

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 2024-25

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. It has been designed to meet the specific needs of B.Sc. Statistics students in accordance with the NEP 2020 guidelines. 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: **The students will be…**

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

Program-Specific Objectives: Students should…

1. Understand the basic concepts of data and the scale of measurement of data.
2. Enable comparison data by using measures of central tendency and dispersion.
3. Establish a relationship between two or more variables and predict the value by regression analysis.
4. Calculate probability and measures of probability for discrete and continuous distributions.
5. Make inferences about a population from sample data.
6. Design the process and extend the sampling.
7. Enable the use of statistical techniques in time series, industry, demography, etc.
8. Understand and develop the necessary computer skill in practical by using MS Excel, R-software, Python, SQL, MATLAB and Power BI.

Program-Specific Outcomes: The students will acquire the knowledge about…

1. Descriptive statistics and inferential statistics, sampling techniques.
2. Univariate, bivariate and multivariate data analysis.
3. Correlation and regression analysis.
4. Probability, discrete and continuous probability distribution, and various measures of these distributions.
5. Different methods of estimation about the inference of parameters of standard discrete and continuous probability distributions.
6. Applied statistics such as ‘Index Number’, ‘Time Series’, ‘Demography’, ‘Reliability Theory’, ‘Industrial Statistics’, ‘Design of Experiments’ and ‘Operation Research’.

1. TITLE: **Statistics**
2. YEAR OF IMPLEMENTATION: From **2024-25**
3. DURATION: **01 year**
4. PATTERN: **Semester**
5. MEDIUM OF INSTRUCTION: **English**
6. ELIGIBILITY**: 12th Science**
7. COURSE STRUCTURE: **As per NEP-2020 (2.0)**

Sem (Level)	Courses			OE	VSC/ SEC	AEC/ VEC/ IKS	OJT/ FP/ CEP/ CC/ RP	Total Credits	Degree/ Cum. Cr. MEME
	Course I	Course II	Course III						
Sem I (4.5)	DSC I (2) DSC II (2) DSC P I (2)	DSC I (2) DSC II (2) DSC P I (2)	DSC I (2) DSC II (2) DSC P I (2)	OE I (2)	-	IKS I (2) (Generic)	-	22	UG Certificate: 44
Sem II (4.5)	DSC III (2) DSC IV (2) DSC P II (2)	DSC III (2) DSC IV (2) DSC P II (2)	DSC III (2) DSC IV (2) DSC P II (2)	OE II (2)	-	VEC I (2) DEGG and IIC	-	22	
Credits	12	12	12	04	-	04	-	44	

VSC- Vocational Skill Courses, SEC- Skill Enhancement Courses, AEC- Ability Enhancement Courses, VEC- Value Education Courses, IKS- Indian Knowledge System, OE-Open Elective, T- Theory, P-Practical.

8. COURSE TITLES

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**	Statistics Practical – 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**	Statistics Practical – II BSP 123	**4**	**2**
2	Discrete Probability Distributions	BST 122		**2**			

9. EVALUATION STRUCTURE:

B. Sc. I Semester I

Course Name	Course Code	CCE	ESE	Total Marks	Credits
Descriptive Statistics – I	BST 111	20	30	50	2
Elementary Probability Theory	BST 112	20	30	50	2
Statistics Practical – I	BSP 113	20	30	50	2

B. Sc. I Semester II

Course Name	Course	CCE	ESE	Total Marks	Credits
Descriptive Statistics – II	BST 121	20	30	50	2
Discrete Probability Distributions	BST 122	20	30	50	2
Statistics Practical – II	BSP 123	20	30	50	2

➢ CONTINOUS COMPRHENSIVE EVALUATION (CCE)STRUCTURE

- Continuous Comprehensive Evaluation (CCE) of theory papers shall carry a weightage of 40%.
- **Activity:** For the internal evaluation of theory papers following activities will be adopted for CCE I & CCE II: class test/ open book test/ online course/ Industrial review/ Industrial Visit/ e learning video creation/ assignment/seminar/ case study/ fieldwork/ project.
- CCE III shall consist of multiple-choice questions.
- Each CCE will carry 10 marks for 2-credit theory papers and 20 marks for 4-credit theory papers, and the best two scores will be considered for final score.
- Internal evaluation of practical papers shall carry a weightage of 40%.
- For practical examinations, internal evaluation will be based on student performance, attendance, journal records, and viva voce.

10. OTHER FEATURES:

A) LIBRARY:

Reference books, Textbooks, Journals, and Periodicals are available in Institute and Departmental Library. (Separate reference lists are attached along with the respective course syllabus)

B) EQUIPMENT:

1. Specific equipment's in laboratory:

   70 Computers, LCD Projector, Visualizer, 04 Smart board etc.

2. Laboratory Software's:

   1. R-Software. 2. SPSS 3. MATLAB

   4. MINITAB 5. Python

Bachelor of Science (B. Sc.) Part I,
Semester-I Statistics

Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Statistics

Programme: B.Sc.	**Semester** – I
Type: DSC	**Marks:** 50
Credits: 2	**From:** A. Y. 2024-25

Name of the Course: DESCRIPTIVE STATISTICS –I (BST 111)

Course Objectives: Students should …

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

Course Outcomes: Students will be able to …

1) Calculate the arithmetic mean, Geometric mean and Harmonic Mean of data.
2) Differentiate between qualitative and quantitative data.
3) Construct appropriate graphs, diagrams from data and interpret the result.
4) Compute the Skewness, Kurtosis and index number.

Module	Title and Contents	Hrs.
Module -1:	**Data Collection, Presentation and Measures of Central Tendency** 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 and graphical presentation with real applications- Pie diagram, line diagram. Simple, multiple & partial bar diagrams, histograms, ogive curves. 1.3 Mathematical and positional averages: A.M, G.M, H.M, the relation between them and their properties. Median, Mode and Partition values.	08
Module -2:	**Measures of Dispersion, Moments, Skewness and Kurtosis** 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 Skewness: 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.	08

Module -3:	**Index Number** 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.	07
Module -4:	**Theory of Attributes** 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.	07

Reference Books :

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

Evaluation Pattern:

Total Marks: 50

Continuous Comprehensive Evaluation (20 Marks):	**End Semester Examination (30 Marks):**
• CCE - I: 10 Marks: Activity • CCE - II: 10 Marks: Activity • CCE – III: 10 Marks: MCQ Test (The Best of two will be considered for the final mark entry)	• Question -1: Solve the following questions (five questions of 2 Marks) • Question -2: Attempt any two questions. (Three questions of 10 marks) • Question -3: Attempt any four questions. (Six questions of 5 marks) (50 Marks converted to 30 marks)

Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Statistics

Programme: B.Sc.	**Semester** – I
Type: DSC	**Marks:** 50
Credits: 2	**From:** A. Y. 2024-25

Name of the Course: ELEMENTARY PROBABILITY THEORY (BST 112)

Course Objectives: Students should …

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 on probability.

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.

Module	Title and Contents	Hrs.
Module -1:	**Probability** 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.	08
Module -2:	**Conditional Probability and Independence of Events** 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.	08

Module -3:	**Univariate Probability Distributions (Finite sample space)** 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 3.3 Mode of a univariate discrete probability distribution.	07
Module -4:	**Mathematical Expectation (Univariate random variable)** 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.	07

Reference Books :

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

Evaluation Pattern:

Total Marks: 50

Continuous Comprehensive Evaluation (20 Marks):	**End Semester Examination (30 Marks):**
• CCE - I: 10 Marks: Activity • CCE - II: 10 Marks: Activity • CCE – III: 10 Marks: MCQ Test (The Best of two will be considered for the final mark entry)	• Question -1: Solve the following questions (five questions of 2 Marks) • Question -2: Attempt any two questions. (Three questions of 10 marks) • Question -3: Attempt any four questions. (Six questions of 5 marks) (50 Marks converted to 30 marks)

Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Statistics

Programme: B.Sc.	**Semester** – I
Type: DSC P-I	**Marks:** 50
Credits: 2	**From:** A. Y. 2024-25

Name of the Course: STATISTICS PRACTICAL – I (BSP-113)

Practical Batch: 20 Students/ Batch

Course Objectives: Students should …

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.

Course Outcomes: Students will be able to …

1) Draw diagrams and graphs for frequency distribution
2) Calculate moments, skewness, and kurtosis.
3) Compute the probabilities of events and conditional probabilities.
4) Summarize data using measures of central tendency and dispersion.

List of Experiments	**Hrs.**
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	60

Reference Books :

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

Evaluation Pattern:

Total Marks: 50

Continuous Comprehensive Evaluation (20 Marks):	**End Semester Examination (30 Marks):**
• Journal : 10 Marks • Students' Performance: 05 Marks • Viva: 05 Marks	• Section I: Attempt any TWO questions (10 marks each) • Section II: Attempt any TWO questions (05 marks each)

Bachelor of Science (B. Sc.) Part I,
Semester-II Statistics

Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Statistics

Programme: B.Sc.	**Semester** – II
Type: DSC	**Marks:** 50
Credits: 2	**From:** A. Y. 2024-25

Name of the Course: DESCRIPTIVE STATISTICS –II (BST 121)

Course Objectives: Students should…

1) Compute the correlation of bivariate data.
2) Understand the concept of simple and multiple correlation and regression.
3) Interpret the relationship between two numeric variables.
4) Build a Simple Linear regression model to predict the response variable.

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.

Module	Title and Contents	Hrs.
Module -1:	**Correlation** 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.	08
Module -2:	**Regression** 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.	08

	2.4 Interchanging the role of X and Y we can study some more properties (1) $bxy \times byx = r^2$ (2) $bxy \times byx \leq 1$ (3) $(bxy + byx)/2 \geq r$ (4) Effect of change of origin and scale on regression coefficients, (5) The point of intersection of two regression lines. 2.5 Angle between two regression lines.	
Module -3:	**Multiple and Partial Correlation (for trivariate data only)** 3.1 Concept of multiple correlation. Definition of multiple correlation coefficient $R_{i.jk}$, derivation of a formula for multiple correlation coefficient. Properties of multiple correlation coefficient; i) $0 \leq R_{i.jk} \leq 1$, (ii) $R_{i.jk} > \lvert r_{ij} \rvert$, (iii) $R_{i.jk} > \lvert r_{ik} \rvert$ $i = j = k = 1, 2, 3$. $i \neq j$, $i \neq k$. Interpretation of $R_{i.jk}=1$, $R_{i.jk}= 0$. 3.2 Coefficient of multiple determination $R^2_{1.23}$ .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) $b_{ij.k} \cdot b_{ji.k} = r^2$, relation between simple, multiple, and partial correlations. Illustrative Examples.	07
Module -4:	**Multiple Linear Regression (for trivariate data only)** 4.1 Concept of multiple linear regression, Planes of regression, Yule's notation, correlation matrix. Fitting of regression planes by a method of least square. 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.	07

Reference Books :

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

Evaluation Pattern:

Total Marks: 50

Continuous Comprehensive Evaluation (20 Marks):	**End Semester Examination (30 Marks):**
• CCE - I: 10 Marks: Activity • CCE - II: 10 Marks: Activity • CCE – III: 10 Marks: MCQ Test (The Best of two will be considered for the final mark entry)	• Question -1: Solve the following questions (five questions of 2 Marks) • Question -2: Attempt any two questions. (Three questions of 10 marks) • Question -3: Attempt any four questions. (Six questions of 5 marks) (50 Marks converted to 30 marks)

Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Statistics

Programme: B.Sc.	**Semester** – II
Type: DSC	**Marks:** 50
Credits: 2	**From:** A. Y. 2024-25

Name of the Course: DISCRETE PROBABILITY DISTRIBUTIONS (BST 122)

Course Objectives: Students should …

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.

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.

Module	Title and Contents	Hrs.
Module -1:	**Some Standard Discrete Probability Distribution (finite sample space)** 1.1 Bernoulli Distribution: p.m.f., mean, variance, additive property of iid 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 distribution. Examples.	08
Module -2:	**Some Standard Discrete Probability Distributions (countably infinite sample space)** 2.1 Definition of a discrete random variable (defined on countably infinite sample space) 2.2 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. 2.3 Geometric Distribution: Definition of Geometric distribution with parameter p. Mean,	08

	Variance, distribution function, p.g.f., Lack of memory property, examples. 2.4 Negative Binomial Distribution: Definition of Negative Binomial distribution 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.	
Module -3:	**Bivariate Discrete Probability Distribution** 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., Examples	07
Module -4:	**Mathematical Expectation (Bivariate Random Variable)** 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. 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, p.g.f. of a sum of two independent r.v., examples.	07

Reference Books :

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

Evaluation Pattern:

Total Marks: 50

Continuous Comprehensive Evaluation (20 Marks):	**End Semester Examination (30 Marks):**
• CCE - I: 10 Marks: Activity • CCE - II: 10 Marks: Activity • CCE – III: 10 Marks: MCQ Test (The Best of two will be considered for the final mark entry)	• Question -1: Solve the following questions (five questions of 2 Marks) • Question -2: Attempt any two questions. (Three questions of 10 marks) • Question -3: Attempt any four questions. (Six questions of 5 marks) (50 Marks converted to 30 marks)

Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Statistics

Programme: B.Sc.	**Semester** – II
Type: DSC P-II	**Marks:** 50
Credits: 2	**From:** A. Y. 2024-25

Name of the Course: STATISTICS PRACTICAL – II (BSP-123)

Practical Batch: 20 Students/ Batch

Course Objectives: Students should …

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.

Course Outcomes: Students will be able to …

1) Compute and interpret simple correlation and regression measures for bivariate data.
2) Apply multiple and partial correlation and multiple regression techniques for multivariate data analysis.
3) Evaluate marginal, conditional, and joint properties of bivariate discrete probability distributions.
4) Use Binomial, Poisson, Hypergeometric, Geometric, and Negative Binomial distributions to model and solve practical statistical problems.

List of Experiments	**Hrs.**
1) Correlation 2) Regression 3) Multiple Correlation 4) Partial Correlation 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.	60

Reference Books :

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

Evaluation Pattern:

Total Marks: 50

Continuous Comprehensive Evaluation (20 Marks):	**End Semester Examination (30 Marks):**
• Journal : 10 Marks • Students' Performance: 05 Marks • Viva: 05 Marks	• Section I: Attempt any TWO questions (10 marks each) • Section II: Attempt any TWO questions (05 marks each)