Karmaveer Bhaurao Patil University, Satara

Syllabus for

B. Sc. I Statistics

Under

Faculty of Science and Technology

(As per NEP 2020)

With effect from Academic Year 2024-2025

SYLLABUS FOR BACHELOR OF SCIENCE PART-I:
STATISTICS

Preamble

This syllabus is framed to give sound knowledge with an understanding of Statistics to undergraduate students in the first year of three years B.Sc. degree course. Students learn Statistics as a separate subject from B.Sc. I. The goal of the syllabus is to make the study of Statistics popular, interesting, and encouraging to the students for higher studies including research. The new syllabus is based on a basic and applied approach with vigor and depth. At the same time precaution is taken to make the syllabus comparable to the syllabi of other Universities and the needs of industries and research. The syllabus is prepared after discussion at length with several faculty members of the subject and experts from industries and research fields. The units of the syllabus are well-defined, taking into consideration the level and capacity of students.

General Objectives of the Program:

1. To nurture academicians with focus and commitment to their subject.
2. To shape good and informed citizens from the students entering into the program.
3. To create a skilled workforce to match the requirements of society.
4. To impart knowledge of science based on this program.
5. To Developing a scientific attitude is the major objective to make the students open-minded critical and curious.
6. To develop skills in practical work, experiments, and laboratory materials and equipment along with collection and interpretation of scientific data to contribute to science.

General Outcomes of the Program:

1. The students will graduate with proficiency in the subject of their choice.
2. The students will be eligible to continue higher studies in the subject.
3. The students will be eligible to pursue her studies abroad.
4. The students will be eligible to appear the examinations for jobs in government organizations.
5. The students will be eligible to apply for jobs with a minimum requirement of B.Sc.

Program-Specific Objectives:

1. To understand the basic concepts of data and the scale of measurement of data.
2. To enable comparison data by using measures of central tendency and dispersion.
3. To establish a relationship between two or more variables and predict the value by regression analysis.
4. To calculate probability and measures of probability for discrete and continuous distributions.
5. To make inferences about a population from sample data.
6. To design the process and extend the sampling.
7. To enable the use of statistical techniques in time series, industry, demography, etc.
8. To understand and develop the necessary computer skill in practical by using MS Excel, R-software, and C-Programming.

Program-Specific Outcomes The students will acquire;

1. Knowledge of descriptive statistics and inferential statistics, sampling techniques.
2. Knowledge about univariate, bivariate, and multivariate data analysis.
3. Knowledge about correlation and regression analysis.
4. Knowledge of probability, discrete and continuous probability distribution, and various measures of these distributions.
5. Knowledge of different methods of estimation about the inference of parameters of standard discrete and continuous probability distributions.
6. Knowledge of applied statistics such as ‘index number’, ‘time series’, ‘demography’, ‘reliability theory’, ‘industrial statistics’, and ‘operation research’.

B.Sc. Part I

1. **Title:** Statistics
2. **Year of Implementation:** June 2024
3. **Duration:** The course shall be full time
4. **Pattern:** Semester Pattern
5. **Medium of Instruction:** English
6. **Course Structure:**

B.Sc. - I: Semester – I

Sr. No	Course Title	Theory			Practical		
		Course Code	Lecture per week	Credits	Course Title	Lecture per week	Credits
1	Descriptive Statistics – I	BST 111	**4**	**2**	Practical Course – I BSP 113	**4**	**2**
2	Elementary Probability Theory	BST 112		**2**			

B.Sc. - I: Semester – II

Sr. No	Course Title	Theory			Practical		
		Course Code	Lecture per week	Credits	Course Title	Lecture per week	Credits
1	Descriptive Statistics – II	BST 121	**4**	**2**	Practical Course – II BSP 123	**4**	**2**
2	Discrete Probability Distributions	BST 122		**2**			

7. Evaluation Structure

Semester - I

Course Name	Course Code	Internal Evaluation			ESE	Total Marks	Credits
		CCE-I	Mid - Semester	CCE-II			
Descriptive Statistics – I	BST 111	5	10	5	30	50	2
Elementary Probability Theory	BST 112	5	10	5	30	50	2
Practical Course – I	BSP 113	--	--	--	50	50	2

Semester – II

Course Name	Course	Internal Evaluation			ESE	Total Marks	Credits
		CCE-I	Mid - Semester	CCE-II			
Descriptive Statistics – II	BST 121	5	10	5	30	50	2
Discrete Probability Distributions	BST 122	5	10	5	30	50	2
Practical Course – II	BSP 123	--	--	--	50	50	2

Title of Papers of B.Sc. I Course:

B.Sc. I, Semester – I, Theory: 30 lectures, 30 hours (for each paper)

BST 111: **Descriptive Statistics – I**

BST 112: **Elementary Probability Theory**

Practical: **60 Hours**

BSP 113: Practical Course – I

B.Sc. I, Semester – II, Theory: 30 lectures, 30 hours (for each paper)

BST 121: **Descriptive Statistics – II**

BST 122: **Discrete Probability Distributions**

Practical: **60 Hours**

BSP 123: Practical Course – II

B. Sc. Part-I (Semester-I)
BST-111: Descriptive Statistics-I (Credits: 02)
Theory: 30 Lectures (30 Hours)

Course Objectives: Students should be able to…

1. understand techniques of data collection and its presentation.
2. compute various measures of central tendencies and measures of dispersion.
3. summarize data through central tendencies and measures of dispersion.
4. apply measures of central tendencies in the computation of Index number

Credits (Total Credits 2)	**SEMESTER – I BST 111 DESCRIPTIVE STATISTICS -I**	**No.of hours per unit**
Unit – I	**Data Collection, Presentation, and Measures of Central Tendency**	**(08)**
	1.1 Definition and scope of Statistics, the concept of the statistical population sample, qualitative & quantitative data, variables. Scales of measurements: Nominal, Ordinal, Interval &Ratio. Collection and Summarization of univariate data and frequency distribution 1.2 Data Presentation: Diagrammatic & graphical presentation with real applications- Pie diagram, line diagram. Simple, multiple & partial bar diagrams, histograms, ogive curves 1.3 Mathematical and positional averages: Data Presentation: A.M, G.M, H.M, the relation between them and their properties. Median, Mode, and Partition values	
Unit - II	**Measures of Dispersion and Moments, Skewness and Kurtosis**	**(08)**
	2.1 Measures of Dispersion: Range, Quartile deviation, Mean deviation, Variance, standard deviation, coefficient of variation. Various properties of these measures and their utility. 2.2 Raw and central moments, factorial moments, and central moments in terms of raw moments up to 4^{th} order. 2.3 Definition, Measures of skewness: Bowley's coefficient, Karl Pearson's coefficient, a measure of skewness based on the moment 2.4 Kurtosis: Definition, measures of kurtosis, Sheppard's correction.	
Unit - III	**Index Number**	**(07)**
	3.1 Meaning and utility of index numbers, problems in the construction of index numbers. Types of index numbers: price, quantity, and value. 3.2 Unweighted and weighted index numbers using (i) aggregate method, (ii) average of price or quantity relative method. 3.3 Index numbers using; Laspeyre's, Paasche's, and Fisher's methods. Tests of index numbers: unit test, time reversal test, and factor reversal tests. Illustrative examples.	

Unit - IV	Theory of Attributes	(07)
	4.1 Notation, Dichotomous, class frequency, order of class, positive and negative class frequency, ultimate class frequency, fundamental set of class frequency. Relationship among class frequencies (up to three attributes). 4.2 Concept of consistency, conditions of consistency (up to three attributes). Independence and association of two attributes, Yule's coefficient of association (Q), coefficient of colligation (Y) Relation between Q and Y.	

Course Outcomes: Students will be able to …

1. calculate the arithmetic mean, Geometric mean, and Harmonic Mean
2. differentiate between qualitative and quantitative data.
3. construct graphs and diagrams from data and interpret the result.
4. compute the Skewness and Kurtosis of the data.

Reference Books:

1. Newbold P., William L. C., Thorne B., 2021, Statistics for Business and Economics, Pearson
2. Larson R., Farber B., 2020, Elementary Statistics, Picturing World, Pearson
3. Triola M. F., 2020, Essentials of Statistics, Pearson
4. Elhance D. N, Elhance V, Aggarwal B. M, 2018, Fundamentals of Statistics, Kitab Mahal Daryaganaj New Delhi.
5. Goon A. M, Gupta M. K., and Dasgupta B, 2016, Fundamentals of Statistics Vol. I and II, Calcutta World Press.
6. Agarwal B. L, 2015, Statistics, New Age International P Ltd. Delhi.
7. Rohatgi V. K., Saleh E. 2008, An Introduction to Probability and Statistics, Wiley
8. Gupta S. P, 2002, Statistical Methods, Sultan Chand and Sons, Delhi.

B. Sc. Part-I (Semester-I)
BST-112: Elementary Probability Theory (Credits: 02)
Theory: 30 Lectures (30 Hours)

Course Objectives: Students should be able to …

1. understand the concept of probability and its applications.
2. differentiate between random and non-random experiments.
3. compute probabilities of different events.
4. solve the examples of probability

Credits (Total Credits 2)	**SEMESTER – I BST 112 ELEMENTARY PROBABILITY THEORY**	**No.of hours per unit**
Unit - I	**Probability**	**(08)**
	1.1. Concepts of experiments and random experiments. Definitions: Sample space, Discrete sample space (finite and countably infinite), Event, Elementary event, Compound event favorable event Definitions of Mutually exclusive events, Exhaustive events, Impossible events, and certain events. Power set |P(Ω) (sample space consisting of at most 3 sample points). Illustrative examples. 1.2. Equally likely outcomes (events). Apriori (classical) definition of probability of an event. Axiomatic definition of probability with reference to a finite and countably infinite sample space. 1.3. Proof of the results: i) $P(\Phi) = 0$, $P(A^c) = 1 - P(A)$, ii) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ (with proof) and its generalization (Statement only). iv) If $A \subset B$, $P(A) \leq P(B)$, v) $0 \leq P(A \cap B) \leq P(A) \leq P(A \cup B) \leq [P(A) + P(B)]$. Definition of probability in terms of odd ratio. Illustrative examples based on results.	
Unit - II	**Conditional Probability and Independence of Events**	**(08)**
	2.1. Definition of the conditional probability of an event. Multiplication theorem for two events. Partition of sample space. The idea of Posteriori probability, Statement and proof of Baye's theorem, examples of Baye's theorem. 2.2 Elementary examples of probability and conditional probability. Concept of Independence of two events. Proof of the result that if A and B are independent then, A and B^c ii) A^c and B, iii) A^c and B^c are independent. Pairwise and Mutual Independence for three events. Elementary examples.	
Unit - III	**Univariate Probability Distributions (Finite sample space)**	**(07)**
	3.1 Definition of a discrete random variable. Probability mass function (p.m.f.) and cumulative distribution function (c.d.f.) of a discrete random variable, Properties of c.d.f. (statements only). 3.2 Probability distribution of a function of a random variable. Median and Mode of a univariate discrete probability distribution.	
Unit - IV	**Mathematical Expectation (Univariate random variable)**	**(07)**

	4.1. Definition of expectation of a random variable, the expectation of a function of a random variable. Results on expectation, i) E (c) = c, where c is a constant, ii) E (aX + b) = aE (X) + b, where a and b are constants. 4.2 Definitions of mean, and variance of univariate distributions. Effect of change of origin and scale on mean and variance. 4.3 Definition of probability generating function (p.g.f.) of a random variable. Effect of change of origin and scale on p.g.f. Definition of mean and variance by using p.g.f. Examples.	

Course Outcomes: Students will be able to …

1. calculate probabilities and conditional probabilities.
2. identify the types of events.
3. compute the expectation of the univariate discrete random variable.
4. apply the concept of probability in real-life situations

Reference Books:

1. Ross S. , 2019, A First Course in Probability, Pearson
2. Elhance D. N, Elhance V, Aggarwal B. M, 2018, Fundamentals of Statistics, Kitab Mahal Daryaganaj New Delhi.
3. Goon A. M, Gupta M. K., and Dasgupta B, 2016, Fundamentals of Statistics Vol. I and II, Calcutta World Press.
4. Agarwal B. L, 2015 Statistics, New Age International P Ltd. Delhi.
5. Mukhopadhyay P, 2011, An Introduction to the Theory of Probability, World Scientific Publishing Company.
6. Feller W., 2008, An Introduction to Probability Theory and its Applications, Wiley
7. Gupta S. P, 2002, Statistical Methods, Sultan Chand and Sons, Delhi.
8. Grewal P. S, 1990, Methods of Statistical Analysis, Sterling Publishers.

B. Sc. Part-I (Semester-I)
BSP-113: Practical Course – I (Credits: 02)
Practical: 60 Hours

Course Objectives: Students should be able to …

1. understand the Consistency, Association of Attributes.
2. differentiate between variables and attributes.
3. compute various measures of central tendency and dispersion
4. calculate different types of index numbers.

Credits (Total Credits 2)	**SEMESTER – I** **BSP 113** **Practical Course - I** (Based on Course BST 111 and BST 112)	**No.of hours 60**
	List of Practicals	
	1. Diagrammatic & Graphical representation of the frequency distribution I (Line diagram, Bar diagram, Pie diagram. 2. Diagrammatic & Graphical representation of the frequency distribution II (Histogram, frequency polygon, frequency curve) 3. Diagrammatic & Graphical representation of the frequency distribution III (Location of Mode, Ogive curves, Location of Partition values) 4. Measures of Central Tendency I (ungrouped data) 5. Measures of Central Tendency II (grouped data) 6. Measures of Dispersion I (ungrouped data) 7. Measures of Dispersion II (grouped data) 8. Moments, Skewness, and Kurtosis (ungrouped data). 9. Moments, Skewness, and Kurtosis (grouped data). 10. Attributes (consistency, Association & Independence). 11. Applications of Probability-I (Elementary Examples based on the definition of probability by using combination and permutation, examples based on expectations) 12. Applications of Probability-II (Examples based on Conditional expectation and Variance, 13. Applications on Bayes' theorem. 14. Applications on Independence Probability 15. Index Number (*Note: Expt. No. 1 to 9 are expected to solve using MS-EXCEL/ R-Software)	

Course Outcomes: Students will be able to …

1. draw diagrams and graphs for frequency distribution
2. compute moments, skewness, and kurtosis.
3. find the probabilities of events and conditional probabilities.
4. summarized data and find averages as well as the spread of the data

Reference Books:

1. Ross S., 2019, A First Course in Probability, Pearson
2. Elhance D. N, Elhance V, Aggarwal B. M, 2018, Fundamentals of Statistics, Kitab Mahal Daryaganaj New Delhi.
3. Goon A. M, Gupta M. K., and Dasgupta B, 2016, Fundamentals of Statistics Vol. I and II, Calcutta World Press.
4. Agarwal B. L, Statistics, 2015, New Age International P Ltd. Delhi.
5. Mukhopadhyay P, 2011, An Introduction to the Theory of Probability, World Scientific Publishing Company.
6. Feller W., 2008, An Introduction to Probability Theory and its Applications, Wiley
7. Gupta S. P, Statistical Methods,2002, Sultan Chand and Sons, Delhi.
8. Grewal P. S, 1990, Methods of Statistical Analysis, Sterling Publishers.

B. Sc. Part-I (Semester-II)
BST-121: Descriptive Statistics-II (Credits: 02)
Lectures (30 Hours)

Course Objectives: Students should be able to …

1. understand the concept of correlation and regression.
2. compute the correlation of bivariate data.
3. interpret the relationship between two numeric variables.
4. build a Simple Linear regression model to predict the response variable.

Credits (Total Credits 2)	**SEMESTER – II BST 121 DESCRIPTIVE STATISTICS -II**	**No.of hours per unit**
Unit – I	**Correlation**	**(08)**
	1.1. Bivariate Data, Covariance: Definition, Effect of change of origin and scale, Concept of correlation between two variables, Types of correlation. Scatter diagram and its utility. 1.2. Karl Pearson's coefficient of correlation (r): Definition, Computation for ungrouped and grouped data, Properties: i) $-1 \leq r \leq 1$, ii) Effect of change of origin and scale. (iii) Interpretation when $r = -1, 0, 1$. Spearman's rank correlation coefficient: Definition, Computation (with and without ties). 1.3 Derivation of the formula for without ties (In case of ties students are expected to compute Karl Pearson Correlation Coefficient), Illustrative examples.	
Unit – II	**Regression**	**(08)**
	2.1 Concept of Dependent and independent variables. Concept of regression, Lines of regression 2.2 Identification of response and predictor variables and the relation between them.	

	2.3 Meaning of regression, the difference between correlation and regression, Connection between correlation and regression. Fitting of line $Y = a + bX$. a and b are estimated using the least square method. Regression coefficient. Explained and unexplained variation, coefficient of determination, standard error of an estimate of a line of regression. 2.4 Interchanging the role of X and Y we can study some more properties i) $bxy \times byx = r^2$ ii) $bxy \times byx \leq 1$ iii) $(bxy + byx) / 2 \geq r$ iv) Effect of change of origin and scale on regression coefficients, v) The point of intersection of two regression lines. vi)Angle between two regression lines.	
Unit – III	**Multiple and Partial Correlation (for trivariate data only)**	**(07)**
	3.1. Concept of multiple correlations. Definition of multiple correlation coefficient Ri.jk, derivation of a formula for multiple correlation coefficient. Properties of multiple correlation coefficient; i) $0 \leq R_{i.jk} \leq 1$, (ii) $R_{i.jk} > |r_{ij}|$, (iii) $R_{i.jk} > |r_{ik}|$ i = j =k = 1, 2, 3. $i \neq j$, $i \neq k$. Interpretation of $R_{i.jk}=1$, $R_{i.jk}= 0$, 3.2. Coefficient of multiple determination R1.23. Concept of partial correlation. Definition of partial correlation coefficient $r_{ij.k}$, derivation of the formula for $r_{ij.k}$. Properties of partial correlation coefficient (i) $-1 \leq r_{ij.k} \leq 1$, (ii) $b_{ij.k} \cdot b_{ji.k} = r_{ij.k}^2$, relation between simple, multiple, and partial correlations. Illustrative Examples.	
Unit – IV	**Multiple Linear Regression (for trivariate data only)**	**(07)**
	4.1 Concept of multiple linear regression, Plane of regression, Yule's notation, correlation matrix. Fitting of regression plane by a method of least squares. 4.2 The definition of partial regression coefficients, and their interpretation. Residual: definition, order, properties, derivation of mean and variance, Covariance between residuals. Illustrative Examples.	

Course Outcomes: Students will be able to …

1. estimate regression coefficients.
2. differentiate between dependent variables and independent variables for a simple linear regression model.
3. compute correlation coefficients, partial and multiple correlation coefficients.
4. apply simple linear regression to real-life data.

Reference Books:

1. Newbold P., William L. C., Thorne B., 2021, Statistics for Business and Economics, Pearson
2. Larson R., Farber B., 2020, Elementary Statistics, Picturing World, Pearson
3. Triola M. F., 2020, Essentials of Statistics, Pearson
4. Elhance D. N, Elhance V, Aggarwal B. M, 2018, Fundamentals of Statistics, Kitab Mahal Daryaganaj New Delhi.

5. Goon A. M, Gupta M. K., and Dasgupta B, 2016, Fundamentals of Statistics Vol. I and II, Calcutta World Press.
6. Agarwal B. L,2015, Basic Statistics, New Age International P Ltd. Delhi.
7. Saxena S., Kapoor J. N.,2010, Mathematical Statistics, Sultan Chand and Sons, Delhi. Kapoor V. K, Gupta S. C, 2008, Fundamental of Mathematical Statistics, S Chand and Sons, Delhi.
8. Gupta S. P, Statistical Methods, 2002, Sultan Chand and Sons, New Delhi.
9. Grewal P. S, 1990, Methods of Statistical Analysis, Sterling Publishers.

B. Sc. Part-I (Semester-II)
BST-122: Discrete Probability Distributions (Credits: 02)
Theory: 30 Lectures (30 Hours)

Course Objectives: Students will be able to …

1. understand the fundamental concepts of discrete probability distributions.
2. differentiate between univariate discrete probability distributions and bivariate probability distributions.
3. analyze and interpret real-world data using discrete probability distributions.
4. apply probability theory to solve real-life problems.

Credits (Total Credits 2)	**SEMESTER – II** **BST 122** **DISCRETE PROBABILITY DISTRIBUTIONS**	**No.of hours per unit**
Unit – I	**Some Standard Discrete Probability Distribution (finite sample space)**	**(08)**
	1.1 Bernoulli Distribution: p.m.f., mean, variance, distribution of a sum of independent and identically distributed Bernoulli variables. 1.2 Discrete Uniform Distribution: p.m.f., mean and variance 1.3 Binomial Distribution: Binomial random variable, p.m.f. with parameters (n, p), Recurrence relation for successive probabilities, Computation of probabilities of different events, mean and variance, mode, skewness, p.g.f., Additive property of binomial variates. Examples. 1.4 Hypergeometric Distribution: p.m.f. with parameters (N, M, n), Computation of probability of different events, Recurrence relation for successive, probabilities, mean and variance of distribution assuming $n \leq N - M \leq M$, approximation of Hypergeometric to Binomial. Examples.	
Unit – II	**Some Standard Discrete Probability Distributions (countably infinite sample space)**	**(08)**

	2.1 Definition of a discrete random variable (defined on countably infinite sample space) 1.1 Poisson Distribution: Definition of Poisson with parameter λ. Mean, variance, probability generating function (p.g.f.). Recurrence relation for successive Probabilities, Additive property of Poisson distribution. Poisson distribution as a limiting case of Binomial distribution, examples. 2.2 Geometric Distribution: Definition of Geometric with parameter p. Mean, Variance, distribution function, p.g.f., Lack of memory property, examples. 2.3 Negative Binomial Distribution: Definition of Negative Binomial with parameters (k, p), Geometric distribution is a particular case of Negative Binomial distribution, Mean, Variance, p.g.f., Recurrence relation for successive probabilities, examples	
Unit – III	**Bivariate Discrete Probability Distribution**	**(07)**
	3.1 Definition of a bivariate discrete random variable (X, Y) on finite sample space, Joint p.m.f., and c.d.f., Properties of c.d.f. (without proof). 3.2. Computation of probabilities of events in the bivariate probability distribution, the concept of the marginal and conditional probability distribution, independence of two discrete r.v.s, Examples	
Unit – IV	**Mathematical Expectation (Bivariate Random Variable)**	**(07)**
	4.1 Mathematical Expectation: Definition of expectation of a function of r.v. in bivariate distribution, Theorems on expectations: (i) $E(X+Y) = E(X) + E(Y)$ (ii) $E(XY) = E(X)\cdot E(Y)$ when X and Y are independent, expectation and variance of a linear combination of two discrete r.v.s. 4.2 The definition of conditional mean, conditional variance, covariance and correlation coefficient, Cov(aX+bY,cX+dY), the distinction between uncorrelated and independent variables, joint p.g.f, proof of the p.g.f. of a sum of two independent r.v.as the product of their p.g.f. examples.	

Course Outcomes: Students will be able to …

1. explain the discrete probability distributions such as binomial, geometric, Poisson, and hypergeometric distributions.
2. compute mean, variance, and standard deviations for discrete probability distributions.
3. find the expectations of the bivariate probability distributions.
4. evaluate the strengths and limitations of different probability models and select appropriate models for specific applications.

Reference Books:

1. Ross S. , 2019, A First Course in Probability, Pearson
2. Elhance D. N, Elhance V, Aggarwal B. M, 2018, Fundamentals of Statistics, Kitab Mahal Daryaganaj New Delhi.
3. Goon A. M, Gupta M. K., and Dasgupta B, 2016, Fundamentals of Statistics Vol. I and II, Calcutta World Press.

4. Agarwal B. L, 2015 Statistics, New Age International P Ltd. Delhi.
5. Mukhopadhyay P, 2011, An Introduction to the Theory of Probability, World Scientific Publishing Company.
6. Feller W., 2008, An Introduction to Probability Theory and its Applications, Wiley
7. Gupta S. P, 2002, Statistical Methods, Sultan Chand and Sons, Delhi.
8. Grewal P. S, 1990, Methods of Statistical Analysis, Sterling Publishers.

B. Sc. Part-I (Semester-II)
BSP-123: Practical Course – II(Credits: 02)
60 Hours

Course Objectives: Students should be able to …

1. understand the basic concepts of regression analysis and correlation.
2. analyze and interpret data from regression and correlation techniques.
3. apply binomial distribution and Poisson distribution to solve real-life problems.
4. compute marginal and conditional probability distributions from bivariate probability distributions.

Credits (Total Credits 2)	**SEMESTER – II** **BSP 123** **Practical Paper - II** **(Based on Course BST 121 and BST 122)**	**No.of hours 60**
	List of Practicals	
	1. Correlation coefficient 2. Regression 3. Multiple correlation coefficients. 4. Partial correlation coefficients 5. Multiple regressions - I. 6. Multiple regressions - II. 7. Bivariate Discrete distribution I. (Marginal Distribution) 8. Bivariate Discrete distribution II (Conditional distribution) 9. Bivariate Discrete distribution III (Expectations /conditional expectations) 10. Bivariate Discrete distribution IV (variances / conditional variance) 11. Bivariate Discrete distribution V (covariance/correlation coefficient) 12. Applications of Binomial Distributions. 13. Applications of Poisson Distributions. 14. Applications of Hypergeometric Distribution. 15. Applications of Geometric and Negative Binomial Distributions. (*Note: Expt. No.4,5 8,9,10 are expected to solve using MS-EXCEL/ R-Software)	

Course Outcomes: Students will be able to …

1. apply concepts of the probability distributions
2. write p.m.f for some standard probability distributions.
3. compute and interpret the regression equation, regression coefficients, and correlation coefficients
4. analyze and interpret real-world data using regression and correlation techniques.

Reference Books :

1. Ross S. , 2019, A First Course in Probability, Pearson
2. Elhance D. N, Elhance V, Aggarwal B. M, 2018, Fundamentals of Statistics, Kitab Mahal Daryaganaj New Delhi.
3. Goon A. M, Gupta M. K., and Dasgupta B, 2016, Fundamentals of Statistics Vol. I and II, Calcutta World Press
4. Agarwal B. L, 2015, Statistics, New Age International P Ltd. Delhi.
5. Mukhopadhyay P.,2011, An Introduction to the Theory of Probability, World Scientific Publishing Company.
6. Saxena S., Kapoor J. N.,2010, Mathematical Statistics, Sultan Chand & Sons, Delhi.
7. Kapoor V. K, Gupta S. C, 2008, Fundamental of Mathematical Statistics, S Chand and Sons, Delhi.
8. Gupta S. P, 2002, Statistical Methods, Sultan Chand and Sons, New Delhi.
9. Grewal P. S, 1990, Methods of Statistical Analysis, Sterling Publishers.