



Abeda Inamdar Senior College

Of Arts, Science and Commerce, Camp, Pune-1

(Autonomous) Affiliated to SavitribaiPhule Pune University

NAAC accredited 'A' Grade

F.Y.B.Sc Statistics

(CBCS – Autonomy 21 Pattern)

STRUCTURE OF F. Y.B.SC. STATISTICS

Structure of the course for three years and the pattern of examination and question papers are as specified below

Semester	Paper code	Paper	Paper title	Credits	Marks		
					CIA	ESE	Total
1	21SBST111	I	Descriptive Statistics-I	2	20	30	50
	21SBST112	II	Discrete Probability Distributions-I	2	20	30	50
	21SBST113	III	Statistics Practical-I	1.5	20	30	50
2	21SBST121	I	Descriptive Statistics-II	2	20	30	50
	21SBST122	II	Discrete Probability Distributions-II	2	20	30	50
	21SBST123	III	Statistics Practical-II	1.5	20	30	50

CONTINUOUS INTERNAL EVALUATION (CIE) FOR B.Sc

For Continuous Internal Evaluation (CIE), Evaluation will be done continuously. Internal assessment will be of **20** marks for a paper of 50 Marks. These 20 marks are divided as follows:

- a) There will be compulsory Test on Demand MCQ Examination of **20** marks of each subject which would be converted into **05 Marks**.
- b) Two Class Tests 10 Marks Each. Converted to 05 Marks.
- c) Mid Sem Exam of 20 Marks converted to 05 Marks
- d) Participation in two activities at department/ college level 05 Marks
- e) In case of students failing to score under category (d), the attendance can be considered to give marks.
- f) There will be a compulsory Mock Practical Examination, Viva Voce of subjects mentioned in for **20 Marks**.
- g) The subject teacher needs to adopt anyone out of the following methods for internal assessment:

Table 7: Methods of Internal Assessment

Written exam	Quiz
Presentations	Projects
Assignments	Tutorials
Oral examination	Open Book Test and Others

- 1) **DURATION OF SEMESTER END EXAMINATION (FINAL):** Question papers will be set for Thirty Marks (One and Half Hour Duration) for Theory and Thirty Marks (Three and Half Hour) for Practical Examination.

Table 8: Criteria for Paper Setting of Internal Assessment and Semester End Examination

Knowledge	Understanding	Applications, Analysis, Problem Solving	Total Marks
50%	25%	25%	100%

- 2) **STANDARD OF PASSING:**

- A student must obtain a minimum of 40% marks in Continuous Internal Evaluation (CIE), and minimum 40% marks in Practical Examination and Semester End Examination (External Examination).

- Passing separately in Internal Assessment, Practical Examination and Semester End Examination is compulsory.
- The student has to secure at least 40 marks (40%) in the total assessment (50 Marks) for each subject.
- Students who are failed in Continuous Internal Evaluation (CIE) of any semester can reappear for the same in the next semester.

PAPER-WISE DETAILED SYLLABUS

Course/ Paper Title	Descriptive Statistics – I
Course Code	21SBST-111
Semester	I
No. of Credits	2 (2.5 Units equivalent to 1 Credit)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To enrich students' knowledge and train them in pure Statistics.
2.	To present the historical developments in Statistics to the students.
3.	To acquaint students with some basic concepts in Statistics
4.	To familiarize students with elementary statistical methods of analysis of data
5.	To introduce the computation of various measures of central tendency, dispersion, skewness and kurtosis.
6.	To acquaint students with the analysis of data pertaining to attributes and to interpret the results

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	Students will be acquainted with the different areas of Statistics

2.	Students will become aware about the role of Statistics in various fields.
3.	Students will be acquainted with the data analysis tools and interpretation of the results

Syllabus

Unit No	Title with Contents	No. of Lectures
Unit I	Introduction to Statistics	2
	1. Meaning of Statistics as a Science.	1
	2. Importance of Statistics.	
	3. Scope of Statistics: In the field of Industry, Biological sciences, Medical sciences, Economics, Social Sciences, Insurance, Psychology.	
	4. Statistical organizations in India and their functions: CSO, ISI, NSSO, IIPS (Devnar, Mumbai).	1
	5. Statistical Heritage (Indian Perspective: Dr. V. S. Huzurbazar, Dr. P.C. Mahalnobis, Dr. P. V. Sukhatme, Dr. C. R. Rao).	
Unit II	Population and Sample	04
	1. Types of characteristics: Attributes: Nominal scale, ordinal scale, Variables: Interval scale, ratio scale, discrete and continuous variables, difference between linear scale and circular scale.	1
	2. Types of data: (i) Primary data, Secondary data. (ii) Cross-sectional data, time series data.	1
	3. Notion of a statistical population: Finite population, infinite population, homogeneous	2

	<p>population and heterogeneous population. Notion of a sample and a random sample. Methods of sampling (Description only): Simple random sampling with and without replacement (SRSWR and SRSWOR), stratified random sampling, systematic sampling, cluster sampling and two-stage sampling.</p>	
Unit III	Summary Statistics	14
	<p>1. Presentation of Data. Interpretation of Data from table and graph. Data validation.</p> <p>2. Frequency Classification: Raw data and its classification, ungrouped frequency distribution, grouped frequency distribution, cumulative frequency distribution, inclusive and exclusive methods of classification, Open end classes, and relative frequency distribution.</p> <p>3. Measures of Central Tendency:</p> <p>(i) Concept of central tendency of statistical data, Statistical averages, characteristics of a good statistical average.</p> <p>(ii) Arithmetic Mean (A.M.): Definition, effect of change of origin and scale, combined mean of a number of groups, merits and demerits, trimmed arithmetic mean.</p> <p>(iii) Mode and Median: Definition, formulae (for ungrouped and grouped data), merits and demerits. Empirical relation between mean, median and mode.</p> <p>(iv) Partition Values: Quartiles, Deciles and Percentiles (for ungrouped and grouped data), BoxPlot.</p> <p>(v) Geometric Mean (G.M.): Definition, formula, merits and demerits. Harmonic Mean (H.M.): Definition. Formula, merits and demerits. Order relation between arithmetic mean, geometric mean, harmonic mean.</p> <p>4. Measures of Dispersion:</p>	<p>2</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>

	(vi) Concept of dispersion, characteristics of good measure of dispersion.	1
	(vii) Range, Semi-interquartile range (Quartile deviation): Definition, merits and demerits, Mean deviation: Definition, merits and demerits, minimality property (without proof), Variance and standard deviation: Definition, merits and demerits, effect of change of origin and scale, combined variance for n groups (derivation for two groups).	2
	(viii) Mean squared deviation: Definition, minimality property of mean squared deviation (with proof), Measures of dispersion for comparison: coefficient of range, coefficient of quartile deviation and coefficient of mean deviation, coefficient of variation(C.V.)	2
Unit IV	Moments, Skewness and Kurtosis	08
	1. Raw moments for ungrouped data. Central moments for ungrouped and grouped data, Effect of change of origin and scale. Relations between central moments and raw moments, upto 4 th order (without proof).	3
	2. Concept of skewness of frequency distribution, positive skewness, negative skewness, symmetric frequency distribution. Bowley's coefficient of skewness: Bowley's coefficient of Skweness lies between -1 to 1 (with proof), interpretation using Boxplot. Karl Pearson's coefficient of skewness. Measures of skewness based on moments.	3
	3. Concepts of kurtosis, leptokurtic, mesokurtic and platykurtic frequency distributions. Measures of kurtosis based on moments.	2
Unit V	Theory of Attributes	08
	1. Attributes: Concept of a Likert scale, classification, notion of manifold classification, dichotomy, class-	4

	frequency, order of a class, positive class-frequency, negative class frequency, ultimate class frequency, relationship among different class frequencies (two attributes), and dot operator to find the relation between frequencies, fundamental set of class frequencies.	
	2. Consistency of data upto 2 attributes.	1
	3. Concepts of independence and association of two attributes. Yule's coefficient of association (Q), $-1 \leq Q \leq 1$, interpretation.	3

References:

- 1) Agarwal, B. L. (2003). Programmed Statistics, Second Edition, New Age International Publishers, New Delhi.
- 2) Ghosh, J. K. and Mitra, S. K., Parthasarthy, K. R. (1993). Glimpses of India's Statistics Heritage, Wiley publishing Co.
- 3) Goon, A. M., Gupta, M. K. and Dasgupta, B. (1983). Fundamentals of Statistics, Vol. 1, Sixth Revised Edition, The World Press Pvt. Ltd., Calcutta.
- 4) Gupta, S. C. and Kapoor, V. K. (1983). Fundamentals of Mathematical Statistics, Eighth Edition, Sultan Chand and Sons Publishers, New Delhi.
- 5) Gupta, S. C. and Kapoor, V. K. (1997). Fundamentals of Applied Statistics, Third Edition, Sultan Chand and Sons Publishers, New Delhi.
- 6) Neil A. Weiss (2016). Introductory Statistics, Tenth Edition, Pearson.
- 7) Purohit, S. G., Gore S. D., Deshmukh S. R. (2008). Statistics Using R, Narosa Publishing House, New Delhi.
- 8) Sarma, K.V.S.(2001). Statistics Made it Simple: Do it yourself on PC. Prentice Hall of India, New Delhi.
- 9) Snedecor G. W. and Cochran W. G.(1989). Statistical Methods, Eighth Ed. East-West Press.

REFERENCE WEBSITES FOR PAPER I AND PAPER II:

1. www.stats.unipune.ac.in[100 Datasets for Statistics Education by Dr. Anil P. Gore, Dr. Mrs. S. A. Paranjpe and Madhav B. Kulkarni available in ISPS folder)].
1. www.freestatistics.tk(National Statistical Agencies)
2. www.psychstat.smsu.edu/sbk00.htm(Online book)
3. www.bmj.bmjournals.com/collections/statsbk/index.shtml
4. www.statweb.calpoly.edu/bchance/stat-stuff.html
5. www.amstat.org/publications/jse/jse-data-archive.html(International journal on teaching and learning of statistics)
6. www.amstat.org/publications/chance(Chance magazine)
7. www.statsci.org/datasets.html(Datasets)
8. www.math.uah.edu/stat(Virtual laboratories in Statistics)
9. www.amstat.org/publications/stats(STATS: the magazine for students of Statistics)
10. www.stat.ucla.edu/cases(Case studies in Statistics).
11. www.statsoft.com
12. www.statistics.com
13. www.indiastat.com
14. www.unstat.un.org
15. www.stat.stanford.edu
16. www.statpages.net
17. www.wto.org
18. www.censusindia.gov.in
19. www.mospi.nic.in
20. www.statisticsofindia.in
21. www.nationmaster.com (Population studies)



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F.Y.B.Sc Statistics

(CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Discrete Probability Distributions-I
Course Code	21SBST-112
Semester	I
No. of Credits	2 (2.5 Units equivalent to 1 Credit)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To introduce the students with the basic concepts of probability theory.
2.	To acquaint students with axiomatic theory of probability, concept of random variable, probability distribution (univariate and bivariate) discrete random variables, expectation and moments of probability distribution
3.	To acquaint students to distinguish between random and non-random experiments.
4.	To familiarize students with the probability distribution of random variable (one or two dimensional) in the given situation.

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	Students will be acquainted with the calculations of the probabilities of events.
2.	Students will become aware about the role of Statistics in the situation of uncertainty.
3.	Students will be acquainted with various available probability models.

Syllabus

Unit No	Title with Contents	No. of Lectures
Unit I	Basics of Probability	06
	1. Experiments/Models, Ideas of deterministic and non-deterministic models. Random Experiment, concept of statistical regularity.	1
	2. Definitions of - Sample space, Discrete sample space: finite and countably infinite, Event, Elementary event, Complement of an event. Certain event and Impossible event Concept of occurrence of an event. Algebra of events and its representation in set theory notation. Occurrence of 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.	2
	3. Classical definition of probability and its limitations.	

	<p>Probability model, probability of an event, equiprobable and non-equiprobable sample space,</p> <p>4. Axiomatic definition of probability. Theorems and results on probability with proofs based on axiomatic definition such as $P(A \cup B) = P(A) + P(B) - P(A \cap B)$. Generalization $P(A \cup B \cup C), 0 \leq P(A) \leq 1, P(A) + P(A^c) = 1, P(\Phi) = 0, P(A) \leq P(B)$ when $A \subset B$, Boole's inequality.</p>	<p>1</p> <p>2</p>
Unit II	Conditional Probability and Bayes' Theorem	05
	<p>1. Definition of conditional probability of an event. Results on conditional probability. Definition of independence of two events $P(A \cap B) = P(A) \cdot P(B)$, Pairwise independence and mutual independence for three events, Multiplication theorem $P(A \cap B) = P(A) \cdot P(B A)$. Generalization to $P(A \cap B \cap C)$.</p> <p>2. Partition of the sample space, prior and posterior probabilities. Proof of Bayes' theorem. Applications of Bayes' theorem in real life.</p>	<p>3</p> <p>2</p>
Unit III	Univariate Probability Distributions (on Discrete Sample Space)	03
	<p>1. Concept and definition of a discrete random variable. Probability mass function (p.m.f.) and cumulative distribution function (c.d.f.), $F(\cdot)$ of discrete random variable, properties of c.d.f..</p> <p>2. Mode and median of a univariate discrete probability distribution.</p>	<p>2</p> <p>1</p>
Unit IV	Mathematical Expectation (Univariate Random Variable)	08
	<p>1. Definition of expectation (Mean) of a random variable, expectation of a function of a random</p>	<p>2</p>

	<p>variable, m.g.f. and c.g.f. Properties of m.g.f and c.g.f.</p> <p>2. Definitions of variance, standard deviation (s.d.) and Coefficient of variation (c.v.) of univariate probability distribution, effect of change of origin and scale on mean, variance and s.d.</p> <p>3. Definition of raw, central and factorial raw moments of univariate probability Distributions and their interrelations (without proof).</p> <p>4. Coefficients of skewness and kurtosis based on moments.</p>	<p>2</p> <p>2</p> <p>2</p>
Unit V	Some Standard Discrete Probability Distributions	14
	<p>1. Degenerate distribution (one point distribution), mean and variance.</p> <p>2. Uniform discrete distribution, p.m.f., c.d.f., mean, variance, real life situations.</p> <p>3. Bernoulli Distribution: p.m.f., notation and mean, variance.</p> <p>4. Binomial Distribution: p.m.f., notation. Recurrence relation for successive probabilities, computation of probabilities of different events, mean, variance, m.g.f. and c.g.f. moments, skewness (comments when $p = 0.5$, $p > 0.5$, $p < 0.5$). Situations where this distribution is applicable. Additive property for binomial distribution.</p> <p>5. Hypergeometric Distribution: Necessity and importance of Hypergeometric distribution, capture-recapture method. p.m.f., notation.</p> <p>6. Computation of probability, situations where this distribution is applicable, binomial approximation to hypergeometric probabilities, statement of mean and variance of the distribution (Derivation is not expected).</p>	<p>1</p> <p>1</p> <p>2</p> <p>4</p> <p>3</p> <p>3</p>

References:

1. Agarwal B.L.(2003).Programmed Statistics, second edition, New Age International Publishers, New Delhi.
2. Gupta,S.C.and Kapoor,V.K.(1983).Fundamentals of Mathematical Statistics, Eighth Edition, Sultan Chand and Sons Publishers, New Delhi.
3. Hoel P. G. (1971). Introduction to Mathematical Statistics, John Wiley and Sons, New York.
4. Hogg, R.V. and Craig R.G.(1989).Introduction to Mathematical Statistics, Ed. Mac Millan Publishing Co., New York.
5. Mayer,P.(1972). Introductory Probability and Statistical Applications, Addison Wesley Publishing Co., London.
6. Mood,A.M.and Graybill, F.A. and Boes D.C. (1974).Introduction to the Theory of Statistics, Ed. 3, McGraw Hill Book Company.
7. Rao, V L S Prakash (2008).First Course in Probability and Statistics, New Age International Publishers, New Delhi.
8. Ross S.(2002).A First Course in Probability, Sixth Edition, Pearson Education, Inc.& Dorling Kindersley Publishing, Inc.



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F.Y.B.Sc Statistics

(CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Statistics Practical – I
Course Code	21SBST-113
Semester	I
No. of Credits	1.5

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To use various graphical and diagrammatic techniques and interpretation
2.	To analyse data pertaining to discrete and continuous variables and to interpret the results
3.	To compute various measures of central tendency, dispersion, skewness and kurtosis
4.	To interpret summary statistics of computer output
5.	To summarize and analyze the data using computers

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	Students will be able to use various graphical and diagrammatic

	techniques and interpretation
2.	Students will be able to compute various measures of central tendency, dispersion, skewness and kurtosis
3.	Students will be acquainted with the usage of computers for data analysis

S.No.	Title of the experiment	No. of Practicals
1	Diagrammatic representation of statistical data: simple and subdivided bar diagrams, multiplebar diagram, percentage bar diagram, piediagram.	1
2	Diagrammatic representation of statistical data: simple and subdivided bar diagrams, multiplebar diagram, percentage bar diagram, piediagram. using Ms-Excel/Any statistical software	1
3	Graphical representation of statistical data: Histogram, frequency curve and ogive curves. Determination of mode and median graphically.	1
4	Graphical representation of statistical data: Histogram, frequency curve and ogive curves. Determination of mode and median graphically. Using Ms-Excel/Any statistical software	1
5	Tabulation	1
6	Data Interpretation from various graphs and diagrams.	1
7	Use of random number tables to draw SRSWOR, SRSWR, stratified sample and systematic sample.	1
8	Use of random number tables to draw	1

	SRSWOR, SRSWR, stratified sample and systematic sample. Using MS-Excel/Any statistical software	
9	Computation of measures of central tendency and dispersion (ungrouped data). Use of an appropriate measure and interpretation of results and computation of partition values.	1
10	Computation of Measures of skewness and kurtosis.	1
11	Computation of Measures of skewness and kurtosis, Boxplot.	1
12	Computation of summary statistics using Ms-Excel/Any statistical software	1



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F.Y.B.Sc Statistics

(CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Descriptive Statistics – II
Course Code	21SBST-121
Semester	II
No. of Credits	2 (2 Units equivalent to 1 Credit)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To acquaint students with the concept of bivariate data
2.	To present to the students the methods of analysis of bivariate data and the related developments in Statistics.
3.	To acquaint students with computation of correlation coefficient for bivariate data and interpret it
4.	To familiarize students with fitting of linear, quadratic and exponential curves to the bivariate data.
5.	To introduce the students with the concept of index numbers, a concept from Econometrics.

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	Students will be acquainted with the data analysis of bivariate data
2.	Students will become aware about the correlation and regression analysis.
3.	Students will be acquainted with the computations of correlation and regression analysis techniques and interpretation of the results

Syllabus

Unit No	Title with Contents	No. of Lectures
Unit I	Correlation Analysis	10
	<p>1. Bivariate data, Scatter diagram and interpretation. Concept of correlation between two variables, positive correlation, negative correlation, no correlation. Covariance between two variables: Definition, computation, effect of change of origin and scale.</p>	3
	<p>2. Karl Pearson's coefficient of correlation (r): Definition, computation for ungrouped data and interpretation. Properties: (i) $-1 \leq r \leq 1$ (with proof), (ii) Effect of change of origin and scale (with proof).</p>	4
	<p>3. Spearman's rank correlation coefficient: Definition, derivation of formula, computation and interpretation (without ties). In case of ties, compute Karl Pearson's correlation coefficient between ranks. (Spearman's rank correlation coefficient formula with correction for ties not expected.)</p>	3
Unit II	Fitting of Linear Regression Equation	10

	<ol style="list-style-type: none"> 1. Concept of dependent and independent variables. 2. Identification of response and predictor variables and relation between them. 3. Meaning of regression, difference between correlation and regression, Connection between correlation and regression. Fitting of line $Y = a + bX$. a and b are estimated using least square method. Regression coefficient. Explained and unexplained variation, coefficient of determination, standard error of an estimate of line of regression 	<p>2</p> <p>2</p> <p>6</p>
Unit III	Fitting of Curves	08
	<ol style="list-style-type: none"> 1. Necessity and importance of drawing second degree curve. 2. Fitting of second degree curve $Y = a + bX + cX^2$, 3. Fitting of exponential curves of the type $Y = ax^b$. In all these curves constants a, b, c are found out by the method of least squares. 	<p>2</p> <p>3</p> <p>3</p>
Unit IV	Index Numbers	08
	<ol style="list-style-type: none"> 1. Definition and Meaning, Introduction and scope of Index Numbers. Various types of Index Numbers like Human Development Index, Happiness Index, BSE sensitivity Index. 2. Problems/considerations in the construction of index numbers. 3. Laspeyre's, Paasche's and Fisher's Index numbers. 4. Consumer price index number: Considerations in its construction. Methods of construction of consumer price index number - (i) family budget method (ii) aggregate expenditure method. 5. Shifting of base, splicing, deflating, purchasing power (Only introduction). 	<p>2</p> <p>1</p> <p>2</p> <p>2</p> <p>1</p>

References:

1. Agarwal, B. L. (2003). Programmed Statistics, Second Edition, New Age International Publishers, New Delhi.
2. Goon,A.M., Gupta,M.K. and Dasgupta, B.(1983).Fundamentals of Statistics, Vol.1, Sixth Revised Edition, The World Press Pvt. Ltd., Calcutta.
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4. Gupta, S.C.and Kapoor,V.K.(1997). Fundamentals of Applied Statistics, Third Edition, Sultan Chand and Sons Publishers, New Delhi.
5. Montgomery D.C, Peck E.A., Vining G.G.(2006).Introduction to Linear Regression Analysis, John Wiley and Sons
6. Purohit S.G., Gore S.D., Deshmukh S.R. (2008).Statistics Using R, Narosa Publishing House, New Delhi.
7. Sarma, K.V.S. (2001).Statistics Made it Simple: Do it yourself on PC. Prentice Hall of India, New Delhi.
8. Snedecor G.W. and Cochran W.G. (1989).Statistical Methods, Eighth Ed. East-West Press, Pvt Ltd. New Delhi.



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F.Y.B.Sc Statistics

(CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Discrete Probability Distributions-II
Course Code	21SBST-122
Semester	II
No. of Credits	2 (2.5 Units equivalent to 1 Credit)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To introduce the students with the concept of bivariate discrete probability distributions.
2.	To acquaint students with the application of standard discrete probability distributions defined on countable infinite sample space to different real life situations.
3.	To acquaint students to with the inter-relationship between different discrete probability distributions.
4.	To familiarize students with the concept of mathematical expectation of bivariate discrete random variable.

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	Students will be acquainted with the understanding of the bivariate probability distributions.
2.	Students will become aware about the computation of bivariate probabilities.
3.	Students will be acquainted with computation of mathematical expectation in case of bivariate discrete random variables.

Syllabus

Unit No	Title with Contents	No. of Lectures
Unit I	Some Standard Discrete Probability Distributions	16
	1. Poisson distribution: p.m.f., m.g.f. and c.g.f. Moments, mean, variance, skewness and kurtosis. Situations where this distribution is applicable. Additive property for Poisson distribution.	8
	2. Geometric distribution: p.m.f., Mean, variance, m.g.f. and c.g.f. Situations where this distribution is applicable. Lack of memory property.	8
Unit II	Bivariate Discrete Probability Distribution	06
	1. Definition of two-dimensional discrete random variable, its joint p.m.f. and its distribution function and their properties.	1
	2. Computation of probabilities of events in bivariate probability distribution.	2
	3. Concepts of marginal and conditional probability distributions.	2
	4. Independence of two discrete random variables based on joint and marginal p.m.f.s	1
Unit III	Mathematical Expectation (Bivariate Random Variable)	14

1.	Definition of raw and central moments, m.g.f, c.g.f.	2
2.	Theorems on expectations of sum and product of two jointly distributed random variables.	4
3.	Conditional expectation.	2
4.	Definitions of conditional mean and conditional variance.	2
5.	Definition of covariance, coefficient of correlation, independence and un-correlatedness of two variables.	2
6.	Variance of linear combination of variables $\text{Var}(aX+bY)$.	2

References:

1. Agarwal B. L. (2003). Programmed Statistics, second edition, New Age International Publishers, New Delhi.
2. Gupta, S.C. and Kapoor, V. K. (1983). Fundamentals of Mathematical Statistics, Eighth Edition, Sultan Chand and Sons Publishers, New Delhi.
3. Hoel P. G. (1971). Introduction to Mathematical Statistics, John Wiley and Sons, NewYork.
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5. Mayer, P. (1972). Introductory Probability and Statistical Applications, Addison Wesley Publishing Co., London.
6. Mood A.M. and Graybill F.A.and Boes D.C.(1974).Introduction to the Theory of Statistics, Ed. 3, McGraw Hill Book Company.
7. Ross S. (2002). A First Course in Probability, Sixth Edition, Pearson Education, Inc.and Dorling Kindersley Publishing, Inc.

Reference Websites for Paper I and Paper II:

1. www.stats.unipune.ac.in [100Datasets for Statistics Education by Dr. Anil P. Gore, Dr. Mrs. S. A. Paranjpe and Madhav B. Kulkarni available in ISPS folder].

22. www.freestatistics.tk(NationalStatisticalAgencies)
23. www.psychstat.smsu.edu/sbk00.htm(Onlinebook)
24. www.bmj.bmjournals.com/collections/statsbk/index.shtml
25. www.statweb.calpoly.edu/bchance/stat-stuff.html
26. www.amstat.org/publications/jse/jse-data-archive.html(International journal on teaching and learning of statistics)
27. www.amstat.org/publications/chance(Chancemagazine)
28. www.statsci.org/datasets.html(Datasets)
29. www.math.uah.edu/stat(VirtuallaboratoriesinStatistics)
30. www.amstat.org/publications/stats(STATS:themagazineforstudentsofStatistics)
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38. www.wto.org
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41. www.statisticsofindia.in
42. www.nationmaster.com (Population studies)



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NAAC accredited 'A' Grade **M. C. E. Society's**

F.Y.B.Sc Statistics

(CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Statistics Practical – II
Course Code	21SBST-123
Semester	II
No. of Credits	1.5

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To compute correlation coefficient, regression coefficients
2.	To compute probabilities of bivariate distributions
3.	To fit binomial and Poisson distributions to the given data
4.	To compute probabilities of bivariate distributions
5.	To use computer software to fit the curves to the given numerical data

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	Students will be able to correlation coefficient along with graphical representation of correlation with interpretation
2.	Students will be able to fit line of regression to the given data
3.	Students will be acquainted with the fitting of curves as a part of data analysis

S.No.	Title of the experiment	No. of Practicals
1	Scatter diagram, correlation coefficient (ungrouped data).	1
2	Fitting of line of regression of Y on X	1
3	Fitting of second degree curve	1
4	Fitting of exponential curve of the type $Y = ax^b$	1
5	Fitting of Binomial distribution and computation of expected frequencies.	1
6	Applications of Binomial and hypergeometric distributions.	1
7	Fitting of Poisson distribution and computation of expected frequencies.	1
8	Index numbers.	1
9	Scatter diagram, correlation coefficient using Ms-excel/ Any statistical software & interpretation.	1
10	Fitting of a line of regression using Ms-excel / Any statistical software & interpretation.	1
11	Fitting of second degree curve using Ms-excel / Any statistical software & interpretation.	1
12	Fitting of exponential curve using Ms-excel / Any statistical software & interpretation.	1