S. S. Jain Subodh P.G. College
(Autonomous)
Jaipur

DEPARTMENT OF STATISTICS

(Syllabus as per NEP-2020 and Choice Based Credit System)

Three-Year Undergraduate Programme in Arts/Science

I & II Semester Examination 2025-26

Medium of Instruction: Hindi/English

w.e.f. Academic Session 2025-26

Department of Statistics

B.A./B.Sc. (Pass Course) Semester I-VI (2025-2028)
Credit Template: CBCS

S.No.	Paper Code	Paper Title	Course Category	Credit	Contact Hours Per Week			ESE Duration (Hrs.)	
					L	T	P	Theory	P
Semester- I									
1	STAT101	Descriptive Statistics	DSC	4	4	-	-	3	-
2	STAT102	Statistics Lab - I	DSCP	2	4	-	-	-	4
Semester- II									
3	STAT201	Probability Theory	DSC	4	2	-	-	3	-
4	STAT202	Statistics Lab - II	DSCP	2	2	-	-	-	4
Semester-III									
5	STAT301	Distribution Theory &Vital Statistics	DSC	4	2	-	-	3	-
6	STAT302	Statistics Lab - III	DSCP	2	2	-	-	-	4
Semester-IV									
7	STAT401	Statistical Inference	DSC	4	2	-	-	3	-
8	STAT402	Statistics Lab - IV	DSCP	2	2	-	-	-	4
Semester-V									
9	STAT501	Sample Survey	DSC	4	2	-	-	3	-
10	STAT502	Statistics Lab -V	DSCP	2	-	-	-	-	4
Semester-VI									
11	STAT601	Design of Experiment	DSC	4	2	-	-	3	-
12	STAT602	Statistics Lab - VI	DSCP	2	2	-	-	-	4

Scheme of Examination

Total Marks for a subject: 150

EoSE Max. Marks: 70
For EoSE (End of Semester Examination):
- The EoSE will be of 3 hours duration.
- There will be two parts of the end – semester theory paper.

Part – A: 14 Marks

Part A will be compulsory having 10 very short answer – type questions (with a limit of 20 words) of two marks each and candidate can attempt any seven questions.

Part – B: 56 marks

Part B of the question paper shall be divided into four units comprising question number 2-5. There will

be one question from each unit with internal choice. Each question will carry 14 marks.

CIA Max. Marks: 30

- Mid- term (2 units) – 10 marks
- Assignment – 10 marks
- DECA – 10 marks

Practical Max. Marks: 50

- The Practical Lab will be of 4 hours duration.
- Internal Marks: 20
- External Marks: 30

Note: - Hardcopy of practical file has to be maintained by the students for each practical paper and submitted at the time of End of Semester Exam.

Program outcomes:

PO1. To imbibe a strong foundation of statistics in students.
PO2. To familiarize students with basic to high-level statistical concepts.
PO3. To update students with mathematical tools that aid in statistical theory.
PO4. To promote application-oriented pedagogy by exposing students to real world data.
PO5. To make students do projects, which prepare them for jobs/markets.

Programme Specific outcome:

PSO 1. This course exposes the students to the beautiful world of Statistics and how it affects each and every aspect of our daily life.

PSO 2. The course is designed to equip students with all the major concepts of Statistics along with the tools required to implement them.

PSO 3. Introduction to computer software helps them in the analysis of data by making optimum usage of time and resources. This software gives them the necessary support and an edge when progressing to their professional careers.

PSO 4. Exposure to the plethora of real-life data helps in honing their analytical skills.

PSO 5. Having a practical component with every paper invokes their exploratory side and the interpretation abilities. Such a pedagogy goes a long way in giving them the required impetus and confidence fine-tunes for consultancy startups/jobs in near future.

PSO 6. The structure of the course also motivates/helps the students to pursue careers in related disciplines, especially the data sciences, financial statistics and actuarial sciences.

Department of Statistics
Semester I
<u>Theory Paper</u>: Descriptive Statistics (STAT101)

1 credit – 25 Marks
4 credit – 100 Marks
Question paper: 70 Marks
Internal Assessment: 30 Marks

<u>Objectives:</u>

Overall, the objectives of descriptive statistics are to simplify and summarize complex data, reveal patterns and relationships, and provide a foundation for further analysis and interpretation. Some of the main objectives of descriptive statistics include:

1. To provide a concise summary of data through various statistical measures.
2. To develop the ability to present data through graphs, charts, and tables visually.
3. To have the ability to organize data in a meaningful way.
4. To understand various characteristics within data viz. shape, spread, and central values, make comparisons, draw conclusions, and comments on findings.
5. To explore relationships between variables.

<u>Course Outcome (COs):</u>

After completing the course in descriptive Statistics it provides several outcomes and benefits. Here are some common outcomes:

1. Students will gain a comprehensive knowledge and understanding of different types of data, data collection methods, and data measurement scales.
2. Students will learn how to present data visually through graphs, charts, and tables.
3. Solving the complex process of the level of Descriptive statistics, will provide the ability to interpret and draw meaningful conclusions from data.
4. Completing the course in descriptive statistics, students will be equipped with the skills necessary to conduct data analysis for research projects, reports, and academic studies during practical hours.
5. Descriptive statistics serves as the foundation for more advanced statistical techniques and analysis. Once the student has a solid understanding of descriptive statistics, he/she can build upon this knowledge to explore inferential statistics, hypothesis testing, regression analysis, and other advanced statistical methods.

<u>Marks distribution in question Paper:</u>

The question paper (EoSE – End of Semester Examination) will consist of two parts A & B.
Part – A: 14 Marks
Part A will be compulsory having 10 very short answer – type questions (with a limit of 20 words) of two marks each and candidate can attempt any seven questions.
Part – B: 56 marks
Part B of the question paper shall be dived into four units comprising question number 2-5. There will be one question from each unit with internal choice. Each question will carry 14 marks.

Unit-I

Types and Presentation of Data: Concept of statistical population and data. Qualitative & Quantitative data, Discrete & Continuous data, Frequency & Non-Frequency data, Geographical & Chronological data, Primary data & Secondary data with suitable examples. Tabular presentation of data- Construction of tables, Types of tables. Frequency distribution —Discrete, grouped, continuous and cumulative. Graphical presentation of data- Histogram, frequency polygon, frequency curve, ogives, and Box-plot.

Unit-II

Statistical Analysis of Quantitative Data: Different types of scales- nominal, ordinal, interval and ratio, Univariate Data- Measures of central tendency, dispersion, moments and its computation from data. Absolute and relative measures of skewness and kurtosis based on quantiles and moments. Sheppard's Correction for moments (without Proof).

Unit-III

Curve fitting and Theory of Attributes: Principle of least squares, fitting of straight line, parabola and curves reducible to straight line (exponential and power curve). Class frequency, order of a class frequency, ultimate class frequency, consistency of data, independence and association of attributes. Various measures of association.

Unit-IV

Statistical Analysis of Bivariate Data: Correlation analysis-scatter diagram, Karl-Pearson's coefficient of correlation and its properties. Correlation of bivariate frequency distribution, Spearman's rank correlation. Regression analysis- Fitting of regression lines, regression coefficients and their properties.

References:

1. Bhatt B.R., Srivenkatrainanna T. and Rao Madhava K.S. (1997): Statistics- A Beginner's Text, Vol-11, New Age lnterational (P) Ltd.
2. Croxton F.E., Cowden D.J. and Kelin S (1973): Applied General Statistics, PHI
3. Goon A.M.,Gupta M.K &.Das Gupta B. (1991): Fundamentals of Statistics,Vol-I, World Press, Kolkata.
4. Kapoor V.K. & Gupta S.C.: Fundamentals of Mathematical Statistics, Sultan Chand and Sons, N. Delhi
5. Gupta S.P: Statistical Methods, Sultan Chand and Sons, New Delhi
6. Elliance D.N: Fundamentals of Statistics
7. कैलाश नाथ नगर, सांख्यिकी के मूल तत्व, मीनाक्षी प्रकाशन

Department of Statistics
Semester I
<u>Practical Paper</u>: Statistics Lab-I (STAT-102)

1 credit – 25 Marks
2credit – 50 Marks
External: 30 Marks
Internal: 20 Marks

<u>Objectives:</u>

Overall, the objectives of descriptive statistics are to simplify and summarize complex data, reveal patterns and relationships, and provide a foundation for further analysis and interpretation. Some of the main objectives of descriptive statistics include:

1. To provide a concise summary of data through various statistical measures.
2. To develop the ability to present data through graphs, charts, and tables visually.
3. To have the ability to organize data in a meaningful way.
4. To understand various characteristics within data *viz.* shape, spread, and central values, make comparisons, draw conclusions, and comments on findings.
5. To explore relationships between variables.

<u>Course Outcome (COs'):</u>

After completing a course in descriptive statistics can provide several outcomes and benefits. Here are some common outcomes that you can expect

1. Students will be able to gain a comprehensive knowledge and understanding of different types of data, data collection methods, and data measurement scales.
2. Students will be able to acquire skills in analyzing and interpreting data using various descriptive statistical techniques.
3. Students will be able to learn how to present data visually through graphs, charts, and tables.
4. Solving the complex problem of the level of Descriptive statistics will provide the ability to interpret and draw meaningful conclusions from data.
5. Students will be able to gain analytical reasoning with decision-making skills after analyzing and evaluating statistical data.
6. Students will gain a solid understanding of descriptive statistics. As a result, they will be able to explore inferential statistics, hypothesis testing, regression analysis, and other advanced statistical methods in the future.

<u>Detailed Syllabus</u>

1. Presentation of data through Frequency Table and Graphs.
2. Calculation of Measures of Central tendency, Dispersion, Moments, Skewness and Kurtosis.
3. Computation of Correlation Coefficient of bivariate data and bivariate frequency distribution table

4. Regression Analysis for Bivariate data.
5. Fitting of curves by least square method.
6. Computation of Spearman's Rank correlation.

References:

1. Bhatt B.R., Srivenkatrainanna T. and Rao Madhava K.S. (1997): Statistics- A Beginner's Text, Vol-11, New Age lnterational.(P) Ltd.
2. Croxton F.E., Cowden D.J. and Kelin S (1973): Applied General Statistics, PHI
3. Goon A.M.,Gupta M.K &, Das Gupta B. (1991): Fundamentals of Statistics,Vol-I, World Press, Kolkata.
4. Kapoor V.K. & Gupta S.C.: Fundamentals of Mathematical Statistics, Sultan Chand and Sons, N. Delhi
5. Gupta S.P. : Statistical Methods, Sultan Chand and Sons, New Delhi
6. Elliance D.N. : Fundamentals of Statistics
7. कैलाश नाथ नगर, सांख्यिकी के मूल तत्व, मीनाक्षी प्रकाशन

Department of Statistics
Semester II
<u>Theory Paper</u> – Probability Theory (STAT-201)

1 credit – 25 Marks
4 credit – 100 Marks
Question paper: 70 Marks
Internal Assessment: 30 Marks

<u>Objectives:</u>

Overall, the objectives of probability theory are to simplify and summarize complex data, reveal patterns and relationships, and provide a foundation for further analysis and interpretation. Some of the main objectives of probability theory include:

1. To develop a thorough understanding of random experiments, trials, events, and different types of events, including their definitions and examples.
2. To learn and apply various definitions of probability, construct sample spaces, and calculate probabilities. Also, to be able to calculate variance, moments, and moment generating function along with their properties.
3. To understand the definition and types of random variables, including discrete and continuous. Learn to use Probability Mass Functions (PMF), Probability Density Functions (PDF), and distribution functions.
4. To understand and compute the expectation of random variables, applying theorems of expectation, and exploring conditional expectation.
5. To develop a deep understanding of key discrete distributions such as Bernoulli, Binomial, Poisson, and Geometric
    distributions and gain a foundational understanding of the Hyper- geometric and Negative Binomial Distribution.

<u>Course Outcome (COs):</u>

After completing the course in probability theory it can provide several outcomes and benefits. Here are some common outcomes-

1. Students will be able to gain a solid understanding of the basic concepts of probability, including random experiments, trials, and events and comprehend the various definitions of probability and construct sample spaces.
2. Students will be able to master the axiomatic approach to probability. They will be able to apply the theorems of probability to calculate conditional probabilities and effectively use Bayes theorem in practical scenarios.
3. Students will be able to learn about random variables and probability functions (PMF and PDF) as well as joint and conditional probability distributions.
4. Students will be able to compute expectation, variance, covariance, moments, and moment generating functions.
5. Students will be able to gain a comprehensive understanding of key univariate discrete distributions

and apply the properties and characteristics of these distributions to solve real– world problems effectively.

Marks distribution in question Paper:

The question paper (EoSE – End of Semester Examination) will consist of two parts A & B.
Part – A: 14 Marks
Part A will be compulsory having 10 very short answer – type questions (with a limit of 20 words) of two marks each and candidate can attempt any seven questions.
Part – B: 56 marks
Part B of the question paper shall be dived into four units comprising question number 2-5. There will be one question from each unit with internal choice. Each question will carry 14 marks.

Unit -I
Important Concepts of Probability: Random Experiment, Trial, Events and their types. Definitions of Probability. Sample Point and Sample Space. Axiomatic Approach of Probability and its properties. Addition and Multiplication theorems of probability. Conditional Probability. Bayes Theorem and its Applications.

Unit-II
Random Variable: Definition with illustrations, Types of Random Variable, Probability Mass Function, Probability Density Function. Distribution Function and its properties. Joint Probability Distribution, Marginal and Conditional Probability Functions (Continuous and Discrete Cases). Chebychev's Inequality and its applications.

Unit-III
Mathematical Expectation: Expectation of a Random Variable and its simple properties. Addition and Multiplication Theorem of Expectation. Conditional Expectation. Definition of Variance and Covariance and properties. Raw and Central Moments, Moment Generating Function and its properties.

Unit-IV
Univariate Discrete Distributions and their properties: Bernoulli Distribution, Binomial Distribution, Poisson Distribution, Geometric Distribution, Hyper-geometric and Negative Binomial Distribution.

References:
1. Bhatt B.R., Srivenkatramanna T. and Rao Madhava 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. (1991): Fundamentals of Statistics, Vol-II, World Press, Kolkata.
3. Kapoor V.K. & Gupta S.C.: Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi
4. Mood A.M. Graybill F.A. Bose D.C. (1974): Introduction to the theory of statistics, McGraw Hill
5 Hoel P.G. (1971): An introduction of Mathematical Statistics, Asia Publishing House.

1 credit – 25 Marks
2credit – 50 Marks
External: 30 Marks
Internal: 20 Marks

<u>Objectives:</u>

Overall, the objectives of probability theory are to simplify and summarize complex data, reveal patterns and relationships, and provide a foundation for further analysis and interpretation. Some of the main objectives of probability theory include:

1. To develop a thorough understanding of random experiments, trials, events, and different types of events, including their definitions and examples.
2. To learn and apply various definitions of probability, construct sample spaces, and calculate probabilities. Also, to be able to calculate variance, moments, and moment generating function along with their properties.
3. To understand the definition and types of random variables, including discrete and continuous. Learn to use Probability Mass Functions (PMF), Probability Density Functions (PDF), and distribution functions.
4. To understand and compute the expectation of random variables, applying theorems of expectation, and exploring conditional expectation.
5. To develop a deep understanding of key discrete distributions such as Bernoulli, Binomial, Poisson, and Geometric distributions and gain a foundational understanding of the Hyper-geometric and Negative Binomial distributions.

<u>Course Outcome (COs):</u>

After completing the course it provides several outcomes and benefits. Here are some common outcomes that you can expect

1. Students will be able to gain a solid understanding of the basic concepts of probability, including random experiments, trials, and events, and comprehend the various definitions of probability and construct sample spaces.
2. Students will be able to master the axiomatic approach to probability. They will be able to apply the theorems of probability to calculate conditional probabilities and effectively use Bayes theorem in practical scenarios.
3. Students will be able to learn about random variables and probability functions (PMF and PDF) as well as joint and conditional probability distributions.
4. Students will be able to compute expectation, variance, covariance, moments, and moment generating functions.
5. Students will be able to gain a comprehensive understanding of key univariate discrete distributions and apply the properties and characteristics of these distributions to solve real-world problems effectively.

Detailed Syllabus

1. Construction of Binomial Probability distributions
2. Construction of Poisson Probability distributions
3. Problems based on probability mass functions and probability density functions
4. Exercise on mathematical expectation
5. Finding Mean, Variance, Skewness, and kurtosis of Univariate probability distributions.
6. Fitting of univariate discrete probability distributions.
7. Computation of Marginal and Conditional Distributions for univariate and bivariate distributions.

References:
1. Bhatt B.R., Srivenkatramanna T. and Rao Madhava 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. (1991): Fundamentals of Statistics, Vol-II, World Press, Kolkata.
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