Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
Autonomous

Course Structure for F. Y. B. Sc. (Computer Science) STATISTICS

Semester	Paper Code	Title of Paper	No. of Credits
I	UCSST111	Statistical Methods -I	2
	UCSST112	Probability and Some Discrete Probability Distributions	2
	UCSST113	Practical-I	2

Programme Outcomes:

PO1. Computer Knowledge : Apply the knowledge of mathematics, statistics and computer fundamentals to IT application

PO2. Design / Development of solution: Design solution for IT applications usinglatest technologies and develop and implement the solutions using various latest language.

PO3. Modern tool usage : Create, select and apply appropriate techniques, resourcesand modern engineering and IT tools including prediction and modelling to complex IT applications with an understanding of the limitations.

PO4. Environment and sustainability : Understand the impact of the IT analyst solutions in societal and environmental contexts, and demonstrate the knowledgeand need for sustainable development.

PO5. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO6. Individual and Team work : Function effectively as an individual, and as a member or leader in diverse team, and in multidisciplinary settings.

PO7. Innovation, employability and Entrepreneurial skills : Identify opportunity, pursue that opportunity to create value and wealth for the betterment of the individual and society at large. Develop the capacity to study and research independently that will help to develop skills for transition to employment in hardware/software companies.

SYLLABUS (CBCS) FOR F. Y. B. Sc.(CS) STATISTICS
(2022 Pattern)
(w. e. from June, 2022)

Name of the Programme	**:** B.Sc. Computer Science
Program Code	**:** USCO
Class	**:** F.Y.B.Sc.
Semester	**:** I
Course Name	**:** Statistical Methods I
Course Code	**:** UCSST111
No. of lectures	**:** 36
Credit	**:** 2 credits

Course Outcomes:

The students will acquire knowledge about the;

CO1. Data representation and visualization.

CO2. Central tendency and its various measures.

CO3. Dispersion and its various measures.

CO4. Concept of skewness and kurtosis.

CO5. Concept of inventory which are used in software development.

CO6. Recognize real-world examples of structured, unstructured, and semi-structured data.

CO7. Concept of inventory and its significance in various industries.

TOPICS/CONTENTS:

UNIT 1: Data Representation (8L)

1.1 Definition, importance, scope and limitations of statistics.

1.2 Scales of measurements: Nominal, Ordinal, Interval & Ratio.

1.3 Data Condensation: Types of data (Primary and secondary), Attributes and Variables, Discrete and Continuous variables, classification and construction of frequency distribution.

1.4 Graphical Representation: Histogram, Frequency polygon, Frequency curve, Ogive Curves, Steam and leaf chart.

1.5 Numerical problems related to real life situations.

UNIT 2: Measures of central tendency   (8L)

2.1 Concept of central tendency, requisites of good measures of central tendency.

2.2 Arithmetic mean: Definition, computation for ungrouped and grouped data, combined mean, weighted mean, merits and demerits.

2.3 Median and Mode: Definition, formula for computation for ungrouped and grouped data, graphical method, merits and demerits. Empirical relation between mean, median and mode. (without proof)

2.4 Partition Values: Quartiles, Percentiles, Deciles, Box Plot.

2.5 Numerical problems related to real life situations.

UNIT 3: Measures of Dispersion   (6L)

3.1 Concept of dispersion and measures of dispersion, requisites of good measures of dispersion, absolute and relative measures of dispersion.

3.2 Range and Quartile Deviation: definition for ungrouped and grouped data and their coefficients, merits and demerits.

3.3 Variance and Standard deviation: definition for ungrouped and grouped data, coefficient of variation, combined variance & standard deviation, merits and demerits.

3.4 Numerical problems related to real life situations.

UNIT 4: Moments, Skewness and Kurtosis   (8L)

4.1 Raw and central moments: definition for ungrouped and grouped data (only first four moments), relation between central and raw moments upto fourth order. (without proof)

4.2 Measures of Skewness: Types of skewness, Pearson's and Bowley's coefficient of skewness, Measures of skewness based on moments.

4.3 Measures of Kurtosis: Types of kurtosis, Measures of kurtosis based on moments

4.4 Numerical problems related to real life situations.

UNIT 5: Inventory Control   (6L)

5.1 Introduction.

5.2 Principal items of inventories.

5.3 Need and importance of inventory.

5.4 ABC analysis.

5.5 Basic parameters to operate the inventory system: Maximum level, Re-order level, Minimum level.

5.6 The pay off matrix approach to select an optimal strategy (EMV criterion).

5.7 Numerical problems related to real life situations.

References:

1. Fundamentals of Applied Statistics (3rd Edition), Gupta and Kapoor, S.Chand and Sons, New Delhi, 1987.
2. An Introductory Statistics, Kennedy and Gentle.
3. Statistical Methods, G.W. Snedecor, W.G. Cochran, John Wiley & sons, 1989.
4. Kantiswroop, Gupta : Operations Research,Sultan Chand and Sons Publisher.

Programme Outcomes and Course Outcomes Mapping :

Course Outcomes	Programme Outcomes(POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	2	-	-	-	-
CO2	2	3	2	-	-	-	-
CO3	2	2	2	-	-	-	-
CO4	2	-	-	-	-	-	-
CO5	-	3	-	2	2	2	3
CO6	-	-	-	-	-	-	-
CO7	-	-	-	-	-	-	-

PO1. Computer Knowledge:

Apply the knowledge of mathematics, statistics, and computer fundamentals to IT application

CO1. Data representation and visualization (Weightage: 3)

Justification: Understanding data representation and visualization requires mathematical and statistical knowledge to interpret and present information effectively in IT applications.

CO2. Central tendency and its various measures (Weightage: 2)

Justification: Central tendency measures involve mathematical concepts and statistical methods, which are fundamental to analyzing and interpreting data in IT applications.

CO3. Dispersion and its various measures (Weightage: 2)

Justification: Dispersion measures involve statistical concepts that are crucial for understanding the spread of data, which is applicable in various IT scenarios.

CO4. Concept of skewness and kurtosis (Weightage: 2)

Justification: Skewness and kurtosis are statistical measures that contribute to the understanding of data distribution, essential for data analysis in IT applications.

PO2. Design/Development of solution:

Design a solution for IT applications using the latest technologies and develop and implement the solutions using various latest languages.

CO2. Central tendency and its various measures (Weightage: 3)

Justification: Designing IT solutions often involves considering the central tendency of data to make informed decisions, and implementing solutions may require the use of statistical measures.

CO3. Dispersion and its various measures (Weightage: 2)

Justification: Understanding data dispersion is crucial in designing solutions to ensure the robustness and reliability of IT applications.

CO5. Concept of inventory used in software development (Weightage: 3)

Justification: Designing and developing software solutions involves managing resources and inventory effectively, making this concept highly relevant.

PO3. Modern tool usage:

Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex IT applications with an understanding of the limitations.

CO1. Data representation and visualization (Weightage: 2)

Justification: Modern tools often require effective data representation and visualization techniques to communicate information, making this concept moderately related.

CO2. Central tendency and its various measures (Weightage: 2)

Justification: Modern engineering tools may involve the application of central tendency measures to analyze and interpret data for IT applications.

CO3. Dispersion and its various measures (Weightage: 2)

Justification: Understanding data dispersion is crucial when applying modern tools to ensure the accuracy and reliability of predictions and models.

PO4. Environment and sustainability:

Understand the impact of IT analyst solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.

CO5. Concept of inventory and its significance in various industries (Weightage: 3)

Justification: Managing inventory has direct implications for sustainable development, making this concept strongly related to environmental and societal impact considerations.

PO5. Ethics:

Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

CO5. Concept of inventory and its significance in various industries (Weightage: 2)

Justification: Managing inventory in various industries often involves ethical considerations, making this concept moderately related to ethical principles.

PO6. Individual and Teamwork:

Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.

CO5. Concept of inventory and its significance in various industries (Weightage: 2)

Justification: Working effectively in teams requires understanding the concept of inventory, as it plays a role in resource management within teams and organizations.

PO7. Innovation, employability, and Entrepreneurial skills:

Identify opportunity, pursue that opportunity to create value and wealth for the betterment of the individual and society at large. Develop the capacity to study and research independently that will help to develop skills for transition to employment in hardware/software companies.

CO5. Concept of inventory and its significance in various industries (Weightage: 3)

SYLLABUS (CBCS) FOR F. Y. B. Sc.(CS) STATISTICS
(2022 Pattern)
(w. e. from June, 2022)

Name of the Programme : B.Sc. Computer Science
Program Code : USCO
Class : F.Y.B.Sc.
Semester : I
Course Name : Probability and Some Discrete
Probability Distributions
Course Code : UCSST112
No. of lectures : 36
Credit : 2 credits

Course Outcomes:

Students are expected to be able to,

CO.1 distinguish between random and non-random experiments.

CO.2 find the probabilities of various events.

CO.3 obtain probability distribution of univariate discrete and continuous random variables.

CO.4 apply Binomial distribution in real life situations.

CO.5 apply Poisson distribution in real life situations.

CO.6 Probability Distributions give up the possible outcome of any random event.

CO.7 Studying probability will help children to develop critical thinking skills and to interpret the probability that surround us daily.

TOPICS/CONTENTS:

Unit 1: Sample Space and Events (6L)

1.1 Concepts of experiments, deterministic and nondeterministic experiments.

1.2 Definitions: Sample space, Types of sample space, Event, Types of Events: Elementary event, Complementary event, Sure event, Impossible event.

1.3 Concept of occurrence of an event, Equally-likely events

1.4 Algebra of events (Union, Intersection, Complementation).

1.5 Definitions of Mutually exclusive events, Exhaustive events.

1.6 Algebra of events and its representation of events in set theory notation:

Occurrence of the following events:

 i) at least one of the given events

ii) none of the given events

iii) all of the given events

iv) mutually exclusive events

v) mutually exhaustive events

vi) exactly one event out of the given events.

1.7 Numerical problems related to real life situations.

Unit 2: Probability (13L)

2.1 Concept of Multiplication principle and Permutation and Combination

2.2 Classical Probability: Classical definition of probability, examples ,Probability model, probability of an event, examples. Axiomatic definition of probability.

Important results and their proofs:

i) $0 \leq P(A) \leq 1$,

ii) $P(A) + P(A^c) = 1$

iii) $P(\Phi) = 0$

iv) If $A \subset B$, $P(A) \leq P(B)$

v) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ (Addition theorem of probability) and its generalization (Statement only).

Numerical problems related to real life situations.

2.3 Conditional Probability

i) Concepts and definitions of Conditional Probability

ii) Definition of conditional probability of an event.

iii) Multiplication theorem for two events. Examples.

iv) Partition of sample space.

v) Idea of Posterior probability, Statement and proof of Bayes' theorem, examples on Baye's theorem.

2.4 Independence of Events

i) Concept of Independence of two events.

ii) Proof of the result that if A and B are independent then,

a) A and B^c,   b) A^c and B   c)A^c and B^c are independent.

iii) Pairwise and Mutual Independence for three events.

iv) Numerical problems related to real life situations.

UNIT 3: Random Variable (4L)

3.1 Definition of random variable (r.v.) , discrete and continuous random variable.

3.2 Definition of probability mass function (p.m.f.) of discrete r.v. and probability density function of continuous r.v.

3.3 Cumulative distribution function (c.d.f.) of discrete and continuous r.v. and their properties. (Characteristic properties only)

3.4 Definition of expectation and variance of discrete and continuous r.v., theorem on expectation and variance (statement only).

3.4 Determination of median and mode using p.m.f. only.

3.5 Numerical problems related to real life situations.

UNIT 4: Standard Discrete Distributions (13L)

4.1 Uniform Distribution : definition, mean, variance

4.2 Bernoulli Distribution : definition, mean, variance, additive property

4.3 Binomial Distribution : definition, mean, variance, additive property

4.4 Poisson Distribution : definition, mean, variance, mode, additive property, limiting case of $B(n, p)$

4.5 Numerical problems related to real life situations

References:

1. Bhat B. R., Srivenkatramana T and Madhava Rao K. S. (1997): Statistics: a Beginner's Text, Vol. II, New Age International (P) Ltd.

2. Goon A. M., Gupta M. K., Das Gupta B. (1999): Fundamentals of Statistics, Vol.II, World Press, Calcutta.

3. Hogg R. V. and Crag R. G.: Introduction to Mathematical Statistics Ed.4.

4. Gupta and Kapoor : Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi.

5. Meyer P.L.(1970): Introductory Probability and Statistical Applications, Edition Wesley.

6. Rohatgi V. K. and Saleh A. K. Md. E. (2002): An Introduction to probability and statistics. John wiley & Sons (Asia)

7. Gupta and Kapoor : Fundamentals of Applied Statistics, Sultan Chand and Sons, New Delhi.

Programme Outcomes and Course Outcomes Mapping :

Course Outcomes	Programme Outcomes(POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	2
CO3	2	-	3	-	-	-	-
CO4	-	3	-	-	-	-	-
CO5	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-
CO7	-	-	-	-	-	2	-

PO1. Computer Knowledge

CO3. Obtain probability distribution of univariate discrete and continuous random variables (Weightage: 2)

Justification: While computer knowledge is not explicitly required to understand probability distributions, the application and computation of these distributions may involve the use of computer tools.

PO2. Design / Development of solution:

CO4. Apply Binomial distribution in real-life situations (Weightage: 3)

Justification: Applying Binomial distribution involves designing solutions in real-life scenarios where outcomes follow a binomial distribution pattern.

PO3. Modern tool usage

CO3. Obtain probability distribution of univariate discrete and continuous random variables (Weightage: 3)

Justification: Understanding and obtaining probability distributions often involve the use of modern statistical tools for computation and analysis.

PO4. Environment and sustainability

No direct mapping found in the provided information.

PO5. Ethics

No direct mapping found in the provided information.

PO6. Individual and Team work

CO7. Studying probability will help children develop critical thinking skills and interpret the probability that surrounds us daily (Weightage: 2)

Justification: Developing critical thinking skills and interpreting probability often involve individual and team efforts, especially when considering real-life situations.

PO7. Innovation, employability, and Entrepreneurial skills

CO2. Find the probabilities of various events (Weightage: 2)

Justification: Finding probabilities requires innovative thinking and contributes to employability and entrepreneurial skills as it involves understanding and predicting uncertain events.

SYLLABUS (CBCS) FOR F. Y. B. Sc.(CS) STATISTICS
(2022 Pattern)
(w. e. from June, 2022)

Name of the Programme : B.Sc. Computer Science
Program Code : USCO
Class : F.Y.B.Sc.
Semester : I
Course Name : Practical – I
Course Code : UCSST113
No. of lectures : 36
Credit : 2 credits

Course Outcomes:

At the end of this course students are expected to be able

CO.1 Represent statistical data diagrammatically and graphically.
CO.2 Compute various measures of central tendency and dispersion
CO.3 Compute various measures of moments, skewness and kurtosis.
CO.4 Interpret summary Statistics of computer output.
CO.5 To use statistical tools like graphical representation, summary statistics of data with the help of MS-Excel.
CO.6 Examine spreadsheet concepts and explore the Microsoft Office Excel environment.
CO.7 Gather information in a measured and systematic manner to ensure accuracy and facilitate data analysis

Sr. No.	Title of Experiments
1.	Measures of Central Tendency
2.	Measures of Dispersion
3.	Problems on Simple Probability, Conditional Probability, Bayes' Theorem and Independence of Event
4.	Measures of Skewness and Kurtosis
5.	Fitting of Binomial distribution
6.	Fitting of Poisson distribution
7.	Introduction to **EXCEL**
8.	Diagrammatic Representation and Descriptive Statistics Using **EXCEL**
9.	Computation of probabilities of discrete probability Distributions using **EXCEL**
10.	Project: Data collection, its condensation and Representation

Programme Outcomes and Course Outcomes Mapping :

Course Outcomes	Programme Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	-	-	-	-	-
CO2	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-
CO5	3	-	3	-	-	-	2
CO6	-	-	-	-	-	-	-
CO7	-	-	-	-	2	2	-

PO1. Computer Knowledge

CO5. To use statistical tools like graphical representation, summary statistics of data with the help of MS-Excel (Weightage: 3)

Justification: This CO directly involves the use of MS-Excel, requiring computer knowledge for statistical analysis and graphical representation.

PO2. Design / Development of solution:

CO1. Represent statistical data diagrammatically and graphically (Weightage: 2)

Justification: Representing statistical data graphically is a step in the design and development of solutions, contributing to effective communication of findings.

PO3. Modern tool usage

CO5. To use statistical tools like graphical representation, summary statistics of data with the help of MS-Excel (Weightage: 3)

Justification: Using modern statistical tools like MS-Excel is essential for efficient data analysis, aligning with modern tool usage.

PO4. Environment and sustainability

No direct mapping found in the provided information.

PO5. Ethics

CO7. Gather information in a measured and systematic manner to ensure accuracy and facilitate data analysis (Weightage: 2)

Justification: Gathering information in a measured and systematic manner aligns with ethical considerations, ensuring accuracy in data analysis.

PO6. Individual and Team work

CO7. Gather information in a measured and systematic manner to ensure accuracy and facilitate data analysis (Weightage: 2)

Justification: Gathering information can involve both individual and team efforts, contributing to individual and team work.

PO7. Innovation, employability, and Entrepreneurial skills

CO5. To use statistical tools like graphical representation, summary statistics of data with the help of MS-Excel (Weightage: 2)

Justification: Using statistical tools in MS-Excel involves innovative thinking and contributes to employability and entrepreneurial skills.