Discussion of recent developments and research trends in correlation and regression analysis

Lecture 14: Case Studies and Applications

- Analysis of real-world case studies using correlation and regression analysis
- Examination of how correlation and regression analysis is applied in various fields such

as economics, social sciences, and business
- Discussion of the practical implications and limitations of correlation and regression analysis

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on correlation and regression analysis
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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GOVERNMENT OF MAHARASHTRA'S
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LECTURE PLAN

DATE : _____
NAME OF THE LECTURER: Vijay Narkhede
DEPARTMENT: **STATISTICS**
CLASS: **F.Y.B.Sc.** SUBJECT: **DESCRIPTIVE STATISTICS (Paper-I)**
UNIT NO.: **II** UNIT TITLE: **Time series**

Lecture 1: Introduction to Time Series Analysis

- Definition of time series and its importance in statistics
- Explanation of the components of a time series: trend, seasonal variation, cyclical variation, and irregular variation
- Overview of different models used in time series analysis

Lecture 2: Trend Estimation

- Introduction to trend estimation in time series analysis
- Explanation of various methods for estimating trend: freehand curve method, method of semi-average, method of moving average, and method of least squares (linear trend only)
- Calculation of trend using each method and interpretation of results

Lecture 3: Freehand Curve Method

- Detailed explanation of the freehand curve method for trend estimation
- Demonstration of how to draw a freehand curve to estimate the trend in a time series
- Analysis of the advantages and limitations of the freehand curve method

Lecture 4: Method of Semi-Average

- Introduction to the method of semi-average for trend estimation
- Explanation of how to calculate semi-averages and use them to estimate the trend
- Understanding the concept of centered moving averages and their application in trend estimation

Lecture 5: Method of Moving Average

- Definition and explanation of the method of moving average for trend estimation
- Calculation of moving averages and interpretation of results
- Analysis of the effectiveness of moving averages in smoothing out fluctuations in a time series

Lecture 6: Method of Least Squares (Linear Trend)

- Introduction to the method of least squares for estimating linear trends in time series
- Explanation of how to fit a straight line to the data using the least squares approach
- Calculation of regression coefficients and interpretation of the fitted trend line

Lecture 7: Estimation of Seasonal Component

- Introduction to seasonal variation in time series analysis
- Explanation of various methods for estimating seasonal component: *method of simple average*, ratio to moving average, and ratio to trend method
- Calculation of seasonal indices using each method and interpretation of results

Lecture 8: Method of Simple Average

- Detailed explanation of the method of simple average for estimating seasonal variation
- Demonstration of how to calculate seasonal averages and seasonal indices
- Analysis of the strengths and weaknesses of the method of simple average

Lecture 9: Ratio to Moving Average

- Introduction to the ratio to moving average method for estimating seasonal variation
- Explanation of how to calculate seasonal ratios and use them to adjust the data for seasonal effects
- Understanding the concept of deseasonalization and its application in time series analysis

Lecture 10: Ratio to Trend Method

- Definition and explanation of the ratio to trend method for estimating seasonal variation
- Calculation of seasonal ratios relative to the trend and their interpretation
- Comparison of the ratio to trend method with other methods of seasonal adjustment

Lecture 11: Examples and Problem Solving

- Solving problems and exercises related to time series analysis
- Application of trend estimation and seasonal adjustment techniques to analyze real-world time series data
- Group activities and discussions to reinforce understanding of concepts

Lecture 12: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of time series analysis through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of time series analysis principles

Lecture 13: Advanced Topics

- Exploration of advanced topics and extensions in time series analysis
- Analysis of non-linear trends and seasonal patterns in time series data
- Discussion of recent developments and research trends in time series analysis

Lecture 14: Case Studies and Applications

- Analysis of real-world case studies using time series analysis techniques
- Examination of how time series analysis is applied in various fields such as finance, economics, and meteorology
- Discussion of the practical implications and limitations of time series analysis

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on time series analysis
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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LECTURE

LECTURE PLAN

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FIRST YEAR B.SC Descriptive Statistics COURSE

SEMESTER I

2022-23

Lecture Plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

Academic Year: 2022-23

NAME OF THE LECTURER: **Samreen Shaikh**
DEPARTMENT: **STATISTICS**
CLASS: **F.Y.B.Sc.**SUBJECT: **DESCRIPTIVE STATISTICS (Paper-I)**
UNIT NO.: **I**UNIT TITLE: - **Types of Data and Data Condensation**

Lecture 1: Introduction to Types of Data and Sampling

- Definition of population and sample in statistics
- Explanation of finite and infinite populations
- Introduction to different sampling methods: Simple Random Sampling (SRS), SRS without replacement (SRSWOR), and SRS with replacement (SRSWR)

Lecture 2: Types of Characteristics and Scales of Measurement

- Overview of different types of characteristics: qualitative and quantitative
- Explanation of nominal, ordinal, interval, and ratio scales of measurement
- Understanding the properties and uses of each type of scale

Lecture 3: Collection of Primary Data

- Explanation of primary data collection methods: questionnaires and schedules
- Introduction to the concept of secondary data and its sources
- Discussion on the advantages and limitations of primary and secondary data

Lecture 4: Types of Data: Qualitative and Quantitative

- Definition and characteristics of qualitative and quantitative data
- Understanding the distinction between qualitative and quantitative variables
- Examples illustrating different types of data in various fields

Lecture 5: Types of Data: Time Series and Cross Section Data

- Definition and examples of time series data and cross-sectional data
- Explanation of the differences between time series and cross-sectional data
- Understanding the applications and analysis techniques for each type of data

Lecture 6: Types of Data: Discrete and Continuous

- Definition and characteristics of discrete and continuous data
- Understanding the distinction between discrete and continuous variables
- Examples illustrating different types of data in various contexts

Lecture 7: Tabulation of Data

- Explanation of tabulation as a method of summarizing and organizing data
- Introduction to frequency distributions and frequency tables
- Demonstration of techniques for tabulating qualitative and quantitative data

Lecture 8: Dichotomous Classification

- Definition and examples of dichotomous classification for two and three attributes
- Explanation of verification techniques for consistency in dichotomous classification
- Understanding the importance of consistent classification in data analysis

Lecture 9: Association of Attributes

- Introduction to measures of association for qualitative data
- Explanation of Yule's coefficient of association (Q) and Yule's coefficient of colligation
- Application of association measures to analyze relationships between attributes

Lecture 10: Examples and Problem Solving

- Solving problems and exercises related to types of data and data condensation
- Application of classification and association techniques to analyze real-world datasets
- Group activities and discussions to reinforce understanding of concepts

Lecture 11: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of data classification and association techniques
- Peer-to-peer learning and collaboration to deepen understanding of data condensation principles

Lecture 12: Advanced Topics in Data Condensation

- Exploration of advanced topics and extensions in data condensation techniques
- Analysis of non-standard data types and specialized data summarization methods
- Discussion of recent developments and research trends in data condensation

Lecture 13: Case Studies and Applications

- Analysis of real-world case studies using data condensation techniques
- Examination of how data condensation is applied in various fields such as marketing, finance, and healthcare
- Discussion of the practical implications and limitations of data condensation analysis

Lecture 14: Review and Practice

- Review of key concepts, definitions, and techniques related to types of data and data condensation
- Practice problems and exercises to reinforce understanding and mastery of concepts
- Q&A session to address any lingering doubts or questions about the material

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on types of data and data condensation
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

Academic Year: 2022-23

NAME OF THE LECTURER: **Samreen Shaikh**
DEPARTMENT: **STATISTICS**
CLASS: **F.Y.B.Sc.** SUBJECT: **DESCRIPTIVE STATISTICS (Paper-I)**
UNIT NO.: **II** UNIT TITLE: **-Classification of Data and Measures of central tendency**

Lecture 1: Introduction to Classification of Data

- Definition of univariate frequency distribution for discrete and continuous variables
- Explanation of cumulative frequency distribution and its importance in data analysis
- Overview of different graphical representation techniques: Histogram, frequency polygon, cumulative frequency curve, and stem-and-leaf diagram

Lecture 2: Univariate Frequency Distribution

- Detailed explanation of univariate frequency distribution for discrete variables
- Demonstration of how to construct frequency tables and histograms for discrete variables
- Examples illustrating the interpretation of frequency distributions for discrete variables

Lecture 3: Univariate Frequency Distribution (contd.)

- Explanation of univariate frequency distribution for continuous variables
- Techniques for constructing frequency tables and histograms for continuous variables
- Interpretation of frequency distributions for continuous variables and their applications

Lecture 4: Cumulative Frequency Distribution

- Definition and significance of cumulative frequency distribution
- Explanation of how to construct cumulative frequency tables and curves
- Understanding the cumulative frequency distribution as a summary measure of data distribution

Lecture 5: Graphical Representation of Frequency Distribution

- Introduction to various graphical representation techniques: Histogram, frequency polygon, cumulative frequency curve, and stem-and-leaf diagram
- Demonstration of how to create and interpret each type of graph
- Comparison of different graphical representations for different types of data

Lecture 6: Measures of Central Tendency

- Concept of central tendency and its importance in summarizing data

- Requirements of a good measure of central tendency
- Overview of different types of locational averages: median, mode, quartiles, deciles, and percentiles

Lecture 7: Median and Mode

- Detailed explanation of median as a measure of central tendency
- Definition and interpretation of mode
- Understanding the applications and limitations of median and mode in data analysis

Lecture 8: Partition Values: Quartiles, Deciles, and Percentiles

- Definition and calculation of quartiles, deciles, and percentiles
- Explanation of how partition values divide the data into equal parts
- Interpretation of quartiles, deciles, and percentiles in data analysis

Lecture 9: Mathematical Averages: Arithmetic Mean

- Definition and calculation of arithmetic mean
- Explanation of simple, weighted, and combined mean
- Demonstration of how to calculate arithmetic mean for different types of data

Lecture 10: Mathematical Averages: Geometric Mean

- Definition and calculation of geometric mean
- Understanding the geometric mean as a measure of central tendency for skewed distributions
- Applications of geometric mean in various fields such as finance and biology

Lecture 11: Mathematical Averages: Harmonic Mean

- Definition and calculation of harmonic mean
- Explanation of harmonic mean as a measure of central tendency for rates and ratios
- Examples illustrating the calculation and interpretation of harmonic mean

Lecture 12: Empirical Relation between Mean, Median, and Mode

- Exploration of the empirical relationship between mean, median, and mode
- Understanding how the measures of central tendency relate to each other in different types of distributions
- Analysis of real-world datasets to demonstrate the relationship between mean, median, and mode

Lecture 13: Merits and Demerits of Different Measures

- Discussion on the advantages and disadvantages of using different measures of central tendency
- Understanding the applicability of each measure in different contexts and scenarios
- Comparison of measures of central tendency based on their robustness and sensitivity to outliers

Lecture 14: Examples and Problem Solving

- Solving problems and exercises related to classification of data and measures of central tendency
- Application of different measures of central tendency to analyze and interpret real-world datasets
- Group activities and discussions to reinforce understanding of concepts

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on classification of data and measures of central tendency
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

Academic Year: 2022-23

NAME OF THE LECTURER: **Samreen Shaikh**
DEPARTMENT: **STATISTICS**
CLASS: **F.Y.B.Sc.** SUBJECT: **DESCRIPTIVE STATISTICS (Paper-I)**
UNIT NO.: **III** UNIT TITLE: **-Measures of Dispersion, Skewness & Kurtosis**

Lecture 1: Introduction to Measures of Dispersion

- Definition of dispersion and its importance in describing the spread of data
- Explanation of the requirements of a good measure of dispersion
- Overview of different types of measures of dispersion: absolute and relative

Lecture 2: Range

- Explanation of the range as a measure of dispersion
- Calculation of the range and interpretation of its significance
- Understanding the limitations of the range as a measure of dispersion

Lecture 3: Quartile Deviation

- Definition and calculation of quartile deviation
- Explanation of quartile deviation as a measure of dispersion based on quartiles
- Interpretation of quartile deviation in relation to the spread of data

Lecture 4: Mean Absolute Deviation

- Introduction to mean absolute deviation as a measure of dispersion
- Calculation of mean absolute deviation and its interpretation
- Comparison of mean absolute deviation with other measures of dispersion

Lecture 5: Standard Deviation

- Definition and calculation of standard deviation
- Understanding the concept of variance and its relation to standard deviation
- Interpretation of standard deviation as a measure of dispersion and its applications

Lecture 6: Variance and Combined Variance

- Explanation of variance and combined variance as measures of dispersion
- Calculation of variance and combined variance for different types of data
- Analysis of variance and combined variance in relation to the spread of data

Lecture 7: Moments

- Definition and calculation of raw moments and central moments
- Understanding the properties of moments and their significance in data analysis
- Exploration of the relationship between raw moments and central moments

Lecture 8: Skewness

- Introduction to skewness as a measure of asymmetry in a distribution
- Explanation of different measures of skewness: Karl Pearson's, Bowley's, and coefficient of skewness based on moments
- Interpretation of skewness measures and their applications

Lecture 9: Measures of Skewness (contd.)

- Calculation of skewness measures using different formulas
- Analysis of skewness measures to determine the shape of a distribution
- Understanding the implications of positive and negative skewness

Lecture 10: Kurtosis

- Definition and calculation of kurtosis as a measure of the peakedness of a distribution
- Interpretation of kurtosis measures and their significance in data analysis
- Comparison of different measures of kurtosis and their applicability

Lecture 11: Box Plot

- Introduction to box plots as a graphical representation of data dispersion
- Explanation of how to create and interpret box plots
- Understanding the advantages of box plots in visualizing the spread of data

Lecture 12: Examples and Problem Solving

- Solving problems and exercises related to measures of dispersion, skewness, and kurtosis
- Application of dispersion measures to analyze and interpret real-world datasets
- Group activities and discussions to reinforce understanding of concepts

Lecture 13: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of skewness and kurtosis measures through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of dispersion, skewness, and kurtosis principles

Lecture 14: Advanced Topics

- Exploration of advanced topics and extensions in measures of dispersion, skewness, and kurtosis
- Analysis of non-standard distributions and specialized measures of dispersion
- Discussion of recent developments and research trends in dispersion, skewness, and kurtosis analysis

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on measures of dispersion, skewness, and kurtosis
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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Credit BASED semester AND GRADING SYSTEM

Of

UNIVERSITY OF MUMBAI

FIRST YEAR B.SC Descriptive Statistics COURSE

SEMESTER II

2022-23

Lecture Plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE : _____
NAME OF THE LECTURER: **Samreen Shaikh**
DEPARTMENT: **STATISTICS**
CLASS: **F.Y.B.Sc.** SUBJECT: **DESCRIPTIVE STATISTICS (Paper-I)**
UNIT NO.: **I** UNIT TITLE: **Correlation and regression analysis**

Lecture 1: Introduction to Correlation Analysis

- Definition of correlation and its importance in statistics
- Explanation of scatter diagrams as a graphical representation of the relationship between two variables
- Introduction to the product moment correlation coefficient (Pearson's correlation coefficient) and its properties

Lecture 2: Product Moment Correlation Coefficient

- Detailed explanation of the product moment correlation coefficient
- Calculation of the correlation coefficient using sample data
- Interpretation of the correlation coefficient and its significance in data analysis

Lecture 3: Properties of Correlation Coefficient

- Discussion on the properties of the correlation coefficient, including range and interpretation
- Analysis of the strength and direction of correlation based on the correlation coefficient
- Understanding the limitations and assumptions of correlation analysis

Lecture 4: Spearman's Rank Correlation

- Introduction to Spearman's rank correlation coefficient
- Explanation of the rank correlation coefficient and its interpretation
- Calculation of Spearman's rank correlation coefficient for ranked data with and without ties

Lecture 5: Concept of Linear Regression

- Definition of linear regression and its applications
- Introduction to the principle of least squares as a method for fitting a regression line
- Understanding the components of a linear regression model

Lecture 6: Fitting a Straight Line by Least Squares Method

- Detailed explanation of the least squares method for fitting a straight line
- Calculation of regression coefficients using the least squares approach
- Interpretation of regression coefficients and the fitted regression line

Lecture 7: Relation between Regression Coefficients and Correlation Coefficient

- Understanding the relationship between regression coefficients and correlation coefficient
- Explanation of how the correlation coefficient influences the slope of the regression line
- Analysis of the implications of correlation on regression analysis

Lecture 8: Fitting of Curves Reducible to Linear Form

- Introduction to curves reducible to linear form by transformation
- Explanation of how to transform nonlinear relationships into linear relationships
- Application of the least squares method to fit curves reducible to linear form

Lecture 9: Concept and Use of Coefficient of Determination (R^2)

- Definition of the coefficient of determination (R^2) and its interpretation
- Calculation of R^2 to assess the goodness of fit of a regression model
- Understanding the significance of R^2 in regression analysis

Lecture 10: Fitting a Quadratic Curve by Least Squares Method

- Introduction to fitting a quadratic curve using the least squares method
- Explanation of how to model quadratic relationships between variables
- Calculation of regression coefficients for quadratic regression models

Lecture 11: Examples and Problem Solving

- Solving problems and exercises related to correlation and regression analysis
- Application of correlation and regression techniques to analyze real-world datasets
- Group activities and discussions to reinforce understanding of concepts

Lecture 12: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of correlation and regression analysis through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of correlation and regression principles

Lecture 13: Advanced Topics

- Exploration of advanced topics and extensions in correlation and regression analysis
- Analysis of non-linear regression models and specialized regression techniques
- Discussion of recent developments and research trends in correlation and regression analysis

Lecture 14: Case Studies and Applications

- Analysis of real-world case studies using correlation and regression analysis
- Examination of how correlation and regression analysis is applied in various fields such as economics, social sciences, and business
- Discussion of the practical implications and limitations of correlation and regression analysis

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on correlation and regression analysis
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE : _____
NAME OF THE LECTURER: **Samreen Shaikh**
DEPARTMENT: **STATISTICS**
CLASS: **F.Y.B.Sc.** SUBJECT: **DESCRIPTIVE STATISTICS (Paper-I)**
UNIT NO.: **II** UNIT TITLE: **Time series**

Lecture 1: Introduction to Time Series Analysis

- Definition of time series and its importance in statistics
- Explanation of the components of a time series: trend, seasonal variation, cyclical variation, and irregular variation
- Overview of different models used in time series analysis

Lecture 2: Trend Estimation

- Introduction to trend estimation in time series analysis
- Explanation of various methods for estimating trend: freehand curve method, method of semi-average, method of moving average, and method of least squares (linear trend only)
- Calculation of trend using each method and interpretation of results

Lecture 3: Freehand Curve Method

- Detailed explanation of the freehand curve method for trend estimation
- Demonstration of how to draw a freehand curve to estimate the trend in a time series
- Analysis of the advantages and limitations of the freehand curve method

Lecture 4: Method of Semi-Average

- Introduction to the method of semi-average for trend estimation
- Explanation of how to calculate semi-averages and use them to estimate the trend
- Understanding the concept of centered moving averages and their application in trend estimation

Lecture 5: Method of Moving Average

- Definition and explanation of the method of moving average for trend estimation

- Calculation of moving averages and interpretation of results
- Analysis of the effectiveness of moving averages in smoothing out fluctuations in a time series

Lecture 6: Method of Least Squares (Linear Trend)

- Introduction to the method of least squares for estimating linear trends in time series
- Explanation of how to fit a straight line to the data using the least squares approach
- Calculation of regression coefficients and interpretation of the fitted trend line

Lecture 7: Estimation of Seasonal Component

- Introduction to seasonal variation in time series analysis
- Explanation of various methods for estimating seasonal component: method of simple average, ratio to moving average, and ratio to trend method
- Calculation of seasonal indices using each method and interpretation of results

Lecture 8: Method of Simple Average

- Detailed explanation of the method of simple average for estimating seasonal variation
- Demonstration of how to calculate seasonal averages and seasonal indices
- Analysis of the strengths and weaknesses of the method of simple average

Lecture 9: Ratio to Moving Average

- Introduction to the ratio to moving average method for estimating seasonal variation
- Explanation of how to calculate seasonal ratios and use them to adjust the data for seasonal effects
- Understanding the concept of deseasonalization and its application in time series analysis

Lecture 10: Ratio to Trend Method

- Definition and explanation of the ratio to trend method for estimating seasonal variation
- Calculation of seasonal ratios relative to the trend and their interpretation
- Comparison of the ratio to trend method with other methods of seasonal adjustment

Lecture 11: Examples and Problem Solving

- Solving problems and exercises related to time series analysis

- Application of trend estimation and seasonal adjustment techniques to analyze real-world time series data
- Group activities and discussions to reinforce understanding of concepts

Lecture 12: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of time series analysis through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of time series analysis principles

Lecture 13: Advanced Topics

- Exploration of advanced topics and extensions in time series analysis
- Analysis of non-linear trends and seasonal patterns in time series data
- Discussion of recent developments and research trends in time series analysis

Lecture 14: Case Studies and Applications

- Analysis of real-world case studies using time series analysis techniques
- Examination of how time series analysis is applied in various fields such as finance, economics, and meteorology
- Discussion of the practical implications and limitations of time series analysis

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on time series analysis
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE : _____
NAME OF THE LECTURER: **Samreen Shaikh**
DEPARTMENT: **STATISTICS**

CLASS: **F.Y.B.Sc.** SUBJECT: **DESCRIPTIVE STATISTICS (Paper-I)**
UNIT NO.: **III** UNIT TITLE: **Index Numbers**

Lecture No. : 1

- Introduce the concept of Index Number.
- Explain the Stages in the construction of price index numbers.

Comparative tool

Lecture No. : 2

- Introduce the concept for comparative tool.
- Describe the various steps involved in comparative tool.

Simple and composite index number

Lecture No. : 3

- Define and explain simple and composite index number.
- Also solved few examples for the same.

Lasperay's and Paasche's index numbers

Lecture No. : 4

- Introduce and brief the concept of Lasperay's & Paasche's Index Numbers.
- ***INNOVATIVE PRACTICES:*** HomeAssignment.

Edgeworth's and Bowley's index Numbers

Lecture No. : 5

- Introduce and brief the concept of Edgeworth's & Bowley's Index Numbers.

INNOVATIVE PRACTICES: HomeAssignment.

Drobisch's and fisher's index Numbers

Lecture No. : 6

- Introduce and brief the concept of Drobisch's & Fisher's Index Numbers.
- ***INNOVATIVE PRACTICES:*** HomeAssignment.

Quantity & value Index Numbers

Lecture No. : 7

- Explain the Quantity Index Numbers and Values Index Numbers.
- Define the difference between them.
- Solved few examples for the same.
-

Types of test for INDEX NUMBER

Lecture No. : 8

- Define and explain the concept of types of tests for index number.
- Time reversal test
- Factor reversal test
- Circular test.

INNOVATIVE PRACTICES: Practice Problems.

FIXED BASE Index Numbers

Lecture No. : 9

- Define and explain the concept of fixed base index number.
- Also state few examples on the same.

INNOVATIVE PRACTICES: Practice Problems

CHAIN BASE Index Numbers

Lecture No. : 10

- Define and explain the concept of Chain base index numbers.
- Also state few examples on the same.

INNOVATIVE PRACTICES: Practice Problems.

BASE SHIFTING & DEFLATING Index Numbers

Lecture No. : 11.

- Define and explain the concept and difference for base shifting , splicing & deflating.
- Also state few examples on the same.
-
- ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 12

- Define and explain the concept of real income based on wholesale price numbers.
- Also state few examples on the same.

- ***INNOVATIVE PRACTICES:*** Practice Problems.

OST OF LIVING Index Numbers

Lecture No. : 13

- Explain the concept for cost of living index numbers.
- Merits and Demerits for the same.

Lecture No. : 14

- Continue with the derivation and solve the problems based on it.

- ***INNOVATIVE PRACTICES:*** Practice Problems.

Lecture No. : 15

Class Test

- A revision of all important concepts, terms and definitions.
- A short class test on the same.

- ***INNOVATIVE PRACTICES:*** Class tests

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HEAD
Department Of Statistics
Ismail Yusuf College Of
Arts, Sc & Commerce
Jogeshwari (E), Mumbai

CREDIT BASED SEMESTER AND GRADING SYSTEM

OF

UNIVERSITY OF MUMBAI

FIRST YEAR B.SC

STATISTICAL METHODS

COURSE

SEMESTER I

2022-23

LECTURE PLAN

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____

NAME OF THE LECTURER: POOJA D. SALUNKHE

DEPARTMENT: STATISTICS

CLASS: F.Y.B.SC.

SUBJECT: STATISTICAL METHODS (PAPER-II)

UNIT NO.: I

UNIT TITLE: ELEMENTARY PROBABILITY THEORY

NAME OF THE TOPIC: BASIC CONCEPTS IN PROBABILITY

Lecture no. 1:

- Basic concepts: experiment, outcome, trial, sample space, sample point.
- Types of experiment with examples.

NAME OF THE TOPIC: EVENTS

Lecture no. 2:

- Events and its types with examples.

NAME OF THE TOPIC: PROBABILITY DEFINITIONS AND LIMITATIONS

Lecture no. 3:

- Definitions of probability and its limitations.

NAME OF THE TOPIC: EXAMPLES BASED ON PREVIOUS LECTURES

Lecture no. 4:

- Examples based on previous lecture topics.

❖ INNOVATIVE PRACTICES:HomeAssignment.

NAME OF THE TOPIC: PROBABILITY COUNTING RULES

Lecture no. 5:

- Principle of sequential counting.

Lecture no. 6:

- Simple random sampling
  - ➢ SRS with replacement
  - ➢ SRS without replacement

NAME OF THE TOPIC: EXAMPLES BASED ON PREVIOUS LECTURES

Lecture no. 7:

- Examples based on previous lecture topics.

❖ INNOVATIVE PRACTICES:HomeAssignment.

NAME OF THE TOPIC:AXIOMS OF PROBABILITY

Lecture no. 8:

- Explain axioms of probability.
- Theorems based on axioms.

NAME OF THE TOPIC: ADDITION THEOREM

Lecture no. 9:

- State and prove addition theorem of probability (Total probability theorem).

Lecture no. 10:

- Theorems: (i) $P(A \cup B) = P(A) + P(B)$, if A and B are mutually exclusive events.
  (ii) Boole's inequality
  (iii) Addition theorem for 3 events
  (iv) $P(A') = 1 - P(A)$

NAME OF THE TOPIC:CONDITIONAL PROBABILITY

Lecture no. 11:

- Introduction about conditional probability with the help of various examples.

❖ INNOVATIVE PRACTICES:HomeAssignment.

NAME OF THE TOPIC:INDEPENDENT EVENTS

Lecture no. 12:

- Brief explanation about independent events with day-to-day life examples.
- Definition of independent events.

NAME OF THE TOPIC:EXAMPLES BASED ON CONDITIONAL PROBABILITY AND INDEPENDENT EVENTS

Lecture no. 13:

- Examples based on conditional probability and independent events.

❖ INNOVATIVE PRACTICES:HomeAssignment.

NAME OF THE TOPIC:THEOREMS

Lecture no. 14:

- Explain theorems: (i) $0 \leq P(A/B) \leq 1$
  (ii) $P(S/B) = 1$
  (iii) $P[(A \cup B)/C] = P(A/C) + P(B/C)$, if A, B and C are mutually exclusive.
  (iv) $P[(A \cup B)/C] = P(A/C) + P(B/C) - P[(A \cap B)/C]$
  (v) $P(A'/B) = 1 - P(A/B)$

NAME OF THE TOPIC:MULTIPLICATION AND BAYES THEOREM

Lecture no. 15:

- State and prove multiplication theorem.
- State and prove bayes theorem.

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____

NAME OF THE LECTURER: POOJA D. SALUNKHE

DEPARTMENT: STATISTICS

CLASS: F.Y.B.SC.**SUBJECT:** STATISTICAL METHODS (PAPER-II)

UNIT NO.: II

UNIT TITLE: CONCEPT OF DISCRETE RANDOM VARIABLE AND PROPERTIES OF ITS PROBABILITY DISTRIBUTION

NAME OF THE TOPIC: RANDOM VARIABLE

Lecture no. 1:

- Explain random variable with examples.
- Explain discrete random variable with various examples.

NAME OF THE TOPIC:PROBABILITY MASS FUNCTION

Lecture no. 2:

- Define probability mass function with its properties.
- Examples based on p.m.f.

NAME OF THE TOPIC:CONDITIONALPROBABILITY DISTRIBUTION FUNCTION

Lecture no. 3:

- Define conditional probability distributionfunction with its properties.
- Define median and mode of the distribution.

NAME OF THE TOPIC:EXAMPLES BASED ON PREVIOUS LECTURES

Lecture no. 4:

- Examples based on c.d.f.

❖ INNOVATIVE PRACTICES:HomeAssignment.

NAME OF THE TOPIC:EXPECTATION

Lecture no. 5:

- Expectation definition and properties.
-

NAME OF THE TOPIC:MOMENTS

Lecture no. 6:

- Explain central and row moments
- Relationship between central and row moments

NAME OF THE TOPIC:SKEWNESS AND KURTOSIS

Lecture no. 7:

- Explainskewness and kurtosis

NAME OF THE TOPIC:EXAMPLES BASED ON PREVIOUS LECTURES

Lecture no. 8:

- Examples based on previous lecture topics.

❖ INNOVATIVE PRACTICES:HomeAssignments

NAME OF THE TOPIC:DISCRETE BIVARIATE RANDOM VARIABLES

Lecture no. 9:

- Joint probability mass function
- Marginal probability mass function
- Conditional probability mass function

NAME OF THE TOPIC:EXAMPLES BASED ON PREVIOUS LECTURES

Lecture no. 10:

- Examples based on previous lecture topics.

❖ INNOVATIVE PRACTICES:HomeAssignments

NAME OF THE TOPIC:EXPECTATIONS OF BIVARIATE RANDOM VARIABLES

Lecture no. 11:

- Concept of expectation
- Addition theorem of expectation

Lecture no. 12:

- Multiplication theorem of expectation

NAME OF THE TOPIC:COVARIANCE

Lecture no. 13:

- Define covariance
- State and prove properties of covariance

NAME OF THE TOPIC: VARIANCE

Lecture no. 14:

- Theorem: variance of linear combination of two variables
- Some special cases based on same theorem

NAME OF THE TOPIC: CORRELATION COEFFICIENT

Lecture no. 15:

- Define correlation coefficient and its properties
- Some examples based on it

❖ INNOVATIVE PRACTICES:HomeAssignments

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____

NAME OF THE LECTURER: POOJA D. SALUNKHE

DEPARTMENT: STATISTICS

CLASS: F.Y.B.SC. **SUBJECT:** STATISTICAL METHODS (PAPER-II)

UNIT NO.: III **UNIT TITLE:** STANDARD DISCRETE DISTRIBUTIONS

NAME OF THE TOPIC: DISCRETE UNIFORM DISTRIBUTION

Lecture no. 1:

- Definition of uniform distribution
- Define its p.m.f. and c.d.f.

Lecture no. 2:

- Properties of uniform distribution: mean, variance, skewness and kurtosis

NAME OF THE TOPIC: BINOMIAL DISTRIBUTION

Lecture no. 3:

- Definition of Bernoulli distribution and binomial distribution with its p.m.f.

Lecture no. 4:

- Properties of binomial distribution: mean, variance, mode

Lecture no. 5:

- Properties of uniform distribution: skewness and kurtosis, central moments, recurrence relationship between probabilities

NAME OF THE TOPIC:EXAMPLES BASED ON UNIFORM AND BINOMIAL DISTRIBUTION

Lecture no. 6:

- Examples based on uniform distribution

Lecture no. 7:

- Examples based on binomial distribution

- INNOVATIVE PRACTICES:HomeAssignments

NAME OF THE TOPIC: POISSON DISTRIBUTION

Lecture no. 8:

- Definition of Poisson distribution
- Define its p.m.f.
- Properties of Poisson distribution: mean, variance

Lecture no. 9:

- Properties of Poisson distribution: mode, skewness and kurtosis, recurrence relationship between probabilities

Lecture no. 10:

- Comparison between binomial and Poisson distribution
- Examples based on Poisson distribution

❖ INNOVATIVE PRACTICES:HomeAssignments

NAME OF THE TOPIC:HYPERGEOMETRIC DISTRIBUTION

Lecture no. 11:

- Definition of hypergeometric distribution
- Define its p.m.f.

Lecture no. 12:

- Properties of hypergeometric distribution: mean, variance

Lecture no. 13:

- Approximation of hypergeometric to binomial distribution

Lecture no. 14:

- Examples based on hypergeometric distribution

❖ INNOVATIVE PRACTICES:HomeAssignments

NAME OF THE TOPIC:REAL LIFE APPLICATIONS OF THE DISTRIBUTIONS

Lecture no. 15:

- Real life applications of the binomial distribution
- Real life applications of the Poisson distribution
- Real life applications of the hypergeometric distribution

CREDIT BASED SEMESTER AND GRADING SYSTEM

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STATISTICAL METHODS

COURSE

SEMESTER II

2022-23

LECTURE PLAN

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: POOJA D. SALUNKHE
DEPARTMENT: STATISTICS
CLASS: F.Y.B.SC. **SUBJECT:** STATISTICAL METHODS (PAPER-II)
UNIT NO.: I **UNIT TITLE:** CONTINUOUS RANDOM VARIABLE

NAME OF THE TOPIC:CONTINUOUS RANDOM VARIABLE

Lecture no. 1:

- Explain the concept of continuous random variable with examples.

NAME OF THE TOPIC:CONTINUOUS PROBABILITY DENSITY FUNCTION

Lecture no. 2:

- Explain continuous probability density function with its properties.

NAME OF THE TOPIC:EXAMPLES BASED ON PREVIOUS LECTURES

Lecture no. 3:

- Examples based on continuous probability density function

❖ INNOVATIVE PRACTICES:HomeAssignments

NAME OF THE TOPIC:CUMULATIVE DISTRIBUTION FUNCTION

Lecture no. 4:

- Explain the concept cumulative distribution function
- Properties of cumulative distribution function

NAME OF THE TOPIC:GRAPHICAL REPRESENTATION

Lecture no. 5:

- Graphical representation of probability density function and cumulative distribution function with the help of example

NAME OF THE TOPIC:EXAMPLES BASED ON PREVIOUS LECTURES

Lecture no. 6:

- Examples based on cumulative distribution function

❖ INNOVATIVE PRACTICES:HomeAssignments

NAME OF THE TOPIC: MEASURES ASSOCIATED WITH CONTINUOUS RANDOM VARIABLE

Lecture no. 7:

- Expectation of a random variable and its properties.

Lecture no. 8:

- Raw and Central moments

Lecture no. 9:

- Variance
- Median

Lecture no. 10:

- Mode
- Quartiles

Lecture no. 11:

- Deciles
- Percentiles

Lecture no. 12:

- Skewness
- kurtosis

NAME OF THE TOPIC: EXAMPLES BASED ON PREVIOUS LECTURES

Lecture no. 13:

- Examples based on Expectation and Variance

❖ INNOVATIVE PRACTICES:HomeAssignments

Lecture no. 14:

- Examples based on mean and median

❖ INNOVATIVE PRACTICES:HomeAssignments

Lecture no. 15:

- Examples based on quartiles and percentiles

❖ INNOVATIVE PRACTICES:HomeAssignments

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____

NAME OF THE LECTURER: POOJA D. SALUNKHE
DEPARTMENT: STATISTICS
CLASS: F.Y.B.SC. **SUBJECT:** STATISTICAL METHODS (PAPER-II)
UNIT NO.: II **UNIT TITLE:** STANDARDCONTINUOUS DISTRIBUTION

NAME OF THE TOPIC:UNIFORM DISTRIBUTION

Lecture no. 1:
- Definition of uniform distribution and its pdf with the help of graph
- Explain cdf of uniform distributionwith the help of graph

Lecture no. 2:
- Mean and variance of uniform distribution

Lecture no. 3:
- Median, Mode, skewness and kurtosis
- Some particular cases of uniform distribution

Lecture no. 4:
- Examples based on uniform distribution and its properties
- INNOVATIVE PRACTICES:HomeAssignments

NAME OF THE TOPIC:EXPONENTIAL DISTRIBUTION

Lecture no. 5:
- Definition of exponential distribution and its pdf, cdf

Lecture no. 6:
- Characteristics of exponential p.d.f and its curve.
- Mean of exponentialdistribution

Lecture no. 7:
- Variance and median of exponential distribution

NAME OF THE TOPIC:MEMORYLESS PROPERTY

Lecture no. 8:
- State and prove memoryless property

Lecture no. 9:

- Examples based on exponential distribution
- INNOVATIVE PRACTICES:HomeAssignments

NAME OF THE TOPIC:NORMAL DISTRIBUTION

Lecture no. 10:

- Definition of normal distribution and its pdf
- Probability curve ofnormal distribution

Lecture no. 11:

- Properties of normal distribution and normal curve

Lecture no. 12:

- Properties of standard normal distribution and its curve

Lecture no. 13:

- Addition property of normal distribution
- Example based on Addition property of normal distribution

❖ INNOVATIVE PRACTICES:HomeAssignments

NAME OF THE TOPIC:NORMAL APPROXIMATION TO BINOMIAL AND POISSON

Lecture no. 14:

- Statement of Laplace DeMoivre theorem
- Example based on normal distribution

❖ INNOVATIVE PRACTICES:HomeAssignments

Lecture no. 15:

- Example based on normal approximation to binomial and poisson

❖ INNOVATIVE PRACTICES:HomeAssignments

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____

NAME OF THE LECTURER: POOJA D. SALUNKHE

DEPARTMENT: STATISTICS

CLASS: F.Y.B.SC. **SUBJECT:** STATISTICAL METHODS (PAPER-II)

UNIT NO.: III

UNIT TITLE: ESTIMATION AND TESTING OF HYPOTHESIS

NAME OF THE TOPIC:BASIC CONCEPTS OF SAMPLING FROM DISTRIBUTION

Lecture no. 1:

- Basic concept: population, sample, estimation, statistic, parameter, estimator, estimate, sampling error, bias in estimator, unbiased estimator

NAME OF THE TOPIC:SAMPLING DISTRIBUTION

Lecture no. 2:

- Basic concept: sampling distribution, standard error
- Statement of central limit theorem, some results based on CLT

Lecture no. 3:

- Example based on central limit theorem

❖ INNOVATIVE PRACTICES:HomeAssignments

NAME OF THE TOPIC:SAMPLING DISTRIBUTION OF MEAN

Lecture no. 4:

- Brief explanation about sampling distribution of mean

NAME OF THE TOPIC:SAMPLING DISTRIBUTION OF SAMPLE PROPORTION

Lecture no. 5:

- Brief explanation aboutsampling distribution of sample proportion

Lecture no. 6:

- Example based on sampling distribution of sample proportion

❖ INNOVATIVE PRACTICES:HomeAssignments

NAME OF THE TOPIC:TYPES OF ESTIMATION

Lecture no. 7:

- Types of estimation: point estimation, interval estimation
- Some results based on Types of estimation

NAME OF THE TOPIC:CONFIDENCE INTERVAL

Lecture no. 8:

- Confidence interval for population mean from large samples
- Confidence interval for population proportion from large samples

Lecture no. 9:

- Examples based on confidence interval

❖ INNOVATIVE PRACTICES:HomeAssignments

NAME OF THE TOPIC: CONCEPTS OF HYPOTHESIS

Lecture no. 10:

- Definitions: statistical hypothesis, null hypothesis, alternative hypothesis, simple and composite hypothesis

Lecture no. 11:

- Concepts: Types of errors, size of the error, test statistic, critical region, critical values

Lecture no. 12:

- Concepts: level of significance and test of significance, power function (power of the test), uniformly most powerful test
- Examples based on hypothesis

❖ INNOVATIVE PRACTICES:HomeAssignments

NAME OF THE TOPIC: LARGE SAMPLE TEST

Lecture no. 13:

- Six step procedure of testing of hypothesis
- Significant test for testing population mean

CREDIT BASED SEMESTER AND GRADING SYSTEM

OF

UNIVERSITY OF MUMBAI

SECOND YEAR B.SC

STATISTICS PAPER I

COURSE

SEMESTER III

2022-2023

LECTURE PLAN

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: MOHAMMED SAHIL ANSARI
DEPARTMENT: STATISTICS
CLASS: S.Y.B.SC.**SUBJECT:** STATISTICS **PAPER:**I
UNIT NO.: 1 **UNIT TITLE:**UNIVARIATE RANDOM VARIABLES (DISCRETE AND CONTINUOUS)

Lecture 1: Introduction to Univariate Random Variables

- Definition of Random Variables
- Discrete vs. Continuous Random Variables
- Probability Mass Function (PMF) and Probability Density Function (PDF)

Lecture 2-3: Moment Generating Function (M.G.F.)

- Definition and properties
- Effect of change of origin and scale
- M.G.F. of sum of two independent random variables
- Extension for n independent random variables
- Uniqueness Property
- Raw moments using M.G.F.

Lecture 4-5: Cumulant Generating Function (C.G.F.)

- Definition and properties
- Effect of change of origin and scale
- Additive Property of C.G.F. and cumulants
- Obtaining Cumulants using C.G.F.
- Relationship between moments and cumulants

Lecture 6: Characteristic Function

- Definition and properties

- Examples of obtaining raw moments and central moments

Lecture 7: Degenerate Distribution

- Definition and properties
- Mean, Variance, and Use
- Example: One-point distribution

Lecture 8: Discrete Uniform Distribution

- Mean, Variance
- Coefficient of skewness using M.G.F.

Lecture 9: Bernoulli Distribution

- Mean, Variance
- Coefficient of skewness using M.G.F.

Lecture 10-11: Binomial Distribution

- Mean, Variance
- Measures of skewness and kurtosis
- Nature of probability curve
- Additive property
- Distribution of n-X

Lecture 12: Recurrence Relation for Moments

- Derivation and proof
- Application in calculating moments

Lecture 13: Relation between Bernoulli and Binomial Distributions

- Using M.G.F. to establish relationship

Lecture 14-15: Transformation of Random Variables

- Definition and examples
- Applications and properties

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____

NAME OF THE LECTURER: MOHAMMED SAHIL ANSARI
DEPARTMENT: STATISTICS
CLASS: S.Y.B.SC. **SUBJECT:** STATISTICS **PAPER:**I
UNIT NO.: 2 **UNIT TITLE:**STANDARD DISCRETE PROBABILITY DISTRIBUTION

Lecture 1: Introduction to Discrete Probability Distributions

- Overview of discrete probability distributions
- Introduction to Poisson distribution
- Mean and Variance of Poisson distribution
- Measures of skewness and kurtosis using M.G.F. and C.G.F.

Lecture 2: Properties of Poisson Distribution

- Nature of probability distribution with changes in parameters
- Mode of Poisson distribution
- Additive property of Poisson distribution
- Recurrence relation for moments with proof

Lecture 3: Conditional Distribution and Independence

- Conditional distribution of X given X+Y with proof
- Poisson distribution as a limiting distribution of Binomial (with proof)
- Real-life examples of Binomial and Poisson distributions

Lecture 4: Introduction to Geometric Distribution

- Definition in terms of number of failures and trials
- Mean and Variance of Geometric distribution
- M.G.F. and C.G.F. of Geometric distribution

Lecture 5: Properties of Geometric Distribution

- Coefficients of skewness and kurtosis
- Lack of memory property with proof
- Conditional distribution of X given X+Y with proof

Lecture 6: Distribution of Sum of Geometric Variables

- Distribution of sum of k i.i.d. Geometric variables

Lecture 7: Introduction to Negative Binomial Distribution

- Definition and parameters of Negative Binomial Distribution
- Mean and Variance of Negative Binomial distribution
- M.G.F. and C.G.F. of Negative Binomial distribution

Lecture 8: Properties of Negative Binomial Distribution

- Recurrence relation for central moments
- Coefficients of skewness and kurtosis
- Lack of memory property with proof

Lecture 9: Fitting of Negative Binomial Distribution

- Recurrence relation for probabilities
- Fitting of distribution

Lecture 10: Limiting Distribution of Negative Binomial

- Limiting distribution of Negative Binomial distribution with proof

Lecture 11: Introduction to Hypergeometric Distribution

- Definition and parameters of Hypergeometric Distribution
- Mean and Variance of Hypergeometric distribution

Lecture 12: Limiting Distribution of Hypergeometric

- Limiting distribution of Hypergeometric distribution with proof

Lecture 13: Conditional Distribution and Independence in Hypergeometric

- Conditional distribution of X given X+Y with proof

Lecture 14: Introduction to Truncated Distribution

- Definition of truncated distribution
- Truncated Binomial and Truncated Poisson Distribution

Lecture 15: Real-life Examples and Recap

- Probability mass function, mean, and variance of truncated distributions
- Real-life situations of Geometric, Negative Binomial, and Hypergeometric distributions
- Recap of key concepts and applications

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: MOHAMMED SAHIL ANSARI
DEPARTMENT: STATISTICS
CLASS: S.Y.B.SC. **SUBJECT:** STATISTICS **PAPER** :I
UNIT NO.: 3 **UNIT TITLE:** BIVARIATE PROBABILITY DISTRIBUTION

Lecture 1: Introduction to Bivariate Probability Distributions

- Definition of Bivariate Probability Distributions
- Overview of two-dimensional discrete random variables
- Joint Probability Mass Function (PMF) and its properties

Lecture 2: Joint Distribution Function and its Properties

- Definition and interpretation of Joint Distribution Function
- Properties of Joint Distribution Function
- Relationship between Joint PMF and Joint Distribution Function

Lecture 3: Moments, Covariance, and Correlation Coefficient

- Definition and calculation of raw and central moments for bivariate distributions
- Covariance and its interpretation
- Correlation coefficient and its significance

Lecture 4: Independence and Correlation

- Concepts of independence and correlation in bivariate distributions
- Calculation of independence and correlation for discrete random variables

Lecture 5: Marginal and Conditional Distributions

- Marginal probability distributions for bivariate random variables
- Conditional probability distributions and their properties

Lecture 6: Conditional Expectation and Conditional Variance

- Definition and computation of conditional expectation for discrete random variables
- Conditional variance and its interpretation

Lecture 7: Continuous Bivariate Random Variables

- Introduction to continuous bivariate distributions
- Joint Probability Density Function (PDF) and its properties

Lecture 8: Joint Distribution Function for Continuous Random Variables

- Definition and properties of Joint Distribution Function for continuous random variables
- Relationship between Joint PDF and Joint Distribution Function

Lecture 9: Moments, Covariance, and Correlation Coefficient (Continuous Case)

- Calculation of moments, covariance, and correlation coefficient for continuous distributions
- Interpretation of results in the continuous context

Lecture 10: Independence and Correlation (Continuous Case)

- Testing independence and correlation for continuous random variables
- Application of independence and correlation concepts in real-world scenarios

Lecture 11: Marginal and Conditional Distributions (Continuous Case)

- Marginal probability distributions for continuous bivariate random variables
- Conditional probability distributions in the continuous context

Lecture 12: Conditional Expectation and Conditional Variance (Continuous Case)

- Computing conditional expectation and conditional variance for continuous random variables
- Interpretation of results in the continuous setting

Lecture 13: Regression Function

- Introduction to regression function in the context of bivariate distributions
- Calculation and interpretation of regression function

Lecture 14: Transformation of Random Variables

- Introduction to transformation of random variables
- Concepts of transformations and their effects on distributions

Lecture 15: Jacobian of Transformation

- Understanding the Jacobian of transformation
- Illustrations and examples of transformations in bivariate distributions

CREDIT BASED SEMESTER AND GRADING SYSTEM OF UNIVERSITY OF MUMBAI

SECOND YEAR B.SC

STATISTICS PAPER II

COURSE

SEMESTER IV

2022-2023

LECTURE PLAN

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____

NAME OF THE LECTURER: MOHAMMED SAHIL ANSARI
DEPARTMENT: STATISTICS
CLASS: S.Y.B.SC. **SUBJECT:** STATISTICS **PAPER :**I
UNIT NO.: 1 **UNIT TITLE:**STANDARD CONTINUOUS PROBABILITY DISTRIBUTION

Lecture 1: Introduction to Continuous Probability Distributions

- Definition and characteristics of continuous probability distributions
- Overview of rectangular or continuous uniform distribution over (a, b)
- Mean, median, and standard deviation of rectangular distribution
- Cumulative Distribution Function (CDF) and Moment Generating Function (MGF) for rectangular distribution

Lecture 2: Properties of Rectangular Distribution

- Mean and variance calculation using MGF
- Third moment (μ_3) and skewness of the distribution
- Introduction to triangular distribution
- Properties and characteristics of triangular distribution

Lecture 3: Triangular Distribution

- Symmetric and asymmetric triangular distributions over (a, b) with peak at c
- MGF, mean, variance, and median of triangular distribution
- Discussion on symmetric and asymmetric cases

Lecture 4: Exponential Distribution

- Definition and properties of exponential distribution
- Moment Generating Function (MGF) and Cumulative Generating Function (CGF)
- Calculation of raw moments and central moments up to fourth order using MGF
- Measures of skewness and kurtosis, nature of probability curve

Lecture 5: Percentiles and Forgetfulness Property

- Calculation of median, quartiles, and percentiles for exponential distribution
- Discussion on the forgetfulness property with proof and examples

Lecture 6: Distribution of First Order Statistic and Ratios

- Distribution of first order statistic (X_1)
- Distribution of ratio of two i.i.d. exponential random variables

- Distribution of -ln(1-X) if X follows Uniform(0,1)

Lecture 7: Distribution of Sum of Two Independent Exponential Variables

- Distribution of X + Y for two independent exponential variables with mean 1
- Proof and discussion on the distribution of the sum

Lecture 8: Cauchy Distribution

- Properties of Cauchy distribution with proof
- Distribution of 1/X, CDF, and percentiles

Lecture 9: Gamma Distribution

- Introduction to gamma distribution with scale and shape parameters
- Expression for the rth raw moment, mean, variance, mode, and standard deviation
- MGF, additive property, CGF, and calculation of raw moments and central moments up to fourth order using MGF

Lecture 10: Skewness and Kurtosis of Gamma Distribution

- Coefficients of skewness and kurtosis
- Nature of probability curve for gamma distribution
- Distribution of sum of independent exponential random variables

Lecture 11: Beta Distribution Type I & II

- Expression for the rth raw moment, mean, mode, and standard deviation
- Harmonic mean calculation
- Distribution of 1 - X for Beta type I and distribution for Beta type II

Lecture 12: Distribution of Sum of Two Independent Gamma Variables

- Distribution of U and V for two independent gamma variables with parameters m and n
- Proof and discussion on the distribution of the sum

Lecture 13: Review and Applications

- Review of concepts covered so far
- Applications and examples of continuous probability distributions

Lecture 14: Advanced Topics and Examples

- Advanced topics related to continuous probability distributions
- Solving complex problems and scenarios using the distributions discussed

Lecture 15: Case Studies and Problem Solving

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____

NAME OF THE LECTURER: MOHAMMED SAHIL ANSARI
DEPARTMENT: STATISTICS
CLASS: S.Y.B.SC. **SUBJECT:** STATISTICS **PAPER :**I
UNIT NO.: 2 **UNIT TITLE:**NORMAL DISTRIBUTION

Lecture 1: Introduction to Normal Distribution

- Definition and characteristics of the normal distribution
- Derivation of mean, median, mode, and standard deviation
- Moment Generating Function (MGF) and Cumulative Generating Function (CGF)
- Moments and Cumulants up to fourth order

Lecture 2: Skewness, Kurtosis, and Nature of Normal Curve

- Calculation of skewness and kurtosis
- Discussion on the nature of the normal curve
- Mean absolute deviation and its calculation

Lecture 3: Properties of Normal Distribution

- Overview of key properties of the normal distribution
- Expression for even order central moments
- Proof showing that odd order central moments are zero
- Understanding percentiles in the normal distribution

Lecture 4: Distribution of Standard Normal Variable

- Definition and properties of the standard normal variable
- Calculation and interpretation of percentiles for the standard normal distribution

Lecture 5: Distribution of Linear Functions of Normal Variables

- Distribution of aX, X+b, aX+bY, X+Y, X-Y, and $\sum(iaiXi)$ for independent normal variables
- Proofs for the distributions of linear combinations

Lecture 6: Fitting of Normal Distribution

- Techniques for fitting a normal distribution to empirical data
- Methods for estimating parameters such as mean and standard deviation

Lecture 7: Central Limit Theorem

- Statement and proof of the Central Limit Theorem for i.i.d. random variables
- Understanding the implications of the Central Limit Theorem

Lecture 8: Log Normal Distribution

- Introduction to the log-normal distribution
- Derivation of mean and variance for the log-normal distribution
- Mode, median, and relation between them for log-normal distribution

Lecture 9: Distribution of Product of Log Normal Variables

- Calculation of the distribution of the product of n log-normal random variables
- Application of the log-normal distribution in real-world scenarios

Lecture 10: Review of Normal Distribution Properties

- Recap of key properties and concepts covered so far
- Practice problems and exercises related to normal distribution

Lecture 11: Advanced Topics in Normal Distribution

- Advanced properties and characteristics of the normal distribution
- Discussion on multivariate normal distribution and its properties

Lecture 12: Applications of Normal Distribution in Finance and Economics

- Use of normal distribution in modeling financial and economic variables
- Case studies and examples from finance and economics

Lecture 13: Applications of Normal Distribution in Engineering and Sciences

- Application of normal distribution in engineering and scientific fields
- Examples and case studies demonstrating the use of normal distribution in various domains

Lecture 14: Limitations and Extensions of Normal Distribution

- Limitations of the normal distribution model
- Introduction to alternative distributions and extensions of the normal distribution

Lecture 15: Project Presentations and Summary

- Students present projects or case studies involving the normal distribution
- Summary of key concepts covered throughout the lecture series
- Discussion on the relevance and importance of understanding normal distribution in various fields

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: MOHAMMED SAHIL ANSARI
DEPARTMENT: STATISTICS
CLASS: S.Y.B.SC. **SUBJECT:** STATISTICS **PAPER** :I
UNIT NO.: 3 **UNIT TITLE:** EXACT SAMPLING DISTRIBUTION

Lecture 1: Introduction to Chi-Square Distribution

- Derivation of probability density function (p.d.f.) of Chi-Square distribution
- Concept of degrees of freedom
- Mean, mode, and standard deviation of Chi-Square distribution
- Moment Generating Function (MGF) and Cumulative Generating Function (CGF)

Lecture 2: Measures of Skewness and Kurtosis in Chi-Square Distribution

- Calculation of skewness and kurtosis for Chi-Square distribution
- Additive property of Chi-Square distribution
- Distribution of ratio of two independent Chi-Square variables with proof

Lecture 3: Distribution of Sum of Squares of Standard Normal Variables

- Derivation of the distribution of sum of squares of independent Standard Normal variables
- Application of the result in various statistical tests

Lecture 4: Sampling Distributions of Sample Mean and Sample Variance

- Sampling distributions of sample mean and sample variance for a sample drawn from Normal distribution
- Independence between sample mean and sample variance with proof

Lecture 5: Applications of Chi-Square Distribution

- Development of decision criteria for significance tests using Chi-Square distribution
- Test procedures for specified value of variance of a Normal population
- Test for goodness of fit and independence of attributes

Lecture 6: Test Procedures for Independence of Attributes

- Test procedure for independence of attributes using Chi-Square distribution
- Application in r x c contingency table and 2 x 2 contingency table
- Derivation of test statistic and Yates' correction with proof

Lecture 7: Confidence Interval for Variance of a Normal Population

- Derivation of confidence interval for the variance of a Normal population when mean is known
- Derivation of confidence interval for the variance when mean is unknown

Lecture 8: Introduction to Student's t-Distribution

- Derivation of probability density function (p.d.f.) of Student's t-distribution
- Mean, median, mean deviation, and standard deviation of Student's t-distribution

Lecture 9: Measures of Skewness and Kurtosis in t-Distribution

- Calculation of skewness and kurtosis for Student's t-distribution
- Additive property of t-distribution
- Limiting distribution of t-distribution with proof

Lecture 10: Applications of Student's t-Distribution

- Development of decision criteria for significance tests using t-distribution
- Test procedure for specified value of mean of Normal population
- Test procedure for difference between means of two independent Normal populations with equal variances

Lecture 11: Test Procedure for Dependent Samples

- Test procedure for dependent samples (Paired t test) using t-distribution
- Derivation of confidence intervals for mean of Normal population and difference between means of two independent Normal populations

Lecture 12: Introduction to Snedecor's F-Distribution

- Derivation of probability density function (p.d.f.) of Snedecor's F-distribution
- Expression for rth raw moment, mean, variance, mode, and standard deviation

Lecture 13: Distribution of Reciprocal of F Variable

- Distribution of Reciprocal of F variable with proof
- Applications in statistical tests

Lecture 14: Applications of Snedecor's F-Distribution

- Test procedure for testing equality of variances of two independent Normal populations
- Derivation of confidence interval for ratio of variances of two independent Normal populations

Lecture 15: Review and Summary

- Review of key concepts and results covered throughout the lecture series
- Summary of applications and significance of Exact Sampling Distributions in statistics

HEAD
Department Of Statistics
Ismail Yusuf College Of
Arts, Sc & Commerce
Jogeshwari (E), Mumbai

Credit BASED semester AND GRADING SYSTEM OF UNIVERSITY OF MUMBAI

SECOND YEAR B.SC

STATISTICS COURSE

SEMESTER III

Paper II

Lecture Plan

Academic Year: 2022-23

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE
LECTURE PLAN

NAME OF THE LECTURER: **Darakshan Shaikh**

DEPARTMENT: **STATISTICS**

CLASS: **S.Y.B.Sc.**

SUBJECT: **Sampling Techniques (Paper 2)**

UNIT NO.: I UNIT TITLE: - **Simple Random Sampling**

Lecture 1:
Introduction to Concepts of Statistics*
- Definition of statistics and its importance in data analysis
- Overview of key concepts including population, sample, parameter, statistic, estimator, bias, mean square error, and standard error

Lecture 2:
Population and Sample*
- Explanation of population and sample units
- Understanding the difference between population parameters and sample statistics

Lecture 3:
Census Survey vs. Sample Survey*
- Differentiating between census survey and sample survey methodologies
- Explanation of the steps involved in conducting a sample survey

Lecture 4:
Designing Questionnaires for Sample Surveys*
- Strategies and examples for designing appropriate questionnaires for sample surveys
- Understanding the importance of clear and unbiased questions in survey design

Lecture 5:
Sampling Errors vs. Non-Sampling Errors*
- Definition and examples of sampling errors and non-sampling errors
- Understanding the impact of errors on the accuracy and reliability of statistical analysis

Lecture 6:
National Sample Survey Office (NSSO) and Central Statistics Office (CSO)*
- Introduction to NSSO and CSO and their functions in data collection and analysis
- Overview of the role of government statistical agencies in providing reliable data for policymaking

Lecture 7:
Probability Sampling vs. Non-Probability Sampling*
- Explanation of probability sampling methods and their advantages
- Understanding non-probability sampling techniques and their limitations

Lecture 8:
Simple Random Sampling (SRS)*
- Definition of simple random sampling and its importance in survey design
- Explanation of sampling with and without replacement and the lottery method

Lecture 9:
Estimation of Population Mean and Total*
- Understanding the process of estimating population mean and total using simple random sampling
- Calculation of expectation and variance of estimators, and unbiased estimator of variance

Lecture 10:
Estimation of Population Proportion*
- Explanation of estimating population proportion using simple random sampling
- Calculation of expectation and variance of estimators, and unbiased estimator of variance

Lecture 11:
Estimation of Sample Size*
- Methods for estimating sample size based on desired accuracy in simple random samplingfor variables and attributes
- Understanding the factors influencing sample size determination

Lecture 12:
Application of Sampling Techniques*
- Application of sampling techniques in real-world scenarios and research studies
- Examination of case studies and examples illustrating the use of simple random sampling invarious contexts

Lecture 13:
Advanced Sampling Methods*
- Exploration of advanced sampling methods such as stratified sampling, cluster sampling,and systematic sampling
- Understanding the advantages and limitations of different sampling techniques

Lecture 14:
Quality Assurance in Sampling*
- Discussion of quality assurance measures in sampling to minimize errors and biases
- Examination of validation techniques and procedures to ensure the reliability of sample data

Lecture 15: Class Test and Review and Final Assessment*
- Comprehensive review of all topics covered in Unit I: Concepts
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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CLASS: **S.Y.B.Sc.**

SUBJECT: **Sampling Techniques (Paper 2)**

UNIT NO.: 2 UNIT TITLE: - **Stratified Random Sampling**

Lecture 1:

Introduction to Stratified Sampling*

- Definition of stratified sampling and its importance in sampling design
- Explanation of the need for stratification with suitable examples

Lecture 2:

Stratified Sample*

- Definition and characteristics of a stratified sample
- Understanding how stratified sampling improves representation of population characteristics

Lecture 3:

Advantages of Stratified Sampling*

- Exploration of the advantages of stratified sampling over simple random sampling
- Discussion of how stratification reduces sampling variability and improves precision

Lecture 4:

Stratified Random Sampling*

- Explanation of stratified random sampling methodology
- Understanding the process of dividing the population into strata and selecting samples from each stratum

Lecture 5:

Estimation of Population Mean and Total*

- Calculation of estimates for population mean and total in case of stratified random sampling without replacement within each stratum
- Derivation of expectation and variance of unbiased estimators, and unbiased estimators of variances

Lecture 6:

Proportional Allocation*

- Explanation of proportional allocation method in stratified sampling
- Understanding how sample size is allocated to each stratum based on the proportion of population size

Lecture 7:

Optimum Allocation*

- Introduction to optimum allocation method in stratified sampling
- Understanding how sample size is allocated to each stratum considering varying costs

Lecture 8:

Comparison of Sampling Methods*

- Comparison of simple random sampling, stratified random sampling using proportional allocation, and stratified random sampling using Neyman allocation
- Understanding the advantages and limitations of each sampling method

Lecture 9:

Neyman Allocation*

- Explanation of Neyman allocation method in stratified sampling
- Understanding the optimization process for allocating sample size to each stratum

Lecture 10:

Allocation with Varying Costs*

- Analysis of optimum allocation method considering varying costs associated with each stratum
- Understanding the trade-offs between sampling efficiency and cost-effectiveness

Lecture 11:

Case Studies and Examples*

- Examination of real-world case studies illustrating the application of stratified sampling techniques
- Analysis of different scenarios and decision-making processes in stratified sampling design

Lecture 12:

Sampling Efficiency*

- Discussion of sampling efficiency measures in stratified sampling
- Understanding how to evaluate the effectiveness of stratified sampling designs

Lecture 13:

Stratification Criteria*

- Explanation of criteria for stratification including demographic characteristics, geographical regions, and other relevant factors
- Understanding how to identify suitable stratification variables based on research objectives

Lecture 14:

Practical Considerations in Stratified Sampling*

- Exploration of practical considerations such as data availability, cost constraints, and sampling frame quality in stratified sampling design
- Discussion of strategies for addressing challenges and optimizing sampling designs

Lecture 15:

Review and Final Assessment*

- Comprehensive review of all topics covered in Unit II: Stratified Sampling
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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CLASS: **S.Y.B.Sc.**

SUBJECT: **Sampling Techniques (Paper 2)**

UNIT NO.: 3 UNIT TITLE: - **Ratio and Regression Estimates**

Lecture 1:

Introduction to Ratio Estimation*

- Definition of ratio estimation and its importance in sampling
- Explanation of ratio estimators for population ratio, mean, and total assuming simple random sampling without replacement (SRSWOR)

Lecture 2:

Ratio Estimators: Expectation and MSE*

- Calculation of expectation and mean square error (MSE) of ratio estimators
- Understanding the properties and limitations of ratio estimators

Lecture 3:

Estimators of MSE for Ratio Estimators*

- Introduction to estimators of MSE for ratio estimators
- Understanding how to assess the accuracy and precision of ratio estimators

Lecture 4:

Uses of Ratio Estimator*

- Discussion of the applications and advantages of ratio estimators in sampling
- Examination of real-world examples illustrating the use of ratio estimators

Lecture 5:

Introduction to Regression Estimation*

- Definition of regression estimation and its relevance in sampling
- Explanation of regression estimators for population mean and total assuming known value of regression coefficient 'b'

Lecture 6:

Regression Estimators: Expectation and Variance*

- Calculation of expectation and variance of regression estimators
- Understanding how the estimation of 'b' affects the variance of the estimators

Lecture 7:

Estimation of Regression Coefficient 'b'*

- Methods for estimating the regression coefficient 'b' in regression estimation
- Understanding the importance of accurate estimation of 'b' in regression analysis

Lecture 8:

Comparison of Ratio, Regression, and Mean per Unit Estimators*

- Comparative analysis of ratio, regression, and mean per unit estimators
- Understanding the strengths and weaknesses of each estimator and their suitability for different sampling scenarios

Lecture 9:

Introduction to Systematic Sampling*

- Definition and methodology of systematic sampling
- Understanding how systematic sampling differs from simple random sampling and its advantages

Lecture 10:

Introduction to Cluster Sampling*

- Explanation of cluster sampling methodology
- Understanding the concept of clusters and the sampling process in cluster sampling

Lecture 11:

Introduction to Two-Stage Sampling*

- Explanation of two-stage sampling methodology
- Understanding the sampling process and the stages involved in two-stage sampling

Lecture 12:

Illustrations of Systematic, Cluster, and Two-Stage Sampling*

- Real-world examples and illustrations demonstrating the application of systematic, cluster, and two-stage sampling methods
- Analysis of different sampling scenarios and decision-making processes in each method

Lecture 13:

Advantages and Limitations of Different Sampling Methods*

- Discussion of the advantages and limitations of systematic, cluster, and two-stage sampling methods
- Understanding the factors influencing the choice of sampling method in different research contexts

Lecture 14:

Practical Considerations in Sampling Design*

- Exploration of practical considerations such as sampling frame, sample size, and sampling variability in sampling design
- Discussion of strategies for addressing challenges and optimizing sampling designs

Lecture 15:

Class Test and Review and Final Assessment*

- Comprehensive review of all topics covered in Unit III
- Final assessment to evaluate students' understanding and mastery of concepts

Credit BASED semester AND GRADING SYSTEM OF UNIVERSITY OF MUMBAI

SECOND YEAR B.SC

STATISTICS COURSE

SEMESTER IV

Paper II

Lecture Plan

Academic Year: 2022-23

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE
LECTURE PLAN

NAME OF THE LECTURER: **Darakshan Shaikh**

DEPARTMENT: **STATISTICS**

CLASS: **S.Y.B.Sc.**

SUBJECT: **Analysis of Variance and Designs of Experiments (Paper 2)**

UNIT NO.: I UNIT TITLE: - **Analysis of Variance**

Lecture 1:
Introduction to ANOVA*
-Overview of ANOVA and its applications-Importance of ANOVA in statistical analysis
-Brief history and development of ANOVA

Lecture 2:
Cochran's Theorem*
-Statement of Cochran's Theorem -Understanding the significance of Cochran's Theorem in ANOVA

Lecture 3:
One-Way Classification with Equal Observations*
-Introduction to one-way classification -Handling equal observations per class
-Calculation and interpretation of sums of squares

Lecture 4:
One-Way Classification with Unequal Observations*
-Challenges and solutions in handling unequal observations
-Adjustments in ANOVA for unequal observations per class

Lecture 5:
Two-Way Classification*
-Introduction to Two-way classification -Understanding the structure of two-way ANOVA

Lecture 6:
Mathematical Model of ANOVA*
Formulation of the mathematical model for ANOVA and Assumptions underlying the ANOVA model
-Interpretation of model parameters

Lecture 7:
Expectation of Various Sums of Squares*
-Calculation and interpretation of expected values of sums of squares and derivation of expected values under different scenarios
-Significance of expected values in ANOVA analysis

Lecture 8:
F-Test*
-Introduction to the F-test in ANOVA and understanding the F-statistic and its distribution
-Application of the F-test for hypothesis testing

Lecture 9:
Analysis of Variance Table*
-Construction and interpretation of the ANOVA table and components of the ANOVA table and their significance
-Practical exercises on ANOVA table construction

Lecture 10:
Least Square Estimators*
-Introduction to least square estimators and derivation of least square estimators in ANOVA
-Properties and limitations of least square estimators

Lecture 11:
Variance of Estimators*
-Calculation and interpretation of variance of estimators and understanding the precision of estimators in ANOVA
-Impact of sample size on estimator variance

Lecture 12:
Estimation of Treatment Contrasts*
-Techniques for estimating treatment contrasts in ANOVAand importance of treatment contrasts in data interpretation
-Examples demonstrating the estimation of treatment contrasts

Lecture 13:
Standard Error and Confidence Limits*
-Calculation and interpretation of standard error in ANOVA and determination of confidence limits for elementary treatment contrasts
-Practical applications of standard error and confidence limits

Lecture 14:
Review and Practice*
-Review of key concepts covered in previous lectures
-Practice problems and exercises to reinforce learning and clarification of doubts and questions from students
-Class Test

Lecture 15:
Case Studies and Applications*
-Analysis of real-world datasets using ANOVA techniques
-Case studies demonstrating the application of ANOVA in different fields
-Discussion on challenges and best practices in ANOVA analysis

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CLASS: S.Y.B.Sc.

SUBJECT: **Analysis of Variance and Designs of Experiments (Paper 2)**

UNIT NO.: 2 UNIT TITLE: - Designs of Experiments

Lecture 1 :

Introduction to Experimental Design*
-Concepts of Experiments - Experimental unit, Treatment, Yield, Block, Replicate, Experimental Error
-Precision in experiments

Lecture 2:

Principles of Design of Experiments*

Replication, Randomization, and Local Control and importance and benefits of replication

Lecture 3:

Efficiency Comparison*

-Understanding efficiency in experimental designs and comparing efficiency of design D1 with respect to design D2

Lecture 4:

Choice of Plot and Block Size and Shape*

-Factors influencing the choice of plot and block size and shape and considerations for agricultural experiments

-Considerations for non-agricultural experiments

Lecture 5:

Completely Randomized Design (CRD)*

-Mathematical Model of CRD and assumptions underlying CRD and Expectation of various sums of squares in CRD

-F-test in CRD

Lecture 6:

Analysis of Variance (ANOVA) for CRD*

-Constructing an Analysis of Variance table for CRD

-Interpretation of ANOVA results and Applications and limitations of CRD

Lecture 7:

Randomized Block Design (RBD)*

-Introduction to RBD

-Mathematical Model of RBD and assumptions underlying RBD and Expectation of various sums of squares in RBD

Lecture 8:

Analysis of Variance (ANOVA) for RBD*

-Constructing an Analysis of Variance table for RBD and Interpretation of ANOVA results in RBD

-Comparison of RBD with CRD

Lecture 9:

Least Square Estimators*

-Understanding least square estimators of parameters and Variance of the estimators

Lecture 10:

Standard Error and Confidence Intervals*

-Calculation of standard error for treatment contrasts and determining confidence limits for elementary treatment contrasts

-Interpretation of confidence intervals

Lecture 11:

Efficiency of RBD Relative to CRD*

-Comparative analysis of efficiency between RBD and CRD

-Factors influencing the efficiency of RBD and CRD

Lecture 12:

Experimental Error and Precision*

-Revising the concepts of experimental error and precision and advanced techniques for minimizing experimental error

Lecture 13:

Application of Experimental Design in Real-world Scenarios*

-Case studies showcasing the application of experimental design principles

-Practical examples from agriculture, industry, and scientific research

Lecture 14:

Advanced Topics in Experimental Design*

-Advanced experimental design techniques and Factorial designs, split-plot designs, and nested designs

Lecture 15:

Review and Applications*

-Review of key concepts covered throughout the course and discussion on real-world applications and implications of experimental design principles, Q&A session to address any remaining doubts or questions

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CLASS: S.Y.B.Sc.

SUBJECT: **Analysis of Variance and Designs of Experiments (Paper 2)**

UNIT NO.: 3 UNIT TITLE: - **Latin Square Design**

Lecture 1:

Introduction to Experimental Design*
-Overview of experimental design principles and importance of experimental design in research
-Basic concepts: factors, treatments, experimental units

Lecture 2:

Latin Square Design (LSD): Introduction*
-Definition and characteristics of Latin Square Design and Historical background and applications
-Assumptions of LSD

Lecture 3:

Latin Square Design (LSD): Mathematical Model*
-Mathematical representation of LSD and Notation and terminology used in LSD
-Construction of a Latin Square

Lecture 4:

Latin Square Design (LSD): Expectation of Various Sums of Squares*
-Expected mean squares under different sources of variation and calculation of expected sums of squares
-Interpretation of expected values in LSD

Lecture 5:

Latin Square Design (LSD): F-test and Analysis of Variance Table*
-Introduction to F-test and its application in LSD
-Construction and interpretation of the analysis of variance (ANOVA) table for LSD

Lecture 6:

Latin Square Design (LSD): Least Square Estimators*
-Definition and calculation of least square estimators for LSD
-Properties and interpretation of least square estimators

Lecture 7:

Latin Square Design (LSD): Variance of Estimators*
-Calculation of the variance of estimators in LSD and Factors influencing the variance of estimators
-Interpretation of variance estimates

Lecture 8:

Latin Square Design (LSD): Estimation of Treatment Contrasts*
-Definition and significance of treatment contrasts and calculation of treatment contrasts in LSD
-Interpretation of treatment contrasts

Lecture 9:

Latin Square Design (LSD): Standard Error and Confidence Limits*
-Calculation of standard error for elementary treatment contrasts and Determination of confidence limits for treatment contrasts
-Interpretation of confidence intervals

Lecture 10:

Latin Square Design (LSD): Efficiency Relative to RBD and CRD*
-Comparison of efficiency of LSD with Randomized Block Design (RBD) and Completely Randomized Design (CRD)

Lecture 11:

Missing Plot Technique in Experimental Designs*
-Introduction to missing plot technique and its application of missing plot technique for one missing observation in CRD, RBD, and LSD
-Interpretation of results using missing plot technique

Lecture 12:

Factorial Experiments: Introduction and Purpose*
-Definition and significance of factorial experiments and advantages of factorial designs over single-factor designs and Examples of factorial experiments

Lecture 13:

Factorial Experiments: Main Effects and Interaction Effects*
-Calculation and interpretation of main effects in factorial experiments
-Calculation and interpretation of interaction effects in factorial experiments
-Importance of main effects and interactions in factorial designs

Lecture 14:

Factorial Experiments: Analysis and Contrast*
-Analysis of 2^2 and 2^3 factorial experiments
-Definition and calculation of contrasts in factorial designs and application of Yates' method for calculating contrasts

Lecture 15:

Factorial Experiments: Orthogonal Contrasts and Conclusion*
-Definition and significance of orthogonal contrasts
-Calculation and interpretation of orthogonal contrasts

-Review of key concepts and conclusions of the course

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HEAD
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CREDIT BASED SEMESTER AND GRADING SYSTEM

OF

UNIVERSITY OF MUMBAI

SECOND YEAR B.SC

STATISTICS PAPER

IIICOURSE

SEMESTER III

2022-23

LECTURE PLAN

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER: POOJA D. SALUNKHE
DEPARTMENT: STATISTICS
CLASS: S.Y.B.SC. **SUBJECT:** STATISTICS **PAPER:**III
UNIT NO.: 1 **UNIT TITLE:** OPERATION RESEARCH

NAME OF THE TOPIC: LINEAR PROGRAMMING PROBLEM

LECTURE NO. : 1

- Introduce the concept of L.P.P. as one of the major branches of Operation Research, its importance and necessity.
- Begin at the very beginning by introducing and defining concepts integral to the study of L.P.P. such as Maximization & Minimization.

LECTURE NO. : 2

- Concepts of Solution: namely, Feasible Solution, Basic Feasible solution, Optimal Solution.
- Give a few examples of Solutions.
- Mathematical Formulation of the given problem.

❖ ***INNOVATIVE PRACTICES:*** Classroom presentations.

NAME OF THE TOPIC: GRAPHICAL PROBLEM

LECTURE NO. : 3

- Solving Linear Programming Problem by Graphical Method for Maximization Objective Function.
- Finding Feasible Solution using Graphical Method.

❖ ***CASE STUDY/EXAMPLES: Solving Examples based on Graphical methods.***

❖ ***INNOVATIVE PRACTICES :*** HomeAssignments

LECTURE NO. : 4

- Solving Linear Programming Problem by Graphical Method for Minimization Objective Function.
- Finding Feasible Solution using Graphical Method.

❖ ***CASE STUDY/EXAMPLES: Solving Examples based on Graphical methods.***

❖ ***INNOVATIVE PRACTICES :*** HomeAssignments

NAME OF THE TOPIC: SIMPLEX METHOD

LECTURE NO. : 5

- Solving Linear Programming Problem by Simplex Method for Maximization Objective Function for two variables.
- Finding Optimal Solution using Simplex Method.

❖ ***CASE STUDY/EXAMPLES:*** Practical Problems

❖ ***INNOVATIVE PRACTICES:*** HomeAssignments

LECTURE NO. : 6

- Solving Linear Programming Problem by Simplex Method for Maximization Objective Function for more than two variables.
- Finding Optimal Solution using Simplex Method.

❖ ***CASE STUDY/EXAMPLES:*** Practical Problems

❖ ***INNOVATIVE PRACTICES:*** HomeAssignments

LECTURE NO. : 7

- Solving Linear Programming Problem by Simplex Method for Minimization Objective Function for two variables.
- Finding Optimal Solution using Simplex Method.

❖ ***CASE STUDY/EXAMPLES:*** Practical Problems

❖ ***INNOVATIVE PRACTICES:*** HomeAssignments

LECTURE NO. : 8

- Solving Linear Programming Problem by Simplex Method for Minimization Objective Function for more than two variables.
- Finding Optimal Solution using Simplex Method.

❖ ***CASE STUDY/EXAMPLES:*** Practical Problems

❖ ***INNOVATIVE PRACTICES:*** HomeAssignments

NAME OF THE TOPIC: BIG M METHOD

LECTURE NO. : 9

- Solving Linear Programming Problem by Simplex Method for Minimization Objective Function for two variables.
- Finding Optimal Solution using Big M Method.

❖ ***CASE STUDY/EXAMPLES:*** Practical Problems

❖ ***INNOVATIVE PRACTICES:*** HomeAssignments

LECTURE NO. : 10

- Solving Linear Programming Problem by Big M Method for Minimization Objective Function for more than two variables.
- Finding Optimal Solution using Big M Method.

❖ ***CASE STUDY/EXAMPLES:*** Practical Problems

INNOVATIVE PRACTICES: HomeAssignments

NAME OF THE TOPIC: PRIMAL &DUALITY

LECTURE NO. : 11.

- Introduction of Primal, its advantages and Limitation.

LECTURE NO. : 12

- Introduction of Dual, its advantages and Limitation.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

LECTURE NO. : 13

- Use of Duality in solving Linear Programming Problem.

LECTURE NO. : 14

- Relationship between optimum solution to Primal and Dual.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

LECTURE NO. : 15

- A revision of all important concepts, terms and definitions, and all formulae.
- A short class test on the same.

❖ ***INNOVATIVE PRACTICES:*** Class tests

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER : POOJA D. SALUNKHE
DEPARTMENT: STATISTICS
CLASS : S.Y.B.SC. **SUBJECT :** STATISTICS **PAPER:** III
UNIT NO.: 2 **UNIT TITLE :** OPERATION RESEARCH

NAME OF THE TOPIC: TRANSPORTATION PROBLEM

LECTURE NO. : 1

- Introduce concept of need for Transportation Problem by giving suitable examples
- Formally define Transportation Problem.

LECTURE NO. : 2

- Illustrate the Mathematical Formulation of Transportation Problem.
- Different types of Solutions possible in Transportation Problem.

LECTURE NO. : 3

- Stating the different methods for solving the Transportation Problem: North – West Corner Rule, Matrix Minima Method, Vogel's Approximation Method.

LECTURE NO. : 4

- Explain the procedure of North – west Corner Rule.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

LECTURE NO. : 5

- Explain the procedure of Matrix Minima Method.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

LECTURE NO. : 6

- Explain the procedure of Vogel's Approximation Method.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

LECTURE NO. : 7

- Comparison on the method of Transportation Problem, between North West Corner Rule, Matrix Maxima Method, Vogel's Approximation Method

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

NAME OF THE TOPIC: MODI METHOD

LECTURE NO. : 8

- Explain the procedure for obtaining optimal solution for the transportation problem by MODI Method.

LECTURE NO. : 9

- Obtaining optimal solution for the transportation problem by MODI Method for North – West Corner Rule.

LECTURE NO. : 10

- Obtaining optimal solution for the transportation problem by MODI Method for Matrix Maxima Method.

LECTURE NO. : 11

- Obtaining optimal solution for the transportation problem by MODI Method for Vogel's Approximation Method.

NAME OF THE TOPIC: TRANSPORTATION PROBLEM

LECTURE NO. : 12.

- Introduction of Optimality Test, its advantages and Limitation.

LECTURE NO. : 13

- Finding any Improvement procedure for solving the Transportation Problem.

❖ ***INNOVATIVE PRACTICES:*** Practice Problems.

LECTURE NO. : 14

- Variants in Transportation Problem: Unbalanced and Maximization type.

LECTURE NO. : 15

- A revision of all important concepts, terms and definitions, and all formulae.
- A short class test on the same.

❖ ***INNOVATIVE PRACTICES:*** Class tests

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER : POOJA D. SALUNKHE
DEPARTMENT: STATISTICS
CLASS : S.Y.B.SC. **SUBJECT :** STATISTICS **PAPER:** III
UNIT NO.: 3 **UNIT TITLE :** OPERATION RESEARCH
NAME OF THE TOPIC: ASSIGNMENT PROBLEM

NAME OF THE TOPIC: ASSIGNMENT PROBLEM

LECTURE NO. : 1

- Explain the concept of Assignment Problem.
- Situation where Sequencing Problem can be applied.

LECTURE NO. : 2

- Formulation of Assignment Problem with different situations.

❖ ***INNOVATIVE PRACTICES : Assignments***

LECTURE NO. : 3

- Stating different method for getting the solution for the Assignment Problem.

LECTURE NO. : 4

- Explain the concept and procedure for obtaining solution for Assignment Problem by Complete Enumeration Method.

LECTURE NO. : 5

- Explain the concept and procedure for obtaining solution for Assignment Problem by Hungarian Method.

❖ ***CASE STUDY/EXAMPLES: Practice problems from Reference books***

LECTURE NO. : 6

- Explain the concept and procedure for obtaining solution for Assignment Problem in Unbalanced type.
- To see the variants in Assignment problem of unbalanced type.

LECTURE NO. : 7

- Explain the concept and procedure for obtaining solution for Assignment Problem in Maximization type.
- To see the variants in Assignment problem of Maximization type.

❖ ***CASE STUDY/EXAMPLES: Practice problems from Reference books***
❖ ***INNOVATIVE PRACTICES: Assignments***

LECTURE NO. : 8

- Explain the concept and procedure for obtaining solution for Assignment Problem in Travelling Salesman Problem

LECTURE NO. : 9

- Explain the concept and procedure for obtaining solution for Assignment Problem in Travelling Salesman Problem.
- To see the variants in Assignment problem of Maximization type.

❖ ***CASE STUDY/EXAMPLES: Practice problems from Reference books***

❖ ***INNOVATIVE PRACTICES: Assignments***

LECTURE NO. : 10

- A revision of all important concepts, terms and definitions, theorems and proofs and all formulae.

- A short class test on the same
  ❖ ***INNOVATIVE PRACTICES: Class test***

NAME OF THE TOPIC: SEQUENCING PROBLEM

LECTURE NO. : 11

- Introduction to the concept of Sequencing Problem.
- Situation where Sequencing Problem can be applied.

LECTURE NO. : 12

- Processing n jobs through ' 2 ' machines procedure and examples based on it.

❖ **INNOVATIVE PRACTICES:** Assignments.

LECTURE NO. : 13

- Processing n jobs through ' 3 ' machines procedure and examples based on it.

❖ **INNOVATIVE PRACTICES:** Assignments.

LECTURE NO. : 14

- Processing n jobs through ' m ' machines procedure and examples based on it.

❖ **INNOVATIVE PRACTICES:** Assignments.

LECTURE NO. : 15

- A revision of all important concepts, terms and definitions, theorems and proofs and all formulae.
- A short class test on the same

CREDIT BASED SEMESTER AND GRADING SYSTEM

OF

UNIVERSITY OF MUMBAI

SECOND YEAR B.SC

STATISTICS PAPER III

COURSE

SEMESTER IV

2022-23

LECTURE PLAN

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER : POOJA D. SALUNKHE
DEPARTMENT: STATISTICS
CLASS : S.Y.B.SC. **SUBJECT :** STATISTICS **PAPER:**III
UNIT NO.: 1
UNIT TITLE : CPM AND PERT

NAME OF THE TOPIC: CPM

LECTURE NO. : 1

- Introduce the concept of Critical Path Method as one of the major branches of Project Management, its importance and necessity.
- Begin at the very beginning by introducing and defining concepts integral to the Objective of the techniques.

LECTURE NO. : 2

- Rules and regulation for drawing the network diagram.
- Diagrammatic representation of activities in a project by Gantt Chart.

❖ ***INNOVATIVE PRACTICES:*** Classroom presentations.

LECTURE NO. : 3

- Rules and regulation for drawing the network diagram.
- Diagrammatic representation of activities in a project by Network Diagram.

❖ ***INNOVATIVE PRACTICES:*** Classroom presentations.

LECTURE NO. : 4

- Stating different types of float, Slack time.
- Steps for obtaining float, and slack time.
- Importance of slack time.

LECTURE NO. : 5

- Procedure for determining the critical path for the given network diagram.
- Determining the project duration .

❖ ***INNOVATIVE PRACTICES:*** Practical problem from reference book.

NAME OF THE TOPIC: PERT

LECTURE NO. : 6

- Introduce the concept of Project Evaluation Review Technique as one of the major branches of Project Management, its importance and necessity.
- Begin at the very beginning by introducing and defining concepts integral to the Objective of the techniques.

LECTURE NO. : 7

- Rules and regulation for drawing the network diagram.
- Diagrammatic representation of activities in a project by Gantt Chart.

❖ ***INNOVATIVE PRACTICES:*** Classroom presentations.

LECTURE NO. : 8

- Rules and regulation for drawing the network diagram.
- Diagrammatic representation of activities in a project by Network Diagram.

❖ ***INNOVATIVE PRACTICES:*** Classroom presentations.

LECTURE NO. : 9

- Stating different types of float, Slack time.
- Steps for obtaining float, and slack time.
- Importance of slack time.

LECTURE NO. : 10

- Procedure for determining the critical path for the given network diagram And comparing the difference between CPM and PERT.
- Determining the project duration.

❖ ***INNOVATIVE PRACTICES:*** Practical problem from reference book.

LECTURE NO. : 11

- Procedure for determining the probability consideration in project scheduling..
- Determining the project duration.

❖ ***INNOVATIVE PRACTICES:*** Practical problem from reference book.

LECTURE NO. : 12

- Objective of Project cost analysis.
- Steps for finding the crash time.

❖ ***INNOVATIVE PRACTICES:*** Practical problem from reference book.

LECTURE NO. : 13

- Continuation of Project cost analysis.
- Steps for finding the crash time.

❖ ***INNOVATIVE PRACTICES:*** Practical problem from reference book.

LECTURE NO. : 14

- Objective of Updating
- Steps for Updating the network diagram.

❖ ***INNOVATIVE PRACTICES:*** Presentation.

LECTURE NO. : 15

- A revision of all important concepts, terms and definitions, and all formulae.
- A short class test on the same.

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER : POOJA D. SALUNKHE
DEPARTMENT: STATISTICS
CLASS : S.Y.B.SC. **SUBJECT :** STATISTICS **PAPER:** III
UNIT NO.: 2
UNIT TITLE : GAME THEORY

LECTURE 1: INTRODUCTION TO GAME THEORY

- Definition and importance of game theory in economics and decision-making
- -Overview of the basic concepts including players, strategies, payoffs, and equilibrium

LECTURE 2: TWO-PERSON ZERO SUM GAME

- Definition and characteristics of a two-person zero-sum game
- Explanation of the concept of a saddle point and its significance in game theory

LECTURE 3: VALUE OF THE GAME

- Understanding the value of the game and its calculation in two-person zero-sum games
- Discussion on the optimal strategies for players to maximize their payoffs

LECTURE 4: PURE AND MIXED STRATEGIES

- Definition and explanation of pure and mixed strategies in game theory
- Understanding the concept of Nash equilibrium and its application in strategic decision-making

LECTURE 5: OPTIMAL SOLUTION OF TWO-PERSON ZERO SUM GAMES

- Explanation of the dominance property and its role in identifying optimal strategies
- Derivation of formulae for solving (2x2) games using dominance property and linear programming

LECTURE 6: GRAPHICAL SOLUTION OF (2XN) GAMES

- Introduction to graphical methods for solving (2xn) games

- Understanding the graphical representation of payoff matrices and identifying optimal strategies

LECTURE 7: GRAPHICAL SOLUTION OF (MX2) GAMES

- Explanation of graphical methods for solving (mx2) games
- Application of graphical techniques to analyze and solve (mx2) games efficiently

LECTURE 8: REDUCTION OF GAME THEORY TO LINEAR PROGRAMMING PROBLEMS

- Introduction to the concept of reducing game theory problems to linear programming problems
- Understanding the mathematical formulation and solution methods for converting game theory to linear programming

LECTURE 9: LINEAR PROGRAMMING FORMULATION

- Detailed explanation of the linear programming formulation for game theory problems
- Solving examples and exercises to illustrate the conversion of game theory problems to linear programming

LECTURE 10: APPLICATIONS OF GAME THEORY

- Analysis of real-world applications of game theory in various fields such as economics, politics, and biology
- Examination of strategic interactions and decision-making processes using game theory models

LECTURE 11: EXTENSIVE FORM GAMES

- Introduction to extensive form games and their representation using game trees
- Understanding the concepts of subgame perfection and backward induction in extensive form games

LECTURE 12: EVOLUTIONARY GAME THEORY

- Explanation of evolutionary game theory and its application in modeling biological and social systems

- Understanding the dynamics of strategy evolution and stability in evolutionary game theory

LECTURE 13: COOPERATIVE GAME THEORY

- Introduction to cooperative game theory and its focus on coalition formation and cooperative behavior
- Understanding solution concepts such as the core, Shapley value, and Nash bargaining solution in cooperative games

LECTURE 14: BEHAVIORAL GAME THEORY

- Overview of behavioral game theory and its integration with insights from psychology and neuroscience
- Analysis of bounded rationality, fairness, and other behavioral factors in strategic decision-making

LECTURE 15: REVIEW AND FINAL ASSESSMENT

- Comprehensive review of all topics covered in Unit II: Game Theory
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

NAME OF THE LECTURER : POOJA D. SALUNKHE
DEPARTMENT: STATISTICS

CLASS : S.Y.B.SC. **SUBJECT :** STATISTICS **PAPER:** III

UNIT NO.: 3

UNIT TITLE : DECISION THEORY

LECTURE 1: INTRODUCTION TO DECISION THEORY

- Definition and importance of decision theory in decision-making under uncertainty and risk
- Overview of the basic concepts including decision criteria and decision-making frameworks

LECTURE 2: DECISION MAKING UNDER UNCERTAINTY

- Explanation of decision-making under uncertainty and its challenges
- Introduction to Laplace criterion, Maximax (Minimin) criterion, and Maximin (Minimax) criterion for decision-making

LECTURE 3: LAPLACE CRITERION

- Detailed explanation of the Laplace criterion and its application in decision-making
- Understanding the principle of equal probabilities and its role in the Laplace criterion

LECTURE 4: MAXIMAX AND MAXIMIN CRITERION

- Explanation of the Maximax and Maximin criteria for decision-making under uncertainty
- Understanding the principles of optimism and pessimism in decision-making

LECTURE 5: HURWICZ AND MINIMAX REGRET CRITERIA

- Introduction to the Hurwicz criterion and its interpretation in decision-making
- Explanation of the Minimax Regret criterion and its application in minimizing potential regrets

LECTURE 6: DECISION MAKING UNDER RISK

- Explanation of decision-making under risk and its characteristics
- Introduction to the Expected Monetary Value (EMV) criterion and

Expected Opportunity Loss (EOL) criterion

LECTURE 7: EXPECTED MONETARY VALUE (EMV)

- Detailed explanation of the EMV criterion and its calculation in decision-making
- Understanding how to calculate the expected payoff for each decision alternative

LECTURE 8: EXPECTED OPPORTUNITY LOSS (EOL)

- Explanation of the EOL criterion and its application in evaluating decision alternatives
- Understanding how to calculate the expected loss associated with each decision alternative

LECTURE 9: EPPI AND EVPI

- Introduction to Expected Posterior Probability of Improvement (EPPI) and Expected Value of Perfect Information (EVPI)
- Understanding the concepts of uncertainty reduction and information value in decision-making

LECTURE 10: BAYESIAN DECISION RULE FOR POSTERIOR ANALYSIS

- Explanation of the Bayesian decision rule and its application in decision-making under uncertainty
- Understanding how to incorporate prior probabilities and likelihoods into decision-making

LECTURE 11: DECISION TREE ANALYSIS

- Introduction to decision tree analysis and its use in structuring decision problems
- Explanation of how to construct and analyze decision trees for decision-making under uncertainty and risk

LECTURE 12: POSTERIOR PROBABILITIES IN DECISION TREES

- Understanding the concept of posterior probabilities and their role in decision tree analysis
- Calculation of posterior probabilities and their incorporation into

decision-making

LECTURE 13: CASE STUDIES AND EXAMPLES

- Analysis of real-world case studies and examples illustrating the application of decision theory concepts
- Examination of decision-making processes in various contexts including business, finance, and healthcare

LECTURE 14: ADVANCED TOPICS

- Exploration of advanced topics and extensions in decision theory
- Discussion of topics such as decision theory applications in game theory, behavioral economics, and machine learning

LECTURE 15: REVIEW AND FINAL ASSESSMENT

- Comprehensive review of all topics covered in Unit III: Decision Theory
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

HEAD
Department Of Statistics
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Credit BASED semester AND GRADING SYSTEM OF UNIVERSITY OF MUMBAI

THIRD YEAR B.SC

STATISTICS COURSE

SEMESTER V

Paper III

Lecture Plan

Academic Year: 2022-23

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE
LECTURE PLAN

NAME OF THE LECTURER: **Darakshan Shaikh**

DEPARTMENT: **STATISTICS**

CLASS: **T.Y.B.Sc.**

SUBJECT: **Biostatistics(Paper 3)**

UNIT NO.: I UNIT TITLE: - **Epidemic Theory**

Lecture 1:

Introduction to Epidemic Models*

- Definition of epidemic spread and its features
- Explanation of various terms involved in epidemic modeling such as susceptible, infected, and recovered individuals
- Overview of simple mathematical models for epidemics including deterministic models without removals and carrier models

Lecture 2:

Deterministic Model without Removals*

- Detailed explanation of the deterministic model without removals for epidemic spread
- Understanding the dynamics of disease transmission in a population with multiple introductions.

Lecture 3:

Carrier Model*

- Introduction to the carrier model for epidemic spread
- Derivation of the formulae for Number of Susceptibles and Number of Carriers

Lecture 4:

Chain Binomial Models*

- Definition and explanation of chain binomial models for epidemic spread
- Introduction to Reed-Frost and Greenwood models
- Understanding the distribution of individual chains and the total number of cases in chain binomial models

Lecture 5:

Reed-Frost Model*

- Detailed explanation of the Reed-Frost model for epidemic spread
- Calculation of the distribution of individual chains and the total number of cases using the Reed-Frost model
- Analysis of the assumptions and limitations of the Reed-Frost model

Lecture 6:

Greenwood Model*

- Introduction to the Greenwood model for epidemic spread
- Explanation of how the Greenwood model differs from the Reed-Frost model
- Understanding the distribution of individual chains and the total number of cases using the Greenwood model

Lecture 7:

Maximum Likelihood Estimation*

- Introduction to maximum likelihood estimation (MLE) and its application in epidemic modeling
- Calculation of MLE of the transmission probability (p) in chain binomial models
- Understanding the asymptotic variance of the MLE of p and its implications for parameter estimation

Lecture 8:

Maximum Likelihood Estimation (contd.)*

Undertaking derivations of the probability 'p'and its variance for various chains with single, double or triple introductions as the case may be under both GW and RF models.

Lecture 9:

Maximum Likelihood Estimation (contd.)*

Undertaking derivations of the probability 'p' and its variance for various chains with single, double or triple introductions as the case may be under both GW and RF models.

Lecture 10:

Maximum Likelihood Estimation (contd.)*

Undertaking derivations of the probability 'p' and its variance for various chains with single, double or triple introductions as the case may be under both GW and RF models.

Lecture 11:

Maximum Likelihood Estimation (contd.)*

Undertaking derivations of the probability 'p' and its variance for various chains with single, double or triple introductions as the case may be under both GW and RF models.

Lecture 12:

Maximum Likelihood Estimation (contd.)*

Undertaking derivations of the probability 'p' and its variance for various chains with single, double or triple introductions as the case may be under both GW and RF models.

Lecture 13:

Review and Final Assessment*

- Comprehensive review of all topics covered in the unit on epidemic models
- Final assessment to evaluate students' understanding and mastery of concepts

Lecture 14:

Class Test on the Unit covering all topics

Lecture 15:

- Feedback session and discussion of students' performance, strengths, and areas for improvement

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CLASS: **T.Y.B.Sc.**

SUBJECT: **Biostatistics(Paper 3)**

UNIT NO.: 2 UNIT TITLE: - **Bioassays**

Lecture 1:

Introduction to Bioassays*

- Definition and importance of bioassays in pharmacology and toxicology
- Overview of the scope and applications of bioassays
- Explanation of relative potency and its significance in comparing the effectiveness of drugs or toxins

Lecture 2:

Direct Assays and Fieller's Theorem*

- Detailed explanation of direct assays in bioassays
- Understanding Fieller's theorem and its application in estimating relativepotency in direct assays

Lecture 3:

Indirect Assays and Dose-Response Relationship*

- Introduction to indirect assays and their role in bioassays
- Explanation of the dose-response relationship and its importance in indirect assays

Lecture 4:

Conditions of Similarity and Monotony*

- Understanding the conditions of similarity and monotony in dose-response curves

- Analysis of how similarity and monotony affect the interpretation of dose response relationships

Lecture 5:

Linearizing Transformations*
- Explanation of linearizing transformations and their application in bioassays
- Techniques for transforming non-linear dose-response curves into linear relationships

Lecture 6:

Parallel Line Assays*
- Introduction to parallel line assays in bioassays
- Explanation of symmetrical (2, 2) and (3, 3) parallel line assays
- Calculation of relative potency using parallel line assays

Lecture 7:

Validity Tests using Orthogonal Contrasts*
- Understanding the importance of validity tests in bioassays
- Introduction to orthogonal contrasts and their application in testing the validity of parallel line assays.

Lecture 8:

Point Estimate and Interval Estimate of Relative Potency*
- Calculation of point estimate and interval estimate of relative potency
- Interpretation of point estimate and confidence interval in comparing drug effectiveness.

Lecture 9:

Quantal Response Assays*
- Introduction to quantal response assays in bioassays
- Explanation of tolerance distribution and its significance in quantal response assays.

Lecture 10:

Median Effective Dose (ED50) and Median Lethal Dose (LD50)*
- Understanding the concepts of ED50 and LD50 in quantal response assays
- Calculation of ED50 and LD50 and their interpretation.

Lecture 11:

Probit Analysis*
- Introduction to probit analysis and its application in quantal response assays
- Calculation of probit values and their interpretation.

Lecture 12:

Logit Analysis*
- Explanation of logit analysis and its comparison with probit analysis
- Calculation of logit values and their interpretation.

Lecture 13:

Examples and Problem Solving*
- Solving problems and exercises related to bioassays
- Application of statistical techniques to analyze and interpret bioassay data

of concepts.

Lecture 14:

Class Test on the Unit covering all topics

Lecture 15:

- Feedback session and discussion of students' performance, strengths, and areas for improvement

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CLASS: **T.Y.B.Sc.**

SUBJECT: **Biostatistics(Paper 3)**

UNIT NO.: 3 UNIT TITLE: - **Clinical Trials**

Lecture 1:

Introduction to Clinical Trials*
- Definition and importance of clinical trials in medical research
- Discussion on the need for clinical trials and their role in evidence-based medicine
- Overview of the ethical considerations involved in conducting clinical trials.

Lecture 2:

Common Terminology in Clinical Trials*
- Explanation of common terms and concepts used in clinical trials such as efficacy, safety, adverse events, and endpoints
- Understanding the definitions and significance of terms commonly used in clinical trial protocols.

Lecture 3:

Overview of Phases (I-IV)*
- Introduction to the phases of clinical trials (Phase I, Phase II, Phase III, and Phase IV)
- Explanation of the objectives, design, and characteristics of each phase of clinical trials
- Discussion on the progression of drugs/devices through the phases of clinical development

Lecture 4:

ICH E9 Guidelines*
- Introduction to the International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use (ICH)
- Explanation of the ICH E9 guidelines for statistical principles for clinical trials
- Understanding the key principles and recommendations outlined in the ICH E9 guidelines

Lecture 5:

Study Protocol and Case Record/Report Form*

- Definition and components of a study protocol in clinical trials
- Explanation of the purpose and structure of a case record/report form (CRF)
- Discussion on the importance of standardized protocols and CRFs in clinical trial conduct and data collection

Lecture 6:

Blinding in Clinical Trials*
- Explanation of blinding in clinical trials and its importance in minimizing bias
- Understanding the concepts of single-blind and double-blind study designs
- Discussion on the advantages and limitations of blinding in clinical trial design

Lecture 7:

Randomized Controlled Trials*
- Introduction to randomized controlled trials (RCTs) and their importance in clinical research
- Explanation of different types of RCTs including placebo-controlled and active-controlled trials
- Understanding the principles and design considerations of RCTs

Lecture 8:

Study Designs (Parallel, Cross Over)*
- Explanation of parallel and crossover study designs in clinical trials
- Understanding the advantages and limitations of each study design
- Discussion on factors influencing the selection of study designs based on research objectives and practical considerations

Lecture 9:

Types of Trials (Inferiority, Superiority, Equivalence)*
- Definition and explanation of inferiority, superiority, and equivalence trials
- Understanding the objectives, design considerations, and statistical methods used in each type of trial
- Discussion on factors influencing the choice of trial type based on research questions and hypotheses

Lecture 10:

Multicentric Trials*
- Introduction to multicentric trials and their importance in evaluating treatment effects across diverse populations and settings
- Explanation of the challenges and considerations in planning and conducting multicentric trials
- Understanding the benefits and limitations of multicentric trial designs

Lecture 11:

Inclusion/Exclusion Criteria*
- Definition and explanation of inclusion and exclusion criteria in clinical trials
- Discussion on the rationale and importance of defining clear criteria for participant selection
- Understanding the implications of inclusion/exclusion criteria on the study

Lecture 12:

Sample Size Estimation*
- Explanation of sample size estimation in clinical trials and its importance in ensuring statistical power
- Understanding the factors influencing sample size calculation including effect size, variability, and significance level
- Discussion on methods for estimating sample size based on study objectives and statistical considerations

Lecture 13:

Examples and Problem Solving*
- Solving problems and exercises related to clinical trial design and sample size estimation
- Application of statistical techniques to calculate sample size and design clinical trials
- Group activities and discussions to reinforce understanding of concepts

Lecture 14:

Case Studies and Applications*
- Analysis of real-world case studies illustrating different aspects of clinical trial design and conduct
- Examination of ethical dilemmas, challenges, and lessons learned from clinical trial case studies
- Discussion of best practices and strategies for overcoming common obstacles in clinical trial implementation

Lecture 15:

- Feedback session and discussion of students' performance, strengths, and areas for improvement.
Class Test on the Unit covering all topics

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CLASS: **T.Y.B.Sc.**

SUBJECT: **Biostatistics(Paper 3)**

UNIT NO.:4 UNIT TITLE: - **Bioequivalence**

Lecture 1:

BIOEQUIVALENCE*
- Introduction to bioequivalence in pharmacokinetic studies
- Definitions of generic drug product, bioavailability, and bioequivalence
- Explanation of pharmacokinetic parameters including Cmax, AUCt, AUC0-∞, Tmax, Kel, and Thalf

Lecture 2:

Estimation of PK Parameters*
- Understanding the estimation of pharmacokinetic parameters using time vs. concentration profiles
- Explanation of the methods for estimating PK parameters in bioequivalence studies

Lecture 3:

Designs in Bioequivalence*
- Overview of study designs used in bioequivalence studies including parallel and crossover designs
- Understanding the advantages and limitations of crossover design over parallel design

Lecture 4:

Analysis of Parallel Design using Logarithmic Transformation*
- Explanation of the analysis of parallel design using logarithmic transformation
- Calculation of summary statistics, ANOVA, and 90% confidence interval using logarithmic transformation

Lecture 5:

Confidence Interval Approach to Establish Bioequivalence*
- Introduction to the confidence interval approach for establishing bioequivalence
- Understanding the 80/125 rule and its application in determining bioequivalence

Lecture 6:

- Introduction to statistical tools used in clinical trials
- Overview of parallel design and its analysis using analysis of variance (ANOVA)

Lecture 7:

Analysis of Parallel Design using ANOVA*
- Detailed explanation of the analysis of parallel design using ANOVA
- Understanding the principles and assumptions of ANOVA in the context of clinical trials

Lecture 8:

Concept of Odds Ratio*
- Definition and explanation of odds ratio in the context of clinical trials
- Understanding the interpretation and significance of odds ratio in analyzing categorical data

Lecture 9:

Repeated Measures ANOVA*
- Introduction to repeated measures ANOVA and its application in clinical trials
- Explanation of the concept of within-subjects factors and their impact on study design and analysis

Lecture 10:

Survival Analysis*
- Introduction to survival analysis and its application in clinical trials
- Understanding the estimation of median survival time and the Kaplan-Meier approach for survival analysis

Lecture 11:

Examples and Problem Solving*
- Solving problems and exercises related to statistical analysis in clinical trials and bioequivalence studies
- Application of statistical techniques to analyze clinical trial data and evaluate bioequivalence

Lecture 12:

Case Studies and Applications*
- Analysis of real-world case studies illustrating the use of statistical methods in clinical trials and bioequivalence studies
- Examination of challenges and considerations in designing and analyzing clinical trials and bioequivalence studies

Lecture 13:

Regulatory Considerations*
- Overview of regulatory requirements and guidelines for conducting clinical trials and bioequivalence studies
- Understanding the role of regulatory agencies in approving generic drug products based on bioequivalence data

Lecture 14:

:Review and Final Assessment*
- Comprehensive review of all topics covered in Unit IV: Clinical Trials and Bioequivalence
- Final assessment to evaluate students' understanding and mastery of concepts

Lecture 15:

- Feedback session and discussion of students' performance, strengths, and areas for improvement
- Final assessment to evaluate students' understanding and mastery of concepts
-Class Test

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Credit BASED semester AND GRADING SYSTEM OF UNIVERSITY OF MUMBAI

THIRD YEAR B.SC STATISTICS COURSE

SEMESTER VI

Paper III

Lecture Plan

Academic Year: 2022-23

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE
LECTURE PLAN

NAME OF THE LECTURER: **Darakshan Shaikh**

DEPARTMENT: **STATISTICS**

CLASS: **T.Y.B.Sc.**

SUBJECT: **Operations Research (Paper 3)**

UNIT NO.: I UNIT TITLE: **- Linear Programming**

Lecture 1:
Introduction to Linear Programming Problem (LPP)*
- Definition and significance of linear programming in optimization
- Overview of basic concepts including decision variables, objective function, and constraints

Lecture 2:
Two-Phase Simplex Method*
- Explanation of the two-phase simplex method for solving linear programming problems
- Understanding the algorithm and step-by-step procedure for implementing the two-phase simplex method

Lecture 3:
Dual Simplex Method*
- Introduction to the dual simplex method for solving linear programming problems
- Explanation of the algorithm and computational steps involved in the dual simplex method

Lecture 4:
Post-Optimality Sensitivity Analysis*
- Definition and importance of sensitivity analysis in linear programming
- Understanding the concept of post-optimality sensitivity analysis and its role in evaluating the robustness of optimal solutions

Lecture 5:
Effect of Change in Cost Coefficient*
- Analysis of how changes in the cost coefficients affect the optimal solution to the LPP
- Understanding the implications of cost coefficient changes on decision-making and solution quality

Lecture 6:
Effect of Change in Requirement Vector*

- Explanation of how changes in the elements of the requirement vector impact the optimal solution to the LPP
- Understanding the sensitivity of the solution to variations in resource availability

Lecture 7:
Effect of Addition/Deletion of a Variable*
- Analysis of the impact of adding or removing decision variables on the optimal solution
- Understanding how changes in the variable set affect the feasibility and optimality of the solution

Lecture 8:
Effect of Addition/Deletion of a Constraint*
- Explanation of how adding or removing constraints affects the optimal solution to the LPP
- Understanding the changes in feasible solution space and objective function values due to constraint modifications

Lecture 9:
Examples and Problem-Solving*
- Solving examples and exercises to illustrate the application of two-phasesimplex method, dual simplex method, and sensitivity analysis
- Application of algorithms and techniques to solve linear programmingproblems in various contexts

Lecture 10:
Case Studies and Applications*
- Analysis of real-world case studies demonstrating the use of linear programming in optimization
- Examination of applications in logistics, production planning, finance, and other fields

Lecture 11:
Advanced Topics in Linear Programming*
- Exploration of advanced topics such as integer programming, network flow problems, and non-linear programming extensions
- Discussion of specialized algorithms and solution techniques for complex optimization problems

Lecture 12:
Software Tools for Linear Programming*
- Introduction to software tools and packages for solving linear programming problems
- Hands-on demonstration of using software for modeling, solving, and analyzing linear programming models

Lecture 13:
Sensitivity Analysis Techniques*
- In-depth exploration of sensitivity analysis techniques including shadow prices, slack variables, and dual values

- Understanding how sensitivity analysis results inform decision-making and problem-solving strategies

Lecture 14:

Optimization in Practice*

- Discussion of practical considerations and challenges in applying linear programming in real-world settings
- Examination of implementation issues, data requirements, and organizational factors influencing optimization projects

Lecture 15:

Review and Final Assessment*

- Comprehensive review of all topics covered in Unit I: Linear ProgrammingProblem
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for ...

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CLASS: **T.Y.B.Sc.**

SUBJECT: **Operations Research (Paper 3)**

UNIT NO.: 2 UNIT TITLE: **- Inventory Control**

Lecture 1:

Introduction to Inventory Problem*

- Definition and significance of inventory control in supply chain management
- Overview of inventory management objectives and challenges

Lecture 2:

Deterministic Models - Single Item Static EOQ Models*

- Introduction to deterministic inventory models
- Explanation of single-item static Economic Order Quantity (EOQ) models for constant rate of demand with instantaneous replenishment, with and without shortages

Lecture 3:

EOQ Models with Uniform Rate of Replenishment*

- Analysis of EOQ models for constant rate of demand with uniform rate of replenishment, with and without shortages
- Understanding the implications of different replenishment scenarios on inventory management

Lecture 4:

EOQ Models with Price Breaks*

- Explanation of EOQ models for constant rate of demand with instantaneous replenishment and at most two price breaks
- Understanding the impact of price breaks on optimal order quantity and total inventory costs

Lecture 5:

Probabilistic Models - Single Period Inventory*

- Introduction to probabilistic inventory models
- Analysis of single-period inventory models with instantaneous and uniform demand, without setup costs

Lecture 6:

Instantaneous Demand*

- Explanation of single-period inventory models with instantaneous demand, considering both discrete and continuous demand distributions
- Understanding how to determine optimal order quantity and stocking decisions

Lecture 7:

Uniform Demand*

- Analysis of single-period inventory models with uniform demand, considering both discrete and continuous demand distributions
- Understanding the implications of demand variability on inventory stocking decisions

Lecture 8:

Inventory Control Policies*

- Discussion of inventory control policies including reorder point, order quantity, and safety stock
- Understanding how different policies influence inventory performance and service levels

Lecture 9:

Inventory Costs*

- Analysis of inventory costs including holding costs, ordering costs, and shortage costs
- Understanding how to calculate and optimize total inventory costs in various inventory control models

Lecture 10:

Inventory Optimization Techniques*

- Introduction to optimization techniques for inventory control models
- Explanation of mathematical optimization methods including linear programming and dynamic programming

Lecture 11:

Multi-Item Inventory Models*

- Introduction to multi-item inventory models and their complexities
- Analysis of inventory management strategies for managing multiple items simultaneously

Lecture 12:

Supply Chain Coordination*

- Discussion of supply chain coordination strategies in inventory management
- Understanding the role of collaboration, information sharing, and incentives in optimizing supply chain performance

Lecture 13:

Inventory Forecasting*

- Introduction to inventory forecasting techniques and methods
- Explanation of demand forecasting models and their applications in inventory planning

Lecture 14:

Advanced Topics in Inventory Control*

- Exploration of advanced topics such as stochastic inventory models, dynamic inventory policies, and inventory optimization in omnichannel retail
- Discussion of emerging trends and technologies shaping the future of inventory management

Lecture 15:

Review and Final Assessment*

- Comprehensive review of all topics covered in Unit II: Inventory Control
- Final assessment to evaluate students' understanding and mastery of concepts and Class Test
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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CLASS: **T.Y.B.Sc.**

SUBJECT: **Operations Research (Paper 3)**

UNIT NO.: 3 UNIT TITLE: - **Replacement Theory**

Lecture 1:
Introduction to Replacement Problems*
- Definition and significance of replacement problems in maintenance and asset management
- Overview of the objectives and challenges of replacement analysis

Lecture 2:
Replacement of Items with Deterioration*
- Explanation of replacement models for items that deteriorate over time
- Analysis of replacement strategies when the value of money remains constant

Lecture 3:
Replacement Models with Constant Value of Money*
- Introduction to replacement models for items with deterioration, considering constant value of money

- Understanding the criteria and decision-making process for determining optimal replacement policies

Lecture 4:
Replacement Models with Changing Value of Money*
- Analysis of replacement models for items with deterioration, considering changing value of money over time
- Understanding the impact of inflation and discounting on replacement decisions

Lecture 5:
Replacement of Items that Fail Completely*
- Introduction to replacement models for items that fail completely
- Explanation of individual replacement and group replacement policies

Lecture 6:
Individual Replacement Policies*
- Analysis of individual replacement policies and their application in maintenance decision-making
- Understanding the criteria for determining optimal replacement intervals for individual items

Lecture 7:
Group Replacement Policies*
- Explanation of group replacement policies and their advantages over individual replacement
- Understanding the criteria for grouping items and determining optimal replacement schedules

Lecture 8:
Deterministic Replacement Models*
- Introduction to deterministic models for replacement analysis
- Analysis of deterministic replacement policies under various scenarios

Lecture 9:
Probabilistic Replacement Models*
- Explanation of probabilistic models for replacement analysis
- Analysis of stochastic factors and uncertainty in replacement decision-making

Lecture 10:
Economic Analysis of Replacement*
- Discussion of economic analysis techniques for evaluating replacement alternatives
- Understanding how to calculate and compare total costs, including maintenance, replacement, and downtime costs

Lecture 11:
Optimization Techniques for Replacement*
- Introduction to optimization techniques for solving replacement problems
- Explanation of mathematical programming, dynamic programming, and other optimization methods for determining optimal replacement policies

Lecture 12:
Maintenance Strategies and Reliability*
- Analysis of maintenance strategies and their impact on replacement decisions
- Understanding the relationship between reliability, maintenance, and replacement in asset management

Lecture 13:
Case Studies and Examples*
- Analysis of real-world case studies illustrating the application of replacement models in various industries
- Examination of different scenarios and decision-making processes in replacement analysis

Lecture 14:
Advanced Topics in Replacement*
- Exploration of advanced topics such as predictive maintenance, condition-based replacement, and optimization in asset lifecycle management
- Discussion of emerging trends and technologies in replacement analysis

Lecture 15:
Review and Final Assessment*
- Comprehensive review of all topics covered in Unit III: Replacement
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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CLASS: **T.Y.B.Sc.**

SUBJECT: **Operations Research (Paper 3)**

UNIT NO.:4 UNIT TITLE: - **Reliability and Simulation**

Lecture 1:
Introduction to Simulation and Reliability*
- Definition and scope of simulation and reliability in engineering and decision-making
- Overview of the importance and applications of simulation and reliability analysis

Lecture 2:
Concept of Simulation*
- Explanation of simulation as a modeling technique for mimicking real-world systems or processes

- Understanding the scope and advantages of simulation in various domains

Lecture 3:
Monte Carlo Technique of Simulation*
- Introduction to the Monte Carlo technique for simulation
- Explanation of random number generation methods including Mid-Square Method and Multiplicative Congruential Method

Lecture 4:
Generation of Random Numbers*
- Explanation of random number generation methods for uniform, exponential, gamma, and normal distributions
- Understanding the Inverse method for generating random observations from various probability distributions

Lecture 5:
Simulation Techniques in Inventory Models*
- Application of simulation techniques in inventory management models
- Understanding how simulation can be used to optimize inventory levels and improve operational efficiency

Lecture 6:
Simulation Techniques in Queueing Models*
- Application of simulation techniques in queueing theory and models
- Understanding how simulation can be used to analyze and optimize system performance in queuing systems

Lecture 7:
Concept of Reliability*
- Definition and significance of reliability in engineering and system design
- Overview of reliability metrics and measures including hazard rate and the bathtub curve

Lecture 8:
Failure Time Distributions*
- Explanation of common failure time distributions including exponential, gamma, Weibull, and Gumbel distributions
- Understanding the characteristics and applications of each distribution in reliability analysis

Lecture 9:
Increasing and Decreasing Failure Rate*
- Definition and significance of increasing and decreasing failure rate in reliability analysis
- Understanding the relationship between failure rate and system reliability

Lecture 10:
System Reliability*
- Analysis of system reliability in series and parallel configurations

- Understanding how system reliability is affected by the reliability of individual components

Lecture 11:
Mean Time to Failure (MTTF)*
- Definition and calculation of Mean Time to Failure (MTTF) for systems and components
- Understanding the significance of MTTF in reliability analysis and system design

Lecture 12:
Reliability Testing and Assessment*
- Introduction to reliability testing methods and techniques
- Explanation of accelerated life testing, reliability prediction models, and reliability assessment methodologies

Lecture 13:
Case Studies and Examples*
- Analysis of real-world case studies illustrating the application of simulation and reliability analysis techniques
- Examination of different scenarios and decision-making processes in simulation and reliability analysis

Lecture 14:
Advanced Topics in Simulation and Reliability*
- Exploration of advanced topics such as dynamic simulation, reliability-centered maintenance, and predictive reliability modeling
- Discussion of emerging trends and technologies in simulation and reliability analysis

Lecture 15:
Review and Final Assessment*
- Comprehensive review of all topics covered in Unit IV: Simulation and Reliability
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

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Department Of Statistics
Ismail Yusuf College Of
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CREDIT BASED SEMESTER AND GRADING SYSTEM

OF

UNIVERSITY OF MUMBAI

THIRD YEAR B.SC

STATISTICS PAPER

IVCOURSE

SEMESTER V

2022-23

LECTURE PLAN

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: POOJA D. SALUNKHE
DEPARTMENT: STATISTICS
CLASS: T.Y.B.SC.**SUBJECT:** STATISTICS **PAPER** :IV
UNIT NO.: 1**UNIT TITLE:**FUNDAMENTALS OF R

NAME OF THE TOPIC:INTRODUCTION ABOUT R

LECTURE NO. : 1

- Introduction to R
- Features of R
- Installation of R
- Starting and ending R session
- Getting help in R
- Value assigning to variables

NAME OF THE TOPIC: BASIC OPERATIONS

LECTURE NO. : 2

- Addition
- Subtraction
- Multiplication
- Division
- Power
- Square root

NAME OF THE TOPIC: NUMERICAL FUNCTIONS

LECTURE NO. : 3

- log 10
- log
- sort
- max
- unique
- dim

NAME OF THE TOPIC:PROBLEM SOLVING

LECTURE NO. : 4

- Based on previous lectures solved some examples

  ❖ CASE STUDY/EXAMPLES:Solving Examples based on previous lectures

  ❖ INNOVATIVE PRACTICES : Home Assignments

LECTURE NO. : 5

- range
- length
- var
- prod
- sum
- summary

NAME OF THE TOPIC:DATA TYPES

LECTURE NO. : 6

- Vector
- List
- Matrices
- Array
- Data frame

NAME OF THE TOPIC:VARIABLE TYPE

LECTURE NO. : 7

- Logical
- Numeric
- Integer
- Complex
- Character and factor

NAME OF THE TOPIC:PROBLEM SOLVING

LECTURE NO. : 8

- Based on previous lectures solved some examples

  ❖ CASE STUDY/EXAMPLES:Solving Examples based on previous lectures

  ❖ INNOVATIVE PRACTICES : Home Assignments

NAME OF THE TOPIC: DATA MANIPULATION

LECTURE NO. : 9

- Selecting random N rows
- Removing duplicate row(s)
- Dropping a variable(s)
- Renaming variable(s)
- Sub setting data

LECTURE NO. : 10

- Creating a new variable(s)
- Selecting of random fraction of row(s)

- Appending of row(s) and column(s)
- Simulation of variables.

NAME OF THE TOPIC:DATA PROCESSING

LECTURE NO. : 11

- Data import and export
- Setting working directory
- Checking structure of Data :Str(), Class(), Changing type of variable

NAME OF THE TOPIC:PROBLEM SOLVING

LECTURE NO. : 12

- Based on previous lectures solved some examples

  ❖ CASE STUDY/EXAMPLES:Solving Examples based on previous lectures

  ❖ INNOVATIVE PRACTICES : Home Assignments

NAME OF THE TOPIC:DATA VISUALIZATION USING GGPLOT

LECTURE NO. : 13

- Simple bar diagram
- subdivided bar diagram
- multiple bar diagram pie diagram

LECTURE NO. : 14

- Box plot for one and more variables
- Histogram
- frequency polygon
- scatter plot

NAME OF THE TOPIC:PROBLEM SOLVING

LECTURE NO. : 15

- Based on previous lectures solved some examples

  ❖ CASE STUDY/EXAMPLES:Solving Examples based on previous lectures

  ❖ INNOVATIVE PRACTICES : Home Assignments

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: POOJA D. SALUNKHE
DEPARTMENT: STATISTICS
CLASS: T.Y.B.SC. **SUBJECT:** STATISTICS **PAPER :**IV
UNIT NO.: 2 **UNIT TITLE:** SIMPLE LINEAR REGRESSION MODEL

NAME OF THE TOPIC:INTRODUCTION

LECTURE NO. : 1

- Explanation about correlation
- Nature of correlation
- Interpretation
- Graphical representation

LECTURE NO. : 2

- Explanation about Regression analysis with examples
- Explain concept of Linearity with examples

NAME OF THE TOPIC:SIMPLE LINEAR REGRESSION MODEL

LECTURE NO. : 3

- Briefly explanation about the simple linear regression model
- Deterministic model
- Residuals
- Homoscedasticity
- Multicollinearity

NAME OF THE TOPIC: ASSUMPTIONS AND PROPERTIES OF THE MODEL

LECTURE NO. : 4

- Assumption of the linear regression model
- Properties of the OLS estimates
- Expectation and variance of Y

NAME OF THE TOPIC: ESTIMATION OF REGRESSION COEFFICIENTS

LECTURE NO. : 5

- Derivation to obtain estimation of regression coefficients

LECTURE NO. : 6

- Concept of sum of squares

LECTURE NO. : 7

- Concept of degrees of freedom

NAME OF THE TOPIC: RELATIONSHIP BETWEEN TOTAL, REGRESSION AND ERROR SUM OF SQUARES

LECTURE NO. : 8

- Mathematical expression to show the relationship between total,regression and error sum of squares

NAME OF THE TOPIC: ESTIMATION OF POPULATION VARIANCE

LECTURE NO. : 9

- Derivation to find out estimated value of the variance.

NAME OF THE TOPIC: COEFFICIENT OF DETERMINATION AND ADJUSTED R^2

LECTURE NO. : 10

- Coefficient of determination R^2
- Adjusted R^2

NAME OF THE TOPIC: PROCEDURE OF TESTING SIGNIFICANCE

LECTURE NO. : 11, 12

Procedure of testing

a) Overall significance of the models

b) Significance of individual coefficients

c) Confidence intervals for the regression coefficients

NAME OF THE TOPIC: DATA PRE-PROCESSING

LECTURE NO. : 13, 14 , 15

- Detection and treatment of missing value(s) and outliers
- Variable selection and Model building
- Interpretation of output produced by lm command in R.

❖ CASE STUDY/EXAMPLES:Solving Examples based on previous lectures

❖ INNOVATIVE PRACTICES : Home Assignments

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: POOJA D. SALUNKHE
DEPARTMENT: STATISTICS
CLASS: T.Y.B.SC. **SUBJECT:** STATISTICS **PAPER :**IV
UNIT NO.: 3 **UNIT TITLE:** MULTIPLE LINEAR REGRESSION MODEL

NAME OF THE TOPIC: MULTIPLE LINEAR REGRESSION MODEL

LECTURE NO. :1, 2

- Derivation of ordinary least square (OLS) estimators of regression coefficients for multiple regression models

LECTURE NO. :3

- Coefficient of determination R^2
- Adjusted R^2

NAME OF THE TOPIC: PROCEDURE OF TESTING SIGNIFICANCE

LECTURE NO. :4, 5

- Overall significance of the models

❖ CASE STUDY/EXAMPLES:Solving Examples based on previous lectures

❖ INNOVATIVE PRACTICES : Home Assignments

LECTURE NO. :6

- Significance of individual coefficients

LECTURE NO. :7

- Confidence intervals for the regression coefficients

❖ CASE STUDY/EXAMPLES:Solving Examples based on previous lectures

❖ INNOVATIVE PRACTICES : Home Assignments

NAME OF THE TOPIC: DATA PRE-PROCESSING

LECTURE NO. :8, 9

- Detection and treatment of missing value(s) and outliers

LECTURE NO. :10

- Variable selection

❖ CASE STUDY/EXAMPLES:Solving Examples based on previous lectures

❖ INNOVATIVE PRACTICES : Home Assignments

LECTURE NO. :11

- Model building

LECTURE NO. :12,13

- Interpretation of output produced by lm command in R.

LECTURE NO. :14, 15

❖ CASE STUDY/EXAMPLES:Solving Examples based on previous lectures

❖ INNOVATIVE PRACTICES : Home Assignments

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: POOJA D. SALUNKHE
DEPARTMENT: STATISTICS
CLASS: T.Y.B.SC. **SUBJECT:** STATISTICS **PAPER :**IV
UNIT NO.: 4 **UNIT TITLE:**VALIDITY OF ASSUMPTIONS

NAME OF THE TOPIC:RESIDUAL DIAGNOSTICS

LECTURE NO. :1
- Explanation about Residual

LECTURE NO. :2
- Standardized residuals

LECTURE NO. : 3
- Studentized residuals

LECTURE NO. :5, 6
- Residual plots

LECTURE NO. :7
- Interpretation of four plots

LECTURE NO. : 8, 9
- Interpretation output produced by plotcommand in R and corrective measures such as transformation of response variable

LECTURE NO. : 10
- Testing normality of data .

NAME OF THE TOPIC: AUTOCORRELATION

LECTURE NO. : 11
- Autocorrelation: Concept and detection using Durbin Watson Test
- Interpretation of output produced by DW-test function in R

NAME OF THE TOPIC: HETEROSCEDASTICITY

LECTURE NO. : 12
- Heteroscedasticity: Concept and detection using Breusch –Pagan-Godfrey Test
- Interpretation of output produced by bptest function in R.

NAME OF THE TOPIC: MULTICOLLINEARITY

LECTURE NO. : 12, 13

- Multicollinearity: Concept and detection using R
  - i) t-ratios
  - ii) pairwise correlation between repressors
  - iii) Variance Inflation Factor(VIF)

NAME OF THE TOPIC: INTERPRETATION

LECTURE NO. : 14

- Interpretation of output produced by mctest function in R,
- Consequences of using OLS estimators in presence of Autocorrelation,

LECTURE NO. : 15

- Heteroscedasticity and Multicollinearity, Remedial measures,
- Ridge Regression : Concept and case study using R,

CREDIT BASED SEMESTER AND GRADING SYSTEM

OF

UNIVERSITY OF MUMBAI

THIRD YEAR B.SC

STATISTICS PAPER IV

COURSE

SEMESTER VI

2022-23

LECTURE PLAN

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: POOJA D. SALUNKHE
DEPARTMENT: STATISTICS
CLASS: T.Y.B.SC.**SUBJECT:** STATISTICS **PAPER** :IV
UNIT NO.: 1 **UNIT TITLE:**MORTALITY TABLES

NAME OF THE TOPIC: MORTALITY FUNCTIONS

LECTURE NO. : 1

- Various mortality functions
- Probabilities of living and dying

LECTURE NO. : 2

- The force of mortality
- Central Mortality Rate

NAME OF THE TOPIC: ESTIMATION OF μ_x

LECTURE NO. : 3

- Estimation of μ_x from the mortality table

NAME OF THE TOPIC: LAWS OF MORTALITY

LECTURE NO. : 4,5

- Gompertz's Laws of mortality

LECTURE NO. : 6, 7, 8

- Makeham's first law of mortality

LECTURE NO. : 9, 10

❖ CASE STUDY/EXAMPLES:Solving Examples based on previous lectures

❖ INNOVATIVE PRACTICES : Home Assignments

NAME OF THE TOPIC: MORTALITY TABLES

LECTURE NO. : 11, 12

- Select, Ultimate and Aggregate mortality tables

NAME OF THE TOPIC: STATIONARY POPULATION

LECTURE NO. : 13

- Stationary population

LECTURE NO. : 14, 15

- Expectation of life and Average life at death
  - ❖ CASE STUDY/EXAMPLES:Solving Examples based on previous lectures
  - ❖ INNOVATIVE PRACTICES : Home Assignments

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: POOJA D. SALUNKHE
DEPARTMENT: STATISTICS
CLASS: T.Y.B.SC.**SUBJECT:** STATISTICS **PAPER :**IV
UNIT NO.: 2 **UNIT TITLE:**COMPOUND INTEREST AND ANNUITIES CERTAIN

NAME OF THE TOPIC: BASIC INTRODUCTION

LECTURE NO. : 1

- Accumulated value
- Present value

NAME OF THE TOPIC: RATES OF INTEREST

LECTURE NO. : 2

- Nominal and effective rates of interest
- Varying rates of interest

NAME OF THE TOPIC:EQUATION OF VALUE

LECTURE NO. : 3

- Equation of value
- Equated time of payment

NAME OF THE TOPIC:PRESENT AND ACCUMULATED VALUES OF ANNUITYWITHOUT DEFERMENT PERIOD

LECTURE NO. : 4

- Present and accumulated values of immediate annuity certain

LECTURE NO. : 5

- Present and accumulated values of annuity due certain

NAME OF THE TOPIC:PRESENT VALUE FOR PERPETUITY (IMMEDIATE ANDDUE) WITH AND WITHOUT DEFERMENT PERIOD

LECTURE NO. : 6,7

- Present value of immediate perpetuity with and without deferment Period
- Present value of due perpetuity with and without deferment Period

NAME OF THE TOPIC:PRESENT AND ACCUMULATED VALUES

LECTURE NO. : 8

- Present and accumulated values of increasing annuity

LECTURE NO. : 9

- Present and accumulated values of increasing annuity when successive installments form arithmetic progression

LECTURE NO. : 10, 11

- Present and accumulated values of annuity with frequency different from that with which interest is convertible

NAME OF THE TOPIC: REDEMPTION OF LOAN

LECTURE NO. : 12

- Redemption of loan

NAME OF THE TOPIC: EXAMPLES

LECTURE NO. : 13,14, 15

- ❖ CASE STUDY/EXAMPLES:Solving Examples based on previous lectures
- ❖ INNOVATIVE PRACTICES : Home Assignments

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: POOJA D. SALUNKHE
DEPARTMENT: STATISTICS
CLASS: T.Y.B.SC. **SUBJECT:** STATISTICS **PAPER :**IV
UNIT NO.: 3 **UNIT TITLE:** LIFE ANNUITIES

NAME OF THE TOPIC: PRESENT VALUE IN TERMS OF COMMUTATION FUNCTIONSOF LIFE ANNUITIESWITH DEFERMENT PERIOD.

LECTURE NO. : 1, 2

- Present value in terms of commutation functions of Life annuities with deferment period.
  - Immediate

LECTURE NO. : 3, 4

- Present value in terms of commutation functions of Life annuities with deferment period.
  - Due

LECTURE NO. : 5, 6

- Present value in terms of commutation functions of Life annuities with deferment period.
  - Immediate Due

NAME OF THE TOPIC: PRESENT VALUE IN TERMS OF COMMUTATION FUNCTIONSOF LIFE ANNUITIESWITHOUT DEFERMENT PERIOD.

LECTURE NO. : 7, 8

- Present value in terms of commutation functions of Life annuities without deferment period.
  - Immediate

LECTURE NO. : 9, 10

- Present value in terms of commutation functions of Life annuities without deferment period.
  - Due

LECTURE NO. : 11, 12

- Present value in terms of commutation functions of Life annuities without deferment period.
  - Immediate Due

NAME OF THE TOPIC: PRESENT VALUE

LECTURE NO. : 13

- Present values of Variable

LECTURE NO. : 14, 15

- Present values of Increasing life annuities and increasing Temporary life annuities (immediate and due).

GOVERNMENT OF MAHARASHTRA'S
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LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: POOJA D. SALUNKHE
DEPARTMENT: STATISTICS
CLASS: T.Y.B.SC. **SUBJECT:** STATISTICS **PAPER** :IV
UNIT NO.: 4 **UNIT TITLE:**ASSURANCE BENEFITS

NAME OF THE TOPIC: PRESENT VALUE OF ASSURANCE BENEFITS IN TERMS OF COMMUTATION FUNCTIONS

LECTURE NO. : 1

- Present value of Assurance benefits in terms of commutation functions pure endowment assurance.

LECTURE NO. : 2

- Present value of Assurance benefits in terms of commutation functions temporary assurance

LECTURE NO. : 3

- Present value of Assurance benefits in terms of commutation functions endowment assurance

LECTURE NO. : 4

- Present value of Assurance benefits in terms of commutation functions whole life assurance

LECTURE NO. : 5

- Present value of Assurance benefits in terms of commutation functions double endowment assurance

LECTURE NO. : 6

- Present value of Assurance benefits in terms of commutation functions special endowment assurance

LECTURE NO. : 7

- Present value of Assurance benefits in terms of commutation functions deferred temporary assurance

NAME OF THE TOPIC:NET PREMIUMS

LECTURE NO. : 8, 9, 10, 11, 12, 13

- Net level annual premiums (including limited period of payment) for various assurance plans

NAME OF THE TOPIC:EXAMPLES

LECTURE NO. : 14,15

- CASE STUDY/EXAMPLES:Solving Examples based on previous lectures
- INNOVATIVE PRACTICES : Home Assignments

HEAD
Department Of Statistics
Ismail Yusuf College Of
Arts, Sc & Commerce
Jogeshwari (E), Mumbai

Credit BASED semester AND GRADING SYSTEM OF UNIVERSITY OF MUMBAI

THIRD YEAR B.SC

STATISTICS COURSE

SEMESTER V

Lecture Plan

Academic Year : 2022-23

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE
LECTURE PLAN

NAME OF THE LECTURER: **Samreen Shaikh**

DEPARTMENT: **STATISTICS**

CLASS: **T.Y.B.Sc.**

SUBJECT: **PROBABILITY AND DISTRIBUTION THEORY (Paper-I)**

UNIT NO.: I UNIT TITLE: - Probability

Lecture 1: Introduction to Probability

- Definition of a random experiment
- Understanding outcomes and events
- Introduction to sample space and its significance
- Basic properties of events: complementary, mutually exclusive, exhaustive, and equally likely events

Lecture 2: Types of Probability

- Mathematical probability: Definition and examples
- Statistical probability: Introduction and differences from mathematical probability
- Axiomatic probability: Foundations and principles
- Subjective probability: Understanding subjective judgments and applications

Lecture 3: Addition Theorem

- Addition theorem for two events: Definition and proof
- Application of addition theorem in probability calculations
- Examples and exercises demonstrating addition theorem for two events

Lecture 4: Addition Theorem (contd.)

- Addition theorem for three events: Definition and proof
- Application of addition theorem in probability calculations for three events
- Examples and exercises demonstrating addition theorem for three events

Lecture 5: Conditional Probability

- Introduction to conditional probability

- Multiplication theorem for two events: Definition and proof
- Application of multiplication theorem in probability calculations
- Examples and exercises demonstrating multiplication theorem for two events

Lecture 6: Conditional Probability (contd.)

- Multiplication theorem for three events: Definition and proof
- Application of multiplication theorem in probability calculations for three events
- Examples and exercises demonstrating multiplication theorem for three events

Lecture 7: Bayes' Theorem

- Introduction to Bayes' theorem
- Understanding the formula and its derivation
- Application of Bayes' theorem in real-life scenarios
- Examples and exercises applying Bayes' theorem

Lecture 8: Theorems on Probability of Realization

- Theorem on probability of realization of at least one event
- Theorem on probability of realization of exactly m events
- Theorem on probability of realization of at least m of N events
- Application of theorems in classical occupancy problems, matching, and guessing problems

Lecture 9: Theorems on Probability of Realization (contd.)

- Further examples and exercises on theorems of probability realization
- Application of theorems in practical scenarios and problem-solving

Lecture 10: Classical Occupancy Problems

- Introduction to classical occupancy problems
- Understanding the concept and its relevance in probability theory
- Solving classical occupancy problems using probability theorems

Lecture 11: Matching and Guessing Problems

- Introduction to matching and guessing problems
- Understanding different types of problems and their variations
- Solving matching and guessing problems using probability concepts

Lecture 12: Examples and Problem Solving

- Review of concepts covered in previous lectures
- Solving a variety of problems integrating multiple probability concepts
- Class discussion and problem-solving sessions

Lecture 13: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios
- Application of probability concepts in real-world situations
- Group activities and discussions to enhance understanding

Lecture 14: Review and Practice

- Review of key concepts, theorems, and formulas covered throughout the unit
- Practice problems and exercises for reinforcement
- Q&A session to address any lingering doubts or questions

Lecture 15: Final Assessment

- Comprehensive assessment covering all topics discussed in the unit
- Evaluation of students' understanding and application of probability concepts
- Feedback session and discussion on areas for improvement

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE
LECTURE PLAN

NAME OF THE LECTURER: **Samreen Shaikh**

DEPARTMENT: **STATISTICS**

CLASS: **T.Y.B.Sc.**

SUBJECT: **PROBABILITY AND DISTRIBUTION THEORY (Paper-I)**

UNIT NO.: II UNIT TITLE: - Inequality and law of large numbers

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Lecture 1: Introduction to Inequalities

- Overview of the importance of inequalities in probability theory and statistics
- Introduction to various types of inequalities and their applications
- Outline of the topics to be covered in the unit

Lecture 2: Markov Inequality

- Definition and statement of Markov's inequality
- Derivation and proof of Markov's inequality
- Applications of Markov's inequality in probability and statistics
- Examples illustrating the use of Markov's inequality in real-world scenarios

Lecture 3: Tchebyshev's Inequality

- Introduction to Tchebyshev's inequality
- Derivation and proof of Tchebyshev's inequality
- Comparison of Tchebyshev's inequality with Markov's inequality
- Practical applications of Tchebyshev's inequality in probability and statistics

Lecture 4: Boole's Inequality

- Definition and statement of Boole's inequality
- Explanation of Boole's inequality in terms of probabilities of union events
- Derivation and proof of Boole's inequality
- Examples demonstrating the use of Boole's inequality in probability calculations

Lecture 5: Cauchy-Schwarz's Inequality

- Introduction to Cauchy-Schwarz's inequality
- Statement and proof of Cauchy-Schwarz's inequality
- Applications of Cauchy-Schwarz's inequality in probability and statistics
- Illustrative examples showcasing the utility of Cauchy-Schwarz's inequality

Lecture 6: Weak Law of Large Numbers

- Overview of the law of large numbers and its significance in probability theory
- Statement and explanation of the weak law of large numbers
- Proof and understanding of the weak law of large numbers
- Real-world implications and applications of the weak law of large numbers

Lecture 7: Applications of Inequalities

- Review of the inequalities covered so far: Markov, Tchebyshev, Boole, Cauchy-Schwarz
- Practical applications of inequalities in various statistical and probabilistic scenarios
- Case studies and examples demonstrating the use of inequalities in data analysis and inference

Lecture 8: Examples and Problem Solving

- Solving problems and exercises related to Markov, Tchebyshev, Boole, and Cauchy-Schwarz inequalities
- Application of inequalities to analyze and interpret real-world data
- Group activities and discussions to reinforce understanding of inequality concepts

Lecture 9: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of inequalities through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of inequality principles

Lecture 10: Review and Practice

- Review of key concepts, definitions, and theorems related to inequalities
- Practice problems and exercises to reinforce understanding and mastery of inequality concepts

- Q&A session to address any lingering doubts or questions about inequalities

Lecture 11: Review and Practice (contd.)

- Continued review and practice session, focusing on areas where students may need additional reinforcement
- Application of inequalities to solve practical problems and case studies
- Individualized assistance and feedback to support students' learning goals

Lecture 12: Case Studies and Applications

- Analysis of real-world case studies using inequalities
- Examination of how inequalities are applied in various fields such as finance, economics, and engineering
- Discussion of the limitations and assumptions of inequalities in practical applications

Lecture 13: Advanced Topics in Inequalities

- Exploration of advanced topics in inequalities, such as the Jensen's inequality and Holder's inequality
- Statement, proof, and application of Jensen's inequality
- Statement, proof, and application of Hölder's inequality
- Comparison of these advanced inequalities with the ones previously covered

Lecture 14: Advanced Applications and Extensions

- Application of advanced inequalities to solve complex problems and analyze data
- Extensions of inequality concepts to higher dimensions and more general scenarios
- Discussion of recent developments and research trends in inequality theory

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on inequalities and the law of large numbers
- Final assessment to evaluate students' understanding and mastery of inequality concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE
LECTURE PLAN

NAME OF THE LECTURER: **Samreen Shaikh**

DEPARTMENT: **STATISTICS**

CLASS: **T.Y.B.Sc.**

SUBJECT: **PROBABILITY AND DISTRIBUTION THEORY (Paper-I)**

UNIT NO.: III UNIT TITLE: - Joint moment generating function, trinomial distribution and multinomial Distribution

Lecture 1: Introduction to Moment Generating Function (MGF)

- Definition and properties of Moment Generating Function (MGF) for two random variables of discrete and continuous type
- Understanding the role of MGF in characterizing probability distributions
- Necessary and Sufficient conditions for the independence of two random variables
- Concept and definition of Bivariate MGF

Lecture 2: Joint Moment Generating Function (MGF)

- Introduction to Bivariate MGF and its significance in analyzing joint distributions
- Derivation and properties of Joint Moment Generating Function
- Application of Bivariate MGF in determining moments and other statistical properties
- Examples illustrating the computation and interpretation of Bivariate MGF

Lecture 3: Trinomial Distribution

- Definition and characteristics of the trinomial distribution
- Joint probability distribution of (X, Y) in trinomial distribution
- Calculation of joint moment generating function and moments
- Analysis of marginal and conditional distributions, means, and variances

Lecture 4: Trinomial Distribution (contd.)

- Continued discussion on the trinomial distribution
- Exploration of the correlation coefficient between (X, Y)
- Distribution of the sum X+Y in trinomial distribution
- Application of trinomial distribution in real-world scenarios

Lecture 5: Multinomial Distribution

- Introduction to Multinomial distribution with parameters (n, (p_1), (p_2), …, (p_{k-1})) where (p_1 + p_2 + … + p_{k-1} + p_k = 1)
- Definition and characteristics of the multinomial distribution
- Expression for joint MGF in multinomial distribution
- Derivation of joint probability distribution of ((X_i), (X_j)) in multinomial distribution

Lecture 6: Multinomial Distribution (contd.)

- Continued discussion on the multinomial distribution
- Calculation of conditional probability distribution of (X_i) given (X_j)
- Analysis of the relationship between different categories in multinomial experiments
- Examples demonstrating the application of multinomial distribution in practical situations

Lecture 7: Applications of Joint MGF, Trinomial, and Multinomial Distributions

- Review of concepts covered in previous lectures
- Practical applications of joint moment generating function, trinomial, and multinomial distributions in statistics, finance, and engineering
- Case studies and examples showcasing the utility of these distributions in data analysis and modeling

Lecture 8: Examples and Problem Solving

- Solving problems and exercises related to joint moment generating function, trinomial, and multinomial distributions
- Application of distributions to analyze and interpret data from experiments and surveys
- Group activities and discussions to reinforce understanding of distribution concepts

Lecture 9: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of joint moment generating function, trinomial, and multinomial distributions through challenging problems and case studies

- Peer-to-peer learning and collaboration to deepen understanding of distribution principles

Lecture 10: Review and Practice

- Review of key concepts, definitions, and theorems related to joint moment generating function, trinomial, and multinomial distributions
- Practice problems and exercises to reinforce understanding and mastery of distribution concepts
- Q&A session to address any lingering doubts or questions about distributions

Lecture 11: Review and Practice (contd.)

- Continued review and practice session, focusing on areas where students may need additional reinforcement.
- Application of distributions to solve practical problems and case studies
- Individualized assistance and feedback to support students' learning goals

Lecture 12: Advanced Topics in Joint MGF and Multinomial Distribution

- Exploration of advanced topics in joint moment generating function and multinomial distribution
- Analysis of special cases and extensions of these distributions
- Discussion of recent developments and research trends in joint MGF and multinomial distribution theory

Lecture 13: Advanced Applications and Extensions

- Application of advanced concepts in joint moment generating function and multinomial distribution to solve complex problems and analyze data
- Extensions of distribution concepts to higher dimensions and more general scenarios
- Exploration of open research questions and areas for future study

Lecture 14: Practical Examples

- Analysis of real-world case studies using joint moment generating function, trinomial, and multinomial distributions
- Discussion of the limitations and assumptions of these distributions in practical applications

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on joint moment generating function, trinomial, and multinomial distributions
- Final assessment to evaluate students' understanding and mastery of distribution concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE
LECTURE PLAN

NAME OF THE LECTURER: **Samreen Shaikh**

DEPARTMENT: **STATISTICS**

CLASS: **T.Y.B.Sc.**

SUBJECT: **PROBABILITY AND DISTRIBUTION THEORY (Paper-I)**

UNIT NO.: IV UNIT TITLE: - Order Statistics

Lecture 1: Introduction to Order Statistics

- Overview of order statistics and their importance in statistical analysis
- Definition of order statistics based on a random sample
- Explanation of the role of order statistics in understanding the distribution of sample data

Lecture 2: Cumulative Distribution Function of the r^{th} Order Statistic

- Derivation of the cumulative distribution function (CDF) of the order statistic
- Interpretation of the r^{th} order statistic's CDF in terms of probability of observing values less than or equal to a given value
- Examples illustrating the computation and interpretation of the CDF for various distributions

Lecture 3: Probability Density Function of r^{th} Order Statistic

- Derivation of the probability density function (PDF) of the r^{th} order statistic
- Understanding the relationship between the PDF and the CDF of order statistics
- Application of the PDF in calculating probabilities and expected values for order statistics

Lecture 4: Joint Probability Density Function of r^{th} and s^{th} Order Statistic ($r < s$)

- Derivation of the joint probability density function (PDF) of the r^{th} and s^{th} order statistics, where ($r < s$)
- Analysis of the dependence structure between different order statistics
- Illustrative examples demonstrating the computation and interpretation of joint PDFs

Lecture 5: Joint Probability Density Functions of All (n) Ordered Statistics

- Derivation of the joint probability density function (PDF) of all (n) ordered statistics
- Understanding the multivariate nature of joint PDFs for order statistics
- Application of joint PDFs in analyzing the distribution of entire sample data sets

Lecture 6: Distribution of Maximum and Minimum Observations

- Analysis of the distribution of the maximum (nth order statistic) and minimum (first order statistic) observations
- Special cases of uniform and exponential distributions for maximum and minimum observations
- Derivation and interpretation of distribution functions for maximum and minimum observations

Lecture 7: Distribution of Maximum and Minimum Observations (contd.)

- Continued discussion on the distribution of maximum and minimum observations
- Comparison of distribution properties between different types of distributions
- Examples illustrating the application of distribution functions for maximum and minimum observations

Lecture 8: Probability Density Function of the Difference Between r^{th} and s^{th} Order Statistic ($r < s$)

Derivation of the probability density function (PDF) of the difference between the r^{th} and s^{th} order statistics, where ($r < s$)

Understanding the distribution of differences between order statistics

Application of PDFs for differences in analyzing variability and spread within a sample

Lecture 9: Probability Density Function of the Difference Between r^{th} and s^{th} Order Statistic ($r < s$) (contd.)

- Continued discussion on the PDF of the difference between order statistics
- Exploration of special cases and properties of PDFs for differences
- Examples demonstrating the computation and interpretation of PDFs for differences

Lecture 10: Applications of Order Statistics

- Review of concepts covered in previous lectures

- Practical applications of order statistics in various fields such as finance, engineering, and medicine
- examples showcasing the utility of order statistics in data analysis and inference

Lecture 11: Examples and Problem Solving

- Solving problems and exercises related to order statistics
- Application of order statistics to analyze and interpret real-world data sets
- Group activities and discussions to reinforce understanding of order statistic concepts

Lecture 12: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of order statistics through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of order statistic principles

Lecture 13: Review and Practice

- Review of key concepts, definitions, and theorems related to order statistics
- Practice problems and exercises to reinforce understanding and mastery of order statistic concepts
- Q&A session to address any lingering doubts or questions about order statistics

Lecture 14: Review and Practice (contd.)

- Continued review and practice session, focusing on areas where students may need additional reinforcement
- Application of order statistics to solve practical problems and case studies
- Individualized assistance and feedback to support students' learning goals

Lecture 15: Advanced Topics and Extensions

- Exploration of advanced topics and extensions in order statistics
- Analysis of special cases and applications in non-standard distributions
- Discussion of recent developments and research trends in order statistics theory

Credit BASED semester AND GRADING SYSTEM OF UNIVERSITY OF MUMBAI

THIRD YEAR B.SC

Statistics COURSE

SEMESTER VI

Lecture Plan

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE
LECTURE PLAN

DATE : _____

NAME OF THE LECTURER: **Samreen Shaikh**

DEPARTMENT: **STATISTICS**

CLASS: **T.Y.B.Sc.**

SUBJECT: **DISTRIBUTION THEORY AND STOCHASTIC PROCESSES(Paper-I)**

UNIT NO.: I UNIT TITLE: - Bivariate Normal Distribution

Lecture 1: Introduction to Bivariate Normal Distribution*

- Definition of joint probability distribution (X, Y)
- Understanding the concept of bivariate normal distribution
- Overview of joint moment generating function and moments

Lecture 2: Marginal and Conditional Distributions

- Derivation of marginal distributions for X and Y
- Understanding conditional distributions given X and Y
- Calculation of means and variances for marginal and conditional distributions

Lecture 3: Correlation Coefficient

- Definition and interpretation of correlation coefficient between random variables X &Y
- Derivation of correlation coefficient formula
- Necessary and sufficient conditions for the independence of X and Y

Lecture 4: Distribution of aX + bY

- Understanding the distribution of linear combinations of random variables
- Derivation and interpretation of the distribution of $aX + bY$
- Analysis of properties and implications of $aX + bY$ distribution

Lecture 5: Distribution of Sample Correlation Coefficient

- Introduction to the distribution of the sample correlation coefficient
- Understanding the significance of sample correlation coefficient in statistical analysis

- Explanation of Fisher's z-transformation and its application in testing correlation coefficients

Lecture 6: Testing the Significance of a Correlation Coefficient

- Explanation of hypothesis testing for correlation coefficients
- Derivation of tests
- Calculation of confidence intervals for correlation coefficients

Lecture 7: Testing the Significance of a Correlation Coefficient (contd.)

- Continued discussion on hypothesis testing for correlation coefficients
- Interpretation of test results and significance levels
- Application of testing procedures to real-world datasets

Lecture 8: Examples and Problem Solving

- Solving problems and exercises related to bivariate normal distribution and correlation coefficients
- Application of statistical tests and techniques to analyze data
- Group activities and discussions to reinforce understanding of concepts

Lecture 9: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of correlation coefficient testing and confidence interval calculations
- Peer-to-peer learning and collaboration to deepen understanding of statistical techniques

Lecture 10: Review and Practice

- Review of key concepts, definitions, and theorems related to bivariate normal distribution and correlation coefficients
- Practice problems and exercises to reinforce understanding and mastery of concepts
- Q&A session to address any lingering doubts or questions about the material

Lecture 11:Review and Practice (contd.)

- Continued review and practice session, focusing on areas where students may need additional reinforcement
- Application of statistical techniques to solve practical problems and case studies

- Individualized assistance and feedback to support students'

Lecture 12: Advanced Topics in Bivariate Normal Distribution

- Exploration of advanced topics and extensions in bivariate normal distribution theory
- Analysis of special cases and applications in multivariate analysis
- Discussion of recent developments and research trends in bivariate normal distribution theory

Lecture 13: Advanced Topics in Correlation Coefficients

- Further exploration of advanced topics in correlation coefficient testing and estimation
- Analysis of non-linear relationships and alternative correlation measures
- Discussion of limitations and assumptions of correlation coefficient testing procedures

Lecture 14: Applications

- Discussion of the practical implications and limitations of statistical analysis techniques
- Q&A session to address any lingering doubts or questions

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on bivariate normal distribution and correlation coefficients
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE
LECTURE PLAN

DATE : _____

NAME OF THE LECTURER: **Samreen Shaikh**

DEPARTMENT: **STATISTICS**

CLASS: **T.Y.B.Sc.**

SUBJECT: **PROBABILITY AND DISTRIBUTION THEORY (Paper-I)**

UNIT NO.: II UNIT TITLE: - Generating Functions

Lecture 1: Introduction to Generating Functions

- Definition of generating functions and their significance in probability theory
- Overview of probability generating functions
- Explanation of how generating functions provide a concise representation of probability distributions

Lecture 2: Mean and Variance in terms of Generating Functions*

- Expression for mean and variance of a random variable in terms of generating functions
- Derivation of formulas for mean and variance using generating functions
- Understanding the relationship between moments and generating functions

Lecture 3: Convolution of Sequences

- Definition of convolution of two or more sequences
- Explanation of how convolutions combine sequences to produce new sequences
- Derivation of the generating function of a convolution

Lecture 4: Generating Function of Convolution

- Calculation of generating functions for convolutions of sequences
- Application of convolution techniques to analyze probability distributions
- Examples illustrating the computation and interpretation of generating functions for convolutions

Lecture 5: Generating Functions of Standard Discrete Distributions

- - Overview of generating functions for standard discrete distributions such as Bernoulli, Binomial, Geometric, and Negative Binomial
- - Derivation of generating functions for each distribution
- - Analysis of the properties and characteristics of generating functions for standard discrete distributions

Lecture 6: Bernoulli and Binomial Distributions

- Understanding the relationship between Bernoulli and Binomial distributions
- Derivation of the Binomial distribution from the Bernoulli distribution through convolutions
- Application of generating functions to analyze and compare Bernoulli and Binomial distributions

Lecture 7: Geometric and Negative Binomial Distributions

- Exploration of the connection between Geometric and Negative Binomial distributions
- Derivation of the Negative Binomial distribution from the Geometric distribution through convolutions
- Analysis of the differences and similarities between Geometric and Negative Binomial distributions using generating functions

Lecture 8: Examples and Problem Solving

- Solving problems and exercises related to generating functions and standard discrete distributions
- Application of generating functions to analyze and interpret real-world data sets
- Group discussions to reinforce understanding of concepts

Lecture 9: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of generating functions and their applications in probability theory
- Peer-to-peer learning and collaboration to deepen understanding of generating function principles

Lecture 10: Review and Practice

- Review of key concepts, definitions, and theorems related to generating functions
- Practice problems and exercises to reinforce understanding and mastery of concepts
- Q&A session to address any lingering doubts or questions about the materialQ&A session to address any lingering doubts or questions about inequalities

Lecture 11: Review and Practice (contd.)

- Continued review and practice session, focusing on areas where students may need additional reinforcement
- Application of generating functions to solve practical problems and case studies
- Individualized assistance and feedback to support students' goals

Lecture 12: Advanced Topics in Generating Functions

- Exploration of advanced topics and extensions in generating function theory
- Analysis of generating functions for non-standard distributions and complex sequences
- Discussion of recent developments and research trends in generating function theoryDiscussion of the limitations and assumptions of inequalities in practical applications

Lecture 13: Advanced Applications and Extensions

- Further exploration of advanced applications of generating functions in probability theory and statistics
- Analysis of generating functions in combinatorics, number theory, and other areas of mathematics
- Discussion of open research questions and areas for future study in generating function theory

Lecture 14: Case Studies and Applications

- Analysis of real-world case studies using generating functions
- Examination of how generating functions are applied in various fields such as finance, engineering, and biology
- Discussion of the practical implications and limitations of generating function analysis

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on generating functions
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE
LECTURE PLAN

DATE : _____

NAME OF THE LECTURER: **Samreen Shaikh**

DEPARTMENT: **STATISTICS**

CLASS: **T.Y.B.Sc.**

SUBJECT: **PROBABILITY AND DISTRIBUTION THEORY (Paper-I)**

UNIT NO.: III UNIT TITLE: - Stochastic Process

Lecture 1: Introduction to Stochastic Processes

- Definition of stochastic process and its significance in modeling random phenomena
- Overview of different types of stochastic processes
- Introduction to the postulates and differential equations governing stochastic processes

Lecture 2: Pure Birth Process

- Explanation of the pure birth process and its characteristics
- Derivation of the difference differential equations for the pure birth process
- Analysis of the population growth over time in a pure birth process

Lecture 3: Poisson Process with Initially 'a' Members

- Definition and properties of the Poisson process with initially 'a' members
- Derivation of difference differential equations for the Poisson process with initial members
- Understanding the impact of initial conditions on the evolution of the Poisson process

Lecture 4: Yule-Furry Process

- Introduction to the Yule-Furry process and its applications
- Derivation of difference differential equations for the Yule-Furry process
- Analysis of population growth and branching in the Yule-Furry process

Lecture 5: Pure Death Process

- Explanation of the pure death process and its characteristics
- Derivation of difference differential equations for the pure death process
- Analysis of population decline over time in a pure death process

Lecture 6: Death Process with Constant Death Rate

- Introduction to the death process with a constant death rate \(\mu \)
- Derivation of difference differential equations for the death process with constant death rate
- Analysis of population decline with a constant death rate

Lecture 7: Death Process with Linear Death Rate

- Definition and characteristics of the death process with a linear death rate \(\mu n \)
- Derivation of difference differential equations for the death process with linear death rate
- Analysis of population decline with a linear death rate

Lecture 8: Birth and Death Process

- Explanation of the birth and death process and its applications
- Derivation of difference differential equations for the birth and death process
- Analysis of population growth and decline in a birth and death process

Lecture 9: Linear Growth Model

- Introduction to the linear growth model in stochastic processes
- Derivation of difference differential equations for the linear growth model
- Analysis of population growth over time in a linear growth model

Lecture 10: Derivation of Mean, and Variance

- Explanation of the probability function for stochastic processes
- Derivation of mean and variance for stochastic processes where applicable
- Understanding the significance of mean and variance in characterizing stochastic processes

Lecture 11: Examples and Problem Solving

- Solving problems and exercises related to stochastic processes

- Application of differential equations and probability functions to analyze stochastic processes
- Group activities and discussions to reinforce understanding of concepts

Lecture 12: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of stochastic processes through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of stochastic process principles

Lecture 13: Advanced Topics in Stochastic Processes

- Exploration of advanced topics and extensions in stochastic processes theory
- Analysis of non-standard stochastic processes and their applications
- Discussion of recent developments and research trends in stochastic processes theory

Lecture 14: Applications

- - Discussion of the practical implications and limitations of stochastic process analysis

Lecture 15: Review and Final Assessment

- Comprehensive review of all topics covered in the unit on stochastic processes
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE
LECTURE PLAN

DATE : _____

NAME OF THE LECTURER: **Samreen Shaikh**

DEPARTMENT: **STATISTICS**

CLASS: **T.Y.B.Sc.**

SUBJECT: **PROBABILITY AND DISTRIBUTION THEORY (Paper-I)**

UNIT NO.: IV UNIT TITLE: - Queuing Theory

Lecture 1: Introduction to Queuing Theory

- Definition and significance of queuing theory in modeling waiting lines and service systems
- Overview of basic elements of queuing models: arrivals, service, and queue discipline
- Explanation of the key performance measures in queuing systems

Lecture 2: Poisson and Exponential Distributions in Queuing Theory

- Roles of the Poisson distribution in modeling arrivals and the Exponential distribution in modeling service times
- Derivation and interpretation of the Poisson and Exponential distributions in queuing theory
- Understanding the relationship between these distributions and queuing processesExamples illustrating the computation and interpretation of the CDF for various distributions and queuing processes

Lecture 3: Steady State Probabilities for Birth and Death Process

- Definition of birth and death processes in queuing theory
- Derivation of steady-state probabilities for birth and death processes
- Analysis of the equilibrium behavior of queuing systems using steady-state probabilities

Lecture 4: (M/M/1): (GD/ ∞ /∞) Model

- Introduction to the (M/M/1) queuing model with infinite arrivals and service facilities
- Derivation of steady-state probabilities and various average characteristics for the (M/M/1) model

- Analysis of performance measures such as system utilization, waiting time, and queue length

Lecture 5: (M/M/1): (GD/ N /∞) Model

- Explanation of the (M/M/1) queuing model with a finite number of arrivals and infinite service facilities
- Derivation of steady-state probabilities and average characteristics for the (M/M/1) model with finite arrivals
- Analysis of system behavior under varying arrival rates and service capacities

Lecture 6: (M/M/c): (GD/∞/∞) Model

- Introduction to the (M/M/c) queuing model with multiple servers and infinite arrivals
- Derivation of steady-state probabilities and average characteristics for the (M/M/c) model
- Analysis of system performance and efficiency in multi-server queuing systemsDerivation

Lecture 7: (M/M/c): (GD/ N /∞) Model

- Explanation of the (M/M/c) queuing model with multiple servers and a finite number of arrivals
- Derivation of steady-state probabilities and average characteristics for the (M/M/c) model with finite arrivals
- Analysis of system behavior under varying arrival rates, service capacities, and queue lengths

Lecture 8: (M/M/∞): (GD/ ∞ /∞) Model

- Introduction to the (M/M/∞) queuing model with an infinite number of servers and infinite arrivals
- Derivation of steady-state probabilities and average characteristics for the (M/M/∞) model
- Analysis of system behavior and performance in scenarios with unlimited service capacity

Lecture 9: Examples and Problem Solving

- Solving problems and exercises related to queuing theory models
- Application of queuing theory concepts to analyze and optimize real-world systems

- Group activities and discussions to reinforce understanding of queuing theory principles

Lecture 10: Examples and Problem Solving (contd.)

- Continued problem-solving session focusing on complex scenarios and applications
- Further exploration of queuing theory through challenging problems and case studies
- Peer-to-peer learning and collaboration to deepen understanding of queuing theory concepts

Lecture 11: Advanced Topics in Queuing Theory

- Exploration of advanced topics and extensions in queuing theory
- Analysis of non-standard queuing models and specialized queuing systems
- Discussion of recent developments and research trends in queuing theory

Lecture 12: Applications

- Analysis of real-world case studies using queuing theory models
- Examination of how queuing theory is applied in various fields such as telecommunications, transportation, and healthcare
- Discussion of the practical implications and limitations of queuing theory analysis

Lecture 13: Simulation and Optimization Techniques

- Introduction to simulation and optimization techniques in queuing theory
- Explanation of simulation models and optimization algorithms for queuing systems
- Application of simulation and optimization methods to analyze and improve queuing system performance

Lecture 14: Review and Practice

- Review of key concepts, definitions, and theorems related to queuing theory
- Practice problems and exercises to reinforce understanding and mastery of concepts
- Q&A session to address any lingering doubts or questions about the material

Lecture 15:Review and Final Assessment

- Comprehensive review of all topics covered in the unit on queuing theory
- Final assessment to evaluate students' understanding and mastery of concepts
- Feedback session and discussion of students' performance, strengths, and areas for improvement

HEAD
Department Of Statistics
Ismail Yusuf College Of
Arts, Sc & Commerce
Jogeshwari (E), Mumbai

CREDIT BASED SEMESTER AND GRADING SYSTEM

OF

UNIVERSITY OF MUMBAI

THIRD YEAR B.SC

STATISTICS PAPER

IICOURSE

SEMESTER V

2022-2023

LECTURE PLAN

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: MOHAMMED SAHIL ANSARI
DEPARTMENT: STATISTICS
CLASS: T.Y.B.SC. **SUBJECT:** STATISTICS **PAPER** :II
UNIT NO.: 1 **UNIT TITLE:** POINT ESTIMATION AND PROPERTIES OF ESTIMATORS

Lecture 1: Introduction to Point Estimation

- Notion of a Parameter and Parameter Space
- Overview of Point Estimation Problem
- Definitions: Statistic, Estimator, and Estimate

Lecture 2: Unbiased Estimators (Part 1)

- Definition of an Unbiased Estimator
- Illustrations and Examples of Unbiased Estimators
- Proof of the property that Two Distinct Unbiased Estimators give rise to infinitely many unbiased estimators

Lecture 3: Unbiased Estimators (Part 2)

- Proof that if T is an unbiased estimator of θ, then U(T) is an unbiased estimator of $U(\theta)$ provided $U(\theta)$ is a linear function
- Examples and Applications

Lecture 4: Consistency of Estimators (Part 1)

- Definition of Consistency
- Sufficient Condition for Consistency
- Proof and Illustrations

Lecture 5: Consistency of Estimators (Part 2)

- Further Discussions on Consistency
- Examples and Applications

Lecture 6: Sufficiency of Estimators

- Concept and Definition of Sufficient Statistic
- Neyman's Factorization Theorem (without proof)
- Exponential Family of Probability Distributions and Sufficient Statistics

Lecture 7: Relative Efficiency

- Definition of Relative Efficiency of an Estimator
- Illustrative Examples

Lecture 8: Minimum Variance Unbiased Estimator (MVUE)

- Definition and Properties of MVUE
- Uniqueness Property of MVUE (Proof)
- Fisher's Information Function

Lecture 9: Regularity Conditions and Cramer-Rao Inequality (Part 1)

- Overview of Regularity Conditions
- Statement and Proof of Cramer-Rao Inequality

Lecture 10: Regularity Conditions and Cramer-Rao Inequality (Part 2)

- Cramer-Rao Lower Bound (CRLB)
- Efficiency of an Estimator using CRLB

Lecture 11: Attainment of Equality in Cramer-Rao Inequality

- Conditions when Equality is Attained in Cramer-Rao Inequality
- Use of Equality in Finding MVUE

Lecture 12-15: Case Studies and Applications

- Application of the Concepts Learned in Real-world Scenarios
- Case Studies, Examples, and Exercises

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: MOHAMMED SAHIL ANSARI
DEPARTMENT: STATISTICS
CLASS: T.Y.B.SC. **SUBJECT:** STATISTICS **PAPER :**II
UNIT NO.: 2 **UNIT TITLE:**POINT ESTIMATION AND PROPERTIES OF ESTIMATORS

Lecture 1: Introduction to Point Estimation and MLE

- Overview of point estimation.
- Introduction to Maximum Likelihood Estimation (MLE).
- Definition of likelihood function.
- Likelihood function for discrete and continuous distributions.

Lecture 2: MLE for Standard Distributions - Part 1

- Derivation of MLE for parameters of standard distributions (e.g., normal, binomial) with one unknown parameter.
- Application examples and exercises.

Lecture 3: MLE for Standard Distributions - Part 2

- Derivation of MLE for parameters of standard distributions with two unknown parameters.
- Application examples and exercises.

Lecture 4: Properties of MLE

- Overview of properties of MLE (unbiasedness, efficiency, consistency).
- Illustrative examples demonstrating these properties.
- Limitations and assumptions of MLE.

Lecture 5: Method of Moments - Part 1

- Introduction to the Method of Moments.

- Derivation of moment estimators for standard distributions with one unknown parameter.

Lecture 6: Method of Moments - Part 2

- Derivation of moment estimators for standard distributions with two unknown parameters.
- Comparison with MLE and discussion on advantages/disadvantages.

Lecture 7: Situations where MLE and Moment Estimators Differ

- Illustrations of scenarios where MLE and moment estimators yield different results.
- Comparison using Mean Square Error (MSE).
- Real-world examples and applications.

Lecture 8: Method of Minimum Chi-square

- Introduction to the Method of Minimum Chi-square.
- Application in parameter estimation.
- Derivation and examples.

Lecture 9: Modified Minimum Chi-square

- Overview of Modified Minimum Chi-square method.
- Comparison with traditional minimum chi-square method.
- Application examples.

Lecture 10: Review and Practice Problems - MLE

- Review of MLE concepts covered so far.
- Solving practice problems related to MLE.
- Application of MLE in various statistical scenarios.

Lecture 11: Review and Practice Problems - Method of Moments

- Review of Method of Moments concepts covered so far.
- Solving practice problems related to Method of Moments.
- Application of moment estimators in statistical analysis.

Lecture 12: Case Studies and Applications

- Presenting case studies showcasing the application of point estimation methods in various fields.
- Discussing challenges and limitations faced in real-world applications.
- Q&A session.

Lecture 13: Advanced Topics in Point Estimation

- Generalized Method of Moments (GMM).
- Extensions and variations of MLE and Method of Moments.
- Higher-order moments and their role in estimation.

Lecture 14: Practical Implementation and Software

- Practical implementation of point estimation methods in statistical software (e.g., R, Python)
- Demonstrations and hands-on exercises.
- Tips for effective implementation and troubleshooting.

Lecture 15: Conclusion and Future Directions

- Summary of key concepts covered throughout the course
- Discussion on potential future research directions in point estimation
- Closing remarks and farewell

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: MOHAMMED SAHIL ANSARI
DEPARTMENT: STATISTICS
CLASS: T.Y.B.SC. **SUBJECT:** STATISTICS **PAPER :**II
UNIT NO.: 3 **UNIT TITLE:**BAYESIAN ESTIMATION METHOD & INTERVAL ESTIMATION

Lectures 1-5: Bayes Estimation

Lecture 1: Introduction to Bayes Estimation

- Overview of Bayesian inference
- Prior distribution and posterior distribution

Lecture 2: Loss Functions

- Introduction to loss functions
- Definition of risk function

Lecture 3: Types of Loss Functions

- Squared error loss function (SELF)
- Absolute error loss function (AELF)

Lecture 4: Bayes' Risk

- Definition and significance of Bayes' risk
- Methods of minimizing Bayes' risk

Lecture 5: Bayes' Method of Finding Point Estimator

- Bayes' method under the assumption of SELF
- Calculation of point estimators

Lectures 6-10: Examples and Applications

Lecture 6: Example 1 - Binomial-Beta

- Application of Bayes' estimation to Binomial distribution with Beta prior

Lecture 7: Example 2 - Poisson-Gamma

- Application of Bayes' estimation to Poisson distribution with Gamma prior

Lecture 8: Example 3 - Gamma-Gamma

- Application of Bayes' estimation to Gamma distribution with Gamma prior

Lecture 9: Example 4 - Normal-Normal

- Application of Bayes' estimation to Normal distribution with Normal prior

Lecture 10: Review and Problem-solving session

- Review of examples and concepts covered so far
- Problem-solving session for better understanding

Lectures 11-15: Interval Estimation

Lecture 11: Introduction to Interval Estimation

- Concept of confidence interval and confidence limits

Lecture 12: Pivotal Quantity

- Definition and importance of pivotal quantity in obtaining confidence limits

Lecture 13: Confidence Interval for Population Mean

- Derivation of confidence interval for population mean with known variance
- Derivation of confidence interval for population mean with unknown variance

Lecture 14: Confidence Interval for Population Variance

- Derivation of confidence interval for population variance with Normal distribution

Lecture 15: Confidence Interval for Other Distributions

- Derivation of confidence interval for parameters of Binomial, Poisson, and Exponential distributions
- Conclusion and recap of interval estimation

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: MOHAMMED SAHIL ANSARI
DEPARTMENT: STATISTICS
CLASS: T.Y.B.SC.**SUBJECT:** STATISTICS **PAPER** :II
UNIT NO.: 4 **UNIT TITLE:**INTRODUCTION TO LINEAR MODELS

Lecture 1: Introduction to Linear Models

- Overview of linear models in statistics.
- Importance and applications of linear models.
- Basic concepts and terminology.

Lecture 2: General Linear Model of Full Rank

- Definition and explanation of the general linear model.
- Assumptions underlying the general linear model.
- Mathematical representation: $Y = X\beta + e$.

Lecture 3: Derivation of Least Squares Estimator

- Introduction to the least squares method.
- Derivation of the least squares estimator of β.
- Interpretation and significance of the least squares estimator.

Lecture 4: Expectation of Least Squares Estimator

- Understanding the expected value (E) of the least squares estimator.
- Properties and implications of the expected value.

Lecture 5: Variance of Least Squares Estimator

- Calculation of the variance (V) of the least squares estimator.
- Factors influencing the variance.
- Interpretation and significance of the variance.

Lecture 6: Gauss-Markov Theorem

- Statement and significance of the Gauss-Markov theorem.
- Conditions under which the least squares estimator is best linear unbiased estimator (BLUE).

Lecture 7: Confidence Interval for β

- Definition and concept of confidence intervals.
- Derivation of confidence interval for β when the error term is known.

Lecture 8: Gauss-Markov Theorem for Full Rank Model

- Application of Gauss-Markov theorem to the full rank model.
- Understanding the assumptions and implications.

Lecture 9: Expectation of Residuals

- Calculation of the expected value (E) of the residuals.
- Interpretation and significance of the expected residuals.

Lecture 10: Variance of Residuals

- Calculation of the variance (V) of the residuals.
- Factors influencing the variance.
- Interpretation and significance of the variance.

Lecture 11: Confidence Interval for Residuals

- Derivation of confidence interval for residuals.
- Application of confidence interval in linear modelling.

Lecture 12: Confidence Interval for Individual Coefficients

- Calculation of confidence interval for individual coefficients (β).
- Interpretation and significance of individual coefficient confidence intervals.

Lecture 13: Confidence Interval for Linear Combinations

- Derivation of confidence interval for linear combinations of coefficients.

- Application of confidence interval for linear combinations in regression analysis.

Lecture 14: Assumptions and Diagnostics

- Review of assumptions underlying linear models.
- Diagnostic techniques for assessing model adequacy and assumptions.

Lecture 15: Practical Applications and Case Studies

- Real-world examples and case studies illustrating the application of linear models.
- Discussion on challenges and limitations in linear modelling.
- Summary and concluding remarks.

CREDIT BASED SEMESTER AND GRADING SYSTEM OF UNIVERSITY OF MUMBAI

THIRD YEAR B.SC

STATISTICS PAPER II

COURSE

SEMESTER VI

2022-2023

LECTURE PLAN

GOVERNMENT OF MAHARASHTRA'S
ISMAIL YUSUF COLLEGE OF ARTS, SCIENCE AND COMMERCE,
LECTURE PLAN

DATE: _____
NAME OF THE LECTURER: MOHAMMED SAHIL ANSARI
DEPARTMENT: STATISTICS
CLASS: T.Y.B.SC. **SUBJECT:** STATISTICS **PAPER** :II
UNIT NO.: 1 **UNIT TITLE:** MOST POWERFUL TESTS

Lecture 1: Introduction to Hypothesis Testing

- Overview of hypothesis testing in statistics.
- Importance and applications of hypothesis testing.
- Basic concepts and terminology.

Lecture 2: Types of Hypotheses

- Definitions and illustrations of simple hypothesis, composite hypothesis, null hypothesis, and alternative hypothesis.
- Understanding the differences and implications of each type of hypothesis.

Lecture 3: Test of Hypothesis

- Definition and explanation of a test of hypothesis.
- Introduction to critical region and its significance in hypothesis testing.

Lecture 4: Type I and Type II Errors

- Definitions and examples of Type I and Type II errors.
- Understanding the consequences and implications of each type of error.

Lecture 5: Level of Significance

- Definition and interpretation of the level of significance (α).
- Role of the level of significance in hypothesis testing.

Lecture 6: p-value

- Definition and interpretation of the p-value.
- Calculation and significance of the p-value in hypothesis testing.

Lecture 7: Size of the Test

- Definition and calculation of the size of the test.
- Understanding the relationship between size and significance level.

Lecture 8: Power of the Test

- Definition and interpretation of the power of the test.
- Factors influencing the power of the test.

Lecture 9: Power Function of a Test

- Explanation of the power function of a test.
- Calculation and interpretation of the power function.

Lecture 10: Power Curve

- Introduction to power curve.
- Construction and interpretation of power curves.

Lecture 11: Most Powerful Test

- Definition and criteria for the most powerful test.
- Neyman-Pearson fundamental lemma and its significance.

Lecture 12: Size α Test for Simple Hypothesis

- Definition and explanation of size α test for a simple hypothesis against a simple alternative hypothesis.
- Understanding the methodology and significance.

Lecture 13: Randomized Test

- Introduction to randomized tests.
- Explanation of randomization and its role in hypothesis testing.

Lecture 14: Applications and Examples

- Illustrative examples and case studies demonstrating the concepts discussed.
- Practical applications of most powerful tests in various fields.

Lecture 15: Summary and Conclusion

- Recapitulation of key concepts and techniques covered in the lectures.
- Discussion on the importance and challenges of hypothesis testing.
- Summary of the course content and concluding remarks.

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DEPARTMENT: STATISTICS
CLASS: T.Y.B.SC.**SUBJECT:** STATISTICS **PAPER** :II
UNIT NO.: 2 **UNIT TITLE:**UNIFORMLY MOST POWERFUL &LIKELIHOOD RATIO TEST

Lecture 1: Introduction to Hypothesis Testing

- Overview of hypothesis testing
- Importance of power in hypothesis testing

Lecture 2: Uniformly Most Powerful (UMP) Tests: Definition and Existence

- Introduction to UMP tests
- Definition of UMP tests
- Existence of UMP tests
- Examples illustrating the concept of UMP tests

Lecture 3: Construction of UMP Tests

- Methods for constructing UMP tests
- Neyman-Pearson lemma and its role in UMP test construction
- Illustrative examples of constructing UMP tests

Lecture 4: Properties of UMP Tests

- Optimality properties of UMP tests
- Comparison with other test procedures
- Limitations of UMP tests

Lecture 5: Likelihood Ratio Tests (LRT): Introduction

- Introduction to likelihood ratio tests
- Likelihood ratio principle
- Advantages of LRT over other test procedures

Lecture 6: Definition of Test Statistic and Its Asymptotic Distribution

- Definition of the likelihood ratio test statistic
- Asymptotic distribution of the test statistic (statement only)
- Understanding the asymptotic properties of LRT

Lecture 7: LRT for Mean of Normal Distribution (Known Variance)

- Construction of LRT for the mean of a normal distribution with known variance
- Derivation of the test statistic
- Application of LRT to practical examples

Lecture 8: LRT for Mean of Normal Distribution (Unknown Variance)

- Extension of LRT for the mean of a normal distribution with unknown variance
- Derivation of the test statistic under unknown variance
- Application of LRT to practical scenarios

Lecture 9: LRT for Variance of Normal Distribution (Known Mean)

- Construction of LRT for the variance of a normal distribution with known mean
- Derivation of the test statistic for variance testing
- Application of LRT to examples with known mean

Lecture 10: LRT for Variance of Normal Distribution (Unknown Mean)

- Extension of LRT for the variance of a normal distribution with unknown mean
- Derivation of the test statistic for variance testing with unknown mean
- Application of LRT to practical scenarios with unknown mean

Lecture 11: Two-Sided Alternatives in LRT

- Handling two-sided alternatives in likelihood ratio tests
- Formulation of hypotheses for two-sided alternatives
- Application of LRT to two-sided alternative scenarios

Lecture 12: Review of UMP Tests and LRT

- Recap of UMP tests and their properties
- Summary of likelihood ratio tests and their advantages
- Comparison between UMP tests and LRT

Lecture 13: Case Studies: Application of UMP Tests

- Application of UMP tests in real-world scenarios
- Case studies demonstrating the use of UMP tests in various fields
- Discussion on the effectiveness of UMP tests in practical situations

Lecture 14: Case Studies: Application of LRT

- Application of likelihood ratio tests in real-world problems
- Case studies illustrating the use of LRT in different domains
- Evaluation of LRT performance in practical applications

Lecture 15: Advanced Topics and Future Directions

- Advanced topics in UMP tests and LRT
- Recent developments in hypothesis testing methodologies
- Future directions and potential research areas in UMP tests and LRT

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DEPARTMENT: STATISTICS
CLASS: T.Y.B.SC. **SUBJECT:** STATISTICS **PAPER :**II
UNIT NO.: 3 **UNIT TITLE:**SEQUENTIAL PROBABILITY RATIO TESTS

Lecture 1: Introduction to Hypothesis Testing

- Overview of hypothesis testing
- Types of hypothesis tests
- Introduction to Sequential Probability Ratio Tests (SPRT)

Lecture 2: Basic Concepts in SPRT

- Definition and purpose of SPRT
- Comparison with fixed sample size tests (Neyman-Pearson test)
- Advantages and limitations of SPRT

Lecture 3: Simple Null Hypothesis vs. Simple Alternative Hypothesis

- Understanding simple null and alternative hypotheses
- Formulation of hypotheses in SPRT

Lecture 4: Wald's Sequential Probability Ratio Test

- Introduction to Wald's SPRT
- Explanation of the parameters α and β
- Significance of α and β in hypothesis testing

Lecture 5: Graphical Representation of SPRT

- Graphical procedure for Wald's SPRT
- Interpretation of graphical results
- Examples illustrating graphical SPRT

Lecture 6: Tabular Procedure for SPRT

- Tabular method for implementing SPRT
- Step-by-step procedure for carrying out SPRT

- Practical examples demonstrating tabular SPRT

Lecture 7: SPRT for Bernoulli Distribution

- Application of SPRT to Bernoulli distributed data
- Calculation of sample size and stopping boundaries
- Interpretation of results in the context of Bernoulli trials

Lecture 8: SPRT for Binomial Distribution

- Extending SPRT to Binomially distributed data
- Analysis of sample size and stopping boundaries
- Case studies illustrating SPRT with Binomial data

Lecture 9: SPRT for Poisson Distribution

- Utilizing SPRT for Poisson distributed data
- Determination of sample size and decision boundaries
- Practical examples demonstrating SPRT with Poisson data

Lecture 10: SPRT for Normal Distribution

- Application of SPRT to normally distributed data
- Calculation of sample size and thresholds
- Case studies illustrating SPRT with Normal data

Lecture 11: SPRT for Exponential Distribution

- Implementing SPRT for exponentially distributed data
- Determining sample size and critical values
- Real-world scenarios demonstrating SPRT with Exponential data

Lecture 12: Advanced Topics in SPRT

- Adaptive SPRT: Introduction and concept
- Comparison of adaptive and non-adaptive SPRT
- Practical considerations in adaptive SPRT

Lecture 13: Extensions of SPRT

- Sequential likelihood ratio tests
- Multiple hypothesis testing using SPRT
- Recent developments and research in SPRT

Lecture 14: Applications of SPRT in Various Fields

- Medical diagnostics and clinical trials
- Quality control and manufacturing processes

- Surveillance and monitoring systems

Lecture 15: Case Studies and Review

- Review of key concepts in SPRT
- Discussion of case studies applying SPRT in different scenarios
- Q&A session and review of the course material

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DEPARTMENT: STATISTICS
CLASS: T.Y.B.SC. **SUBJECT:** STATISTICS **PAPER :**II
UNIT NO.: 4 **UNIT TITLE:**NON-PARAMETRIC TESTS

Lecture 1: Introduction to Non-Parametric Tests

- Need for non-parametric tests
- Overview of the distinction between parametric and non-parametric tests
- Importance of distribution-free statistics

Lecture 2: Concept of Distribution-Free Statistics

- Definition and characteristics of distribution-free statistics
- Advantages and limitations of distribution-free tests
- Examples illustrating distribution-free statistics

Lecture 3: Single Sample Non-Parametric Tests

- Introduction to single sample non-parametric tests
- Sign test: Theory, assumptions, and applications
- Practical demonstration of the sign test with examples

Lecture 4: Wilcoxon's Signed Rank Test

- Theory behind Wilcoxon's signed rank test
- Procedure for conducting Wilcoxon's signed rank test
- Application of Wilcoxon's signed rank test to real-world data

Lecture 5: Median Test

- Explanation of the median test

- Assumptions and conditions for conducting the median test
- Application of the median test in various scenarios

Lecture 6: Two-Sample Non-Parametric Tests

- Introduction to two-sample non-parametric tests
- Mann-Whitney U test: Theory, assumptions, and applications
- Practical examples demonstrating the Mann-Whitney U test

Lecture 7: Run Test

- Understanding the run test
- Conditions for applying the run test
- Examples illustrating the use of the run test

Lecture 8: Fisher Exact Test

- Introduction to the Fisher exact test
- Procedure for conducting the Fisher exact test
- Real-world applications of the Fisher exact test

Lecture 9: Kruskal-Wallis Test

- Theory behind the Kruskal-Wallis test
- Assumptions and conditions for the Kruskal-Wallis test
- Interpretation of results and post-hoc analyses

Lecture 10: Friedman Test

- Explanation of the Friedman test
- Procedure for conducting the Friedman test
- Comparison with other non-parametric tests

Lecture 11: Assumptions of Non-Parametric Tests

- Assumptions underlying non-parametric tests
- Justification of test procedures for small samples
- Justification of test procedures for large samples

Lecture 12: Small Sample Non-Parametric Tests

- Adaptations of non-parametric tests for small sample sizes
- Considerations and adjustments for small sample analysis
- Practical examples demonstrating small sample non-parametric tests

Lecture 13: Large Sample Non-Parametric Tests

- Extensions of non-parametric tests for large sample sizes

- Handling large sample datasets in non-parametric analysis
- Application of large sample non-parametric tests to real-world data

Lecture 14: Case Studies and Applications

- Case studies showcasing the application of non-parametric tests
- Real-world examples demonstrating the versatility of non-parametric tests
- Discussion on the appropriateness of non-parametric tests in different scenarios

Lecture 15: Review and Future Directions

- Review of key concepts covered in the course
- Summary of various non-parametric tests and their applications
- Exploration of potential future research directions in non-parametric testing methodologies

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